Oil and Gas Investor

SHALE OUTLOOK

Stakeholder demands, booming inflation limit potential industry profit, growth

CARBON CAPTURE CATALYST

Geopolitical tensions boost momentum driving emissions reduction trends

BOLD AND DECISIVE

CEO Rick Muncrief on dealmaking and diversifying Devon Energy

50 YEARS HARTENERGY SINCE 1973

HARTENERGY.COM

JANUARY 2023

CENTERED IN TRUST AND LONG-TERM RELATIONSHIPS

Stephens maintains a long history of advising oil & gas companies. In recent years, we have been particularly active advising mineral & royalty businesses across a wide variety of transaction types.

Recent Minerals & Royalties Transactions

UNDISCLOSED	UNDISCLOSED	UNDISCLOSED	UNDISCLOSED	UNDISCLOSED
Haynesville Minerals Platform	**Diversified Minerals Aggregator**	**Midland Basin Operator**	**Eagle Ford Minerals Platform**	NOBLE ROYALTIES, INC.
EQUITY PRIVATE PLACEMENT	STRATEGIC PARTNERSHIP	ASSET ACQUISITION	EQUITY PRIVATE PLACEMENT	EQUITY PRIVATE PLACEMENT
Sole Placement Agent	Sole Placement Agent	Financial Advisor	Sole Placement Agent	Sole Placement Agent
UNDISCLOSED	UNDISCLOSED	UNDISCLOSED	UNDISCLOSED	$350 MILLION
VIKING MINERALS	VIKING MINERALS	**Shadow Creek Minerals**	NOBLE ROYALTIES, INC.	VIPER Energy Partners
ASSET DIVESTITURE	ASSET DIVESTITURE	ASSET DIVESTITURE	ASSET DIVESTITURE	FOLLOW ON OFFERING
Financial Advisor	Financial Advisor	Financial Advisor	Financial Advisor	Underwriter
$66 MILLION	$104 MILLION	$53 MILLION	UNDISCLOSED	UNDISCLOSED
KIMBELL ROYALTY PARTNERS	KIMBELL ROYALTY PARTNERS	KIMBELL ROYALTY PARTNERS	**Multi-Basin Minerals Company**	**Multi-Basin Minerals Company**
FOLLOW ON OFFERING	INITIAL PUBLIC OFFERING	FOLLOW-ON OFFERING	ASSET DIVESTITURE	VALUATION ANALYSIS
Underwriter	Underwriter	Underwriter	Financial Advisor	Financial Advisor

MINERALS & ROYALTIES STATISTICS	PRIVATE FINANCING STATISTICS
~$2.4 Billion	~$11.7 Billion
Aggregate Transaction Volume Since 2017	Aggregate Capital Raised Since 2009
15 Closed Transactions Since 2017	37 Closed Transactions since 2009

Keith Behrens, Managing Director, Head of the Energy Group • 214-258-2762 • keith.behrens@stephens.com
Charlie Lapeyre, Managing Director • 214-258-2784 • charlie.lapeyre@stephens.com
Brad Nelson, Managing Director • 214-258-2763 • brad.nelson@stephens.com

300 Crescent Court | Suite 600 | Dallas, TX 75201

For the most recent list of our transactions, visit **stephens.com/buildingblocks**

Stephens
Investment Banking

HARTENERGY.COM

Oil and Gas Investor

JANUARY 2023/VOLUME 43/NUMBER 1

COLUMNS

ACTIVITY HIGHLIGHTS

Oil and Gas Investor (ISSN 0744-5881, PM40036185) is published monthly by Hart Energy Publishing, LP, 1616 S. Voss Rd., Suite 1000, Houston, Texas 77057. Periodicals postage paid at Houston, TX. Ride-along enclosed. Advertising rates furnished upon request. POSTMASTER: Send address changes to Oil and Gas Investor, PO Box 5020, Brentwood, TN 37024. Address all correspondence to Oil and Gas Investor, 1616 S. Voss Rd., Suite 1000, Houston, Texas 77057. Telephone: +1.713.260.6400. Fax: +1.713.840.8585. oilandgasinvestor@hartenergy.com

Subscription rates: United States and Canada: 1 year (12 issues) US$297; 2 years (24 issues) US$478; all other countries: 1 year (12 issues) US$387; 2 years (24 issues) US$649. Single copies: US$30 (prepaymentrequired). Denver residents add 7.3%; suburbs, 3.8%; other Colorado, 3%.

Oil and Gas Investor
HARTENERGY.COM

A&D WATCH

ENERGY TRANSITION

FINANCE & INVESTMENT

GLOBAL ENERGY

PERSPECTIVES


OGXMinerals
MIDLAND BASED. PERMIAN FOCUSED.
Actively acquiring minerals and royalties.
OGX MINERALS LP | 400 N. MARIENFELD STREET | MIDLAND, TX 79701
432.685.1287 | INFO@OGXRESOURCES.COM

Oil and Gas Investor
by HARTENERGY
1616 S. Voss Rd., Suite 1000 • Houston, TX 77057
1.713.260.6400 Fax: 1.713.840-8585
HartEnergy.com

EDITOR-IN-CHIEF
Deon Daugherty • ddaugherty@hartenergy.com

MANAGING EDITOR
Brandy Fidler • bfidler@hartenergy.com

SENIOR ART DIRECTOR
James Milbrandt • jmilbrandt@hartenergy.com

SENIOR EDITOR, MARKET DATA
Joseph Markman • jmarkman@hartenergy.com

SENIOR EDITOR, ENERGY TRANSITION
Velda Addison • vaddison@hartenergy.com

SENIOR EDITOR, TECHNOLOGY
Jennifer Pallanich • jpallanich@hartenergy.com

INTERNATIONAL MANAGING EDITOR
Pietro Donatello Pitts • pdpitts@hartenergy.com

ASSOCIATE EDITOR
Madison Ratcliff • mratcliff@hartenergy.com

ASSOCIATE DEVELOPMENT EDITOR
Jennifer Martinez • jmartinez@hartenergy.com

TECHNOLOGY REPORTER
Jaxon Caines • jcaines@hartenergy.com

ASSOCIATE EDITOR
Giselle Warren • gwarren@hartenergy.com

Hart Energy Editorial Management:

EDITORIAL DIRECTOR
Jordan Blum • jblum@hartenergy.com

SENIOR MANAGING EDITOR
Darren Barbee • dbarbee@hartenergy.com

EXECUTIVE EDITOR-AT-LARGE
Nissa Darbonne • ndarbonne@hartenergy.com

Creative Services:

CREATIVE DIRECTOR
Derick Baker • dbaker@hartenergy.com

Business Development:

VICE PRESIDENT SALES
Darrin West • dwest@hartenergy.com • 713.260.6449

DIRECTOR OF BUSINESS DEVELOPMENT
Jeremy Bunnell • jbunnell@hartenergy.com • 713.260.5204

DIRECTOR OF BUSINESS DEVELOPMENT
Morgan Mascio • mmascio@hartenergy.com • 713.260.4633

DIRECTOR OF BUSINESS DEVELOPMENT
Bailey Simpson • bsimpson@hartenergy.com • 713.260.4612

BUSINESS DEVELOPMENT MANAGER
Rachel Richards • rrichards@hartenergy.com • 713.260.4602

BUSINESS DEVELOPMENT MANAGER
Manal Foty • mfoty@hartenergy.com • 713.260.4653

ADVERTISING TRAFFIC MANAGER
Valerie Moy • vmoy@hartenergy.com

Hart Energy Corporate:

CHIEF EXECUTIVE OFFICER
John Hartig

CHIEF REVENUE OFFICER
Rob Cravaritis

SENIOR VICE PRESIDENT, EVENTS
Russell Laas

SENIOR VICE PRESIDENT, DIGITAL MEDIA
Mark Chiles

REGULATORY

MIDSTREAM

TECHNOLOGY

AROUND THE INDUSTRY

INDEX

ABOUT THE COVER: Photographer Marshall Hawkins spent an afternoon in December shooting images of Devon Energy Corp. CEO Rick Muncrief at the company's Oklahoma City headquarters.

NOG CLOSES DEALS

$3.0 Billion of Deals Signed Since 2018

PERMIAN

50+ Transactions

including:

VERITAS ENERGY, LLC

LAREDO PETROLEUM

$1.2 Billion+

2021-2022

WILLISTON

250+ Transactions

including:

W Energy Partners

PIVOTAL PETROLEUM

FLYWHEEL ENERGY

SALT CREEK OIL+GAS

COMSTOCK RESOURCES

INCLINE ENERGY PARTNERS

$1.1 Billion+

2018-2022

MARCELLUS

Northern Oil

purchased non-operated assets from:

Reliance Marcellus, LLC

$120.9 Million

Closed April 2021

NOG

Northern Oil and Gas, Inc.

Adam Dirlam, *President*
Nicholas O' Grady, *Chief Executive Officer*

952.476.9800
bizdev@northernoil.com

BRING IT, 2023: ENERGY INDUSTRY BRACES FOR NEW YEAR OF TUMULT

DEON DAUGHERTY
EDITOR-IN-CHIEF
@Deon_Daugherty
ddaugherty@hartenergy.com

This year marks 50 years of Hart Energy, and at *Oil and Gas Investor*, we couldn't be prouder of what the company has accomplished. Moreover, its historic vigor and depth of expertise—whether read in these pages, viewed online or experienced at our conferences—is an exciting prelude to many phenomenal years ahead.

But let's not get ahead of ourselves.

Viewed by almost any industry standard, 2022 was a weird year. The E&P index routinely outperformed the broader S&P 500. Producers earned record, or "windfall," profits quarterly. Still, the chorus of armchair experts calling the end for U.S. shale grew louder, amplified by mixed results of wells drilled by top producers. And global energy exposure escalated along with the aggression of a Russian megalomaniac tyrant hellbent on annexing an independent nation.

None of this goes away with the flip of a calendar page.

For many, it was 12 months of personal challenge too. Millions of Texans hoped against hope that state politicians would do the right thing. The most vulnerable among them will spend the coming weeks anxiously watching the weather and praying for a light winter. Last year presented another opportunity for Texas officials to fix the state's old and busted power grid, but the Texas Legislature and the gubernatorial appointees at the Public Utilities Commission and Electric Reliability Council of Texas blew their shot. Check out Ed Hirs' column on page 63 for more on the grid failure, which left millions powerless, leaving hundreds to die in the cold in February 2021.

In Europe, people will rely more on their leaders to work with U.S. officials and natural gas producers to find some degree of warmth as Russia continues its assault on Ukraine, degrading the promise of abundant natural gas into a weapon of mass destruction.

So where do we go from here?

I started writing this column in my parents' living room, where I would soon prepare a potent cocktail of antibiotics created to kill a vicious infection in my dad's blood.

Dad is jovial, as usual. Nothing keeps this man down. I made a crack about the Minnesota Vikings' gorgeous upset of the Indianapolis Colts the day before. Anyone could beat the Colts and earn my applause. But on Dec. 17, the Vikings came back from a 30-point deficit at halftime to win 39-36. Dad is delighted that his "girly-girl daughter" finally has a football vendetta.

I'll never live this one down. We're Irish and probably the worst—or maybe, the best—people to sit next to at a funeral.

In any event, the examples offered by dear old Dad and my now-beloved Minnesota Vikings can offer some inspiration, daring us to boldly step into 2023 with a little pluck and a lot of never-say-die attitude.

At *Oil and Gas Investor*—and indeed, across Hart Energy—we've laid a sturdy foundation on which we intend to build a fortress of progress.

Our January edition includes Shale 2023, a dynamic outlook publication beginning after page 62. Our friends at Enverus were critical to this endeavor, and I am personally delighted to offer our readers the work product of Justin Lepore, lead consultant at Enverus. His ability and speed with numbers was a crucial part of making Hart Energy's Shale 2023 a fantastic primer on U.S. shale in the coming year.

Whatever happens to oil and gas amid the energy transition, we're bringing the industry's top expert insight to you. On page 26, you'll see the first of a new quarterly series produced by the big brains at Pickering Energy Partners in which they will parse the industry impact of ESG issues.

On the midstream front, we're teaming up with the folks at East Daley Analytics to bring you their expert research every other month. And, our robust lineup of investment gurus for the monthly Market Watchers column initiated last year continues to gain momentum.

Our intent is that as Hart Energy closes in on 50 in December, the fact of middle age is only a clear indication that we're hitting our prime. OGI

Wright & Company, Inc.

Petroleum Consultants

Divisions of Wright

Wright Energy Advisors

Wright Analytics Group

Serving the petroleum industry for more than

34 Years

Founded by D. Randall Wright, President – 1988

www.wrightandcompany.com

TURBULENT GEOPOLITICAL LANDSCAPE REQUIRES SOUND ENERGY POLICY

ENERGY POLICY

JACK BELCHER
CORNERSTONE GOVERNMENT AFFAIRS
@JackBelcher1
jbelcher@cgagroup.com

The world enters 2023 in a state of geopolitical chaos that is both impacting and being impacted by oil and gas supplies. The world is experiencing a "global energy crisis of unprecedented depth and complexity," according to the International Energy Agency.

Following Russia's invasion of Ukraine—a geopolitical realignment that has isolated Russia from the West and moved it closer to China, Iran and Saudi Arabia—the market is filled with heightened uncertainty about the world's energy future, with long-term implications for global oil and gas prices and economic stability. The resulting policy responses from the U.S. and its allies are adding to that uncertainty.

Toward the end of 2022, the G7, EU and Australia established a price cap that ultimately allows Russian oil to continue to flow to countries such as India and China and to avoid global supply shortages. At the same time, Russia pledged not to sell crude to any countries participating in the price cap, resulting in a realignment rather than an actual reduction of oil shipments.

However, that realignment is not without logistical hitches impacting prices.

Amid these developments, OPEC+ in December chose to keep production steady in an attempt to keep oil prices stable.

Meanwhile, LNG import capacity in the EU and U.K. is projected to expand by 34%, or 6.8 Bcf/d, by 2024 versus 2021 levels amid the significant expansion of LNG-related infrastructure in Europe. In the interim, while experiencing extremely high prices, Europe was forced to decrease natural gas consumption, with usage down about 25% in November.

Underscoring the enormous economic and supply chain implications, the biggest decreases came from industrial users, which slowed down or shuttered operations due to high prices.

With winter underway, the challenge for Europe is at its peak. Facing a significant shortage, Europe built its storage and was near capacity in December, with LNG imports expected to make up the difference. We will know in the coming weeks whether those shipments will give Europe adequate supply to keep the lights and heat on through the winter.

The U.S., now the world's largest LNG exporter, is shipping much of its gas to Europe. Offtake commitments are greater than 30 million metric tons per annum (MMmtpa), with another 100 MMmtpa expected to come online in the next three years. Additionally, despite the shutdown of virtually all pipeline gas from Russia, Europe continues to import significant volumes of Russian LNG out of necessity.

The lingering question is whether the U.S. will have adequate natural gas supplies to meet its own needs and those of Europe over the long haul. While U.S. natural gas production has risen, continued production growth is challenged by three factors:

1. Lack of adequate takeaway capacity from producing basins due to regulatory, legal and community opposition challenges.
2. Lack of investment capital for exploration and production.
3. Lack of political support and opposition to expanded oil and gas production.

Despite commitments made by the Biden administration for the U.S. to support Europe through LNG exports, the lack of pipeline infrastructure support and new exploration threaten the U.S.' ability to deliver on that promised supply.

In fact, the Biden administration continues to threaten the U.S. oil and gas industry with a windfall profits tax. Additionally, California Gov. Gavin Newsom accused the industry of "price gouging" and said he would support legislation this year to impose monetary penalties on oil company profits deemed excessive. None of this is helpful in terms of increasing supply or lowering prices. To the contrary, this rhetoric presents a major obstacle to solving the problem. It is thwarting needed investment in infrastructure.

In terms of alternative energy sources, the U.S. and Europe appear to be completely outfoxed by China, with the latter dominating the supply of alternative energy technology and rare earth minerals. The Inflation Reduction Act, which provides about $370 billion for U.S. energy and climate incentives, could help the nation catch up. However, it is causing serious strains in the Transatlantic Alliance, as European governments protest these incentives as protectionist and in violation of free- and fair-trade practices.

As the geopolitical landscape changes, the industry hopes our political leaders recognize the harm they could impose to our economy and to peace and stability. The desire is for them to pursue effective policies that increase domestic production and the delivery of energy to help U.S. citizens at home and allies abroad. OGJ

WILDCATTER JOHN A. YATES DEAD AT 93

John A. Yates's wildcatting was key to the exploration and growth in the New Mexico and West Texas oil fields.

BY HART ENERGY STAFF

John A. Yates, known for his persistent wildcatting, died Nov. 29, 2022. He was 93.

The son of Martin Yates Jr., who pioneered oil well drilling in New Mexico's in 1924, Yates began working in his father's Delaware Basin oil fields at the age of 12.

He left for a short time to study economics at Dartmouth College, but soon found himself drawn back to oil and gas, returning to the industry in 1951.

Yates used his passion for exploring oil and natural gas to encourage his brothers to join him in operations, founding Yates Petroleum in 1960. Yates and his brothers, Harvey, Martin III and Saint Peyton, played significant roles in the exploration and growth of the oil and gas industry in southeast New Mexico and West Texas, as well as into Colorado and Wyoming. Yates Petroleum was known for frequently drilling more wildcat wells than any major company.

Yates held several offices in Yates Petroleum, including secretary-treasurer, vice president, president, chairman of the board. He served as chairman emeritus until the company sold to EOG Resources in October 2016. Yates founded the John A. & Charlotte G. Yates Legacy LLC in 2016 where he served as chairman of the board and director until his death.

Yates's determination led him to discovering and developing the Pecos Slope Abo Field in New Mexico. The field had been overlooked by log experts, who believed it to be void of natural gas. Yates proved the experts wrong, drilling more than 400 producing wells over several years. His success as a wildcatter was recognized through his selection as "All American Wildcatter of the Year" in 1996.

Additionally, in 1996, Yates was selected as "Chief Roughneck of the Year" by the IPAA, a prestigious award that Yates considered an honor, due to it only being awarded to a single person in the U.S. annually. His expertise was recognized through appointments to the National Petroleum Council advisory committee by five U.S. presidents. He received an honorary doctorate of laws degree from New Mexico State University and was inducted into multiple industry halls of fame.

According to Yates's obituary, "In all of his endeavors, John was a respected leader. He led with a strong and quiet confidence and was a mentor and friend to many."

PRENG & ASSOCIATES

The most respected global energy executive and board search firm

Over our 42 years, Preng & Associates has assisted more than 800 management teams and boards in 91 countries and conducted over 3,800 engagements. Preng & Associates is at the forefront of the energy industry—fulfilling the demand for innovative and diverse leadership for an industry that continues to evolve and decarbonize. We bring deep experience working with traditional energy suppliers and the most progressive and innovative companies leading the energy transformation.

Drawing on our direct industry experience, our consultants excel at attracting best-in-class talent from across the energy continuum and the globe—leaders who will make a significant, durable, and truly positive impact on corporate performance and shareholder value and lead the way in energy transition.

INDUSTRY FOCUS

- Energy Transition
- Renewables
- Power & Utilities
- Oil & Gas
- Engineering & Construction
- Industrial
- Financial Services & Private Equity

EXECUTIVE & BOARD SEARCH

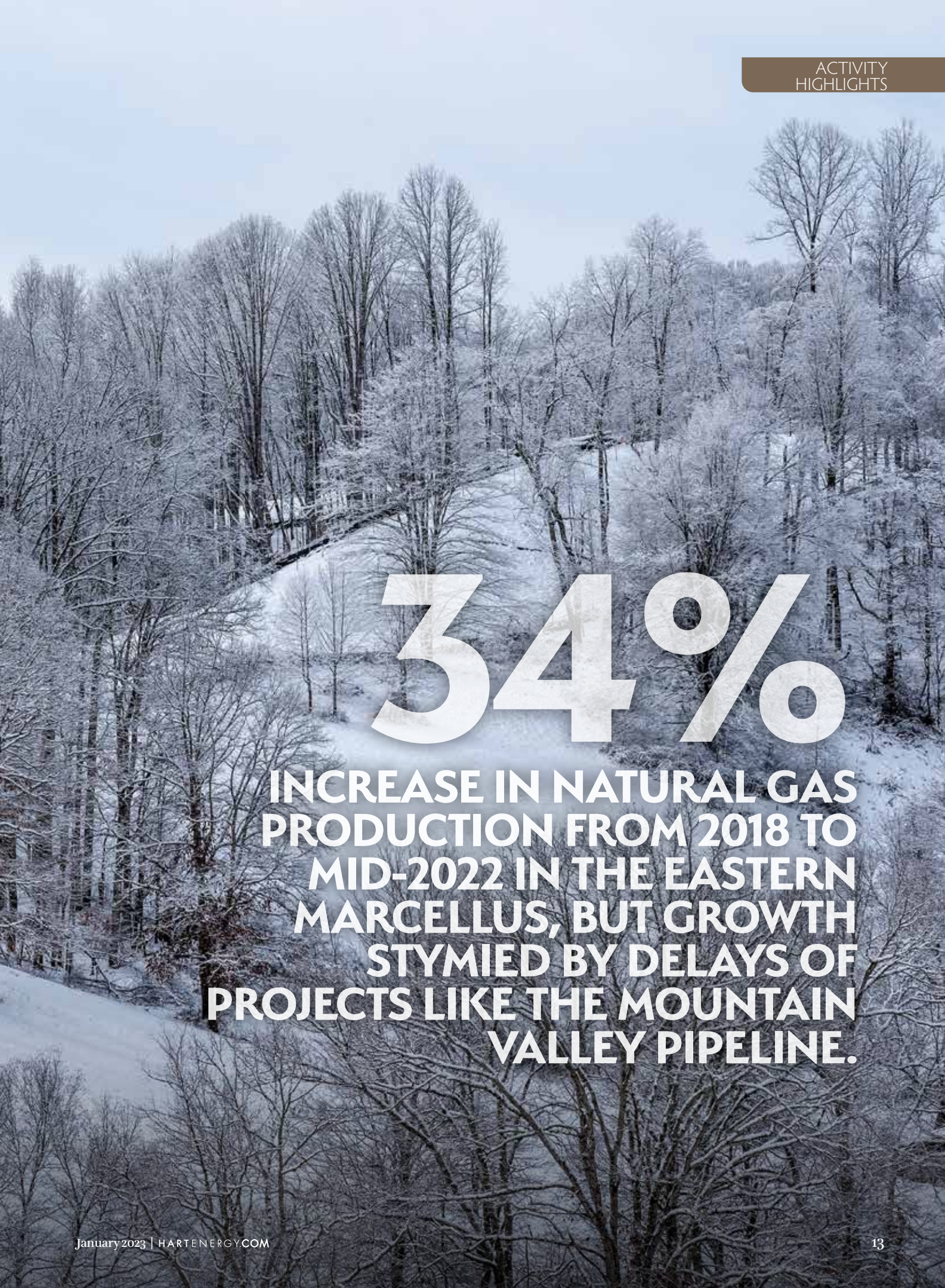
- Board of Directors
- C-Suite
- Human Resources
- Strategy & Transformation
- Operational Leadership
- ESG & Health/Safety
- Legal & Regulatory
- Sales & Marketing
- Security, IT, and R&D
- Finance, Investor Relations, and Risk

PRENG & ASSOCIATES
The Global Energy Search Leader

UNITED STATES: 800 Gessner, Suite 1125, Houston, Texas 77024 Tel +1 (713) 266-2600
UNITED STATES: 560 Frontage Road, Suite 300, Northfield, Illinois 60093 Tel +1 (713) 243-2650
UNITED KINGDOM: 42 Brook St., Mayfair London, W1K 5DB Tel +44 (0) 207-958-9445

preng.com

MALACHI JACOBS/SHUTTERSTOCK.COM



34%

INCREASE IN NATURAL GAS PRODUCTION FROM 2018 TO MID-2022 IN THE EASTERN MARCELLUS, BUT GROWTH STYMIED BY DELAYS OF PROJECTS LIKE THE MOUNTAIN VALLEY PIPELINE.

PERMITS

The number of U.S. oil and gas well permits slipped again in October, responding to expectations of slower production growth in 2023.

The price of WTI crude, which averaged close to $90/bbl in October, had dropped to less than $77/bbl at the close of November. The falloff stemmed from concerns over COVID-19 lockdowns and subsequent political instability in China, feeding fears of a global recession in the new year.

Texas again led all states in permits issued, but its October total was 30% below the high for the year in June. The state's monthly permit total was down 5.5% compared to October 2021. Nationally, permits decreased 42.5% in October over the same month in 2021.

Pioneer Natural Resources secured the most permits among operators in the past month, followed by Terra Energy Partners and BPX Operating. While Texas led all states in permits, several counties in other states—notably Rio Blanco and Weld in Colorado, Williams in North Dakota and Campbell in Wyoming—ranked among Texas counties as leaders.

Permitted Wells By State

State	Well Count
Texas	321
Colorado	99
Oklahoma	55
Wyoming	44
North Dakota	41
Louisiana	18

Permitted Wells By Operator

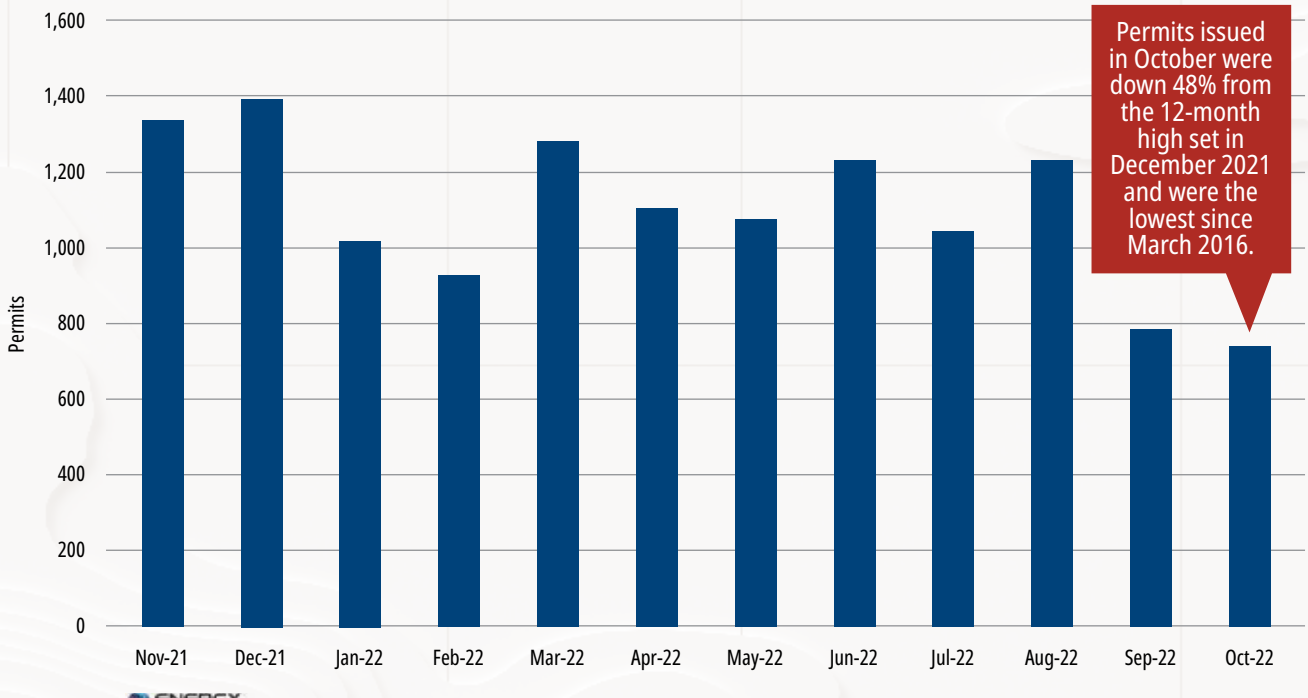
Operator	Well Count
Pioneer Natural Resources	40
Terra Energy Partners	22
BPX Operating	18
Devon Corp.	16
Crestone Peak Resources	14
Nickel Road Operating	13
Continental Resources	13
EOG Resources	13
The Anschutz Corp.	10

Permitted Wells By County

County	Well Count
Martin, Texas	39
Reeves, Texas	29
Rio Blanco, Colo.	22
Upton, Texas	22
Weld, Colo.	22
Williams, N.D.	16
Campbell, Wyo.	15
Howard, Texas	15
Dunn, N.D.	14
Converse, Wyo.	13
Midland, Texas	12
Panola, Texas	11
Canadian, Okla.	10
Karnes, Texas	10
Reagan, Texas	10
Irion, Texas	9

Oil And Gas Drilling Permits Issued

(November 2021-October 2022)



Data from Rextag ENERGY DATALINK

MERGE
ELECTRIC FLEET SOLUTIONS

ELECTRIC VEHICLE PILOT PROGRAM (EVPP™)

Merge's unique Electric Vehicle Pilot Program (EVPP™) offers oil and gas fleets the opportunity to try a selection of Merge-owned electric cars within their fleets with no long-term commitment.

WE OFFER:

- **A rapid deployment of EVs to drivers of your choice**
- **Planning and installation of charging infrastructure at homes and/or office locations**
- **Access to public DC fast-charging networks**
- **Telematics data monitoring and analysis throughout the pilot term**

The EVPP™ helps oil and gas fleets evaluate electric vehicles in a real-world trial, build confidence among drivers and stakeholders, and gain first-hand familiarity with the advantages of an electric fleet. This holistic program includes hands-on experience paired with data analytics so fleets can make sound decisions as they electrify.

Scan for more on Merge

GET IN TOUCH info@mergefleet.com • (833) MERGE-EV

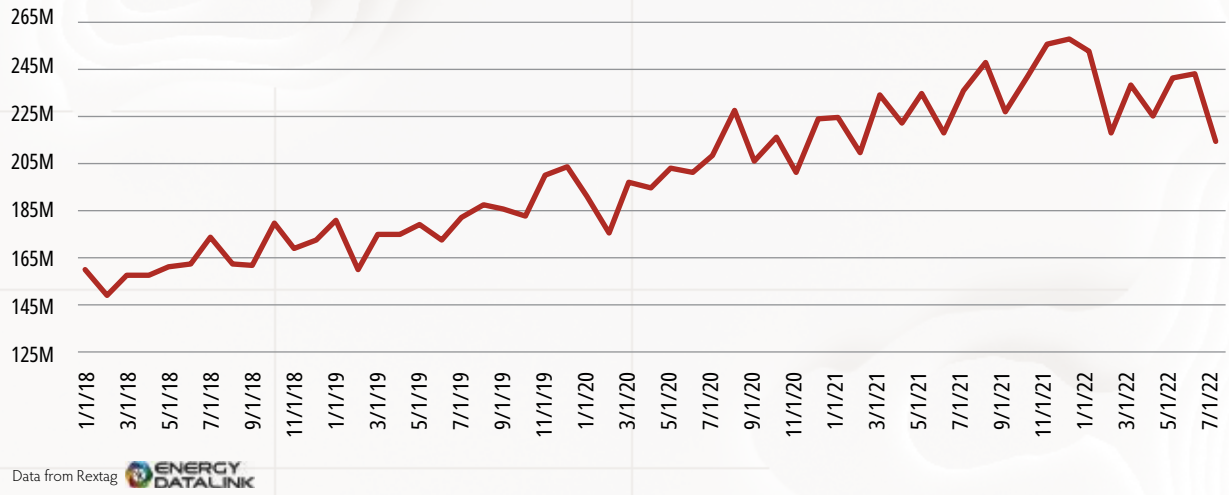
FOCUS ON: EASTERN MARCELLUS

Were the eastern portion of the sprawling Marcellus Shale its own country, it would rank No. 12 in the world in natural gas production. Despite a dip in production in the first half of 2022, natural gas output in the eastern Marcellus still registered a 34% increase from the start of 2018 through midway 2022.

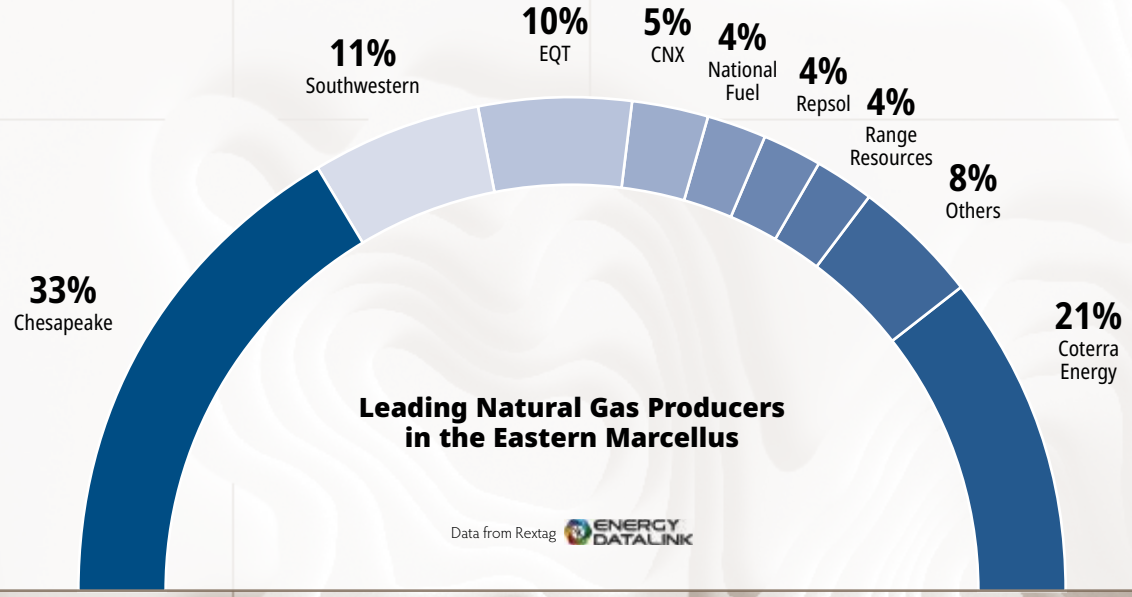
Comprised of Middle Devonian sedimentary rock, the eastern portion of the Marcellus stretches diagonally across Pennsylvania into southern New York State. Its most prolific area is in Susquehanna County, Pa., in the northeast corner of the state. Chesapeake Energy Corp. and Coterra Energy Inc. together account for more than half of the area's natural gas production.

The biggest challenges facing the region are not a lack of resource but limitations on transporting it to key markets, particularly the Northeast. Persistent legal challenges have led to the cancellation of the $8 billion Atlantic Coast Pipeline in 2020 and the $1.1 billion PennEast Pipeline in 2021. Litigation has also delayed construction of the Mountain Valley Pipeline.

NATURAL GAS PRODUCTION IN THE EASTERN MARCELLUS
JANUARY 2018-JULY 2022



Data from Rextag ENERGY DATALINK



Data from Rextag ENERGY DATALINK

EnergyNet Indigo

Tech Enabled Upstream Oil & Gas Acquisition & Divestiture Platform

for Asset Deals Valued $20MM to $250MM+

The EnergyNet Indigo platform combines EnergyNet's unrivaled transaction expertise and market reach with the full-service, white glove A&D technical advisory capabilities of an investment bank.

Superior Outcomes
Successful Transactions

Arkoma Drilling II, LP

Eagle Ford Shale
Operated Opportunity

Webb County, TX

August 2022

ENERVEST

Utica Shale Non-Op

Ohio & Pennsylvania

February 2022

Chevron

Eunice / Hobbs Field
Operations

Lea County, NM

August 2021

COMSTOCK RESOURCES

Bakken Shale Non-Ops

North Dakota,
& Wyoming

November 2021

HRM Resources III, LLC

Green River Basin
Operated Opportunity

Colorado & Wyoming

March 2022

EnergyNet INDIGO

HOUSTON | DALLAS | DENVER | OKLAHOMA CITY | MIDLAND
877-351-4488 | EnergyNet.com | Indigo.EnergyNet.com

Diamondback Flexes Equity Muscles in $3.3 Billion Bolt-on Deals

Some key stats from **Diamondback Energy Inc.**'s two Midland Basin bolt-on deals: 83,000 net acres, 448 new net drilling locations and about two years.

Roughly 24 months is the incremental inventory life that $3.3 billion in cash and stock buys in the Permian Basin.

Diamondback on Nov. 16 announced it would buy **Lario Permian LLC** on Nov. 16 in a cash-and-stock transaction valued at $1.55 billion. It follows an October deal to buy **FireBird Energy LLC** for $1.75 billion that closed on Nov. 30.

By leveraging its attractive stock—along with $1.6 billion cash—Diamondback continues to consolidate private operators in the Midland Basin. The company expects to generate unlevered free cash flow (FCF) of $570 million from its Midland bolt-ons.

In both deals, Diamondback will immediately tap the brakes on drilling activity, reducing cumulative rigs on the Lario and FireBird positions from five rigs to two to preserve inventory.

David Deckelbaum, an analyst at **Cowen**, told Hart Energy that Lario's drilling program would have depleted its inventory in about four years. At Diamondback's pace, the inventory will stretch to six years.

Similarly, FireBird's inventory stretches out to 12 years in drilling activity as Diamondback will reduce rigs operated there from three to one.

"Overall, total to FANG [Diamondback], it's about two total incremental years of companywide inventory," Deckelbaum said.

Deckelbaum also said that Diamondback has again found a clear financial arbitrage in its acquisition. The company is paying $60,000 per flow boe/d and 3.3x 2023E EBITDA versus its prevailing multiple of $83,000 per boe/d and 5.2x EBITDA.

"We expect the deal to remain FCF/share accretive above $73/bbl," Deckelbaum said.

When combined with the pending FireBird acquisition, Diamondback will grow its Midland Basin footprint by approximately 83,000 net acres. Additionally, the deal will add 500 high-quality drilling opportunities that Diamondback chairman and CEO Travis Stice said would "compete for capital with our current development plan and increase our 2023 production profile by approximately 37,000 bbl/d of oil (50,000 boe/d)."

Large-cap equity advantage

The Lario acquisition and other similar deals of late demonstrate the ability of large-cap public companies to outcompete smaller E&Ps.

As with other recent deals by large-cap public E&Ps for private operators, Diamondback is leveraging its considerable balance sheet strength and equity performance to overrun smaller public competitors.

"Large-cap E&Ps focused on oil like Diamondback, as well as other big buyers from 2022 like **Marathon Oil** and **Devon Energy**, are trading at an average of 5x EBITDA and a 14% yield on free cash flow whereas small-cap companies are trading at just 3x EBITDA, and their stock price implies a yield of 20% on free cash flow," said Andrew Dittmar, director at **Enverus**. "That puts those smaller companies at a significant competitive disadvantage when bidding on deals because they cannot offer the same value as larger companies without diluting shareholders."

That disadvantage is further heightened because in many cases smaller companies are "much more in need of the inventory that is included in these acquisitions," he added.

But such acquisitions are also the lifeblood of Diamondback. President and CFO Kaes Van't Hof said at Hart Energy's Executive Oil Conference in Midland, Texas, on Nov. 16, Diamondback is built to acquire and exploit assets. "What we're not good at is making big bets on exploration," he said.

Dittmar said the Lario acquisition "walks the line of staying accretive to Diamondback's 2023 EBITDA multiple and free cash flow yield while adding inventory that is immediately competitive in its portfolio."

Lario's acreage adds an estimated 20 to 25 DUCs to be transferred at closing on Jan. 31.

In contrast to FireBird, the purchase from Lario is more immediately accretive to free cash flow but has less runway for undeveloped

SHUTTERSTOCK/DANIEL DE PETRO

locations, Dittmar said.

"The Lario acreage is also more centrally located within the core development fairway of the Midland Basin relative to FireBird but scattered whereas the FireBird land was nearly in one contiguous block," he said.

The Lario bolt-on brings 15,000 net acres in Midland and Martin counties, Texas, that are projected to average 18,000 bbl/d of oil in 2023, said Mark A. Lear, senior research analyst at **Piper Sandler & Co.**

Lario Permian, the subsidiary of 95-year-old Lario Oil & Gas Co., has delivered "fairly consistent well performance" across its core Midland asset base, Lear wrote in a Nov. 16 report. Piper Sandler estimates Lario will add 132 net locations with an average lateral length of 9,400 ft in the Wolfcamp A and B, lower and middle Spraberry and Joe Mill formations.

"Upstream deal activity has been picking up pace in 2H22, and investors have applauded companies taking advantage of arbitrage opportunities to add [cash flow] and inventory runway relatively inexpensively," Lear said.

Jeoffrey Lambujon, an analyst at **Tudor, Pickering, Holt & Co.**, said the deal adds roughly $150 million of capex to Diamondback's ledger in 2023 for an estimated annual spend of $2.5 billion to $2.6 billion.

The deal will be funded with 4.18 million Diamondback shares and $850 million in cash. Diamondback said that the cash costs will net to $775 million because of cash flows it accumulates between the effective date of Nov. 1 and the expected close of Jan. 31.

"On the margin, we view the deal as positive for macro/industry with more private operatorship taken off the board and FANG's plans including dropping the 2 rigs currently running on the acreage down to <1 in 2023," Lambujon wrote in a Nov. 17 report.

—Darren Barbee

FireBird And Lario Transactions At-A-Glance

	FireBird	Lario	Combined
Value ($B):	$1.75	$1.55	$3.3
Cash ($MM):	$775	$850	$1,630
Shares (MM):	5.86	4.18	10.04
Net acres:	68,000	15,000	83,000
Locations (gross/net):	353/316	154/132	507/448
2023E Production oil (bbl/d):	19,000	18,000	37,000
2023E Production (boe/d):	25,000	25,000	50,000
Incremental capex ($MM):	$250	$150	$400

Source: Diamondback Energy Inc.

"Large-cap E&Ps focused on oil like Diamondback, as well as other big buyers from 2022 like Marathon Oil and Devon Energy, are trading at an average of 5x EBITDA and a 14% yield on free cash flow whereas small-cap companies are trading at just 3x EBITDA, and their stock price implies a yield of 20% on free cash flow."

—Andrew Dittmar, *Enverus*

Shell to Aquire RNG Producer Nature Energy

Shell is planning to grow its low-carbon business with a nearly $2 billion acquisition of **Nature Energy Biogas**, the largest producer of renewable natural gas (RNG) in Europe.

The company said Nov. 28 that **Shell Petroleum NV** reached an agreement with Nature Energy's consortium of investors—**Davidson Kempner Capital Management LP, Pioneer Point Partners** and **Sampension**—to buy the biogas company. The transaction is set to close in first-quarter 2023 subject to regulatory approvals, moving Shell closer to its decarbonization goals with expectations of delivering double-digit returns. The deal would also make Shell the largest RNG producer in Europe.

"Acquiring Nature Energy will add a European production platform and growth pipeline to Shell's existing RNG projects in the United States," said Huibert Vigeveno, downstream director for Shell, in a company press release. "We will use this acquisition to build an integrated RNG value chain at global scale, at a time when energy transition policies and customer preferences are signaling strong growth in demand in the years ahead."

The deal is among several billion-dollar acquisitions announced recently in the RNG space as companies look to lower their carbon profiles and reach net-zero emissions by 2050. RNG, which is biogas that has been upgraded to pipeline quality, can be used in the same way as conventional natural gas derived from fossil fuels. Considered carbon neutral, RNG assets capture naturally occurring methane from places like landfills and dairy farms.

Founded as a natural gas distributor more than 40 years ago, Nature Energy has 14 plants in operation producing about 6.5 MMBtu/year. It also has a pipeline of about 30 new plant projects—mainly in Europe and North America—that could deliver up to 9.2 MMBtu/year by 2030, according to Shell.

SHELL PLC

That's equivalent to about 4,400 boe/d. Shell's integrated gas unit reported production of about 924,000 boe/d in third-quarter 2022.

"Nature Energy has grown into a leading producer of biomethane from organic waste and has pioneered a standardized large-scale commercial production process in Denmark that creates higher on-farm crop yields," said Jesper Lok, board chair for Nature Energy. "Under the new ownership of Shell, our team will continue to advance its unique vision of unlocking additional valuable resources from waste materials while offering secure and affordable energy to customers and promoting a circular economy."

The acquisition, which Shell said is within its current capital range, will accelerate the company's existing biogas business, including in the U.S. where Shell has one RNG site operating and four more under construction.

—Velda Addison

IOG Resources Acquires Appalachia Assets

IOG Resources II LLC (IOGR II) said Nov. 22 that it acquired producing gas assets in the Appalachian Basin operated by **Seneca Resources**, an affiliate of **National Fuel Gas**.

The assets consist of nonoperated wellbores primarily located in Clearfield, Elk and McKean counties, Pa., with current net production averaging about 17 MMcf/d.

The purchase price was not disclosed.

The acquisition represents the initial investment for IOGR II, the successor platform to IOG Resources LLC. Both firms are Dallas-based energy investment platforms sponsored by **First Reserve**.

Following the November transaction, the IOG Resources platform now includes 13 discrete investments across six core basins in the U.S.

In March 2022, IOGR acquired producing oil and gas assets in the Delaware Basin from Tier 1 **Merced Holdings LLC**. The nonoperated wellbores were primarily located in Eddy and Lea counties, N.M.

The IOG group was established in 2017 and is focused on onshore producing nonoperated oil and gas investments and structured drilling capital in North America. In 2018, National Fuel Gas sold assets to **IOG CRV – Marcellus LLC** for $17.3 million through a joint development agreement, according to National Fuel Gas' regulatory filings.

HELGE HANSEN

First Reserve is a private equity firm focused on investing across diversified energy, infrastructure and general industrial end-markets. The firm, founded in 1983, has raised more than $32 billion of aggregate capital since its inception. Its investment and operational experience have been built from over 725 transactions, including platform investments and add-on acquisitions, on six continents.

Kirkland & Ellis LLP acted as legal counsel for IOGR II.

—Darren Barbee

WORLD OILMAN'S

MARC™

MINERAL & ROYALTY CONFERENCE

All Minerals – All the Time

Please join us again next spring for the biggest Mineral Conference in the country. Early bird registration is now open.

April 10–11, 2023 | Post Oak Hotel | Houston, TX

www.mineralconference.com

Thank you to our 2023 sponsors!

RBC Capital Markets
RBC Richardson Barr

KIRKLAND & ELLIS

TRACTS

Vinson&Elkins LLP

DETRING ENERGY ADVISORS

HAYMAKER MINERALS & ROYALTIES

NSAI NETHERLAND, SEWELL & ASSOCIATES, INC.
WORLDWIDE PETROLEUM CONSULTANTS

ENERTEL

citi

OPPORTUNE

MINERALWARE

ENVERUS

RR&A R. REESE & ASSOCIATES

ComboCurve

BAKER BOTTS

Oil and Gas Investor
A HARTENERGY COMPANY

IPAA INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA

KeyBanc Capital Markets

RIVERBEND ENERGY GROUP

FIFTHPEAK VENTURES

For 2023 sponsorship information please email info@mineralconference.com

Phoenix Capital Group Plans to go From Underdog to Big Dog

In a year of multibillion-dollar oil and gas deals, **Phoenix Capital Group Holdings LLC**'s relatively small $33 million acquisition of 4,000 royalty acres in Colorado could easily be overlooked as a drop-in-the-bucket transaction.

But for a company that relishes being the underdog, that's just fine with them. The acquisition of interests from the city of Thornton is another in a long series of steps the company is taking as it aims to become a "leader in the minerals rights space," the company said.

Curtis Allen

Along with ambition, it's also a company with a leadership that doesn't mince words, whether it's calling out "unsavory and at times unethical and dishonest mineral shops" or "lowball offers" or celebrating its wins over its better capitalized private-equity competitors.

In about four years, Phoenix Capital Group has bootstrapped its way to 400 deals and developed a database of "nearly 150,000 individual records in the current markets of interest, which are comprised of the key basins in North Dakota, Montana, Wyoming, Colorado and Texas," according to a September Securities and Exchange Commission filing.

On Nov. 10, Phoenix Capital Group purchased mineral interests in Weld and Adams counties from the city. The company said the acquisition was one of the largest mineral rights transactions in the Denver-Julesburg (D-J) basin.

Colorado, known for its political instability and sometimes open hostility toward oil and gas companies, has been an increasingly difficult state for oil and gas companies. But the Thornton deal still holds the promise of bringing in cash, Phoenix Capital Group partner and CFO Curtis Allen said. The assets the company purchased include roughly 60 DUCs.

"We pay up for DUCs," he said. "That's why we win most bids."

The company's due diligence team worked on its Thornton deal, performing due diligence on 18 tracts and found the title work surprisingly messy.

"It wasn't actually clean. You kind of expect a city's minerals to be pretty clean," Allen said. "These were not. There were title flaws everywhere. But our team was able to digest all 18 tracks in less than 30 days."

Phoenix Capital Group put 12 full-time professionals on the running title checks to get the deal closed.

"I don't know too many other shops that could, one, take on the size of it, but two handle the massive amounts of due diligence as quickly as we did," he said. "So, it kind of worked out very well."

Disruptive business model

Allen described Phoenix Capital Group as a "wholesale shop" with a large land team looking for opportunities that aren't heavily bid against.

"A lot of the things we're closing are mom and dads and, you know, in the Midwest, just small families that just wanted to sell, get out of the oil game," he said.

But the market for minerals rights remains inefficient. He pointed to the bids for the Thornton assets—Allen said there were 10 bidders but only two were "competitive."

"On a $33 million acquisition, only two of the bids were even reasonable," he said. So, it's the same thing across the nation. It's a relatively inefficient marketplace and I think a lot of groups have taken advantage of that. They just, you know, lowball offers and hope they win."

Despite a now sizeable portfolio with interests in 2,126 wells in the Williston, D-J Basin and Permian, the company still sees its story as a David and Goliath tale in which the company was initially out capitalized by its peers "a hundred to one," Lindsey Wilson, managing member and COO of the company, said in a press release.

Allen said Phoenix remains on unequal footing with public companies and private-equity-backed buyers.

"They still have more money than us, by probably a four-to-one, five-to-one margin at this point. But is the gap closing? Yes. And extremely fast."

Phoenix Capital Group has developed what it calls a disruptive business model that empowers sellers.

"For too long, mineral owners have been saddled with noncompetitive bids from unsavory and at times unethical and dishonest mineral shops," Allen said. "We've made it our personal mission to change this space permanently and for the benefit of the community. By changing the traditional capitalization sources and creating an honest, fair and efficient process, we are changing the mineral owner's experience from the "used-car lot" feel they've traditionally been force-fed, to a transparent and high-touch partnership that Phoenix Capital Group is offering."

Allen said one competitor has tried to snuff out the competition and called the Phoenix Capital Group's reputation into question with "slanderous information."

"Every time we do see these people in the field in terms of a bidding war, we'll always win," he said, declining to name the company. "We tend to run into them a lot."

—Darren Barbee

Scan to read the full article

Phoenix Capital Group Mineral And Royalty Interests

(As of June 2022)

Basin/Region	Well count
Bakken/Williston Basin	1,875
D-J Basin/Rockies/Niobrara	164
Permian Basin	87
Total	2,126

Source: Phoenix Capital Group SEC filing

KING
OPERATING
CORPORATION

DISCOVER THE UPSIDE OF OIL AND GAS INVESTING

FORECAST OF...

100%	21%	3.5x
TAX WRITE-OFF	IRR	MULTIPLE ON EXIT

Achieve value with 3 uniquely linked elements of financial return by investing in a unique energy fund in which investors can achieve monthly passive income, a multiple on invested capital, and significant tax savings.

Is it a fit?

Scan the QR code for more info

Monthly Passive Income

Receive 80% of distributable revenue in the form of MPI, or, Monthly Passive Income.

Forecasted Multiple on Exit

While timelines vary, the horizon to multiply invested capital is typically within 3-5 years.

100% Tax Write-off

Achieve a 100% tax write-off on your investment, leading to a significantly lowered tax burden.

The foregoing financial illustrations are "forward looking statements" within the meaning of the Private Securities Litigation Reform Act of 1995 and are based on numerous variables and assumptions which, although believed in good faith to be reasonable, may prove to be incorrect and could cause actual results to differ materially from those projected. Please refer to the King Operating Partners I LP Confidential Private Placement Memorandum dated January 3, 2022 for a description of some of the risks and uncertainties to which the foregoing financial illustrations are subject."

(214) 420-3000 6142 Campbell Road, Dallas, TX 75248 info@kingoperating.com www.kingoperating.com

MIDSTREAM

Outrigger Energy II LLC announced the sale of D-J Basin Midstream System in Weld County, Colo., to **Summit Midstream Partners LP** on Dec. 1.

Summit Midstream said in a separate Dec. 1 press release that it had acquired Outrigger's assets along with infrastructure from **Sterling Energy Investments LLC**, **Grasslands Energy Marketing LLC** and **Centennial Water Pipelines LLC** for a total of approximately $305 million in cash. Further financial details weren't disclosed.

The recently sold Outrigger system involves a 60-MMcf/d cryogenic natural gas processing plant, with product distribution to the Cheyenne Plains gas pipeline and **DCP Midstream LP**'s NGL system.

Outrigger's system also includes about:

- 70 miles of low-pressure natural gas gathering pipelines;
- 90 miles of high-pressure natural gas gathering pipelines; 12,800 hp of field and plant compression; and
- 30 miles of crude oil gathering pipelines with transportation to the Pony Express Pipeline.

The D-J system's high-pressure gas gathering footprint will now provide Summit with a connection to multiple midstream systems in the D-J Basin, Outrigger president and CEO Dave Keanini said in a company release.

RBC Capital Markets served as lead financial adviser on the Outrigger D-J acquisition. **TD Securities** was lead financial adviser on the Sterling DJ acquisition, and **Locke Lord LLP** served as legal adviser to Summit.

Evercore served as exclusive financial adviser, and **Vinson & Elkins LLP** served as legal adviser to Outrigger Energy II LLC. **TPH&Co.**, the energy business of **Perella Weinberg Partners**, served as exclusive financial adviser, and Vinson & Elkins LLP served as legal advisor to **Sterling Investment Holdings LLC**.

MIDLAND BASIN

Diamondback Energy Inc. completed its nearly $2 billion acquisition of **FireBird Energy LLC** on Nov. 30, adding "significant, high-quality inventory" right in Diamondback's backyard of the Midland Basin, according to the company's chairman and CEO, Travis Stice.

Based in Fort Worth, Texas, FireBird operates over 450 vertical and horizontal wells in the Midland Basin. Diamondback announced its agreement to acquire the private operator on Oct. 11 in a cash-and-stock transaction valued at roughly $1.6 billion.

The value of the FireBird transaction has since increased to $1.75 billion, according to a recent investor presentation.

Diamondback's FireBird transaction is part of a duo of acquisitions in the Midland Basin the company announced in the fourth quarter.

In addition to FireBird, Diamondback also agreed to acquire **Lario Permian LLC** on Nov. 16 in a cash-and-stock transaction valued at $1.55 billion. In total, Diamondback is spending roughly $3.3 billion to expand its position in the Midland Basin.

FireBird Energy LLC is backed by **RedBird Capital Partners** and **Ontario Teachers' Pension Plan**. A bulk of the company's portfolio was acquired from **Chevron Corp.** around the time of FireBird's founding, according to its website.

In its October release, Diamondback said the acquisition of FireBird will add approximately 75,000 gross (68,000 net) highly contiguous acres in the Midland Basin in West Texas. The acreage is 98.5% operated, with an average 92% working interest and is currently 84% HBP.

The FireBird asset also includes 353 estimated gross (316 net) horizontal locations in primary development targets with an average lateral length of approximately 11,400 ft, which Stice also noted in October is adjacent to Diamondback's current Midland Basin position.

Primary targets are the middle Spraberry, lower Spraberry, Wolfcamp A and Wolfcamp B formations, according to the company release.

"This asset adds more than a decade of inventory at our anticipated development pace, including inventory that competes for capital right away in Diamondback's current development plan," he said in the October release.

Diamondback expects the FireBird asset to add roughly 17,000 bbl/d of oil, or 22,000 boe/d, of production at closing, expected late in the fourth quarter. Production from the FireBird asset is estimated to average about 19,000 bbl/d of oil, or 25,000 boe/d, in 2023.

Alongside its agreement to acquire FireBird, Diamondback also unveiled a target in October to sell at least $500 million of noncore assets by year-end 2023.

So far, Diamondback has sold about 3,250 net acres in the Delaware Basin for $155 million as part of its divestiture target. Divestiture proceeds are earmarked for further debt reduction, to support the Midland, Texas-based company's pledge to reward shareholders.

Kirkland & Ellis LLP is legal adviser to Diamondback for the transaction. **Akin Gump Strauss Hauer & Feld LLP** and **Weil, Gotshal & Manges LLP** are serving as legal advisers to FireBird and its affiliates. **RBC Capital Markets** and **Goldman Sachs & Co. LLC** are lead financial advisers to FireBird.

DELAWARE BASIN

Northern Oil and Gas Inc. (NOG) closed on Dec. 1 its Delaware Basin acquisition of assets from **Alpha Energy Partners** for $155.1 million, one of a spate of deals the company announced in the second half of 2022, totaling roughly $900 million.

The final price reflects a reduction from the initial acquisition price of $157.5 million announced Sept. 30 and is net of preliminary and customary purchase price adjustments. The deal remains subject to post-closing settlements between NOG and Alpha.

The acquired assets include nonoperated working interests in the core of the Delaware, NOG said. The interests consist of 2,800 acres, 9.6 net producing wells, 2.8 net authorization for expenditures and wells-in-process in New Mexico's Lea and Eddy counties and Loving County, Texas.

NOG anticipates $32 million of additional capex over each of the next three years on the Alpha asset.

"These assets are poised to deliver substantial growth over the coming years, with some of the lowest cost inventory we have acquired, tied to our top operators in the Permian," Adam Dirlam, NOG's president, said in a Dec. 1 press release. "We remain focused on our mission to allocate capital efficiently, grow our enterprise to bolster long-term returns on capital employed and increase shareholder returns in kind."

30 NAPE
years of making deals happen

OIL AND GAS *(AND MORE).*

NEW! BITCOIN MINING PAVILION

Bitcoin mining is an emerging energy source that has captured the interest and curiosity of our industry. NAPE Summit is the largest venue for oil & gas professionals to establish partnerships and explore how to make bitcoin mining part of an effective asset management strategy.

RENEWABLE ENERGY PAVILION

The Renewable Energy Pavilion is a dedicated space for those with renewable interests on our expo floor.

Both pavilions will showcase energy-producing properties and educate attendees on recent developments and trends.

ENERGY BUSINESS CONFERENCE

The action kicks off Wednesday after breakfast with business and technical track sessions, followed by a luncheon with Devon Energy Corp. President and CEO Rick Muncrief, combined afternoon sessions for all attendees and the governor's panel with Gov. J. Kevin Stitt and Gov. Mark Gordon.

NAPE SUMMIT WEEK

1-3 FEB 2023
Houston
George R. Brown Convention Center

Attend • Exhibit • Sponsor • Advertise • NAPEexpo.com

TOP Q1 ESG TRENDS

DAN ROMITO
PICKERING ENERGY PARTNERS

Dan Romito is a consulting partner with Pickering Energy Partners, where he focuses on quantitative ESG strategy and implementation.

A volatile economy and widespread net-zero commitments combined with energy supply and security concerns have created an imperfect storm for the oil and gas industry. Unfortunately, the groups responsible for these headwinds also exercise tremendous control over the broader investment narrative and continue to not only influence capital access but also energy policy. Furthermore, once these types of viewpoints are baked into regulatory practice, it will be difficult to reverse.

Top 3 ESG Trends for Q1 2023

1 BlackRock's voting democratization will gain popularity and likely be adopted by State Street and Vanguard, thereby adding an entirely new roster of stakeholders and straining companies' investor engagement resources. BlackRock CEO Larry Fink's 2022 letter outlines a systematic change to proxy voting and marks a potentially disruptive inflection point within the conventional proxy voting process. BlackRock's client base now possesses the ability to directly vote on climate-related and human capital-related issues. Finks' letter specifically reinforces that "this new ecosystem will also pose challenges for CEOs and their companies. Those of us who lead public companies will have a broader set of shareholders with whom to engage. Companies may need to develop new models of engaging with asset owners on their most important voting matters. This may take time to evolve."

This enables broader shareholder groups to incorporate and perpetuate adverse biases against the energy sector. The best counter to this approach centers on tactical data organization, mapping to influential disclosure frameworks, data verification and preemptively understanding where disclosure and ESG-related performance vulnerabilities exist.

2 General partners will be required to provide specific ESG-related quantitative data not only to proactively convey material differentiators but also to keep fundraising efforts alive. The regulatory landscape has finally caught up with the disclosure expectations for both debt and equity investors. The SEC Climate Disclosure Mandate is the most obvious example; however, capital markets participants must also account for the corresponding ripple effects stemming from the Sustainable Finance Disclosure Regulation in Europe and the Office of the Comptroller of the Currency announcing in 2021 a proposal to address climate-related financial risks by banks. Disclosure expectations associated with public companies are anticipated to trickle into private markets in 2023. Although not mandated by current U.S. law or regulation, it is common practice for large investors to require private equity clients to provide certain ESG-related data points consistently and quantitatively.

3 Shareholder proposals will increase their focus on ESG data. BlackRock and State Street are expected to become more aggressive in requesting climate disclosures and directives from public companies. BlackRock voted against 255 directors in 2021 (up from 55 in 2020) and failed to support the management of 319 companies for climate-related reasons in 2021 (up from 53 in 2020). In its 2022 proxy voting summary, BlackRock "saw a 133% increase in the number of environmental and social shareholder proposals, many of them more prescriptive than in prior years." Importantly, approximately 25% of BlackRock's assets under management are also invested in issuers with science-based targets or equivalent and are striving to hit 75% by 2030. State Street announced in 2022 that it will launch a targeted engagement campaign with the most significant emitters in their portfolio to encourage and enhance disclosure aligned with its expectations for climate transition plans, which includes decarbonization strategy, capital allocation, climate governance and climate policy.

Proactive communications

The inevitable ramp up of disclosure requirements creates an important window for the oil and gas industry to proactively communicate with shareholders and help rectify the anti-fossil fuel narratives in the most objective way possible. The regulatory environment generally moves at a glacier space, but once it settles on incremental regulatory measures, reversing course and retracting measures rarely occur. To mitigate the existing gap, management teams would do well to take the following proactive steps:

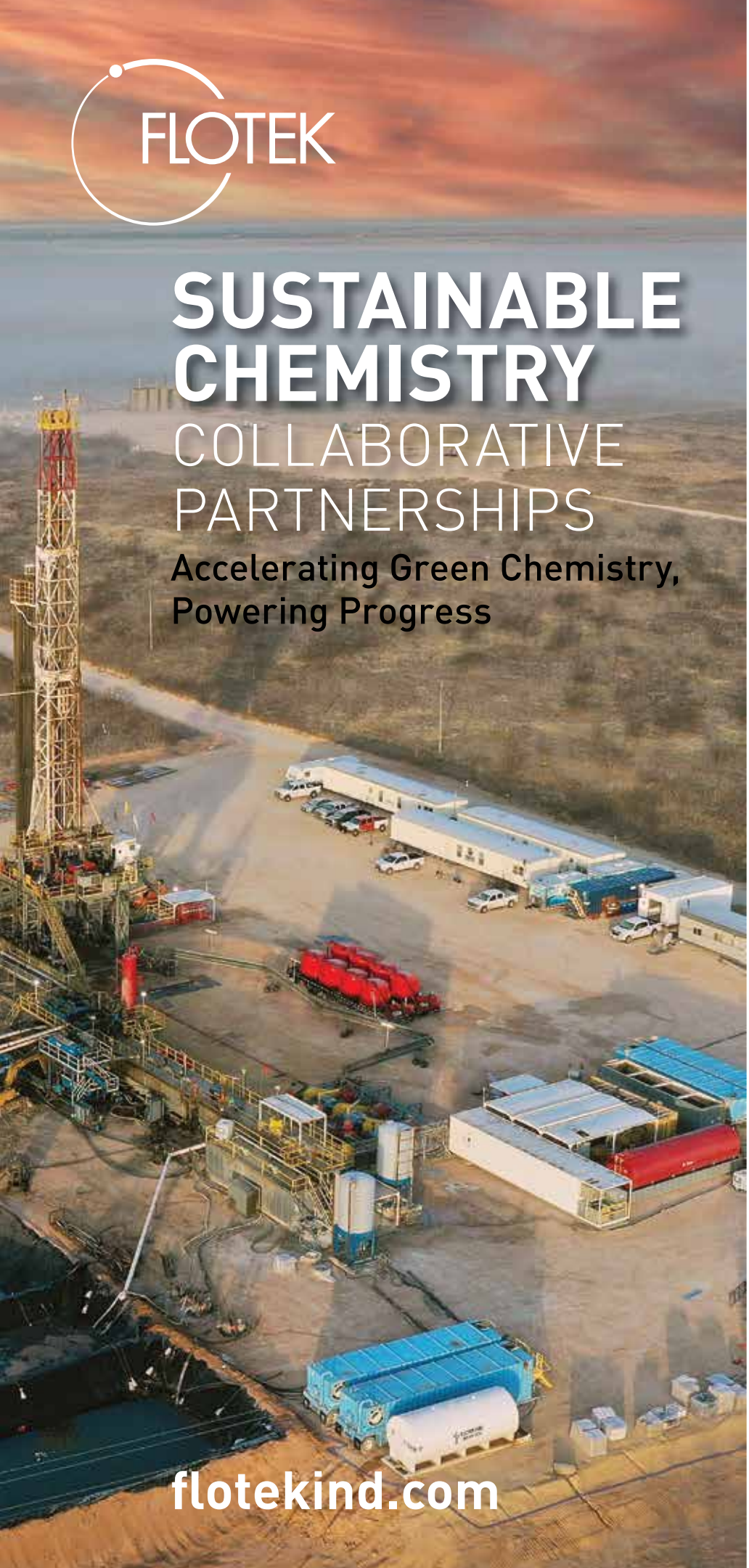
- Initiate or update a bottom-up materiality assessment and employ an objective, data-driven approach to quantitatively identify and prioritize competitive differentiators and drivers of valuation premium.
- Customize the materiality assessment to include vendors, customers, investors, employees, management, board members and even some industry detractors.
- Implement a reporting infrastructure that allows the team to systematically track trends, progress and vulnerabilities for the data.
- Ensure the reporting and selected disclosures not only meets the expectations of the impending regulatory environment and existing investor base but also the expectations of aspirational generalist investors.
- Proactively identify potential vulnerabilities and organize a concise narrative outlining how the company will specifically address the matter.
- Preemptively disclose and assertively convey a strategic narrative based on what the company is anticipated to look like and what a generalist would expect as opposed to relegating perspective to the conventional energy peer class. OGI

FLOTEK

SUSTAINABLE CHEMISTRY

COLLABORATIVE PARTNERSHIPS

Accelerating Green Chemistry, Powering Progress



flotekind.com

CARBON CAPTURE GAINS MOMENTUM

Carbon capture and storage is seen as a solution to wrangling emissions, but there are challenges and opportunities ahead.

VELDA ADDISON
SENIOR EDITOR,
ENERGY TRANSITION
@ VeldaAddison
vaddison@hartenergy.com

Carbon management and other emission reduction technologies are gaining priority in oil- and gas-producing basins across the U.S. as companies look to reduce their carbon footprints amid the energy transition.

The moves come as investors and shareholders pressure energy companies to address climate change, doing their part to cap global warming to about 1.5 C. Making the task more challenging, however, is building a sustainable portfolio without compromising profitability and maintaining energy security, something that is frequently rocked by geopolitics.

The balancing act is bringing together traditional trios of operators, service companies and midstream players with technology specialists, startups and others from different sectors as many target net-zero emissions by 2050.

The task at hand appears to be big, considering data from the U.S. Environmental Protection Agency show total emissions reported from the petroleum and natural gas systems sector have increased, rising to 312.2 million metric tons of CO_2 equivalent (MMt CO_2e) in 2021 from 276.7 MMt CO_2e in 2016. While methane emissions fell to 70.9 MMt CO_2e from 89.8 during the same period, CO_2 emissions jumped to 241.2 MMt CO_2e from 186.7 MMt CO_2e.

Carbon capture and storage (CCS) is being eyed as one of the solutions to wrangle emissions. And incentives in the Inflation Reduction Act (IRA) of 2022, such as an increase to the 45Q tax credit, expanded construction deadlines and lower carbon capture thresholds, are luring companies to incorporate CCS into their emission reduction strategies.

Despite the added benefits, experts say there are still challenges ahead.

"Every major company has the concerns that the whole world has," said Charles Fridge, CEO of Verde CO_2 LLC, a CCS developer focused on carbon capture, transmission, storage and monitoring. "That is a need to decarbonize—either for their investor base or just for the greater good of humanity."

However, when it comes to implementing CCS, some companies, he added, have suffered from "paralysis by analysis," weighing pure sequestration versus enhanced oil and gas recovery and needs to lower the carbon intensity of hydrocarbons needed today.

Experts say carbon capture technologies are critical to lowering greenhouse-gas (GHG) emissions, which are mostly CO_2.

Incentivizing action

Companies did not have a clear line of sight that showed how to make a CCS business model work and get returns until 2021 when the U.S. Treasury spelled out who could earn the 45Q tax credits, Fridge told Hart Energy. The Internal Revenue Code section debuted in 2008, but changes brought by the Bipartisan Budget Act of 2019 led to the IRS and Treasury Department publishing in 2021 final details on regulations meant to encourage CCUS projects.

The IRA, which became law in August 2022, could encourage more developers to pursue such projects as significant tax credits and other benefits improve project economics. The 45Q tax credit is $17 per metric ton for sequestered qualified carbon oxide, but that tax credit value jumps to $60 per ton for storage associated with EOR, $85 per ton for dedicated geologic storage, $130 per ton for direct air capture with carbon utilization and up to $180 per ton for direct air capture with carbon storage.

"Every major company has the concerns that the whole world has."

—**Charles Fridge,** *Verde CO2 LLC*

Certain wage and apprenticeship requirements must be met in some instances.

Making CCS projects even more attractive are direct pay options, the ability to transfer the credits and a lower carbon capture threshold for some plants and facilities. The IRA also gives companies more time to start construction to qualify for the credits.

"There's been a significant increase

in the number of projects that are in development just since 2018," Jeff Erikson, general manager of client engagement for the Global CCS Institute, said in November during KPMG's Global Energy Transformation Conference in Houston. "The IRA then took it to a point where many more facilities are now in the money or close to the money."

Getting started

Collaboration and partnerships have emerged in pursuit of CCS projects. These include Talos Energy, Carbonvert and Chevron Corp. teaming up for the Bayou Bend CCS hub; Exxon Mobil Corp. and several others pushing to develop a massive CCS hub in the Houston Ship Channel; and California Resources Corp. forming a carbon capture joint venture with Brookfield Asset Management Inc.

Oxy and its 1PointFive subsidiary are working with the King Ranch agricultural production and resource management company on what the oil and gas producer said will be the largest direct air capture (DAC) deployment project in the world. Its lease agreement could support up to 30 DAC plants, with the potential to remove up to 30 MMmt of CO_2 per year through DAC with enough pore space estimated to store up to 3 billion metric tons of CO_2, the company said.

"What we're seeing now, especially post Inflation Reduction Act, is very akin to the start of the unconventional days," Fridge said. "You've got a land rush."

He pointed to areas blessed with Miocene- and Oligocene-aged formations along the Gulf Coast and other parts of the country that are ideal for carbon sequestration.

Property owners whose land have had no oil and gas production due to the lack of traps and seals for traditional oil and gas find themselves with ideal locations for injection and permanent storage of CO_2, he added.

A week before the IRA's passage, only a handful of companies with land teams were out in certain areas knocking on doors, Fridge recalled, noting Verde, Talos Energy, Exxon Mobil and Oxy Low Carbon Ventures were among them.

"Not a big rush. Fast forward six weeks after, the same landowners I was talking to had received 20 to 30 calls from startup companies, from oil and gas companies," that had decided to start pursuing projects, he said.

Verde CO_2 is working with Denver-based natural gas producer BKV Corp. to identify CCS projects as the company looks to expand its emission reduction efforts. BKV, the largest producer in the Barnett Shale with assets also in the Marcellus Shale, expects to have its initial CCS project online by the end of 2023. EnLink Midstream will transport the natural gas from BKV's Barnett operations in North Texas to a processing plant where CO_2 will be captured, compressed and permanently sequestered by a nearby injection well, BKV said on its website.

BKV Corp.'s initial CCUS project, in partnership with EnLink Midstream, is expected to come online in the Barnett Shale of North Texas by the second half of 2023.

BKV CORP.

"They have very ambitious carbon reduction goals, so much so that they started with a $250 million commitment to these projects," Fridge said of Verde's agreement with BKV. The two are already working on projects, including one on the Texas Gulf Coast. "It is a nonexclusive joint venture where we both put money in to develop pure carbon sequestration projects."

Verde currently has projects in five areas across the U.S. The three biggest considerations when finding spots for carbon sequestration, Fridge said, are storage capacity, reservoir quality and containment.

"It's all about aggregating enough CO_2 and getting it in a large enough quantity to make it economic because it takes a lot of infrastructure to capture the CO_2."

—**Chad Zamarin,** ***Williams Cos.***

One of the greatest concerns is finding suitable locations to inject CO_2, particularly in some formations where vintage wellbores could be problematic in terms of cross flow moving uphole from a sequestration interval, according to Fridge.

Assessing economics

It's still early days, however, for CCS.

There are about 30 CCS projects in operation globally and about 13 of these are in the U.S., Erikson said.

"Despite the money that's out there, not every industry and not every facility is going to be able to develop and deploy a CCS project that is in the black, even with the increased support for that," Erikson said. "The economics on a per project basis continue to be a challenge. I think companies actually need to look beyond project economics and look

at the impact that it has on their business, their ability to attract new clients that want net zero or want to work with companies that are committed to a net-zero pathway to preserve their current market share."

A sufficient amount of CO_2 is needed to justify investments, according to Chad Zamarin, senior vice president of corporate strategic development for Williams Cos. Project returns are supported by the increased 45Q credit in the IRA.

Williams is working to decarbonize the natural gas value chain by developing CCS infrastructure as part of its Louisiana Energy Gateway project, which will gather 1.8 Bcf/d of natural gas produced in the Haynesville Shale to customers along the Gulf Coast.

With more than 5 Bcf/d of gathering infrastructure already in the Haynesville, the company has a large footprint to leverage.

"It's all about aggregating enough CO_2 and getting it in a large enough quantity to make it economic because it takes a lot of infrastructure to capture the CO_2," Zamarin told Hart Energy. "In the Haynesville, we have a large footprint, and we can leverage that scale to capture a lot of CO_2. We're targeting capturing 2 million tonnes per year of CO_2 from the entire basin."

Plans are to inject the captured carbon into the same pipes Williams utilizes to gather gas and deliver it south to a hub where companies will separate the gas from the CO_2, move it through a CO_2 pipeline and then permanently store it underground, Zamarin explained.

"You've got some key elements there that make it a good first place to prove out that technology," he added. "We feel really good about it."

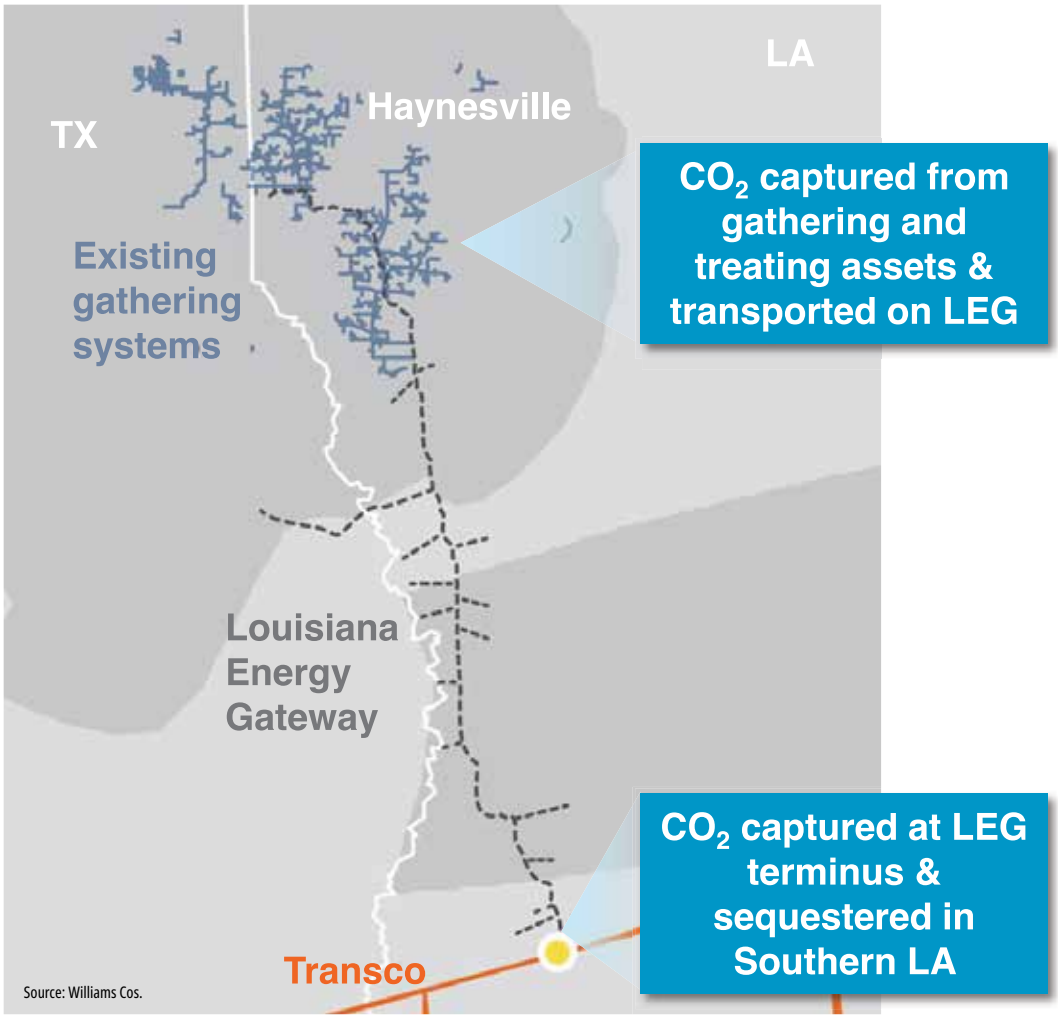
If the project is a success, the concept could be carried out in other shale plays; however, technologies and techniques may need to be adapted to different geologies, he said.

"Louisiana has good geology for permanent storage of CO_2. We're looking at a big decarbonization project in Wyoming, along with wind power, hydrogen and good ability to store," Zamarin said. "We're looking at different technology for different places. In some parts of the country, underground storage may not be the solution for CO_2. So, we're going to need to, as a country, figure out other technologies to capture the CO_2."

Tapping technology

Digital technologies, including high performance computing, could play a beneficial role, providing insight into design feasibility, scalability and costs, according to Hema Prapoo, energy industry director, Americas, for Microsoft. She pointed out that 80% of the cost of CCUS projects is for capture.

Williams' Haynesville Assets And New CCS Project Area



Source: Williams Cos.

Microsoft is among the technology partners on Northern Lights, part of the Longship CCS project offshore Norway with a focus on CO_2 transport and permanent storage. It has also worked with Aker Carbon Capture and Ørsted to explore ways to accelerate the development of biogenic carbon capture.

"When we look at the shale environment when we are trying to drill wells, we are leaving a lot of reserves down there," Prapoo said at the Houston conference. "But when you're looking at CCUS, you cannot afford to have this carbon seep back up to the atmosphere. So, in order to do that, it's very good to run your reservoir modeling."

Digitization opportunities could come with use of sensors, machine learning and digital twins to ensure carbon is being captured and moving in the right direction, she said.

Williams is also tapping technology to manage carbon and other emissions via investments in several tech startups, including Context Labs, a data software company, and Satlantis Technology, a satellite-based GHG monitoring company.

"What we're doing is creating a technology that will allow us to track the emissions of the full lifecycle of energy that we're moving across our systems," Zamarin said, adding that certificates with traceable emission fingerprints will be generated.

The company wants to add the emissions profile of energy, specifically natural gas, to variables that include geography and price to connect end-users to the cleanest sources of energy, he added. "We're calling it next-gen gas."

Looking ahead

While technologies are poised to help overcome challenges and open new CCS opportunities, there are other issues to tackle aboveground. Getting permits for needed infrastructure is among them.

"I think it's going to be difficult in many parts of the country to get pipelines built, which is essential to build out the network here in a timely manner," Erikson said. "The clock is ticking. We are in a race against time."

There were nearly 200 projects in the global CCS facilities pipeline as of September 2022, according to the Global CCS Institute's 2022 Status Report, which noted new projects were announced each month that year. The count was 44% higher than 2021.

Asked whether CCUS will be a success or not, Erikson spoke of heavy headwinds and misunderstanding about what CCUS does.

"For some folks, there is a sense that the best way to decarbonize the oil industry is to get rid of the oil industry, and I get that," Erikson said, adding they are committed to a stable climate. "There are some challenges out there. So, it's important for all of us to engage with our communities, our neighbors, with our policymakers and others to make sure that we are moving this forward because … study after study says that you may be able to get a stable climate without CCS, but it's unlikely." OGJ

'PAY VS. PERFORMANCE'

Market Watchers

JEFF NICHOLSON
OPPORTUNE LLP

Jeff Nicholson is a senior consultant in Opportune LLP's Derivative Reporting practice. He assists companies with the reporting and analysis of derivatives and complex securities.

It is important to investors that executive compensation is directly linked to a company's financial performance. To help ensure investors have adequate information to monitor this relationship, the U.S. Securities and Exchange Commission (SEC) adopted new "pay vs. performance" (PvP) disclosure rules on Aug. 25, 2022. The disclosures must be included in proxy statements for fiscal years ending on or after Dec. 16, 2022, for all reporting companies, except foreign private issuers, registered investment companies and emerging growth companies.

The new PvP rules require registrant companies to provide a table disclosing multiple historical years (three years for small reporting companies and five for larger registrants) of company-level and executive compensation figures. These figures include total shareholder return (TSR), TSR for a peer group of companies, net income, three to seven company-selected performance metrics linked to compensation and executive compensation actually paid. Registrants must report compensation for principal executive officers (PEOs) individually and may report an average for the compensation actually paid to named executive officers (NEOs). In addition to the tabular disclosures, clear descriptions of the relationships between compensation and financial performance and between the company's TSR and the selected peer group's TSR must also be provided.

These rigorous disclosure rules will require companies to implement a new process to track changes in the fair value of their equity classified awards to the PEO and NEOs for each fiscal year required to be included in the disclosure. To comply with the new PvP rules, a registrant company must perform the following tasks:

- **Gather Data And Assess Valuation Needs**
  - o Summarize all awards issued to named executive officers:
    - ■ Award type (restricted stock unit, or RSU, performance units with market conditions, options, stock appreciation right, etc.).
    - ■ The number of units issued on grant date.
    - ■ The number of units vested by vesting date.
  - o Determine required valuation dates by the award.
- **Perform Necessary Valuations**
  - o RSUs can generally use the stock price on the valuation date.
  - o Performance units with market conditions generally require Monte Carlo simulations.
  - o Options may be able to use the Black-Scholes model; however, special consideration of the expected term is required. In certain circumstances, Lattice models may be required.
- **Prepare Supporting Workbook For Disclosure**
  - o Detail the settled values by award at each vesting date for awards that vest in a given year.
  - o Detail the fair value by award at each fiscal year-end for all unvested awards.
  - o Preparation of a summary table showing compensation actually paid related to the equity awards for each fiscal year.

"These rigorous disclosure rules will require companies to implement a new process to track changes in the fair value of their equity classified awards to the [principal executive officers] and [named executive officers] for each fiscal year required to be included in the disclosure."

To ease the burden of implementing these new rules, the SEC allows small reporting companies to disclose two years of the requisite PvP metrics initially and three years of data the following year and thereafter. Larger registrants will need to disclose three years of data initially, four years of data the following year and five years of PvP measures thereafter. While the transition period will reduce the amount of work required to comply with the new rules initially, it will still be a large undertaking for many companies to prepare the initial PvP disclosures.

Companies should start developing these tabular disclosures as soon as possible to avoid unnecessary surprises and to allow additional time to complete the accompanying qualitative disclosures describing the relationship between compensation actually paid and the financial performance and between the company's TSR and the selected peer group's TSR.

Opportune's valuation practice is well-equipped to value awards with market conditions, as well as other option contracts. Additionally, we have internally developed tracking spreadsheets and dashboards to catalog the values required to streamline the disclosure process. OGI

TAILWATER
CAPITAL

PRESENCE.
PARTNERSHIP.
PRECISION.

FULL *immersion* INVESTING

Tailwater Capital is an energy and growth infrastructure private equity firm with a well-established track record of working constructively with proven management teams to deliver value-added solutions. Tailwater has raised more than $3.8 billion in committed capital since inception and the team has executed more than 100 transactions representing over $23 billion in value.

214.269.1183 tailwatercapital.com

NEW FINANCINGS

EQUITY

Company	Exchange/ Symbol	Headquarters	Amount ($MM)	Comments
Chesapeake Energy	NASDAQ: CHK	Oklahoma City	$2,000	Replaced former credit facility with new senior secured reserve-based revolving credit facility agreement. Decreased from initial borrowing base of $3.5 billion with semiannual redetermination. Terms include a facility maturity date of five years, or through Dec. 9, 2027, and credit agreement terms change upon receipt of S&P, Moody's or Fitch investment grade ratings. Upon receiving two investment grade ratings the company can: remove or relax negative covenants, or replace financial covenants with debt to capitalization ratio of 65% or less.
Cheniere Energy Inc.	NYSE: LNG	Houston	$1,250	Announced expiration of cash tender offer issued by Cheniere Corpus Christi Holdings LLC on Dec. 5 to purchase any and all of the $1.25 billion aggregate principal amount of outstanding 7% senior secured notes due 2024. Intends to accept for purchase $752,330,000 combined aggregate principal amount of notes under tender offer. BofA Securities acted as deal manager, while D.F. King Co. Inc. acted as tender and information agent for the tender offer.
Forum Energy Technologies	NYSE: FET	Houston	$32	Closed sale of four Texas- and Louisiana-based manufacturing and distribution centers in long-term lease agreement. Net proceeds from the sale and projected second-half 2022 free cash flow projections represent $60 million to $70 million in net debt reduction since June 2022, according to president and CEO Neal Lux.
San Juan Basin Royalty Trust	NYSE: SJT	Houston	~$8	Declared monthly cash distribution to holders of units of beneficial interest of $0.171971 per unit ($8,015,381.16 total). Distribution is payable to unit holders on record as of Nov. 30, 2022, on Dec. 14, 2022. **PNC Bank, National Association** is the trustee. Operator of subject interests **Hilcorp Energy Co.** reported net profits of $10,864,659 for the trust and $14,810,979 in total revenue for the production month of September 2022.
Tethys Oil AB	STO: TETY	Stockholm, Sweden	~SEK$0.3-SEK$0.6	Repurchased 15,000 of its own shares during the week of Nov. 21-25 in accordance with the EU Market Abuse Regulation No. 596/2014 and the Commission Delegated Regulation No. 2016/1052. Weighted share price per day on Nov. 21 averaged SEK$59.73, while shares on Nov. 23 averaged SEK$61.10. Holding of own shares now amounts to 627,083 of its total 33,056,608 shares as of Nov. 25, 2022. Acquisitions carried out by Pareto Securities on behalf of the company.
ESAB Corp.	NYSE: ESAB	North Bethesda, Md.	N/A	Announced pricing of underwritten offering on 6,003,431 common stock shares owned by former parent company Enovis Corp. Shares sold at $40 per share. The company will not receive any proceeds from shares sold in the offering or from Enovis' debt-for-equity exchange of common stock for indebtedness, owned by **Goldman Sachs & Co. LLC. Goldman Sachs**, **Evercore ISI**, **Bank of America Securities**, **Wells Fargo Securities**, **J.P. Morgan**, **BMO Capital Markets**, **BNP PARIBAS** and **Citizens Capital Markets** are joint lead book-runners, and Goldman Sachs and Evercore are underwriter representatives for the offering.
Comstock Resources Inc.	NYSE: CRK	Frisco, Texas	N/A	Converted Series B convertible preferred common stock, issued July 2019, into 43.75 million shares of common stock. Now no longer has any outstanding shares of preferred stock and 277,507,678 shares of common stock, with 66% of outstanding shares owned by the Jerry Jones family. Dallas Cowboys owner Jerry Jones provided the funds to complete the transaction.
Halliburton Co.	NYSE: HAL	Houston	N/A	Declared $0.12 dividend on common stock shares to holders on record as of business close Dec. 8, 2022, payable on Dec. 21, 2022, for the fourth quarter of 2022.

Scan to see the New Financings database.

DEBT

Company	Exchange/ Symbol	Headquarters	Amount ($MM)	Comments
Energy Transfer LP	NYSE: ET	Dallas	$1,000-$1,500	Announced pricing of $1 billion aggregate principal amount of 5.55% senior notes due 2028 and $1.5 billion of 5.75% of senior notes due 2033, priced at 99.974% and 99.891% respectively of their face value to the public. Sale settles Dec. 14, 2022, subject to closing conditions. Net proceeds will go toward repaying outstanding debt and other general partnership purposes. **Barclays Capital Inc.**, **Bank of America Securities Inc.**, **Deutsche Bank Securities Inc.** and **Wells Fargo Securities LLC** are joint book-running managers.
SLB	NYSE: SLB	Houston	$500	Announced offer to purchase an aggregate purchase price amount of 3.75% senior notes due 2024, 4% senior notes due 2025, 3.9% senior notes due 2028 and 4.3% senior notes due 2029 through **Schlumberger Holdings Corp.** subsidiary. Also increased maximum purchase price to up to $8 million. Offer subject to terms and conditions set forth in the purchase offer dated Nov. 21, 2022, and expires on Dec. 19, 2022, assuming offer is extended or terminated. Withdrawal rights expire Dec. 5, 2022, and tendered notes cannot be withdrawn.
Cheniere Energy Inc.	NYSE: LNG	Houston	N/A	Redeem its 7 % senior secured notes due 2024 through the subsidiary **Cheniere Corpus Christi Holdings LLC** outstanding on Jan. 5, 2023. Will redeem notes at a make-whole redemption price based on treasury rate plus 50 basis points. Notes must be surrendered to the Bank of New York Mellon pursuant to the redemption notice to collect redemption price.

Scan to see the New Financings database.

MUCH ADO ABOUT NOTHING

AROUND THE GLOBE

PIETRO D. PITTS
INTERNATIONAL MANAGING EDITOR
@PietroDPitts
pdpitts@hartenergy.com

U.S. President Joe Biden's ability to strike deals with his Venezuelan counterpart, Nicolas Maduro, is much easier now that the Republicans have all but assured Florida is red after the November midterms.

A key issue in the push for blue versus red in Florida was whether or not negotiations with Venezuela would continue, with the Republicans against it. Losing swing state Florida opens the door for Biden to cut deals with a socialist government that it despises but seemingly won't go away, since it's likely the Democrats figure they can't lose what they've already lost.

The resumption of negotiations in Mexico between Venezuela's ruling party and the opposition is the logical starting point to achieve the U.S.' highly sought after "free and fair" presidential elections in Venezuela in 2024. Such elections are seen as the only true and democratic way for Venezuelan citizens to choose their next president and the direction they want their country to move. In effect, Maduro has made his initial chess move by agreeing to restart negotiations in Mexico City.

Almost two decades of political uncertainty and corruption coupled with a mismanagement of oil sector rents have led to the downfall of the Venezuelan economy and the start of a humanitarian crisis. U.S. sanctions imposed on Venezuela in early 2019 only exacerbated the problems.

With talks on again, communication between Washington and Caracas via Mexico City should improve. And Washington has already sent a message prior to making its initial chess move.

"We urge the parties to engage in good faith toward a comprehensive agreement leading to free and fair elections in 2024, the restoration of democratic institutions and an end to the humanitarian crisis in Venezuela," U.S. Secretary of State Antony J. Blinken said late November in a joint statement with the EU high representative for Foreign Affairs and Security Policy Josep Borrell Fontelles, Canadian Minister of Foreign Affairs Mélanie Joly, and U.K. Secretary of State James Cleverly.

The U.S. Office of Assets Control (OFAC) has subsequently granted U.S. oil major Chevron Corp. General License No. 41, which authorizes the production and lifting of oil and oil products produced by the company's joint ventures (JV) in the South American country.

The deal could see higher production and export flows from Venezuela that could help fill the void left by lower Russian oil flows to global markets after Russia was sanctioned following President Vladimir Putin's war in Ukraine in early 2022.

But Biden's deal with Maduro comes with a promise from Maduro that he'll allow "free and fair" elections. The chess piece movements in Washington and Mexico City via Caracas have been wanted by the oil sector and political pundits. But Biden could get burned if Maduro rejects the negotiations progress and/or the directional flow of humanitarian aid expected to start under the U.N.'s watch.

It may be too soon to celebrate, if Venezuela's past under the Chavistas—which began in 1999 with the presidential election of Hugo Chavez Frias—is any indication of what to be expected.

The initial moves in this high-stake geopolitical chess match are seemingly good for both Washington and Caracas, but maybe Chevron is more likely to benefit in the near term.

OFAC's Nov. 26 deal automatically renews on the first day of each month and is good for six months. The Chevron JVs are also allowed to export oil and oil products to the U.S., provided they are first sold to Chevron.

The deal allows for the import of goods or inputs related to Chevron's JVs, such as diluents, condensates, oil or gas products, as long as they are not of Iranian origin.

But the most vexing part of the deal for Maduro is that it doesn't authorize payment any taxes, royalties or dividends to his government, while the sale of the oil and oil products produced by the Chevron JVs are only allowed to be exported to the U.S.

Realistically, the deal could see Chevron boost production in Venezuela by about 100,000 bbl/d, according to Rystad Energy. Even 200,000 bbl/d is possible, but beyond that, massive investments are required.

Despite the small immediate upside potential, the deal could allow Chevron to recoup accumulated debts in Venezuela estimated to be around $3 billion.

The signal from Washington and its allies to Maduro remains clear: "We reiterate our willingness to review sanctions policies if the regime makes meaningful progress in the announced talks to alleviate the suffering of the Venezuelan people and bring them closer to a restoration of democracy," they announced in a joint statement.

Whether Maduro can hold his nerve is another question. If he can't, he'll likely cause this chess match to go the route of others between Washington and Caracas: nowhere. OGI

New Conference Added for 2023

GoM ENERGY TRANSFORMATION

powered by HARTENERGY LIVE

SAVE THE DATE

FEBRUARY 21, 2023

NORRIS CENTERS, HOUSTON, TX

WHAT'S NEXT FOR ENERGY IN THE GULF OF MEXICO?

The GoM Energy Transformation Conference explores the energy expansion activities taking place in the Gulf of Mexico. Gain insights from major and independent E&P companies who are incorporating new products and technologies into their portfolios.

Session Topics include:

- Investing in American Made Energy Resources
- The Tech Race to Net Zero
- CCS – A New-Waste Disposal Industry for America
- Hydrogen in the GoM: Producing and Transporting a Different Molecule
- Electrons vs. Molecules
- LNG – Answering the Call for Affordable, Reliable, Lower Carbon Energy
- Security and Decarbonization – Can They Co-exist

VIEW THE AGENDA

LEARN MORE TODAY:
GoMEnergyTransformation.com

Hosted by: Oil and Gas Investor

Thanks to our Founding Sponsor: XODUS

Let us help you build a multi-channel sponsorship package that meets your marketing goals and budget.
LEARN MORE & CONTACT: Rob Cravaritis, Chief Revenue Officer | rcravaritis@hartenergy.com | 713-260-1063

HESS INKS CARBON CREDIT DEAL WITH GUYANA

Hess Corp. lands a $750 million, long-term strategic partnership with the Guyana government to purchase carbon credits as part of a plan to prevent deforestation and support sustainable development.

SHUTTERSTOCK/CORONA BOREALIS STUDIO

PIETRO D. PITTS
INTERNATIONAL MANAGING EDITOR
@PietroDPitts
pdpitts@hartenergy.com

Hess Corp. announced Dec. 2 a deal to acquire 37.5 million REDD+ jurisdictional carbon credits directly from the government of Guyana between 2022 and 2032 for a minimum of $750 million.

The credits will be on the Architecture for REDD+ Transactions (ART) registry and independently verified to represent permanent and additional emissions reductions under ART's REDD+ Environmental Excellence Standard 2.0 (TREES), the U.S.-based independent announced in a press release.

The agreement supports government efforts to protect Guyana's vast forests and will provide capital to improve the lives of Guyanese citizens through government investments as part of the country's Low Carbon Development Strategy (LCDS) 2030, Hess said.

Additionally, the agreement strengthens Hess' commitment to back global efforts to address climate change and fits with its pursuit to achieve net-zero greenhouse-gas emissions by 2050, the company added.

Guyana, a small country of almost 800,000 people, according to the U.N., joined the global oil producers club in late 2019 when an Exxon Mobil Corp.-led consortium, including partners Hess and China's CNOOC, initiated production offshore in Stabroek Block.

Stabroek Block holds an estimated gross discovered recoverable resource of around 11 Bboe and is currently producing more than 360,000 bbl/d from the block's first two developments Liza Phase 1 and Phase 2. Production from the block is expected to exceed 1 MMbbl/d gross in 2027, Hess CEO John Hess said in late October in a company press release.

Guyana and Suriname share the prolific Guyana-Suriname Basin offshore, which continues to see ongoing exploration activities across a number of blocks. Guyana is a key part of Hess' growth strategy, which includes a focus on advantaged low-cost, low-carbon barrels.

"Development of Guyana's oil and gas resources is important to meet the world's growing demand for affordable and secure energy, which is essential to ensure a just and orderly energy transition," Hess said. "We are pleased to support the country's efforts to advance sustainable development and enhance the quality

of life for the people of Guyana."

> *"Development of Guyana's oil and gas resources is important to meet the world's growing demand for affordable and secure energy, which is essential to ensure a just and orderly energy transition."*
>
> —John Hess, *Hess Corp.*

Deforestation by 2030

Despite the start of production, the government of the small English-speaking country in northern South America has pledged to end deforestation by 2030. Guyana's immediate neighbors include Venezuela to the west, Suriname to the east and Brazil, with its massive land coverage, to the south.

Guyana has over 18 million hectares of forests estimated to store approximately 20 billion tons of CO_2e, according to details revealed in its' LCDS 2030 report published in July 2022. The strategy looks to preserve Guyana's forests while expanding economic activity with the active participation of Guyanese citizens.

"As one of nine countries/territories in the Amazon Basin—the world's biggest expanse of tropical forest—Guyana, since 2009, has sought to create a global model for avoiding the deforestation-led development path followed by countries all over the world, while at the same time creating opportunities for prosperous, inclusive development," the report said.

Guyana launched the first LCDS in 2009, which set out a vision for inclusive, sustainable development while simultaneously maintaining the country's forests, about 85% of its territory, to help meet some of the most urgent challenges confronting the world, it said.

"Estimates of the economic value that Guyana's ecosystem services provide to the world are considerable. Guyana's forests alone provide value that is estimated to range from $40 billion to $54 billion annually," according to the report. OGJ

Voices

From backstage at the Hart Energy's Executive Oil Conference in Midland, Texas, industry executives discussed exclusive company updates and market insights with Hart Energy editors.

"In a volatile market, you have to be smart about what you pay. And in a volatile market with relatively high prices, you've got folks who want high value for their assets. Finding that equilibrium has been tough. But again, the opportunity is there. So our view is patience, continue to work specific deals and the market probably comes to more of an equilibrium in '23."

—**Dan Pickering**, *founder and CIO, Pickering Energy Partners*

"We're kind of keeping our eyes open and maybe sometime next year ... If there's another deal like this or another that helps drive value to shareholders, we'd absolutely consider it."

—**Will Hickey**, *co-CEO, Permian Resources Corp.*

Scan to read more

"The environment is such that there's just not great capital formation, really, on the exploration side of the business today. I think that's going to have to change because we're running out of drilling locations."

—**Gene Shepherd**, *CEO, VTX Energy Partners*

"We announced recently that we started early site construction on our first DAC [direct air capture] here in Midland. We're really excited. We went through an extensive front engineering design process and also did some testing and validation of the technology with carbon engineering to get us to where we are today ... Based on the current timeline, we hope that it's operational by late 2024."

—**Babatunde Cole**, *president and general manager, Oxy's Delaware Basin business unit*

HARTENERGY.COM

PEGASUS
RESOURCES

www.pegasusresources.com | info@pegasusresources.com | (817) 338-1118

2821 West 7th Street, Suite 500

Fort Worth, Texas 76107

C-SUITE CHAT

SHALE LEADERSHIP

President and CEO Rick Muncrief leads with a lifetime of experience at Devon Energy Corp.

JORDAN BLUM
EDITORIAL DIRECTOR
@JDBlum23
jblum@hartenergy.com

A child of the Permian Basin, Rick Muncrief long knew the potential of the basin's now-booming western lobe.

Muncrief methodically, but rapidly, built up WPX Energy Inc. through West Texas and New Mexico's liquids-rich Delaware Basin after he took over in 2014. Now, he remains focused on the Delaware as the jewel of a multibasin portfolio after WPX combined with Oklahoma City rival Devon Energy Corp. in a $5.75 billion, so-called merger of equals.

"It's driven by the geology and the amount of raw resources in the Delaware," Muncrief told Hart Energy. "The Permian is a place we're very, very comfortable with and very, very proud of."

Muncrief promotes a bold and decisive acquisition approach while still holding dear to strategic and conservative fiscal values. He positioned WPX in the Delaware—while divesting in gassy, noncore areas—and is now further diversifying the merged Devon Energy he took over in the Williston and Eagle Ford shale plays through the recent acquisitions of RimRock Oil & Gas and Validus Energy, respectively.

That intrepid attitude proved imperative in 2020 when Devon and WPX took action in an industry that initially halted all dealmaking during the pandemic.

"During the pandemic, we felt like everyone was on their back heels. They were afraid to make a move," Muncrief said. "At Devon and WPX, we felt like there were things that each of us needed. For WPX, we needed a little more scale and inventory. Devon was concerned about a lot of exposure to federal lands. At WPX, we didn't have as much. That's where it was truly a win-win."

Now, the combined Devon estimates its fourth-quarter production at about 650,000 boe/d, with roughly 65% of the volumes hailing from the Delaware. But the barrels were well more than 70% weighted toward the Delaware before the recent RimRock and Validus deals.

Gabriele Sorbara, managing director of equity research at Siebert Williams Shank & Co., said acquisitions are not the red flags for investors that they were just before and during the pandemic. Companies need to build drilling inventory and they should if they have strong free cash flow like Devon.

MARSHALL HAWKINS

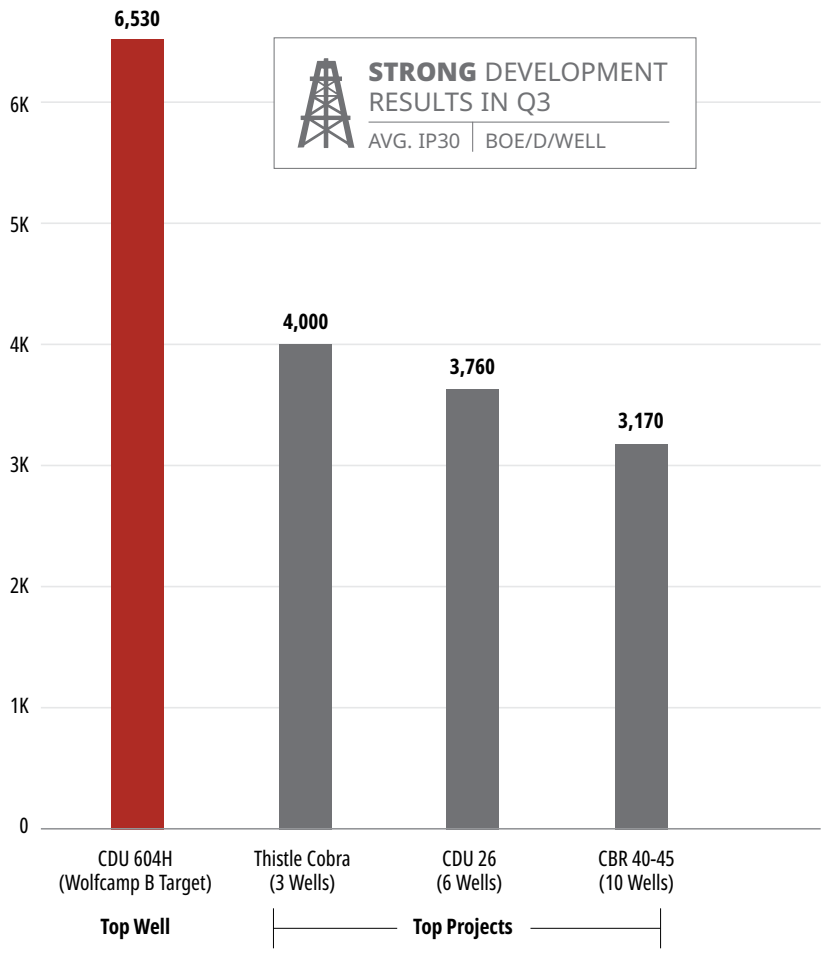
Devon 3Q Financial Indicators

Metric	3Q 2022	Vs. 3Q 2021
Core earnings (per share)	$2.18	102%
Operating cash flow ($MM)	$2,104	32%
Free cash flow ($MM)	$1,476	31%

Source: Devon Energy Corp.

Delaware Basin – Operating Efficiencies Advance

- **Top result:** 3-mile Wolfcamp B appraisal delivers highest well productivity in Q3 (IP30: 6,530 Boe/d)
- Wolfcampdrilling productivity increased **13%** from the previous quarter (~1,000 feet per day)
- **Record-setting** completion efficiency at Cotton Draw pad (Avalon wells: 3,200 feet per day)



Source: Devon Energy Corp.

"M&A isn't the risk it used to be. M&A is good if you've got the cash and you can get the deal done," Sorbara said. "If there's an opportunity, Devon is taking it. It's really important to have scale and use that cash in a productive way. We're going to continue to see consolidation across the basins."

Permian birthright

Born in Ardmore, Okla., Muncrief moved to Odessa, Texas, in 1958—before he was old enough to remember—after his father started working in the Permian for El Paso Natural Gas.

They would later live in the Delaware Basin in Hobbs and Jal, N.M.

At the time, U.S. oil production remained on a steady rise. But, at a domestic total of 7.1 MMbbl/d in 1957, the Permian still did not come near today's record high of 5.5 MMbbl/d, which is 45% of the nation's daily production.

"It's been a foundational basin for the U.S. energy picture," Muncrief said of the Permian.

And he is thrilled his father is still alive to see the growth today.

"He can't believe the size of the facilities being built and the amount of gas and crude oil coming out of the Permian. The activity levels and efficiencies are what you really point to," Muncrief said. "I took him out to a field three or four years ago and he was just amazed. There's a lot of the same country, but just a lot more activity."

Stationed at Devon's headquarters in Oklahoma City today, Muncrief left the Permian to graduate from high school in Oklahoma and to attend Oklahoma State University, where he naturally majored in petroleum engineering technology.

Among other stops, Muncrief loosely followed his father's legacy, working his way up at El Paso, its acquirer, Burlington, and then ConocoPhillips Co., which ultimately swallowed up Burlington. In 2009, he eventually took over as senior vice president of operations and resource development at Harold Hamm's Continental Resources Inc.

And then his big break came in 2014, when a struggling WPX Energy appointed him CEO.

Aiming for the Delaware

WPX spun off from midstream operator Williams Cos. at the end of 2011 so it could concentrate on exploration and production.

The company promptly struggled with a lack of crude oil exposure and challenging natural gas prices.

At the time, WPX's gas-weighted portfolio was only 20% liquids. Muncrief was hired to transform the company.

"We were in seven different basins at that time. The Permian was not one of those," Muncrief said dryly.

"The Permian is a place we're very, very comfortable with and very, very proud of."

MARSHALL HAWKINS

In mid-2015, after oil prices had plunged, WPX made its first move to buy privately held RKI Exploration & Production for $2.35 billion because of its 92,000 acres in the Delaware in Texas' Loving County and New Mexico's Eddy County.

"At that point in time, the Delaware was really struggling. It was much more of a challenging area to drill and operate in than say the Midland side of the Permian," Muncrief said. "I think, for us, we went to the geology. That's the thing that really took us to the Delaware Basin. There was a fair amount of development going on, but we felt there were at least another two or three levels of efficiencies and capabilities that we would see in the Delaware."

Five years later, it turned out that the RKI deal made the Devon merger more practical. Much of RKI's acreage bordered Devon's position.

"That's why ultimately down the road the merger made so much sense with the adjacency to the two companies' acreage positions," Muncrief said.

But Muncrief and WPX did not stop there.

In a recovering, but still-struggling industry in early 2017, WPX scooped up the Delaware assets of Panther Energy and Carrier Energy.

Then, in late 2019, just prior to the pandemic, WPX paid $2.5 billion to buy out privately held Felix Energy and its large Delaware position.

Eventually, WPX's seven basins—without a Permian footprint—turned into two with a big Delaware position and a solid Williston play.

As WPX was growing in the Delaware, Neal Dingmann, Truist Securities energy analyst, said Muncrief was able to successfully pivot WPX to become a leader in shareholder returns at a time when investors were finally forcing producers to practice discipline.

"He's a very disciplined CEO," Dingmann said. "The top leaders are great operators and they understand Wall Street—that's a tough combination. Rick kind of checks all those boxes."

Devon was not as analytical with its strategies before Muncrief took over, sometimes following the trends set by its peers.

And, in the years that WPX was growing in the Delaware, Devon was mostly focused on divesting, with some big buys mixed in between sales.

In Devon's world

After making a big, expensive buy in the Eagle Ford Shale in 2013 amid high crude prices, Devon largely focused on asset sales, with some notable exceptions.

In 2014, Devon sold its noncore portfolio to now-defunct Linn Energy and used the proceeds to buy Oklahoma STACK acreage from Felix.

Then, over three years, Devon sold its Canadian upstream and midstream assets and its noncore Midland Basin acreage.

In 2020, and shortly before the WPX deal, Devon sold its shale pioneering Barnett Shale gas assets to BKV Corp., which is now planning to go public under the strength of those gassy acres and natural gas prices.

Muncrief joked that he asked the Devon team why they made the Barnett deal before he took over. But then he responded seriously.

"I've asked myself that same thing of some of the things WPX sold. But here's the thing," he said. "Those assets were sold at an attractive price but, more importantly, got you focused on and gave you cash to operate on some of your higher-margin and more profitable areas like the Delaware.

"We've been real disciplined in our moves, and I don't think that's going to change."

There's no regrets. You make those calls and take the proceeds and move on and reinvest them."

Now, apart from the Delaware, Devon is positioned in the Anadarko Basin, the Williston, the Eagle Ford and the Powder River Basin. Those positions include newly acquired acreage from RimRock for $865 million in cash in July and from Validus for $1.8 billion in cash in September.

"A multibasin, multicommodity business is the one that's going to be successful over the long haul," Muncrief said. "We all recognize the strength of our Delaware position, but there's also opportunities in other basins, especially when you're in the core of these basins like we are."

And, as long as prices and free cash flows remain healthy, Devon will continue to eye potential growth moves. "We've always had a high bar," he said. "We've been real disciplined in our moves, and I don't think that's going to change."

Those types of bolt-on deals like RimRock and Validus in non-Delaware basins are critical for future growth, said David Harris, Devon's executive vice president and chief corporate development officer, in an interview with Hart Energy. He noted that both deals bring oil-weighted acreage positions close to Devon's existing footprints.

"Scale matters as we've moved into this new era of unconventional development, and we believe having really high-quality, low-breakeven assets in the premiere basins around the country is an important part of that," Harris said. "We think being able to evaluate opportunities and places outside the Permian has given us the opportunity to find some unique value creation for our shareholders."

Gabriele Sorbara said the Wall Street focus on single-basin companies is not as strong as before, especially since it is so hard to still buy into the heart of the Permian.

"I think we're in a different world today. Back in the day, people wanted that pure-play focus. But I think multibasin is an advantage in this day and age," Sorbara said. "I think about who's got the ability to sustain and thrive longer term. Devon is there."

Forward financial focus

Muncrief took over as CEO of the combined Devon in early 2021 and quickly made waves in early May by announcing a pioneering dividend strategy—a fixed-plus-variable dividend—that was quickly followed by others making similar moves, such as Pioneer Natural Resources Co. and ConocoPhillips.

The idea was to reward shareholders with a predictable fixed dividend and return more to investors on a quarterly basis when commodities prices are stronger—as has been the case through most of 2022.

"One of the things we heard from investors for a number of years is what do you do with those cash flows when they're real strong," Muncrief said. "We had a history of putting it to work at the drill bit. We saw an opportunity to change that model. That's where Devon landed with the ability to pay a really nice fixed dividend, and the stronger cash flows allow for the variable dividend returning a substantial portion back to shareholders."

When oil prices dipped in the fall, so did the third-quarter dividend—albeit predictably. But analysts and investors also saw rising capital spending, which is largely from inflation on services, and lower-than-expected production guidance. So the stock price fell a bit in November from recent highs.

But the longer-term optimism remains strong, Sorbara said. "The guidance was a bit lower than expected and it raised some flags with investors. But Rick is a great leader. The assets are top notch. The whole industry has evolved and they're pioneers. At some point, the industry will pivot toward growth and Devon is perfectly situated."

Looking forward, Muncrief sees a company with strong productivity, free cash flow and shareholder returns. But the overall industry challenges of inflation and well productivity will remain. He sees production volumes relatively flat in 2023 with some modest upside while running close to 25 rigs.

"I think we're doing a good job of fighting the impacts of inflation. You're still going to see those capital numbers go up across the board," he said. "I think we just need to stick to our guns. I think everyone is going to try to keep their volumes flat."

Inflation is pushing the cost of wells up, but Devon is saving time and money through efficiencies by cutting down on the amount of days to drill and complete wells. "You're saving 10% on time by doing it more quickly and efficiently," he said. "We'll see how it all plays out."

Well productivity degradation is a real issue across the industry with companies drilling their best opportunities first, he said, but improving efficiencies and new exploration will help offset the weaknesses. That is the booming market scenario for the services sector with flat production requiring more activity, he said.

But do not confuse that realism for a lack of optimism. There is a reason Devon is only hedging 20% to 30% on crude production and even less on natural gas, he said. The global supply-and-demand outlook remains in Devon's favor for some time, he said. And that brings him back to his emphasis on discipline.

"We just need to be disciplined and patient and keep the market supplied," Muncrief said. "We do think there's a supply tightness on the horizon. The U.S. SPR [Strategic Petroleum Reserve] releases are just about over, and we don't even have China really reopened yet. So we see bullish indicators." OGI

FLOGISTIX

ELIMINATE EMISSIONS ACROSS THE OIL AND GAS VALUE CHAIN

Flogistix is driving decarbonization in the oil field with its carbon capture technology.

Carbon Capture technology will:

- Reduce environmental impact while increasing revenue
- Eliminate the need to flare or vent, improving your site's air quality
- Remove VOCs easier and at the source

Vapor Recovery

AirMethane Solutions

Production Optimization

PUT FLOGISTIX TO WORK FOR YOU

www.flogistix.com | (405) 536-0000 | info@flogistix.com

INSIDE DIAMONDBACK

The Permian Basin pure play's president describes the E&P's thinking in M&A, exploring more zones, monetizing associated gas and raising its E-score, all with an eye on the balance sheet.

NISSA DARBONNE
EXECUTIVE EDITOR-AT-LARGE
@NissaDarbonne
ndarbonne@hartenergy.com

As Kaes Van't Hof discussed Diamondback Energy Inc.'s dealmaking, there was no hint another acquisition was underway.

"Acreage is precious right now. It's a knife fight for every acre, particularly in the Midland Basin," the Diamondback president and CFO said at Hart Energy's Executive Oil Conference in Midland, Texas.

The Permian pure play was in the midst of buying FireBird Energy LLC's 68,000 net acres in the Midland Basin for $1.75 billion in cash ($775 million) and stock. Later that day, on Nov. 16, Van't Hof and his colleagues announced a deal to buy Lario Permian LLC's 15,000 net acres for $1.55 billion in cash ($850 million) and stock.

"We started with 10,000 acres by the airport here in Midland and have built up to 500,000 (net)," Van't Hof said that morning. Make that 515,000 net by day's end.

The operator began drilling in the Permian Basin in the conventional rock days of 2007 with 4,174 net acres and 800 net boe/d. It grew to 52,000 net by the time of its IPO in October 2012, selling 12.5 million shares at $17.50 each.

Post-offering, 35.1 million shares were outstanding, giving it a market cap of about $600 million. In early December, it was $24 billion.

Here's an abridged version of three conversations with Van't Hof in Midland.

Nissa Darbonne: ***Generalist investors are returning to oil and gas?***

Kaes Van't Hof: I think we are seeing the mythical generalist investor start to come back into the space. A lot of us have shifted our business model to a lower-growth, higher-return model, and our investors seem to be enjoying that.

I think success begets success. As an industry, we all have healthier balance sheets, healthier companies, healthier business models, and that should attract investor capital over time.

> ***"We haven't looked outside the Permian. I think that's a long way off if it ever happens because the returns here are the best in North America on the oil side."***

You haven't seen them come back into the top five of our shareholder roster, but certainly in the top 15 or 20. They aren't owning 10% or 13% of the stock like they might have when this shale revolution kicked off.

But if we keep executing, keep hitting numbers, more and more investors are going to come back because this is a business that generates real cash in a world where interest rates are rising and businesses that aren't generating cash aren't doing very well in the stock market.

PERMIAN BARNETT

Pioneer Natural Resources Co. plans to test the deep Barnett and Woodford formations underlying its Midland Basin leasehold this year.

In November, Occidental Petroleum Corp. reported a Barnett test in the Midland Basin as a "successful appraisal." That and a Second Bone Spring test in the Delaware Basin, it reported in an investor call, "have moved themselves up to really top tier in our development plans.

"We have optionality in terms of when we develop that and co-develop it, but it's good to see those secondary benches add to that inventory."

In the Central Basin Platform rather than the Midland Basin, Diamondback Energy Inc. tested the Barnett in 2019. In May of 2020 during the COVID-related oil and gas price bust, though, it announced it was suspending further testing.

Hart Energy asked Kaes Van't Hof, Diamondback president and CFO, about the Barnett potential on its Midland Basin acreage.

Nissa Darbonne: ***The Midland Basin's Barnett is in your "Other" category in describing your inventory in public filings. Is deep Permian drilling becoming interesting to you again?***

Kaes Van't Hof: I think it's still a long way off from real development, but it's certainly getting a lot of attention. There have been rumors of some really good Barnett tests. If that happens, we own a lot of mineral rights and a lot of leases that could be developed.

No promises on when we're going to test it, but we're certainly keeping our ear to the street on what some recent results have looked like from peers.

It's another testament to how much rock and resource there is in the Permian. But (for now) we have so many other zones we've been developing.

TOM FOX

ND: ***I'm seeing fewer sector specialists anymore.***
KVH: It was a tough few years for the sector from a public-markets perspective. And that led to a brain drain as well on the investor side. There are certainly fewer energy specialists on the investor side. You're starting to see some of that come back.

It all goes back to making money. This business is very healthy.

ND: ***Returning profit to investors.***
KVH: What a concept.

ND: ***It's fairly novel in the crypto business, certainly. In the Permian, do you feel capital constraint is also better for the basin itself?***
KVH: It's a lot better for the basin. We had—I won't say unlimited—free money for a few years where you could call up a banker and raise equity overnight for every deal and your stock went up.

Maybe too much money was raised and too much money was spent delineating or trying to grow too aggressively. That's inefficient.

I think we've matured as a sector.

ND: ***You issued $1.1 billion of senior notes due 2033 at 6.25% and using $500 million of that to retire 5.625% senior notes due 2025. What's the idea behind using higher-interest money?***
KVH: *We* raised 10-year money two years ago at 3.25%. So it's not the quality of the credit; it's just the Fed raising rates.

ND: ***Would you do the Barnett from existing pads?***
KVH: It depends on the area but in most cases probably. There's probably more oil there than we think. And wet gas as well.

But we'll see. Using your existing infrastructure where you've spent a lot of money is a prudent way to save capital outside of drilling and completing these wells.

ND: ***How do the public equity markets feel about spending on exploration?***
KVH: I think it depends, right? In an area like Spanish Trail by the airport, we own 100% of the minerals and operate. So that's an area where it's easy for us to spend some dollars trying different zones.

I think we'll probably have a Barnett test there sooner rather than later. (But) I think we'll be as we always have been: a fast follower rather than a leader when it comes to testing other zones.

But it's exciting. We kind of had this whole world of everyone just talking about free cash flow and how you're going to return free cash flow for the last two years. And now some of the traditional things that are so exciting about the oil business are coming back—like other zones.

And how do you develop all these zones together? Do they communicate? How do they communicate?

So, I think the Barnett's pretty exciting. I don't want to jump out there and say we have 3,000 locations in the Barnett. But certainly there's going to be some Barnett that works in the Midland Basin.

They're just more expensive than the (shallower) traditional Wolfcamp development.

ND: ***You said "3,000." Is that random?***
KVH: (Laughs.) That was completely

But in this business, it's good to make sure you have cash and you have a significant runway between now and your next maturity. With (rolling Rattler Midstream LP back into Diamondback), we took out Rattler notes.

They also had some reporting provisions we wanted to get rid of. So we took those out and pre-funded some of the FireBird deal and unfortunately had to pay more than 6% for it.

But, with this business generating the free cash it's generating, that should be paid down very, very quickly.

ND: ***With the acquisition in 2021 from Guidon (Operating LP) and of QEP (Resources Inc.) and now with FireBird, you've been buying adjacent, bolting on. Would you consider making a leap?***

KVH: We started with 10,000 acres by the airport here in Midland and have built up to 500,000 acres in the Permian. We've had to scrap for every acre and for deals like Guidon, QEP, Firebird all in our backyard where we know the rock the best, and we think we have a differential advantage from our cost structure and our understanding of the rock.

We did make a move in 2016 to the Delaware Basin and that expanded when we bought Energen (Corp.) in 2018. But 80% of our spending and 75% to 80% of our acreage and inventory are still in the Midland Basin, which we call home.

At a high level, there aren't that many deals left to do. The Permian has been highly consolidated, and that's why getting a deal like FireBird is very beneficial to Diamondback's shareholders—because we're Permian-based.

We haven't looked outside the Permian. I think that's a long way off if it ever happens because the returns here are the best in North America on the oil side.

ND: ***Some of FireBird's portfolio came from Chevron Corp. and others since 2019. I imagine you had looked at those properties as well. You didn't like them then, but they work for you now?***

KVH: Those guys made a great bet. (Many are from) the old RSP Permian (Inc.) team that knew the west side of the Midland Basin very, very well. What Diamondback doesn't do and what we're not good at is making big bets on exploration; we're an acquire-and-exploit company.

In this case, we saw significant well control and good well performance farther west. That gave us the confidence to approach those guys and get a deal done.

So the hat's off to them. They bought during the lows of COVID, spent some capital in areas that people had not spent a ton of horizontal-development capital in and it worked out.

"We spend a lot of time on how we can generate returns to our shareholders and continue to get the stock price up by doing smart deals at the right times."

ND: ***You've sold $155 million toward a target of $500 million in noncore divestments. What did you sell?***

KVH: The first deal was some acreage that was a little scattered around our position in the northern Delaware. The buyer approached us and offered a number that was much higher than our internal value because we weren't going to develop it in the next seven, eight or nine years.

So from a PV perspective, they offered us a lot more value.

Generally, we'll sell any asset if it's the right value, but inventory is certainly precious in this business today.

ND: ***More of your acreage is for sale?***

KVH: As acreage is precious right now, it's a knife fight for every acre, particularly in the Midland Basin. So if someone pays a huge number, we'll take the call.

random, yes. So no quotes on that. There's been like one well drilled (by Oxy) in the basin on it. But the one test looks pretty good.

PERMIAN NATGAS

Nissa Darbonne: ***You're producing a half-Bcf/d. Are you looking to contract with LNG shippers on the Gulf Coast or on Mexico's Pacific coast?***

Kaes Van't Hof: You need to have a few things to do an LNG deal. You have to have a big balance sheet because you have to sign a 10-year or 15-year deal, take or pay.

And you have to control the molecule to the Gulf Coast. We have some gas we do control down to the Gulf that we could probably do a deal on.

But these LNG deals cut both ways too, right? In 2020, anybody that had an LNG deal was having cargos canceled on them because they weren't leaving the coast. You have to be able to deal with that volatility and eat the downside.

Right now, with the crisis in Europe and Asia fighting with Europe for molecules, the price is high.

But that cuts both ways. I think a portion of our gas getting international (price) exposure is probably prudent over time. But it's going to take a few years to get new LNG facilities up and running in the Gulf Coast.

ND: ***ConocoPhillips is in a deal with Sempra Energy on Mexico's Pacific coast, getting Permian gas there via southern California. But is the El Paso Pipeline reliable enough?***

KVH: I'm sure it is. It's just full. And these pipes go down for maintenance and so do gas plants.

When a gas plant goes down for maintenance, you're going to have to produce through it or try to find offloads.

That's why we push our midstream

I've had a lot of people looking for acreage, but I've disappointed all of them when they've asked about it so far.

ND: ***So you're selling some midstream then?***
KVH: We have a significant amount of midstream assets from the Rattler deal and some great joint ventures around the basin. Those businesses trade at eight, nine or 10 times cash flow versus E&Ps trading at four times cash flow. If you can sell an entity for eight or nine times cash flow and buy back shares at four times cash flow, our investors should be happy with that outcome.

So that's kind of where we're focused. We have some time to get it done and, at the end of the day, it comes down to value and making sure that the balance sheet is as strong as possible through the cycle.

ND: ***Do you see Diamondback ultimately being the Permian consolidator or the consolidated? What's the exit strategy or are you everyone's exit strategy?***
KVH: (Laughs.) I don't know if I'm everyone's exit strategy, but certainly a lot of people have exited to us over the years. I mean, we built this business from nothing, right? We went public in 2012 after trying to sell the company and no one put a bid in.

So, we've come a long way and, generally, the way we see this business is we manufacture barrels and we manufacture barrels cheaper than anybody else.

We don't think about an exit. Certainly we will do what's right for our shareholders if there ever was an exit approach.

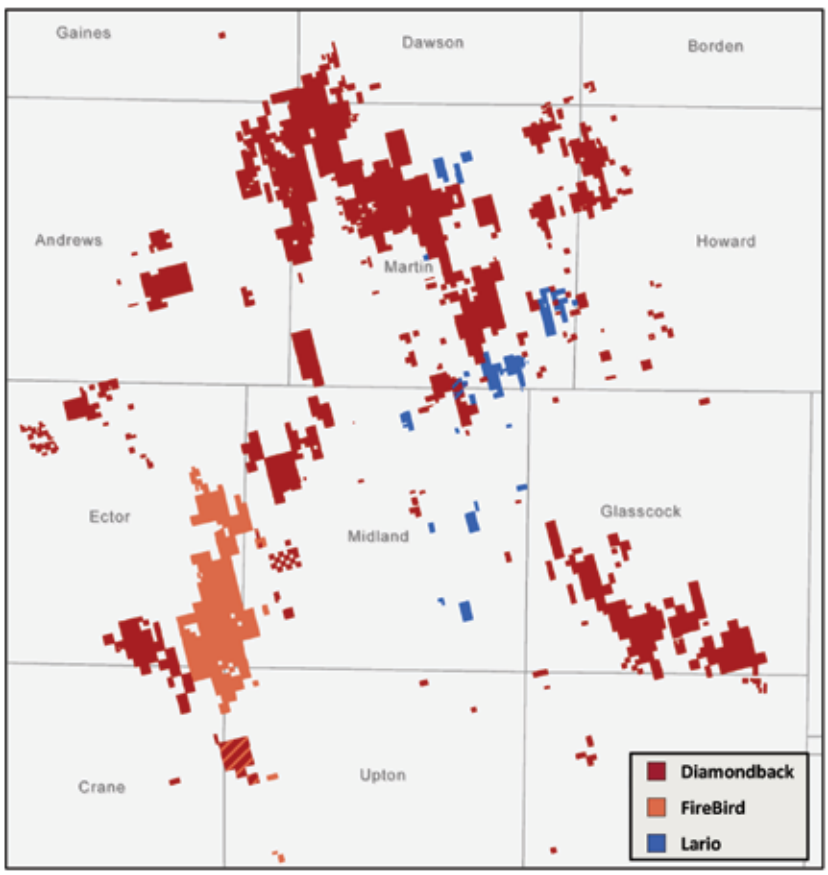
But that's not what we spend a lot of time on. We spend a lot of time on how we can generate returns to our shareholders and continue to get the stock price up by doing smart deals at the right times.

ND: ***How's the availability of field services?***
KVH: There's always a fun push/pull between the service guys and the E&Ps, but the service industry has also figured out capital discipline in some form just like the operators.

I think what's changed is that the service sector, when they want to build new equipment, they want a real contract associated with that. And I think that promotes a healthier relationship between upstream and service and should result in better returns for all of us.

There's a lot of inventory left to develop. I think this new business model of not spending every dollar you have to grow is conducive to a healthier service and upstream market that we can both make money for a long time together rather than fight about pricing all the time. OGJ

Diamondback Pro Forma Midland Basin Acreage Map



Source: Diamondback Energy Inc.

partners to talk to their friends across the fence line and work together to move the gas.

ND: ***At what point does it have to be flared?***
KVH: The gas is going to move; it's just going to move cheap.

It seems like for the past five years, it's just been a one-way street where the operator takes all of the heat. But if you look at our flaring, 85% of it is the fault of downstream issues. And that number is probably going to pick up.

I certainly understand that the supply chain's tight. There are some gas plants coming online here in the next few months. But that's just going to push the problem to the pipelines. So it's going to be tight here in the Permian for the next couple years.

I think operators and midstream providers have gotten together to FID [final investment decision] pipes faster than in the past. But there's going to be some cheap gas in the Permian next year, which is why I'm happy we have two electric fleets starting up that are going to be buying that cheap gas instead of diesel.

ND: ***Tell us more about that.***
KVH: We've really spent a lot of money trying to electrify the oil field. We built a lot of substations and systems to put all of our production online power.

I think we have three rigs online power now too and moving toward about half. It's going to be tough to get all of them on line power.

Second to that, we have a big program kicking off next year with two fleets from Halliburton (Co.). They'll be pulling off the grid but supplemented with significant battery storage on site.

It's fascinating from the environmental perspective, and it saves us a bunch of money not having to pay for diesel.

CAPEX OUTLOOK: A WAKE-UP CALL FOR ALL?

World turmoil hits home for U.S. producers.

IRENE HAAS
CONTRIBUTING EDITOR

Early indications of 2023 spending show that producers are planning for growth of up to 20%, mostly to beat back rising inflation costs.

COVID-19 severely reduced consumption of petroleum products worldwide for most of 2020. According to the U.S. Energy Information Administration (EIA), WTI spot price bottomed at an average of $16.55/bbl in April 2020 and strengthened to an average of $52/bbl in January 2021. This trend continued and reached a peak average price of $114.84/bbl in June.

This improvement in crude prices was driven by a world economy that began to recover from COVID-19 and as such, energy consumption also began to recover accordingly. But a lack of investment in the oil patch led to anemic production growth, and this mismatch drove energy costs higher and continues to contribute to inflation.

Russia's invasion of Ukraine in early 2022 induced further price spikes and created an energy crisis in Europe. Subsequent dislocations of various commodity markets still cast a long shadow on the European economy and on global energy security well beyond the continent. Case and point: U.S. natural gas.

U.S. Henry Hub natural gas spot price averaged at a low of $1.63/MMBtu in June 2020, according to EIA, and gradually improved to an average of $4.38/MMBtu in January 2022. As Russian supply of natural gas to Europe became restricted as the war progressed during the spring, demand for LNG in Europe spiked.

The U.S. is one of the largest exporters of LNG, and the incremental demand for LNG led to a spike in U.S. natural gas price. Henry Hub average gas price peaked at $8.14/MMBtu in May 2022.

Despite prolific shale oil and gas reserves and production that has made the U.S. a net total energy exporter since 2019, the country's producers and consumers are not immune to commodity price volatility.

U.S. consumers and businesses have enjoyed an unprecedented period of secure and affordable energy for almost a decade. But higher energy prices and higher interest rates meant to quell inflationary pressure are dragging down the economy and hitting consumers' pocketbooks directly.

"Resurgent demand following the fading of the pandemic lockdown has run into a constrained supply side. Somewhat surprisingly, the oil and gas extraction and petroleum industry has shown the least amount of recovery of any sector in the economy, producing at 60% of their pre-pandemic levels," said Esther L. George, president and CEO of the Federal Reserve Bank of Kansas City, during a November conference in Houston organized by the Federal Reserve teams in Dallas and Kansas City.

"That performance was worse than the recovery in the automotive sector where output is running at about 70% of pre-pandemic levels," she said. "It comes as no surprise that the imbalance between supply and demand in the oil and gas sectors has pushed up prices."

But muted oil and gas investment is different this time, she said.

"It has been the case that the negative effect of higher energy prices on consumption in the past would be offset by a positive effect on capital investment in the energy sector," George said. "In this cycle, however, the response of energy investment to higher prices has been lackluster and is offering less of an offset to those negative consumption effects."

"Scale in the E&P sector is absolutely necessary in today's world."

—Barton "Bart" Brookman, Jr., *PDC Energy Inc.*

Compounding capital

Barton "Bart" Brookman, Jr., president and CEO of PDC Energy Inc., runs a $7 billion market cap E&P. The Denver-

The oil and gas industry has shown the least amount of recovery of any sector in the economy, according to the Federal Reserve Bank of Kansas City.

based company holds 255,000 net acres combined in Wattenberg Field in Colorado and the Delaware Basin in West Texas. As of the third quarter of 2022, PDC Energy produced 250,000 boe/d with a production mix of 32% crude oil.

The production level represents 23% year-over-year growth, partially driven by acquisition. The company ended third-quarter 2022 with trailing 12-month net debt ratio of 0.5X to EBITDA—a record low for the firm. PDC Energy is poised to generate approximately $1.5 billion of free cash flow in 2022 and is on track to return more than 60% of this to shareholders in the form of share buybacks and dividends, management said.

Toby Rice is the president and CEO of EQT Corp., the largest natural gas producer in the U.S., with a market capitalization of $15 billion. This Pittsburgh-based company holds about 1.1 million net acres in the Marcellus and Utica plays in Appalachia. The company produced 5.3 Bcfe/d in the third quarter of 2022. The firm also ended the quarter with trailing 12 months net debt ratio of 1.2x EBITDA.

Billy Bailey, founder of Dallas-based Saltstone Capital Management (SCM), said the traditional energy business in the past 36 months has been through an incredibly dynamic period of time for a myriad of reasons.

"We are not growing production, despite having the price signal, despite having an inventory with an estimated 1 Tcf of economic projects."

—**Toby Rice,** ***EQT Corp.***

"Rewinding to 2014, 2015, 2016, an abundance of capital was raised for exploration and production companies. Investors were ecstatic about the opportunity that U.S. shale could provide," he said. "This exuberance created a massive supply overhang, translated into poor returns on capital, poor performing stock prices and ultimately, a consolidation and restructuring phase. Just before COVID shocked the world, investors began honing in on their desire for shareholder returns rather than growth. The global shutdown commingled with investor demands was the enforcement mechanism for management team discipline."

Downturn hastened consolidations

Both EQT and PDC Energy have emerged as consolidators. PDC Energy closed the SRC Energy Inc. merger in January 2020, right before COVID-19-related lockdowns. Management said the success of the transaction was overshadowed by the depths of the pandemic.

However, Brookman said, it was the right deal for the company because it was accretive, strengthened inventory and made the company's footprint more contiguous in the Denver-Julesburg (D-J) Basin.

"On top of that, you throw in the strength of our

"Things are coming together and are coalescing toward a constructive period in energy. We are going through a period of underinvestment, which sets the stage for a sustainable cycle."

—**Billy Bailey,** ***Saltstone Capital Management***

balance sheet, our hedge book, the quality and execution of our team and the resiliency of D-J Basin projects, and you have the foundation for a great deal, even with the backdrop of the pandemic which began shortly after closing the transaction," Brookman said.

"While it did not take away the pain and how tough 2020 was, not just for PDC Energy, but for everybody in this industry, it resulted in us being more resilient than most and propelled us into 2021 in a stronger fashion."

Brookman said the company emerged more attractive as a consolidator in the D-J Basin and set PDC Energy up for the $1.3 billion acquisition of Great Western Petroleum (GWP), which was announced in February 2022. This added significant scale to PDC Energy's core Wattenberg Field position.

EQT took on the consolidator role in Appalachia in 2020. Guided by the new management team put in place in mid-2019, leveraging on its strong balance sheet and a valuable stock as currency, the company acquired the midstream and upstream operations of Alta Resources Development LLC in mid-2020 for about $2.9 billion. EQT's production went from about 4 Bcfe/d (4% liquid) in the fourth quarter of 2019 to roughly 5.3 Bcfe/d (5% liquid) by the third quarter of 2022.

In September of 2022, EQT announced a $5.2 billion, bolt-on acquisition of Tug Hill and XCL Midstream, deals that should add 800 MMcf/d of production with a 20% liquid mix. The transaction was financed by half debt and half equity. Management anticipated the deal would boost EQT's free cash flow yield significantly.

Working capital

For companies well-positioned to be consolidators, some of the cash flow generated in the past few years was deployed on strategic acquisitions. Some insiders expect that in 2023, more cash could be deployed toward gaining organic growth.

For EQT, despite a pro forma 2023 free cash flow estimate of more than $6 billion, the company leadership said its capital spending growth will be on the lower end of industry average of 10% to 20%.

In its third-quarter 2022 conference call, CFO David Khani said he expects inflation to be on the lower end of industry average because of EQT's supply chain contracting strategy and its multiyear sand and frac crew contracts.

Given a commanding Appalachian footprint, a strong balance sheet and higher free cash flow yield boosted by the merger, there is some question about why EQT is not ramping up activities.

"You want more supply? We need more pipeline infrastructure. The environmental movement has been the reason why we are out of pipeline infrastructure capacity. Because of that, we are forced to stay in maintenance mode," Rice said. "We are not growing production, despite having the price signal, despite having an inventory with an estimated 1 Tcf of economic projects."

For PDC Energy, the management intended to end 2022 with approximately $1.075 billion spending at the high end of its guidance. Anticipating 2023, the company expects 10% to 12% spending growth after accounting for the increased activity associated with the GWP transaction. The company is targeting annualized production growth of 4% to 5% after accounting for the GWP merger.

In the past two years, capital discipline has been solid, and most overspending can be attributed to inflation, several executives told Hart Energy. That has impacted steel, tubular and oil service costs; labor supply has been a challenge in the past 12 months.

While ESG has become a key part of its operation, after two recent mergers, PDC Energy operates with greater scope and scale and is able to build in more ESG-related functions while minimizing impact to its per unit operating and general and administrative costs.

PDC Energy is hesitant to invest more money to rapidly increase organic growth.

"Right now, we have no tactical plans to accelerate. Even if the market was asking PDC for more growth through the drill bit, which it is not today, there would be some real constraints to work through," Brookman said. The regulatory environment is only a part of that equation, experienced field labor and fit-for-purpose services may also prove to be a challenge.

"Sure, we may be able to go get another rig, but it may not be as efficient or as safe as the equipment that we have running in our steady state operations."

The company is focused on running a safe operation, generating mid-single-digit production growth to maximize capital efficiency and free cash flow for its shareholder returns, Brookman said.

SCM's Bailey said his expectations for industry spending being 10% to 15% higher.

"This is less driven by increased drilling, but inflationary pressure from oil service. This continues to be a theme. The oil service sector has been tattered, beaten,

consolidated and needs pricing power to survive at today's demand levels," he said.

Reliable, clean molecules

For most producers, the operating environment has changed significantly in the past few years. ESG considerations have become more prominent in the planning and execution of capital spending plans.

ESG concerns are front and center for PDC Energy's day-to-day operations and is well-integrated into its long-term plans. The company has committed to reducing greenhouse gas and methane intensity by 60% and 50%, respectively, from 2020 to 2025. The company is actively plugging vertical wells, monitoring emissions to ensure compliance within its operational footprint and identifying operational enhancements to help achieve its reduction targets.

"Scale in the E&P sector is absolutely necessary in today's world. Scale allows us to realize efficiencies across our cost structure as well as appropriately build on our ESG program," Brookman said. "Our ESG journey has been one characterized by thoughtful and incremental progress, and it's clear that 2021 and early 2022 marked a significant leap forward in our emergence as a forward-looking leader in this space."

When Rice took over at EQT, his team launched an ambitious plan to simplify its corporate structure, overhaul its operations and restructure its debt in addition to integrating ESG into its entire operation.

"I don't care what type of energy you are producing. Energy needs to be cheap, reliable and clean. This is really important. We have lowered our emissions significantly," he told Hart Energy. "But all of the things that we are doing to address the public concerns over emissions associated with the production of our products are going to be encapsulated by a net-zero commitment by 2025."

All of the above

Bailey started his buy-side career working for the late T. Boone Pickens, an industry icon who believed that the world needs to use every single resource. Bailey said that the current energy crisis is a wakeup call: The world still uses fossil fuels to supply 82% of its power generation, transportation and industrial activities.

"Energy is the lifeblood of the world, not just fossil fuels, but solar and wind too," Bailey said. "I think all sources are fantastic. I think we need everything."

Rice said the U.S. has largely been on the sidelines of the energy transition. The signs are clear that change is coming, but the new mix will include fossils, not exclude them.

"Solar and wind cannot handle this transition themselves. In the last 12 months, coal emissions have skyrocketed over 500 million tons because of solar and wind inability to meet the need for energy," Rice said. "In just 12 months, our inability to address foreign coal has wiped out all the environmental benefits of solar and wind for the last 15 years. Clearly emissions are a big issue. You need a big champion to solve this. The champion is the oil and gas industry taking over transition".

Reaching out to the consumers

Public perception matters in policy making, and energy is a complicated sector for much of the general public to grasp.

"Nobody is going to take the time to learn it and until

it hurts their bottom line. Nobody is going to take the time to learn about it until it hurts their back pocket. Nobody cares to learn how they're able to pump gasoline into their car," Bailey said. "But they'll definitely be complaining once the cost of pumping hurts them financially. Once that financial burden sets in, it is easier to chastise the industry rather than learn about it."

Bailey said, "At some point in the future when the valuation is there, and when the energy markets are screaming for more U.S. barrels, only then will there be a massive reinvestment cycle happening globally led by the U.S."

For multiple reasons, Bailey said he expects oil and gas prices to be higher for longer.

"Things are coming together and are coalescing toward a constructive period in energy. We are going through a period of underinvestment, which sets the stage for a sustainable cycle. In the last five years in North America versus the previous five years before that, spending is down by 40%. We are in an undersupply situation with limited global spare capacity. OPEC is protecting their downside, which is good for the bottom line."

That will translate into likely investment in the future.

"As more and more investors start to realize the amount of free cash flows that these companies are generating and how enticing that yield is relative to the yield on treasuries, a tsunami of cash being rotated into the traditional energy sector will occur. Dollars flowing into the oil and gas sector, with a finite number of publicly traded companies to choose from, should bode well for higher stock prices. We are in the early innings," Bailey said.

"Free cash flow and returns of capital are pivotal for enticing the incremental dollar to the energy sector."

At the precipice of a new regime

The reasons for subdued 2023 spending increases despite higher prices and cash flows are multiple and complex. The reasons seem to have little to do with a lack of funding.

"The anemic responses of the U.S. oil and gas sector to higher prices reflects years of relatively low investment due partly to a shift in investment toward other sources of energy, as well as increased capital discipline following the industry's poor returns during the previous boom-bust cycle," Kansas City's Fed CEO George said.

In addition to capital discipline and a focus on return to shareholders, other factors such as a tight labor market and the consolidation to fewer operating entities also play a part.

Environmental concerns amid the energy transition also impacts how efficiently producers can operate:

- Environmental activism that constrains infrastructure capacity growth;
- The need to meet regulatory compliance or voluntary targets; and
- ESG performance levels.

Coming out of this period of market turmoil, the industry is adapting, insiders say. Companies are emerging more resilient, more disciplined and more proactive on environmental challenges. Multiple factors contributed to muted spending growth and muted supply growth, which should lend support to the thesis of "higher prices for longer," providing that global demand does not deteriorate. OGI

THE STATE OF THE SERVICE SECTOR

Product and equipment limitations on U.S. oilfield service companies are on track to perpetuate rising inflation throughout the coming year.

MARK WOOLCOTT

NICK VACCARO
CONTRIBUTING EDITOR

The oilfield service sector is generally the first to feel the effect when inflation increases, and then the headwind becomes part of the dialogue among E&Ps and investors. Concerns of cost increases from the E&P perspective started during the first 2022 earnings cycle and amped by with each quarter. By year-end, management throughout the industry eyed rising inflation between 10% and 15% on average, with large companies budgeting for the low side in 2023 and small companies—many of them already struggling—staring down a rate closer to 20% in the year ahead, analysts said.

Historically, high oil prices paralleled increased spending. But when the Federal Reserve Bank of Dallas released the results of its midyear survey, the evidence was clear: Oil and gas companies were not investing in growth. Instead, they were directing cash to shareholders.

The net effect of the E&Ps' capex strategy means service companies must be more competitive in developing the relationships to secure those funds. Once they surpass the competition, however, the more difficult tasks surface, service managers said.

Outfitting the project and supplying the service have grown into a monumental challenge. Like most businesses, supply chain shortages and limitations in skilled labor have plagued progress and jeopardized contracts. Industry insiders said those firms that succeed in securing contracts may struggle to execute them.

Supply chain shortages

When component acquisition becomes difficult, gaps that drive delays are created.

"Supply chain challenges are the No. 1 related handicap thus far," said Ryan Sampey, general manager of GLY-

THE STATE OF THE SERVICE SECTOR

Product and equipment limitations on U.S. oilfield service companies are on track to perpetuate rising inflation throughout the coming year.

Mark Woolcott

NICK VACCARO
CONTRIBUTING EDITOR

The oilfield service sector is generally the first to feel the effect when inflation increases, and then the headwind becomes part of the dialogue among E&Ps and investors. Concerns of cost increases from the E&P perspective started during the first 2022 earnings cycle and amped by with each quarter. By year-end, management throughout the industry eyed rising inflation between 10% and 15% on average, with large companies budgeting for the low side in 2023 and small companies—many of them already struggling—staring down a rate closer to 20% in the year ahead, analysts said.

Historically, high oil prices paralleled increased spending. But when the Federal Reserve Bank of Dallas released the results of its midyear survey, the evidence was clear: Oil and gas companies were not investing in growth. Instead, they were directing cash to shareholders.

The net effect of the E&Ps' capex strategy means service companies must be more competitive in developing the relationships to secure those funds. Once they surpass the competition, however, the more difficult tasks surface, service managers said.

Outfitting the project and supplying the service have grown into a monumental challenge. Like most businesses, supply chain shortages and limitations in skilled labor have plagued progress and jeopardized contracts. Industry insiders said those firms that succeed in securing contracts may struggle to execute them.

Supply chain shortages

When component acquisition

TECH Services. "Delivery times were two to four weeks previously, but now we have experienced some as far out as 16 to 18 weeks."

Sampey said that GLY-TECH's services include gas dehydration, process equipment preventative maintenance and high velocity lube oil flushing. Each service demands critical components, such as chemicals, fittings and other vital details. Limitations in acquiring these products directly hinder its ability to service its customers, making customer satisfaction a growing concern.

Oklahoma-based Tubular Rollers LLC delivers tools that enhance personal safety and limit pinch-point incidents and lacerations. Similar to leadership at GLY-TECH, Tubular Rollers management said the firm struggles from the same crippling wave of supply chain hurdles.

"We are waiting on a supply of shafts constructed from a new aluminum alloy," said Chuck Henkes, who works in business development at Tubular Rollers. "We received one batch in July and made over 100 shafts, and we do not expect our next order until the end of the year or possibly January 2024."

For Legacy Safety LLC, which provides safety services, the supply chain challenges come from data card shortages used in gas detection monitors, said Cody Heubaum, operations manager at the company's Eagle Ford branch. These supply chain issues directly influence Legacy Safety's ability to complete its contracts.

Labor Shortages

Workforce challenges are expected to continue throughout 2023. The Real Economy Blog posted an analysis earlier in the year revealing an overwhelming lack of skilled personnel in a spring outlook, which has been felt throughout the market to date.

While the workforce mirrored the need before the pandemic, GLY-TECH's Sampey said that is no longer the case. The pandemic instituted a culling of experienced personnel. Some left the oil and gas industry for fresh starts in pioneering new initiatives, while others took advantage of early retirement packages. Some still have not reentered the workforce anywhere during the two-year recovery after COVID.

"We continue to deal with employment challenges of qualified and skilled labor shortages," he said.

Heubaum said Legacy Safety staffing needs face similar challenges. The safety of everyone on an oil and gas location becomes the responsibility of Legacy Safety when the firm manages gas detection on site, he said. It takes a particular skill to manage such a task.

"It is hard finding people to do this job," he said. "You might invest time, effort and funding in them, and shortly after that, they leave to take another job down the road making a few dollars more."

"I see new developments in how companies can manipulate data. Focus seems to be directed toward the remote theme and removing the human factor where possible.""

—**Chuck Henkes, *Tubular Rollers***

Restrictive spending

The days of catering meals every shift, buying new vehicles every year and keeping inventories at elevated levels no longer exist, industry insiders said. The service sector must utilize a strategy of carefully competing to receive the money spent. While managing shortages in supply and personnel, Sampey said pricing must be gauged upon the customer's need for the service and the level of importance they place upon it. If the customer fails to recognize the value, the company has less chance to secure a contract. As a result, pricing must be tightened to overcome the restriction on spending.

"The numbers game and the ability to minimize expenses are still key to oil and gas companies, and their frivolous spending habits have been tailored to be more reserved and limit overspending," said Sampey.

Heubaum said there is no doubt that oil and gas companies

MARK WOOLCOTT

MARK WOOLCOTT

embrace improvements in various areas such as automation, but that currently does not spark the release of funds required to make purchases and invest. Instead, industry trends reveal that funds are directed to areas of business vital to daily operations.

"I see new developments in how companies can manipulate data," said Henkes at Tubular Rollers. "Focus seems to be directed toward the remote theme and removing the human factor where possible."

While GLY-TECH has long served the oil and gas industry with services needed for daily operations, its research and development team has also established a service line of innovative technology to match demand.

"We have seen many new products arise relating to the flare gas market and how the EPA [Environmental Protection Agency] is coming down on Big Oil to perform a capture process," said Sampey. "The industry is making strides in venting and flaring, capturing and reusing this gas as energy to support facility operations, while minimizing environmental impacts. We have developed a new product line with our BTX Eliminator to help the flare gas process."

The direction forward

Analysis has offered a new perspective accompanying the service sector. The service provided must surpass others in importance and be offered at reduced costs. The funds available to the service industry are compressed, so the level of competition has heightened.

As the industry marches forward, experts said some companies will still attempt to break into the market and seize the benefits of the current boom and increased oil prices. Heubaum said the newcomers will try to enter the race and focus on offering services specific to daily operations but at a decreased cost.

"New companies will focus on existing services like torque and test-to-safety companies," he said. "They might be successful if they offer reduced rates. Many oil and gas companies seek the same quality they currently receive but at cheaper rates."

While companies like Tubular Rollers, who have created a niche and benefit from patent protection, thrive in the current market, others will continue to combat competition. The challenges experienced are complex and can be potentially crippling.

To outplay the competition, some service company leaders said they must cut prices to keep and develop new business while managing supply chain restraints and skilled labor shortages. The difficulty enters when trying to meet contract requirements and deliver products and services as directed. Labor shortages invoke increased wait times, potentially leading to contract penalties or increased costs in paying inflated prices for quicker deliveries. The labor force available fails to include experience and knowledge, yet it demands higher wages, which often cannot be passed to the customer.

Heubaum said companies must develop a successful strategy to beat out the competition. The recipe for success includes a balance in operating costs and sale prices. Ordering in bulk and forecasting future orders must be exercised to defer supply chain problems. They must also make investments in employees when discovering trainable and capable talent. A basket of benefits and incentives can potentially partner with better pay to root employees and prevent job hopping for slight pay increases.

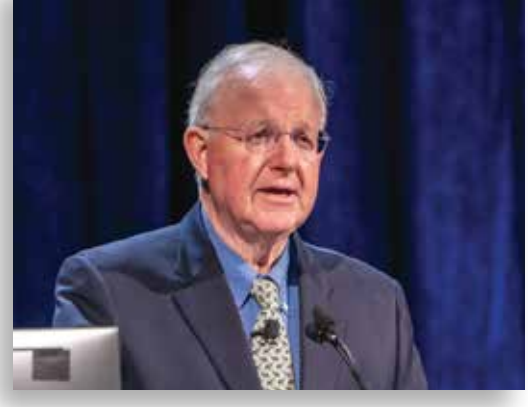
Industry analysts said securing business with must-have service companies will increase workload and allocate funding to develop new services that offer innovation at customer-deemed financially viable rates. OGJ

EXECUTIVE OIL CONFERENCE TAKES MIDLAND

Photos by Arnaldo Larios/Hart Energy

Industry executives discussed company strategies, technology, M&A and more at Hart Energy's ninth Executive Oil Conference and Exhibition held in Midland, Texas, this past November.

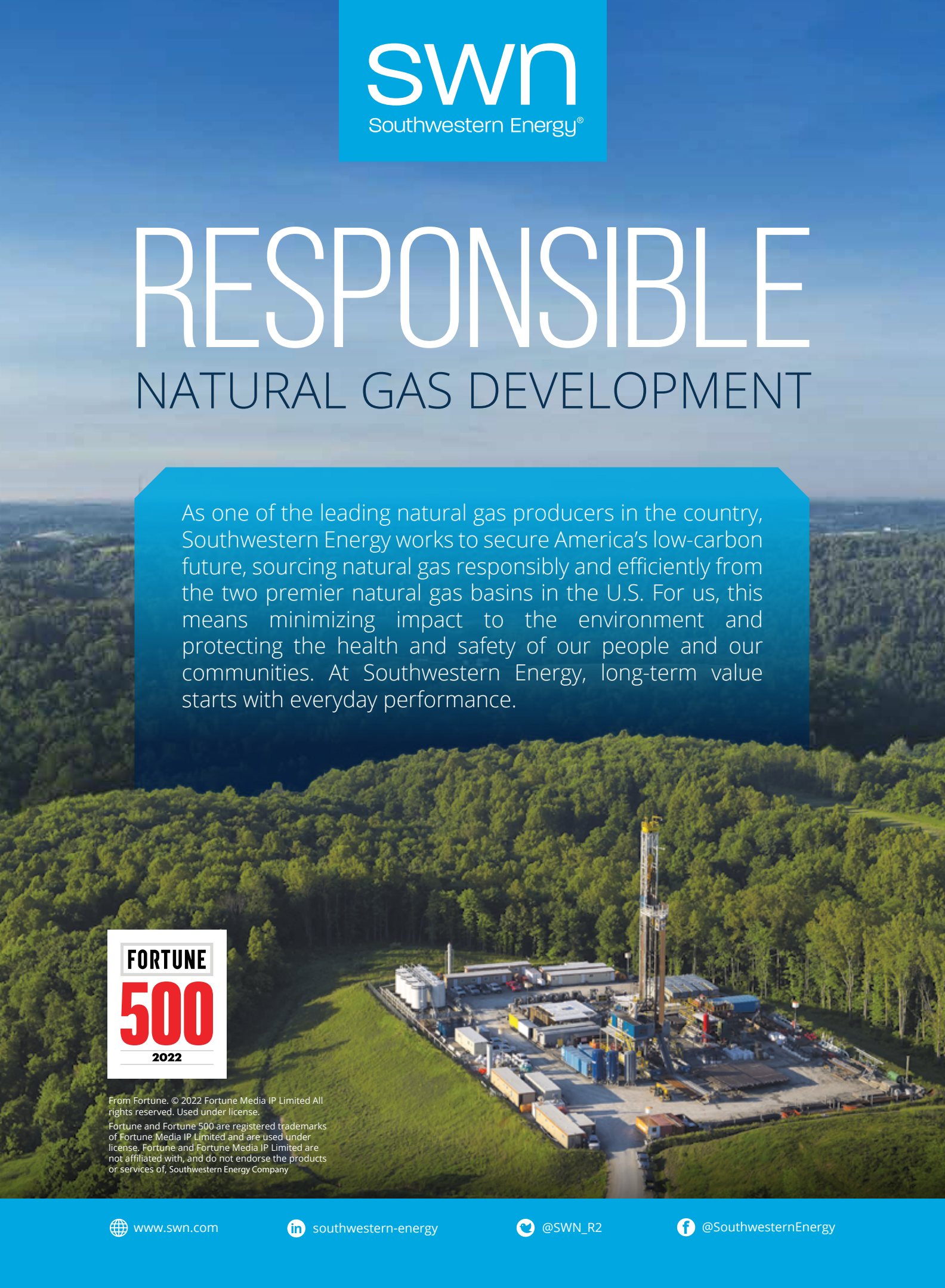
Clockwise from top left: Hart Energy international managing editor Pietro D. Pitts; Rob Cordray, senior vice president of consulting, Rystad Energy; Hart Energy executive director Jordan Blum; Dan Pickering, founder of Pickering Energy Partners; Tom Petrie, chairman, Petrie Partners; Derick Detring, founder of Detring Energy Advisors; Jennifer Pallanich, Hart Energy senior editor, technology; Jeff Beach, vice president, technology, Universal Pressure Pumping; Seth Long, president and CEO, Shepherd Safety Systems; Samantha McPheter, president and CEO of eLynx Technologies; Samantha McPheter, president and CEO of eLynx Technologies, presenting; Rob Wilson, vice president of product, East Daley Analytics; Hart Energy senior editor, technology, Jennifer Pallanich; Babatunde Cole, president and general manager, Delaware Basin Business Unit, Oxy; Hart Energy executive editor-at-large Nissa Darbonne; Kaes Van't Hof, president and CFO of Diamondback Energy Inc.; Conference attendees during the networking break; Attendees registering for the conference; Conference in session.



swn
Southwestern Energy®

RESPONSIBLE
NATURAL GAS DEVELOPMENT

As one of the leading natural gas producers in the country, Southwestern Energy works to secure America's low-carbon future, sourcing natural gas responsibly and efficiently from the two premier natural gas basins in the U.S. For us, this means minimizing impact to the environment and protecting the health and safety of our people and our communities. At Southwestern Energy, long-term value starts with everyday performance.



FORTUNE 500 2022

www.swn.com southwestern-energy @SWN_R2 @SouthwesternEnergy

HARTENERGY

Shale 2023

TURN the PAGE

US shale players brace for what's next

EXCLUSIVE

Enverus analyzes producer performance, basin leadership

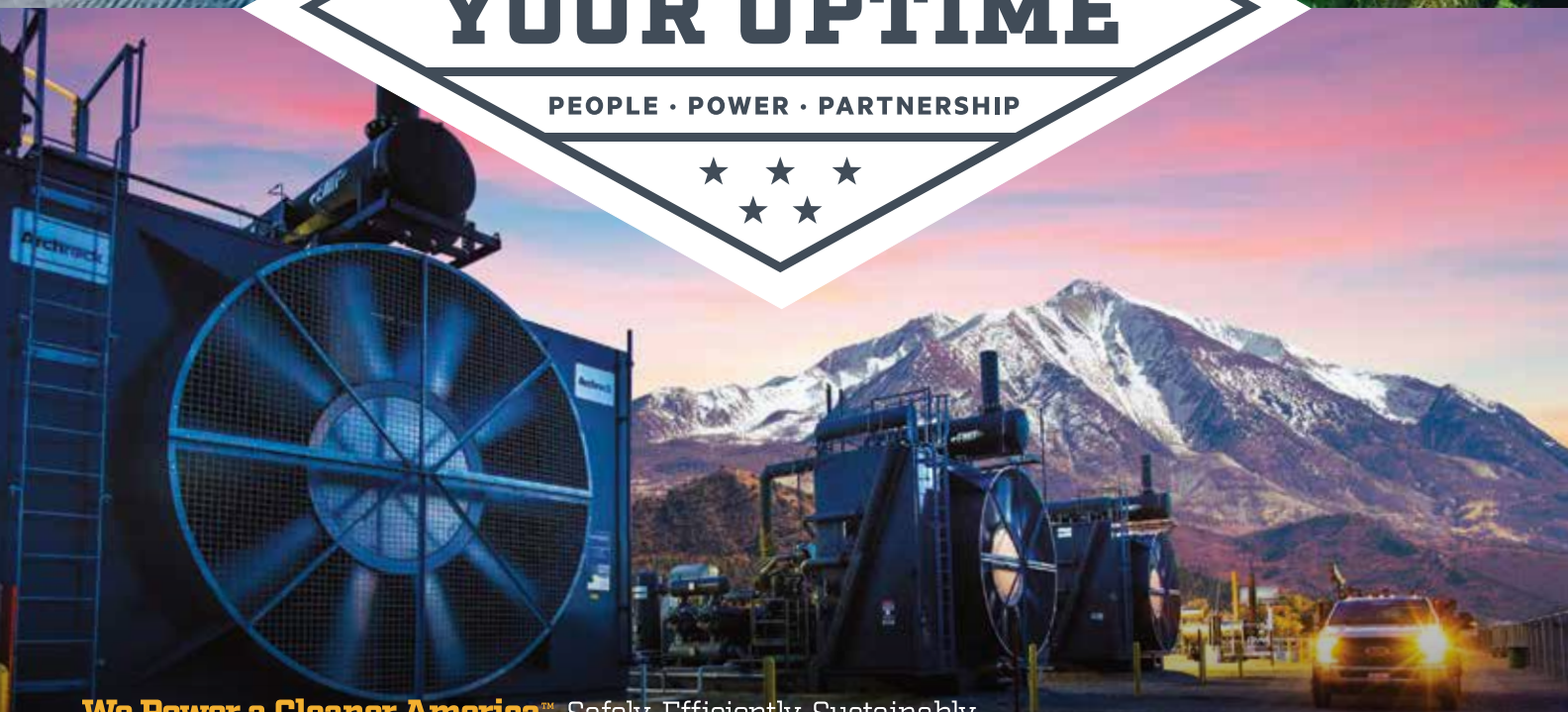
FUTURE FUEL

Focus shifts to finding the fit for carbon capture and storage

Archrock Sustainability™

OUR TIME IS
YOUR UPTIME®

PEOPLE · POWER · PARTNERSHIP



We Power a Cleaner America.™ Safely. Efficiently. Sustainably

With the largest service-area footprint, Archrock is the premier provider of natural gas compression services in the U.S. We help customers safely deliver abundant, cleaner natural gas to various critical industries. As natural gas continues to serve a vital role in meeting our nation's energy needs, we believe the future holds many growth opportunities – from economic to environmental to social. To learn more about Archrock and how we foster a culture committed to sharing our time and resources to better our communities, visit us online at ***archrock.com/sustainability.***

Archrock®

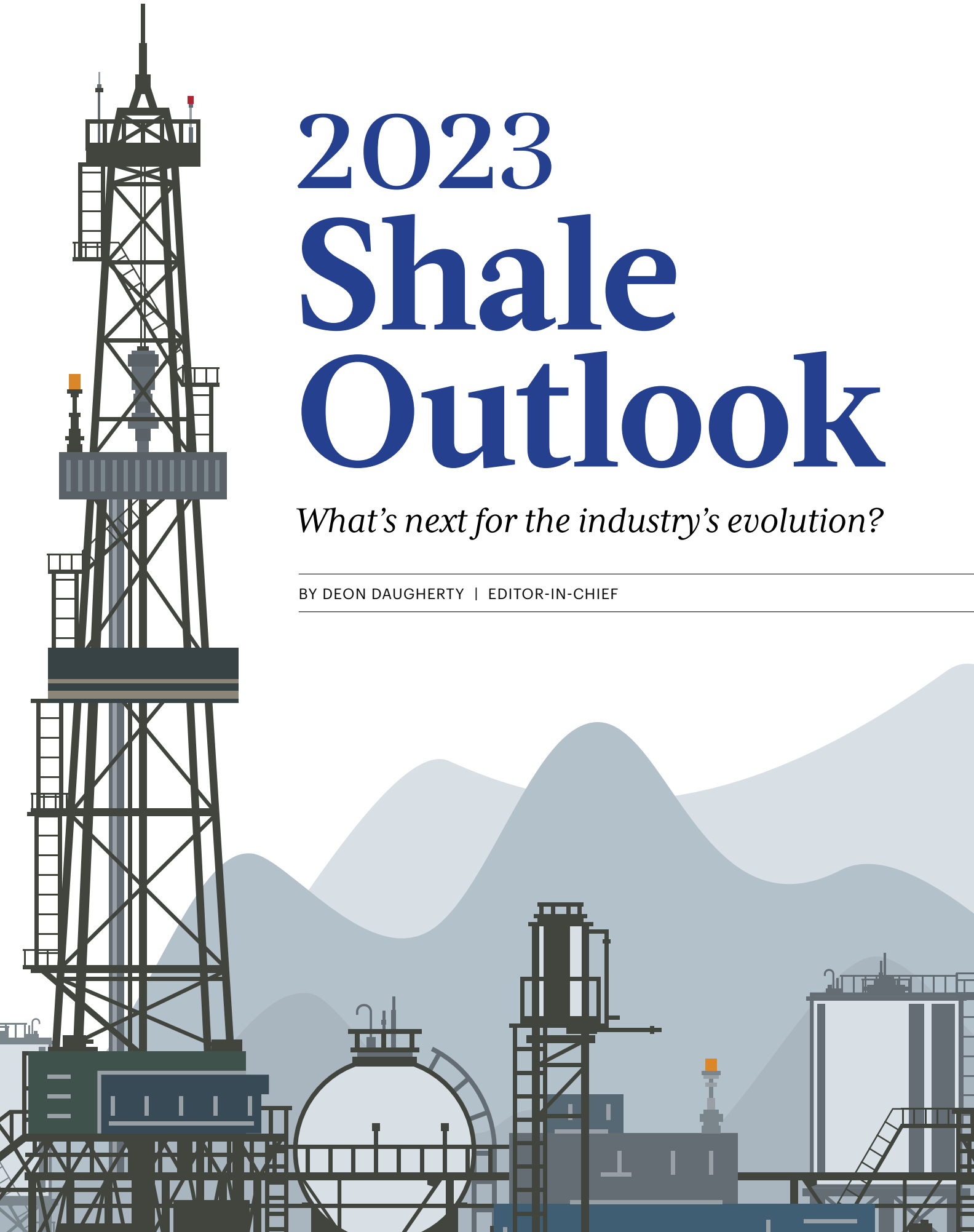
archrock.com

HARTENERGY

Shale 2023

TABLE of CONTENTS

SHALE FORECAST



2023 Shale Outlook

What's next for the industry's evolution?

BY DEON DAUGHERTY | EDITOR-IN-CHIEF

The scene for U.S. shale in 2023 is setting up as a more dramatic iteration of the second half of 2022: more consolidation, higher inflation and more aggressive capital return programs.

Top analysts and market watchers anticipated growth in 2022 on the order of 1 MMbbl/d of oil. It didn't happen in 2022, and it's even less likely to occur in the year ahead. Most forecasts put growth around 500,000 bbl/d for both years.

There is no one issue that's slowed growth. Rather, it's a confluence of things: cost inflation; the corporate commitment to return cash to shareholders; a lower rate of reinvestment in operations; and the aging of even the most prolific plays, which is diminishing the production of some wells developed by some operators.

"We're 15 years into this, and we've learned a lot along the way, but there's not as much virgin rock out there as some people would like to think," said Andrew Gillick, managing director and energy sector strategist at Enverus.

During past periods of shale weakness or operational hiccups, producers have innovated their way out of a slowdown. In 2017, Permian Basin pure-play Pioneer Natural Resources Co. shocked the market with a revelation during the second-quarter earnings season that its gas-to-oil ratio (GOR) in the Midland Basin was increasing. In short, the more a well produces, the more its pressure drops. Gas rises into the oil reservoir and dilutes the resource. Not a marketable proposition at the time for companies that largely viewed oil as the profit and gas as its byproduct.

Certainly, rising GOR wasn't a Pioneer-specific problem. It was a shale drilling challenge that other players confronted too. A massive sell-off of Permian producers' stock ensued.

Undaunted, Pioneer's engineers went to work. The firm tested and retested spacing patterns and pad development. Field managers reworked the producer's aggressive flowback strategy. Operations teams tweaked other elements of the development strategy.

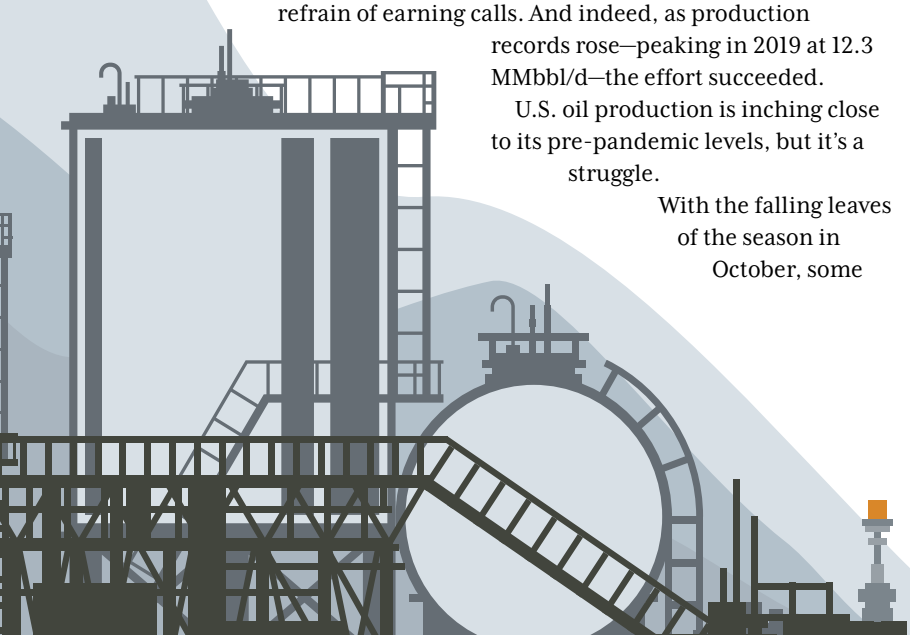
The GOR panic passed, and Permian producers' share prices popped back up.

Then came the angst of parent-child well interference. This is a phenomenon of secondary wells being placed so close to initial wells that they tap into the first flows, diminishing the returns of both.

Operators went back to the drawing board and found ways to modify well spacing to their advantage. The endeavor was so successful that "manufacturing mode" became a common refrain of earning calls. And indeed, as production records rose—peaking in 2019 at 12.3 MMbbl/d—the effort succeeded.

U.S. oil production is inching close to its pre-pandemic levels, but it's a struggle.

With the falling leaves of the season in October, some



Top 50 US Shale Producers
(By average volume, 1H 2022)

Rank	Operator	Gross boe/d
1	HILCORP	2,113,488
2	CHESAPEAKE ENERGY	1,239,866
3	EXXON MOBIL	1,112,851
4	CONOCOPHILLIPS	1,110,972
5	OXY	1,053,035
6	EOG RESOURCES	1,004,558
7	EQT	939,139
8	CHEVRON	892,648
9	SOUTHWESTERN ENERGY	887,668
10	DEVON ENERGY	795,099
11	COTERRA ENERGY	758,568
12	PIONEER NATURAL RESOURCES	750,434
13	BP	602,330
14	CONTINENTAL RESOURCES	599,616
15	ANTERO RESOURCES	529,343
16	SHELL	485,473
17	DIAMONDBACK	434,858
18	ASCENT RESOURCES LLC	398,755
19	OVINTIV	356,185
20	RANGE RESOURCES	352,941
21	MARATHON OIL	351,563
22	AETHON ENERGY	330,601
23	COMSTOCK	326,778
24	MEWBOURNE OIL	321,727
25	CNX	290,085
26	PDC ENERGY	258,852
27	ENDEAVOR ENERGY	254,619
28	CHORD ENERGY	226,281
29	HESS	225,975
30	APA CORP	222,607
31	ROCKCLIFF ENERGY II LLC	220,779
32	CIVITAS RESOURCES	218,255
33	GULFPORT	195,403
34	SM ENERGY	192,448
35	NATIONAL FUEL GAS	189,450
36	ENCINO ENERGY	182,380
37	TRINITY OPERATING	156,079
38	PERMIAN RESOURCES	151,201
39	DIVERSIFIED ENERGY	149,332
40	LEWIS	148,658
41	CROWNQUEST OPERATING	147,624
42	CALLON	133,431
43	TUG HILL OPERATING, LLC	130,646
44	EARTHSTONE	124,958
45	REPSOL	124,741
46	FLYWHEEL ENERGY	122,798
47	MERIT ENERGY	122,409
48	MATADOR RESOURCES	122,235
49	LAREDO	120,048
50	CRESCENT ENERGY CO	118,229
		22,298,020

Source: Enverus

US Rig Count
(Average 1H 2022)

Rank	Operator	U.S. Rigs Running
1	EOG RESOURCES	28
2	CONOCOPHILLIPS	26
3	DEVON ENERGY	25
4	OXY	25
5	MEWBOURNE OIL	23
6	PIONEER NATURAL RESOURCES	21
7	CONTINENTAL RESOURCES	20
8	EXXON MOBIL	19
9	CHEVRON	15
10	DIAMONDBACK	15
11	ENDEAVOR ENERGY	15
12	AETHON ENERGY	14
13	CHESAPEAKE ENERGY	14
14	SOUTHWESTERN ENERGY	9
15	COTERRA ENERGY	9
16	BP	9
17	MARATHON	9
18	COMSTOCK	8
19	OVINTIV	7
20	PERMIAN RESOURCES	7
21	TRINITY OPERATING	6
22	CROWNQUEST OPERATING	6
23	CALLON	6
24	TUG HILL OPERATING, LLC	5
25	EARTHSTONE	5
26	REPSOL	5
27	MATADOR RESOURCES	5
28	PDC ENERGY	4
29	APA CORP.	4
30	ROCKCLIFF ENERGY II LLC	4
31	SM ENERGY	4
32	HILCORP	3
33	EQT	3
34	ANTERO RESOURCES	3
35	CHORD ENERGY	3
36	HESS	3
37	ENCINO ENERGY	3
38	ASCENT RESOURCES LLC	2
39	RANGE RESOURCES	2
40	CNX	2
41	CIVITAS RESOURCES	2
42	GULFPORT	2
43	NATIONAL FUEL GAS	2
44	LAREDO	2
45	DIVERSIFIED ENERGY	1
46	CRESCENT ENERGY COMPANY	1
47	SHELL	0
48	LEWIS	0
49	FLYWHEEL ENERGY	0
50	MERIT ENERGY	0

Source: Enverus

"We're 15 years into this, and we've learned a lot along the way, but there's not as much virgin rock out there as some people would like to think."

—ANDREW GILLICK, Enverus

of the largest U.S. oil producers signaled a slowdown productivity and volume gains in the top shale plays,

Pioneer leadership told investors the company will reshuffle its drilling portfolio in 2023 to target wells with potentially higher returns, a move to boost lagging productivity levels.

Chevron Corp. and Exxon Mobil Corp. also expressed caution against their Permian oil and gas volumes. Chevron's full-year volume will be near the low end of its 700,000-boe/d to 750,000-boe/d guidance. Exxon Mobil dropped its 2022 forecasted gain to 20% from an earlier expectation of 25%.

"Productivity came in a little less than we anticipated, and we wanted to rectify that," Pioneer president Richard Dealy said.

Nevertheless, the Pioneer team remains optimistic.

"We're really just reshuffling the portfolio and bringing forward higher-return wells and deferring some of the wells that were great wells, but … we got higher thresholds that we can hit. And so, we've just deferred those and reallocated the capital," Dealy said. "But the reality is we have high confidence that we're going to achieve the results that we have laid out here."

BOTTLING A LIGHTNING BOLT

The U.S. energy business is rich with some of the most creative and innovative minds of any industry, Gullick told Hart Energy. And so, it's conceivable that the next big thing could revive production.

"I'm not going to sell technology short. I'm not going to sell this industry short," he said. "But I don't think technology is going to find a new basin."

If commodity prices remain high, there is more opportunity to develop lesser quality rock. But that doesn't make the wells produce better, it only makes them somewhat profitable.

Indeed, operators may not have to invest as much in research as they might engage in strategy and planning to boost results, Gillick said.

"I think better planning might bail us out, but I'm looking at the industry now in this mature manufacturing mode where capital is being returned to shareholders. There's a focus on ESG or on holistically running the companies in a way maybe that was different than before," he said. "I'm not sure technology is going to save us."

Still, the U.S. Energy Information Administration (EIA) estimates the nation's oil production in 2023 will top 2019's record 12.29-MMbbl/d output.

Meanwhile, there are steps operators can take to stem declines. Better budgetary planning for asset pace and development and tighter guidance to Wall Street could help.

Moreover, a handful of companies missed meeting production guidance because offset wells degraded their production.

"It's either you're not looking out the window to see what your

UNIVERSAL

CREATIVITY IS UNIVERSAL

Creativity permeates our approach, our character, and our relationships. Creative answers to tough questions. Creative thinking that challenges conventions. Creative solutions to well stimulation problems. Creative ideas that lead to better well completion performance.

Top US Shale Private Operators
(Average 1H 2022)

Operator	Gross boe/d (avg 1H22)	Gross bbl/d	Gross Mcf/d	U.S. Rigs Running
HILCORP	2,113,488	296,930	10,899,055	3
ASCENT RESOURCES LLC	398,755	15,559	2,299,166	2
AETHON ENERGY	330,601	402	1,981,184	14
MEWBOURNE OIL	321,727	195,193	759,166	23
ENDEAVOR ENERGY	254,619	177,708	461,461	15
ROCKCLIFF ENERGY II	220,779	347	1,322,573	4
ENCINO ENERGY	182,380	21,084	967,760	3
TRINITY OPERATING	156,079	14,761	847,891	6
LEWIS	148,658	3,084	873,409	0
CROWNQUEST OPERATING	147,624	95,328	313,771	6
TUG HILL OPERATING, LLC	130,646	7,621	738,150	5
FLYWHEEL ENERGY	122,798	---	736,725	0
MERIT ENERGY	122,409	19,987	614,378	0
	4,650,562	848,004	22,814,688	81
	[21% total]	[11% total]	[27% total]	[20% total]

Source: Enverus

neighbor is doing right next to you or you're not following the permits or you're not talking to your peers," Gillick said. "I think that just comes down to planning."

Some firms blamed supply chain issues for production disruptions. During the third-quarter earnings period, SM Energy Co. reset its second-half guidance downward by 10,000 bbl/d based on delays and offset activity.

Several companies advised investors of capital spending boosts mostly to manage growing inflation.

Producers can no longer plan for several years of $40 breakeven rates, Gillick said.

"There's a couple of years, but that's changing too, as costs go higher," he said. "The rock is the same, but the well doesn't cost $6 million anymore, it costs $8 million. So that changes your return profile. That low-cost breakeven inventory is evaporating every quarter as prices go up."

In general, the 10% to 15% cost inflation rate producers reported in 2022 will likely carry forward into 2023, he said.

For small operators and private producers, the rate of inflation could climb as high as 20%.

"They don't have long-term contracts, so they get dinged now or even earlier, whereas the larger operators have longer-term contracts," Gillick said. "They're going to get dinged next year, and the average cost will be up 20%. But for some operators, it's already more than that. For others, it's not that much."

CONSOLIDATION CONTINUUM

Analysts anticipate the consolidation that began taking shape during the second half of 2022 will continue in 2023. After a lackluster first half, upstream oil and gas M&A jolted awake in the third quarter with $16 billion in announced transactions.

"Operators that are bigger, more liquid and with more inventory have seen much bigger capital inflows over the last six to 12 months than the smaller-cap operators with shorter inventory lives," Gillick said. "If you think about the 2021 mantra, [investors] didn't care about how much inventory you have; the idea was just return all the capital you can as fast as you can because nobody's going to need crude oil in 2030."

But then, he said, something happened during the past 12 months to shake the system.

"People, I guess, opened their eyes to realize, 'Oh, we may need this crude oil stuff a little longer'," he said. "And so that inventory question never came back."

Consequently, the sector's equities have outperformed the commodity almost 30%, he said.

"That means the long money that hasn't been here—like the Fidelity long-term mutual fund money—is coming back."

All of which points to continued consolidation, Gillick and other analysts have said. Companies must grow to continue returning capital to shareholders. Most will opt to do that through acquisitions that may rely on equity.

"If you're a mid-cap, you'll have to bite the bullet at some point and merge maybe with another small- or mid-cap operator," Gillick said.

SETTING THE SCENE FOR 2023

Despite some instances of faltering production, cost overruns and general volatility, the U.S. E&P space showed a robust market performance. At the end of November the sector was outperforming the S&P 500 by 77% and the front month Brent price by 47%, said analyst Neil Mehta at Goldman Sachs.

"As we position for 2023, while we still see attractive risk/

Top 10 US Shale Producers
(By oil production, average 1H 2022)

Rank	Operator	Gross bbl/d
1	CONOCOPHILLIPS	712,315
2	OXY	666,839
3	EOG RESOURCES	606,155
4	CHEVRON	599,412
5	PIONEER NATURAL RESOURCES	493,507
6	DEVON ENERGY	467,572
7	EXXON MOBIL	450,009
8	SHELL	411,376
9	BP	335,235
10	HILCORP	296,930

Source: Enverus

Top 10 US Shale Producers
(By gas production, average 1H 2022)

Rank	Operator	Gross bbl/d
1	HILCORP	10,899,055
2	CHESAPEAKE ENERGY	6,899,970
3	EQT	5,614,692
4	SOUTHWESTERN ENERGY	5,199,056
5	EXXON MOBIL	3,976,879
6	COTERRA ENERGY	3,769,324
7	ANTERO RESOURCES	3,100,350
8	CONOCOPHILLIPS	2,391,854
9	EOG RESOURCES	2,390,327
10	OXY	2,317,080

Source: Enverus

"As we position for 2023, while we still see attractive risk/reward in a firm oil macro environment, we believe that focus will shift to stock picking."

—NEIL MEHTA, Goldman Sachs

reward in a firm oil macro environment, we believe that focus will shift to stock picking," he said in a note to investors.

Companies such as EOG Resources Inc. and Hess Corp. surprised to upside on asset quality and execution, according to Mehta. Gas-weighted Antero Resources Corp. benefited from the return of capital thesis; on the large company side, ConocoPhillips Co.'s performance was a solid example of the market supporting those producers that elevated shareholder returns, he said.

Several executives lamented the undervalued state of their stocks, which traded at a valuation discount for much of the year. Among them, Chesapeake Energy Corp. and Ovintiv Inc. stood out. On the other side of the equation, Occidental Petroleum Corp. benefited from its balance sheet repair.

In its "Macro Forecaster," Enverus Intelligence Research, a subsidiary of Enverus, reported that near-term recession risks, fallout from Russia's war on Ukraine, COVID-19's lingering depression on demand in China and OPEC's oil supply mechanizations will impact oil supply.

The group estimated those factors may coalesce in $100/bbl oil in 2023; Nymex natural gas may dip near $3.50 by summer.

OIL EXPECTATIONS

Analysts at Goldman Sachs remain optimistic for oil prices in 2023, citing near-term potential for improving demand from China and lower U.S. shale growth based on capital discipline, tight services and inflation and the impact of the OPEC+ quota reduction.

"Longer term, we believe underinvestment will drive lower supply growth and keep oil prices higher," Mehta said. "However, we note that E&Ps are increasingly already pricing in an improvement in oil prices relative to the current oil futures."

Relative to consensus estimates and strip pricing, Goldman is slightly bullish. Goldman pegs strip prices for WTI oil at $105/bbl in 2023 before steadying at $85 for the next two years. Consensus estimates forecast 2023 oil in the lower $90s before finding equilibrium in the mid-$80s. Strip prices fall to $70/bbl in 2025 estimates.

ACCOUNTING FOR GAS

In December, the EIA forecasted U.S. production of dry natural gas to average about 100 Bcf/d from December through March. Weather-related declines from freeze-offs and the potential for extreme winter weather anticipated in December dragged the estimate down some 0.5 Bcf/d from November expectations.

The EIA raised its 2023 forecast for all U.S. natural gas production in a December "Short Term Energy Outlook" report by almost 1% from the November estimate.

The researchers said gas production in the Permian Basin is likely to be limited early in 2023 by insufficient pipeline capacity to bring associated natural gas production to market, but those constraints will be resolved in the spring.

Growth in LNG exports will likely increase in 2023, following a peak during the first half of 2022, the EIA said. Those exports are tracking for a new record close to 12.5 Bcf/d in March 2023 and reaching up to 12.7 Bcf/d by year-end.

Henry Hub spot price is expected to average more than $6/MMBtu in the first quarter, up from November's monthly average of about $5.50/MMBtu.

"We expect natural gas prices will begin declining after January as U.S. storage levels move closer to the previous five-year average, largely as a result of rising U.S. natural gas production," the agency said in its report. "However, the possibility of price volatility remains high." ■

The Mighty Permian Persists

BY DEON DAUGHERTY | EDITOR-IN-CHIEF

By almost any measure, the Permian Basin delivers. The 55 counties in Texas and New Mexico that make up the Permian account for almost half—upward of 43%—the U.S.' oil production. The basin's market share is up almost 20% since 2013.

But the winds, as always, are changing and the "it's cyclical" refrain is as evident now as ever.

At the end of 2019, the U.S.' daily output hit 12 MMbbl, once again sustained by the 4.3 MMbbl/d produced in the Permian.

Indeed, it took a worldwide virus and its decimation of demand to slow the Permian's trajectory.

But more than two years since COVID-19 upended commodity and global economies, demand is back.

Is the Permian back, too?

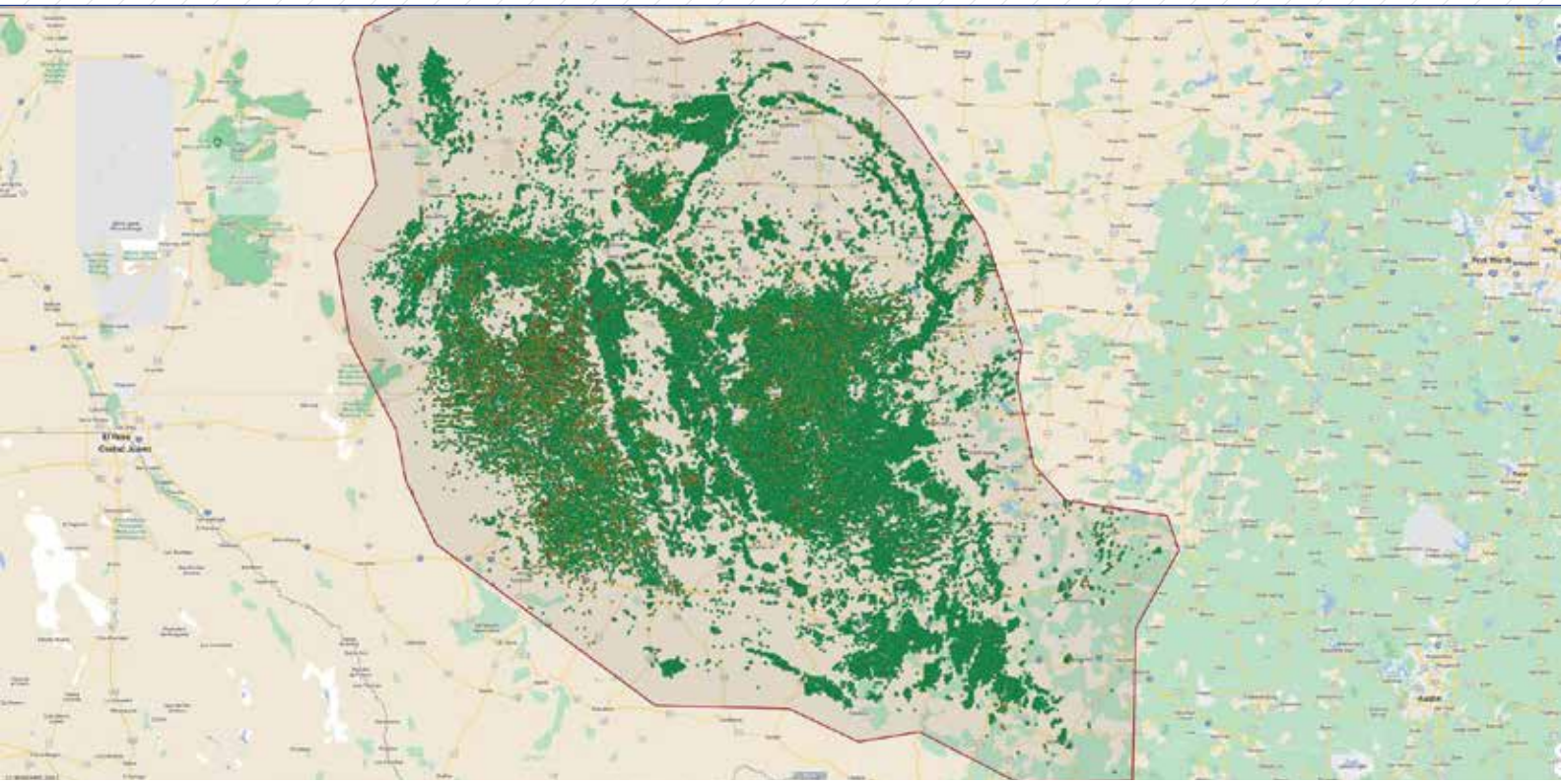
Producers that rolled back their growth—in part driven by positive demand signals, but also by shareholder demand—remain gun-shy about calling high-number production goals. Demand is heading upward, but the shareholder insistence for returns before growth is firmly in place. And as the mighty Permian nears its pre-pandemic production high, questions about its sustainability augment the conversation.

Supermajor ***Exxon Mobil Corp.*** is active in both the Delaware and Midland sides of the Permian, and production expectations were on target for 2022.

"Our production in the Permian Basin reached nearly 560,000 oil equivalent barrels per day, building on our strong growth from last year," said CEO Darren Woods in November.

"In the Permian, one of the challenges there is over the years, what we've been doing is working really hard to make sure we're maximizing the recovery of that resource," Woods said. "Obviously, as we go through that, we're optimizing and adjusting our development plans. That continues to be the case. So I expect this year, we'll probably come in at about 20% up on last year's growth, which was up 25% from the year before. So still very solid growth in the Permian."

ConocoPhillips Co. cemented its position in the Permian in 2021 with its acquisitions of Shell Enterprises' position in the Delaware Basin, which consisted of about 225,000 net acres, more than 600 miles of operated crude, natural gas and water pipelines and infrastructure, along with the purchase of Concho Resources, which owned assets in both the Delaware and Midland basins.



Source: Rextag

Nevertheless, the sentiment of slowing shale production prevails.

"Rapidly escalating costs combined with extremely tight supply are limiting the pace of industry-wide production growth," ConocoPhillips CEO Ryan Lance said in an earnings call.

ConocoPhillips, the largest independent U.S. oil producer, forecast overall production growth of about 900,000 bbl/d this year but warned that gains would slow in 2023 on unrelenting oilfield inflation.

DELAWARE INFLATION

On the storied west side of the Permian Basin is the Delaware Basin's 6.4-acre area, which reaches out from Eddy County in New Mexico to West Texas' Pecos County. It is the deepest of the Permian's sub-basins and holds the thickest rock, according to Enverus.

The top operator in the Delaware by production, the highly diversified EOG Resources, spoke frankly throughout 2022 about the impact of headwinds in the shale space, including mature wells and cost increases.

"Oilfield service capacity remains extremely tight and is further constrained by the limited availability of materials and experienced labor," EOG COO Billy Helms told investors mid-year. Those constraints fueled uncertainty in service costs, and he said the expectation is that they will continue to do so in 2023.

"These constraints are more concentrated in areas with the highest activities such as the Permian Basin," Helms said.

Conversely, the No. 2 producer in the Delaware, ***Devon Energy Corp.***, described "phenomenal" well performance in the play.

"This is an absolutely world-class asset," Clay Gaspar, Devon's operations chief, told investors in November. "We love the position we're in. We love the scale that we have. The team keeps delivering. We're still working on the efficiencies. We're still applying technology, always trying to get a little better, a little smarter each day. No doubt about it. We have some inflation coming our way. So, there is some squeeze on the margin, but I would take this world-class asset and love having it in our portfolio."

Devon's current focus is in the oil-rich Wolfcamp, Bone Spring, Avalon and Delaware formations, according to company data. The firm's operations in the Delaware provide both oil and natural gas production from a core acreage position of roughly 400,000 net acres across those formations.

Rounding out the top three Delaware producers is

Top Permian Producers

(1H 2022 Average)

DELAWARE

Rank	Company	boe/d	bbl/d	Mcf/d
1	EOG	581,410	350,353	1,386,310
2	DEVON	489,513	296,080	1,160,569
3	OXY	414,431	257,670	940,537
4	CONOCOPHILLIPS	385,673	234,733	905,614
5	EXXON MOBIL	309,774	179,276	782,971

MIDLAND

Rank	Company	boe/d	bbl/d	Mcf/d
1	PIONEER	750,168	493,270	1,541,353
2	DIAMONDBACK	308,285	206,561	610,332
3	ENDEAVOR ENERGY	253,505	177,156	458,086
4	EXXON MOBIL	219,674	127,999	550,044
5	CONOCOPHILLIPS	194,880	126,359	411,121

Source: Enverus

Occidental Petroleum Corp. (Oxy).

Oxy CEO Vicki Hollub said management remains "highly encouraged" by well performance in the Delaware.

"We delivered our best quarter to date for early well performance with the 46 wells online averaging peak 30-day rates of over 3,600 boe per day, demonstrating the superior quality of our inventory and subsurface expertise," she told investors during a third-quarter earnings call," she said. "And in the Texas Delaware, we recently brought online a new Silvertip well with the highest initial oil production of any horizontal well previously drilled in the Lower 48."

A key independent producer, Oxy is also testing the waters of carbon capture and sequestration in the Permian. In August, that company first announced a plan to begin detailed engineering and early site construction for its first large-scale direct air capture plant in Ector County, Texas, near Oxy's portfolio of acreage and infrastructure that are conducive to safe and secure storage of CO_2.

"The Permian location of our first direct air capture will provide us [with] multiple options to maximize the value of captured CO_2. We have the ability to inject the CO_2 into a saline reservoir producing CDRs [carbon dioxide removal] or to utilize the captured CO_2 to produce net-zero oil from our enhanced oil recovery assets," Hollub said. "Our conversations with many corporate partners and potential clients have highlighted the significant demand for CDRs generated through CO_2 sequestration."

One of the nation's largest independents, ConocoPhillips, and supermajor Exxon Mobil round out the top five producers in the Delaware, respectively.

FAIR TO MIDLAND

It might have originated as a British expression of 'eh, I'm a bit better than okay,' the oil patch took on the phrase "fair to Midland" and made it part of the lexicon. And it stands up today for the eastern side of the Permian.

Stretching north to south from Lamb and Hale counties to the top of Crockett County, the Midland Basin has been a hotspot since the 1940s, Enverus notes. The play took off in the 1970s and has intermittently been a key performer every time oil pops.

And each of the top five producers are at the top of their respective games, too. ***Pioneer Natural Resources Co.*** has reached the goal of CEO Scott Sheffield to become a basin pure play, and it's paid off. Not only is the company the top producer in the basin, it is also a poster child for emission reduction ambitions across the industry.

Beyond the oil riches of the Permian, Pioneer intends to dig in for deep gas in 2023.The firm will test its deep Barnett and Woodford gas in the Midland to determine productivity, COO Rich Dealy said, during third-quarter earnings in October.

"We expect those wells obviously—they're deeper—to be gassier, and we know we'll find resource there," he said, during a call with analysts.

"We just want to understand what that resource is. So we think it's worthwhile to spend some capital next year to test those zones and then we'll see what the productivity looks like and go from there."

Mississippian-age Barnett and Woodford underlie the Permian's popular oil targets—the Permian-age Wolfcamp and Spraberry—and are at depths up to more than 12,000 feet.

Coming in as the second-largest producer by volume in the Midland is the voracious ***Diamondback Energy Inc.*** In 2022, Diamondback celebrated its first decade as a public company.

Diamondback Energy continued to add onto its position in the Midland portion of the Permian Basin with the acquisition of Lario Permian LLC in November in a cash-and-stock transaction valued at $1.55 billion.

In October, the company made its first acquisition since March 2021, reminding anyone watching that even one of the Permian Basin's largest independents—the company was Texas' second-largest oil producer in 2021—is constantly on the lookout for replacement inventory. Diamondback's $1.6 billion deal to buy Firebird Energy in October follows a torrid M&A stretch for Diamondback in which, over two and a half years beginning in 2018, the company paid more than $13.7 billion for rivals QEP Resources ($2.2 billion), Ajax Resources ($1.2 billion) and Energen Corp. ($9.2 billion) among others.

"The challenge for public E&Ps in the M&A market is adding inventory while keeping the valuation on deals in line or less than their own cash flow multiples and free cash flow yields," said Andrew Dittmar, director at Enverus Intelligence Research. "Diamondback appears to have just managed that."

On the operations side, CFO Kaes Van't Hof addressed portions of the firm's growth strategy during a third-quarter call with investors.

"Our math tells us that we're finding a striking a good balance here between [internal rate of return] and [net present value]. We may not have the highest oil per foot but certainly spacing wells a little tighter, as well as codeveloping more economic zones together and I expect that trend to continue to head our way," he said. "I think we're set up now for a few years of very solid development, particularly in the Midland Basin side."

The third-largest producer in the Midland is privately held ***Endeavor Energy Resources***. With its headquarters located near the action in the city of Midland, Endeavor employs more than 1,200 locals and is one of the largest private producers in the U.S.

Endeavor holds roughly 370,000 net acres in the six core Midland Basin counties, where it focuses its activity. Since 2016, the company has completed more than 900 horizontal wells. Management has said the firm has developed less than 10% of its current inventory, suggesting the room for growth is substantial.

Taking the fourth and fifth slots for the largest-volume producers in the Midland is supermajor Exxon Mobil and mega independent ConocoPhillips, respectively. ■

VortexPrime™

Changing the face of hydraulic fracturing

Catalyst Energy Services' proprietary, natural-gas driven frac technology delivers up to:

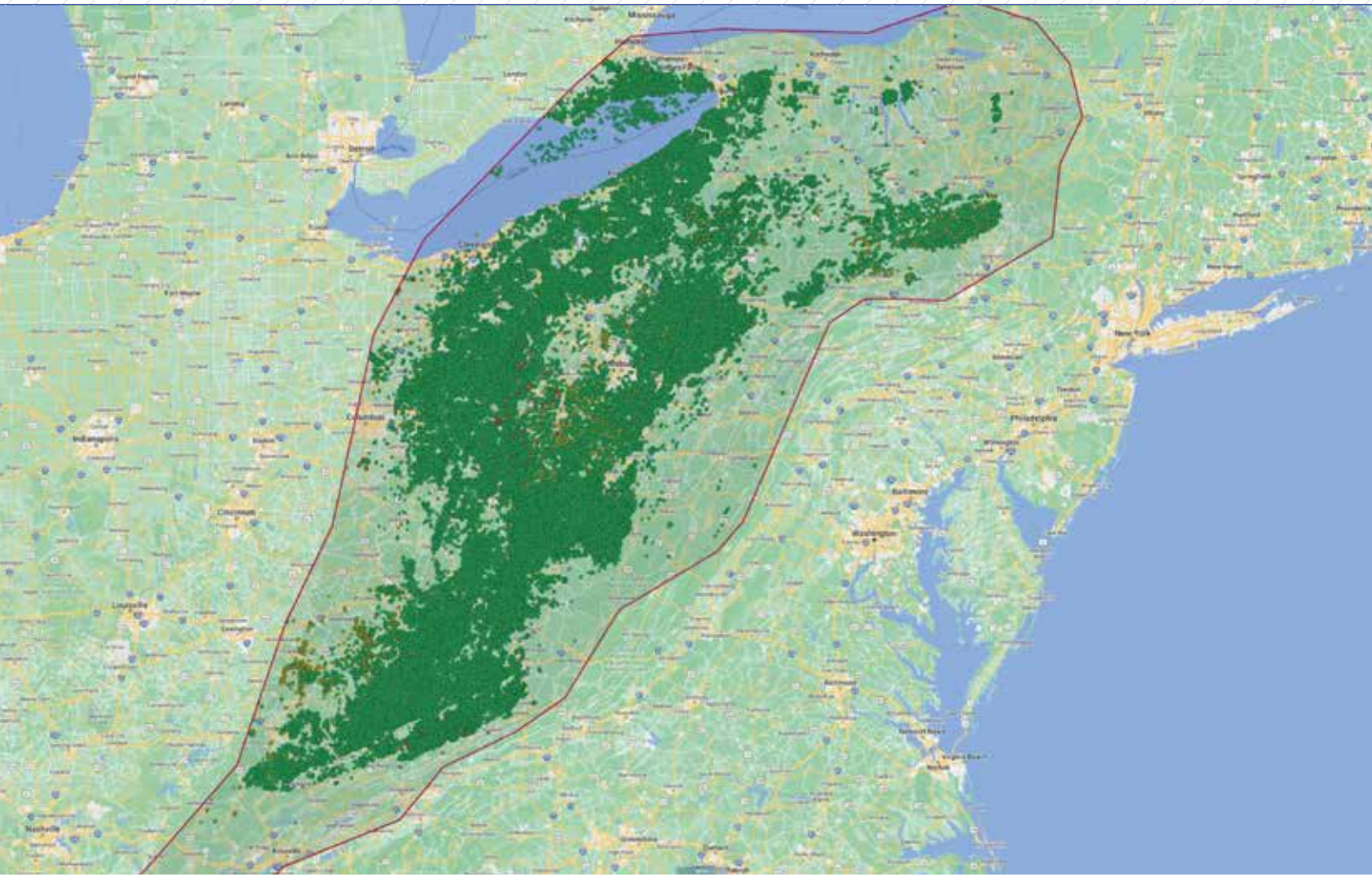
- **65%** fuel savings per month
- **40%** less emissions
- **30%** savings in employee overhead

It's time to take your operations to the next level.

Scan QR code to learn more.

CATALYST

CatalystEnergyMarketing.com/HartShale



Source: Rextag

Marcellus Shale Gains Ground

BY MADISON RATTCLIFF | ASSOCIATE EDITOR

First announced as the newest player in the shale scene by Range Resources Corp. in December 2007, the Marcellus Shale formation has now produced approximately 80 Tcf of natural gas to date.

Through development from natural gas-based producers such as EQT Corp., Southwestern Energy and Chesapeake Energy Corp., the shale play has rapidly expanded and continues to grow, with production anticipated to reach 38 Bcf/d in some areas by 2025, according to Randall Wright, president of Wright & Co. Inc.

"Production growth is on trend to meet that projection," Wright told attendees at Hart Energy's 2022 DUG East conference in June, sharing that earlier predictions of the play more than a decade prior were more skeptic: "If you could get 1 Bcf per 1,000 feet of lateral, it might be a viable play."

As geopolitical turmoil takes center stage in the winter of 2022-2023, many energy leaders believe that Marcellus Shale gas can be a turning point in aiding global economies on the road to energy stability and recovery.

"The energy macro landscape remains volatile as the world continues to grapple with a structural under supply of natural gas. Thanks to American source LNG, Europe has done a commendable job refilling its storage over the past few months," EQT CEO Toby Rice said in his company's third-quarter 2022 earnings call.

Top shale performers ***EQT, Chesapeake Energy, Antero Resources, Southwestern Energy*** and ***Coterra Energy*** produced a combined total of 2.9 MMboe/d, 30,065 bbl/d of oil and 17.3 Bcf/d of gas in the first half of 2022, according to data from advisory firm Enverus.

EQT produced a total of 859,302 boe/d from its Marcellus assets, comparable to the 939,139 boe/d it produced across all its assets in the first half of 2022. In addition, EQT reported 3,348 bbl/d in oil production, as well as 5.13 Bcf/d in natural gas production.

On Sept. 6, EQT announced the planned acquisition of THQ Appalachia I LLC (Tug Hill)'s upstream assets and THQ-XcL Holdings I LLC (XcL Midstream)'s gathering and processing assets for $5.2 billion.

"This deal checks all of the boxes of our guiding M&A principles, have significant industrial logics given direct offset to our existing lease sold in West Virginia and brings over 11 years of core inventory that immediately competes for capital inside and in EQT's portfolio," Rice said in the third-quarter earnings call.

'SUPER-RICH ACTIVITY'

Chesapeake produced 727,286 boe/d in the Marcellus in the first half of 2022, over half of its 1.23 MMboe/d produced across all the company's assets. Similarly, it produced 4.36 Bcf/d of natural gas from the basin, nearly two-thirds of its total 6.89 Bcf/d natural gas production.

Prior to the Russian invasion of Ukraine spurring an uneven dealmaking market, Chesapeake started the M&A year off strong with the acquisitions of Marcellus-based Chief Oil & Gas. On Jan. 25, 2022, the company agreed to acquire Chief E&D Holdings LP, along with Tug Hill Inc.'s associated, nonop interest for $2 billion in cash and approximately 9.44 million common shares.

Through the acquisition, the company was able to add leasehold to the lower part of the play, CEO Nick Dell'Osso said on the company's third-quarter 2022 earnings call.

"In the Marcellus, our synergies from the Chief acquisition continue to come to fruition," he said. "As we've discussed before, we're maximizing the capacity of the combined gathering systems.

"And we're looking forward to 2023, where our well design improvements of longer lateral length and enhanced completions should show up with improved productivity per well," he added.

Antero Resources is growing in the play. In the first half of 2022, the firm produced 455,453 boe/d, 8,286 bbl/d of oil and 2.68 Bcf/d of natural gas from the Marcellus. Combined with the company's Utica assets, it accounts for the majority of its total 529,343 boe/d, 12,615 bbl/d total oil production and 3.1 Bcf/d total natural gas production.

Through Antero's organic leasing program, the company added approximately 60 new drilling locations during the first nine months of the year, chairman, president and CEO Paul Rady said in the company's third-quarter 2022 earnings call.

"We have continued to maintain our focus on our core acreage footprint with a particular emphasis of spending capital on organic lease acquisitions," he said. "As opposed to larger transactions that can dilute our equity, create a large overhang on the stock and lever our balance sheet we have preferred to pick up smaller, more tailored acreage packages within our core liquids-rich position in West Virginia, where we continue to see tremendous well results."

Top Shale Cos/Marcellus
(1H 2022 Average)

Rank	Company	boe/d	bbl/d	Mcf/d
1	EQT	859,302	3,348	5,135,692
2	CHESAPEAKE	727,286	-	4,363,698
3	ANTERO RESOURCES	455,453	8,286	2,682,983
4	SOUTHWESTERN ENERGY	441,111	18,431	2,536,056
5	COTERRA ENERGY	436,933	-	2,621,581

Source: Enverus

CHESAPEAKE ENERGY CORP.

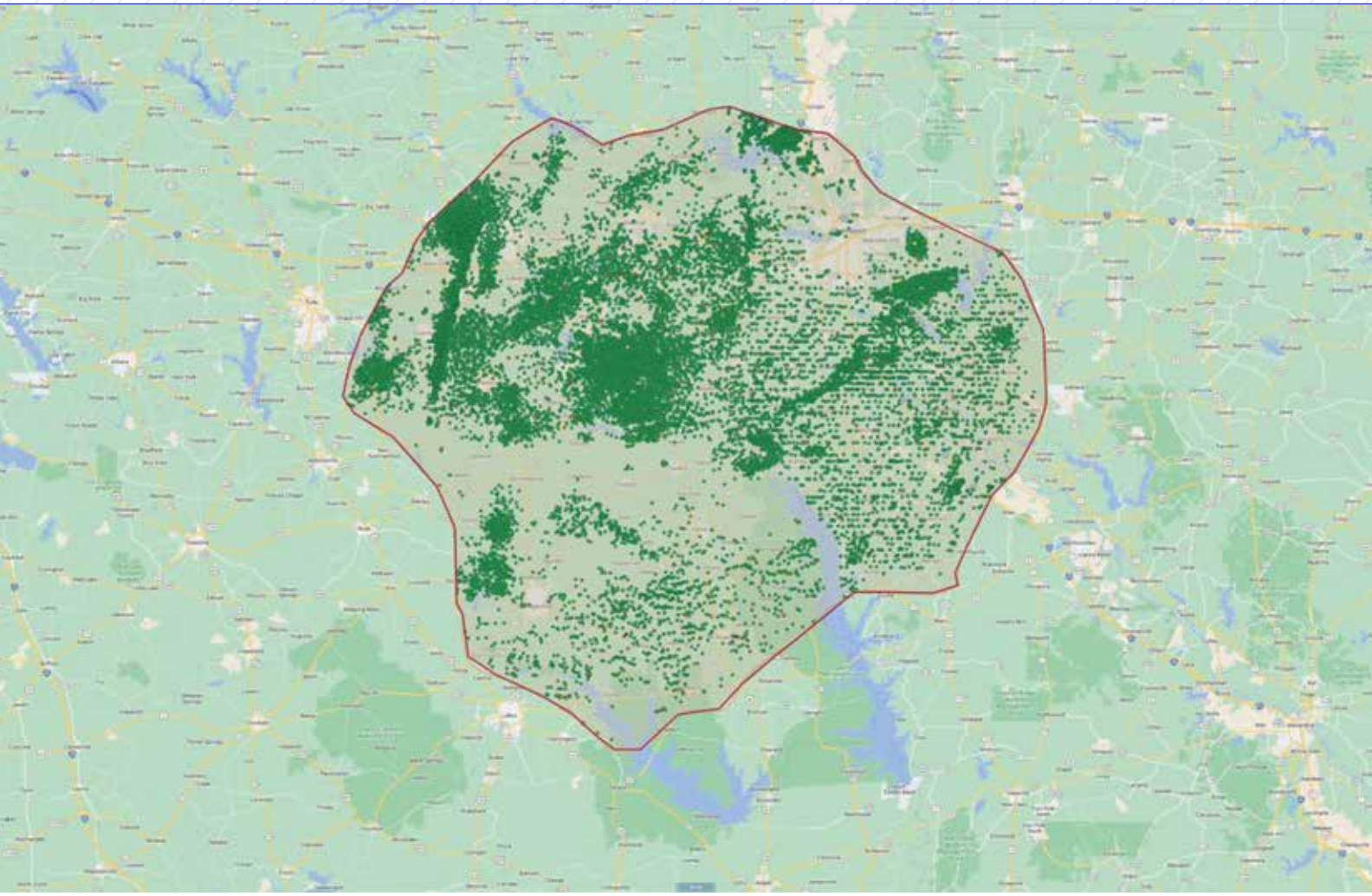
Approximately half of Southwestern Energy's production—887,668 boe/d—came from the Marcellus, which produced 441,111 boe/d in the first half of 2022. The company reported 18,431 bbl/d in oil production, as well as 2.53 Bcf/d in natural gas production, in the basin.

In addition, Southwestern placed 14 wells with an average lateral length of approximately 15,600 ft in the Marcellus during the third quarter of 2022, COO Clay Carrell said on the company's earnings call.

"Our superrich area in West Virginia accounted for eight of those wells, and our Marcellus and Utica dry gas acreage in Pennsylvania and Ohio accounted for the remaining Appalachia turn-in lines," he continued. "In the fourth quarter, based on our superrich activity and the timing of completions, we anticipate holding oil volumes flat."

Coterra Energy's diverse portfolio has operations sprawled across the U.S. from the combined assets of Cabot Oil & Gas and Cimarex Energy. In the Marcellus shale, it holds approximately 177,000 net acres, the company reported on its website.

In the first half of the year, Coterra reported 436,933 boe/d produced in the Marcellus, compared to the total of 758,568 boe/d produced across the Marcellus, Permian and Anadarko basins combined. Additionally, it produced 2.62 Bcf/d of natural gas in the shale, approximately two-thirds of the 3.76 Bcf/d of natural gas produced across all the company's assets. ■



Source: Rextag

The Haynesville Takes Shape

BY MADISON RATTCLIFF | ASSOCIATE EDITOR

Located in northwestern Louisiana and sprawling into eastern Texas, the Haynesville Shale play was thrust into the spotlight in March 2008. Petrohawk Energy Corp. and Chesapeake Energy Corp. both announced lease acreages in Louisiana, sparking a flood of interest to the region.

"The Barnett remains No. 1 in Chesapeake's portfolio, but the Haynesville Shale could be even bigger someday," then-CEO and chairman of Chesapeake, the late Aubrey McClendon, said at IPAA's 2008 Oil & Gas Investment Symposium in New York.

Although some remained skeptical of the shale's potential, the approximately 9,000-sq-mile formation has proven itself worthy of the praise it received at the play's inception.

Analysts from J.P. Morgan found in its September "JPM Natural Gas Reservoir" report a 54% increase in Haynesville rig activity from the 46 average count in 2021 to 71 in the first half of 2022. In addition, they reported the increase in Haynesville activity as "one of the key factors that is supporting the supply imbalance in our 2023 natural gas supply-demand work.

"Recent gas pipeline scrapes are running ahead of expectations, reaching record highs of ~99.3 Bcf/d in September, with MTD gas production estimated at 98.7 Bcf/d, which compares to the August average of 97.7 Bcf/d and the September 2021 average of 92.7 Bcf/d," the analysts stated.

Top basin performers ***Chesapeake Energy, Southwestern Energy, Comstock Resources, Aethon Energy*** and ***Rockcliff Energy II*** produced a combined total of 1.53 MMboe/d, 83 bbl/d of oil and 9.2 Bcf/d of gas in the first half of 2022, according to data from advisory firm Enverus.

One of the first operators to enter the basin, Chesapeake was the Haynesville's largest producer in the first half. Enverus data showed that of the company's 1.23 MMboe/d produced in the half, 365,766 boe/d came from its Haynesville operations, with 2.19 Bcf/d of the 6.98 Bcf/d total produced coming from the Haynesville as well.

Although it produced 89,862 bbl/d of oil in the first half of the year, none of Chesapeake's oil production came from the Haynesville, according to the data.

The latter half of the year was dedicated to focusing on Chesapeake's midstream capacity, the company shared on its third-quarter 2022 earnings call, which includes developing a new pipeline project with an associated carbon capture and sequestration program.

"In the Haynesville, we've made significant strides with midstream capacity," CEO Nick Dell'Osso said on the earnings call. "We've increased our gathering and treating capacity by 25% for this year and up to 60% in four years."

"We've also committed 700 MMcf/d to a new pipeline to be built by momentum from the heart of the Haynesville play down to [Gilles]," he continued.

HIGH RESULTS

At Southwestern, the company's "strategic intent is to generate resilient free cash flow from responsible natural gas development," has enabled it to establish a presence within the two largest natural gas basins in the U.S. and become the largest gas producer in the Haynesville Shale.

"Our well-timed Haynesville acquisition [Indigo Natural Resources, GEP Haynesville] positioned us as the largest Haynesville producer, giving us scaled production and reserves near the LNG corridor and other growing gas demand centers along the Gulf Coast," president and CEO Bill Way said in Southwestern's third-quarter 2022 earnings call.

The company reported 334,716 boe/d in first half 2022 production from the Haynesville, comparable to the total 887,668 boe/d produced by the company across all its assets, according to Enverus data. In the basin, it also produced 2 Bcf/d of its total reported 5.19 Bcf/d across the combined Haynesville and Appalachian assets.

Comstock has assets spanning throughout northern Louisiana and eastern Texas, making it the third most productive Haynesville operator with eight total rigs. The company produced a total of 314,483 boe/d, 28 bbl/d of oil and 1.88 Bcf/d of gas in the Haynesville in the first half of 2022.

Top Haynesville Producers
(1H 2022 Average)

Rank	Company	boe/d	bbl/d	Mcf/d
1	CHESAPEAKE	365,766	N/A	2,194,587
2	SOUTHWESTERN ENERGY	334,716	0	2,008,290
3	COMSTOCK	314,483	28	1,886,725
4	AETHON ENERGY	313,492	19	1,880,835
5	ROCKCLIFF ENERGY II	205,997	36	1,235,764

Source: Enverus

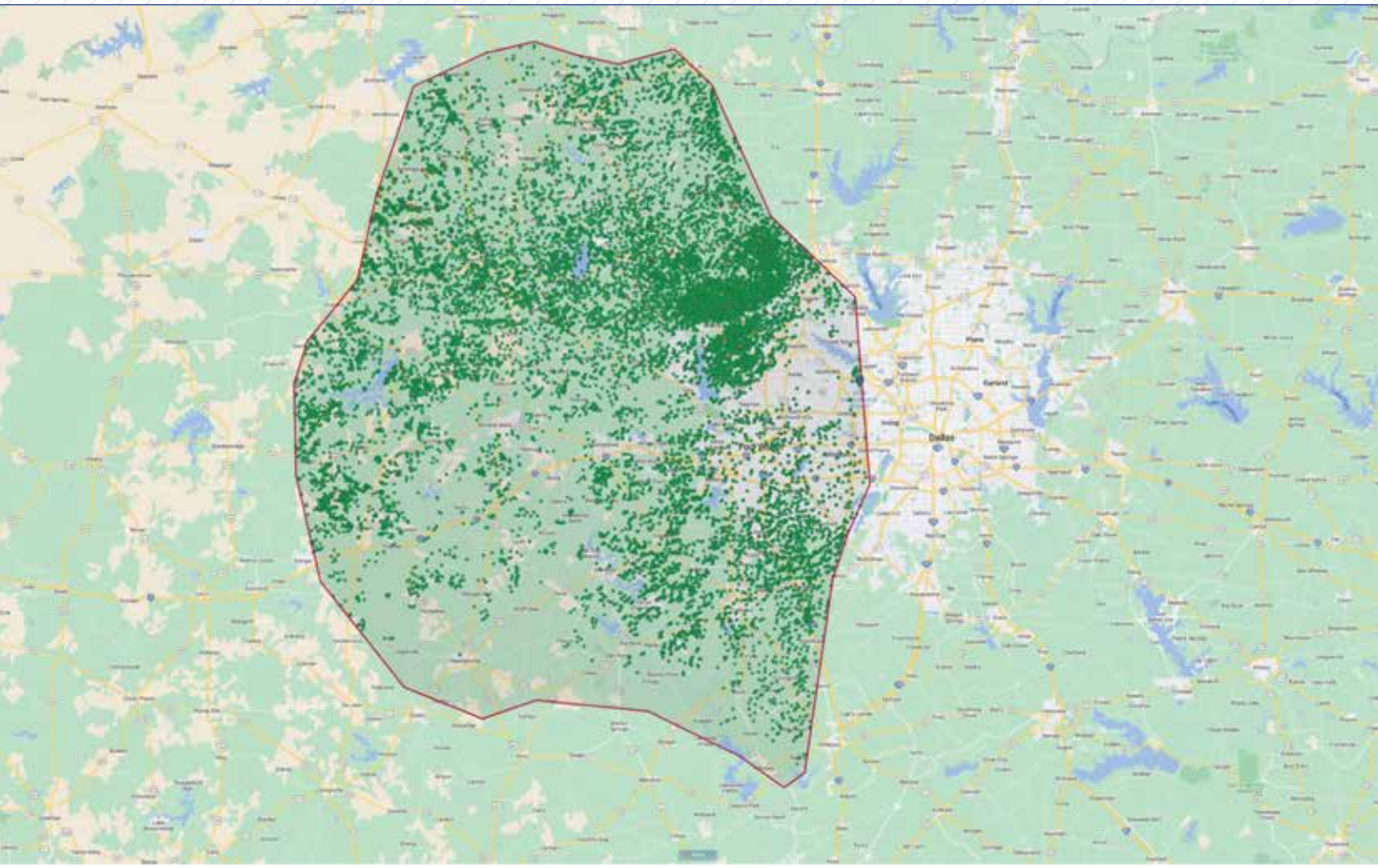
CHESAPEAKE ENERGY CORP.

During the company's third-quarter 2022 earnings call, chairman and CEO Jay Allison shared that Comstock had the highest quarterly results ever achieved in its history thanks to the increased sale of shale natural gas. He added that a new well in Robertson County in the western region contributed to the company's success and that the company also drilled a second well.

"We've also drilled our second well in this region, near the Circle M called the KC Block [ph], which was successfully drilled and completed, and is expected to be turned to sales this month," Allison said.

As the largest private producer in the Haynesville, Aethon produced 313,492 boe/d of its total 330,601 boe/d from the basin. Additionally, 19 bbl/d of its total 402 bbl/d of oil production and 1.88 Bcf/d of its total 1.98 Bcf/d of natural gas production came from the Haynesville.

The second private company to emerge as a Haynesville top player, Rockcliff production totaled 205,997 boe/d in the Haynesville in the first half of the year, according to Enverus. Thirty-six bbl/d of its 347 bbl/d total oil production in the half came from the East Texas basin, as did 1.24 Bcf/d of its 1. 32 Bcf/d total natural gas production. ■



Source: Rextag

The Barnett Revitalizes

BY DEON DAUGHERTY | EDITOR-IN-CHIEF

In North Texas' Barnett Shale play, older wells are being rejuvenating and recompleted with modern fracturing technology. The net effect is boosting E&P volumes and midstream opportunities.

The gas play's top producer, ***BKV Corp.***, a private operator based in Denver, has successfully implemented refracturing at more than 200 wells in the Barnett Shale.

Researchers at East Daley Analytics said that although the basin was previously one in decline, the Barnett's production could stabilize as a result of well refracs—provided natural gas prices remain at or above the economic threshold to maintain the programs.

A successful refrack can boost output from an old well near its original initial production (IP) rate, though production tends to fall off quickly, the analysts said.

And in the Barnett, home to at least 16,000 horizontal wells, the oldest of which is 40 years old, that technology is crucial.

BKV already stood as the top producer in the grandfatherly Barnett after its 2020 entry into Texas, following the purchase of assets from Devon Energy for up to $830 million, including contingency fees.

But the firm supersized in July with the purchase, led by CEO Chris Kalnin, of upstream and midstream infrastructure from subsidiaries of Exxon Mobil Corp. for $750 million. The transaction included Exxon Mobil subsidiary XTO Energy Inc.'s upstream assets in Tarrant, Johnson and Parker counties, Texas, as well as Barnett Gathering LLC's 750 miles of gathering pipelines, compression and midstream processing.

Kalnin told Hart Energy this summer that he intends to make BKV a Barnett consolidator.

"That's the strategy, right? You've got to be the biggest dog in the play and certainly that's where we're going on the upstream side," he said.

BKV is eyeing additional acquisitions among the

Barnett's "long in the tooth" upstream producers.

"I could see a billion dollars going into that business, upstream," he said.

BKV's Barnett thesis relies on four decades and 7,000 wells worth of data, jumpstarting first-generation wellbores with cost-efficient refracs.

BKV on Nov. 18 filed paperwork to conduct an initial public offering, following more than $2 billion in acquisitions in the past two years.The company averages daily production of 864 MMcfe/d, consisting of approximately 79% natural gas and approximately 21% NGL, according to a filing with the Securities and Exchange Commission.

NEW TECHNOLOGY

TotalEnergies has been exploring and producing the U.S. since 1957. Its onshore business in the Barnett, called TEEP Barnett, was founded in 2016. From its headquarters in Fort Worth, Texas, the firm is focused on developing natural gas wells in urban areas.

In 2009, TotalEnergies acquired a 25% stake in a Barnett partnership. Its transaction in 2016 provided the firm with more than 2,800 wells, 750 padsites and over 200,000 mineral leases.

The Paris-based supermajor has plans to deploy new technology that will eliminate about 7,000 tons of methane emissions each year in the play by 2024. During a successful pilot project at the Barnett site in March 2021, Qnergy's technology proved to be reliable, simple to install and easy to operate, allowing to eliminate up to 98% of the methane venting emissions related to instruments using natural gas.

Following successful additional tests, TotalEnergies has decided to install this new technology by deploying 100 units on the Barnett field in 2021 and 2022.

"To fully play its role in the energy transition, notably as a substitute for coal, the integrated natural gas chain must limit its methane emissions as much as possible," said Carole Le Gall, senior vice president of sustainability and climate at TotalEnergies.

"We have successfully demonstrated the effectiveness of Qnergy's technology on the Barnett field. By immediately deploying this technology on our U.S. onshore operations, we are actively demonstrating our commitment to reducing our own methane emissions by 20% between 2020 and 2025."

THE PRIVATES

The next highest grossing producers in the Barnett are private operators: ***Bedrock Energy Partners*** in Houston, ***United Production Partners*** (UPP) in Houston and ***Crescent Energy Co.***, also in Houston.

Bedrock is focused primarily on the acquisition and exploitation of mature onshore assets. It was founded by CEO Will Todd and COO Spencer Cox in 2018. The

Top Barnett Producers
(1H 2022 Average)

Rank	Company	boe/d	bbl/d	Mcf/d
1	BKV CORP.	110,170	392	658,615
2	TOTALENERGIES	64,719	6	388,258
3	BEDROCK ENERGY PARTNERS	24,903	289	147,673
4	UPP OPERATING	19,238	21	115,283
5	CRESCENT ENERGY CO.	18,059	45	108,074

Source: Enverus

BKV CORP.

firm operates gas-weighted properties in seven North Texas counties.

"It's difficult to be a small operator with a large well count," Todd told Hart Energy, "but we overcame it by creating a fun culture where data and the accessibility to that data matters. … Every well matters and every person matters. If you set things up correctly, you give yourself a chance to make the right decision for both."

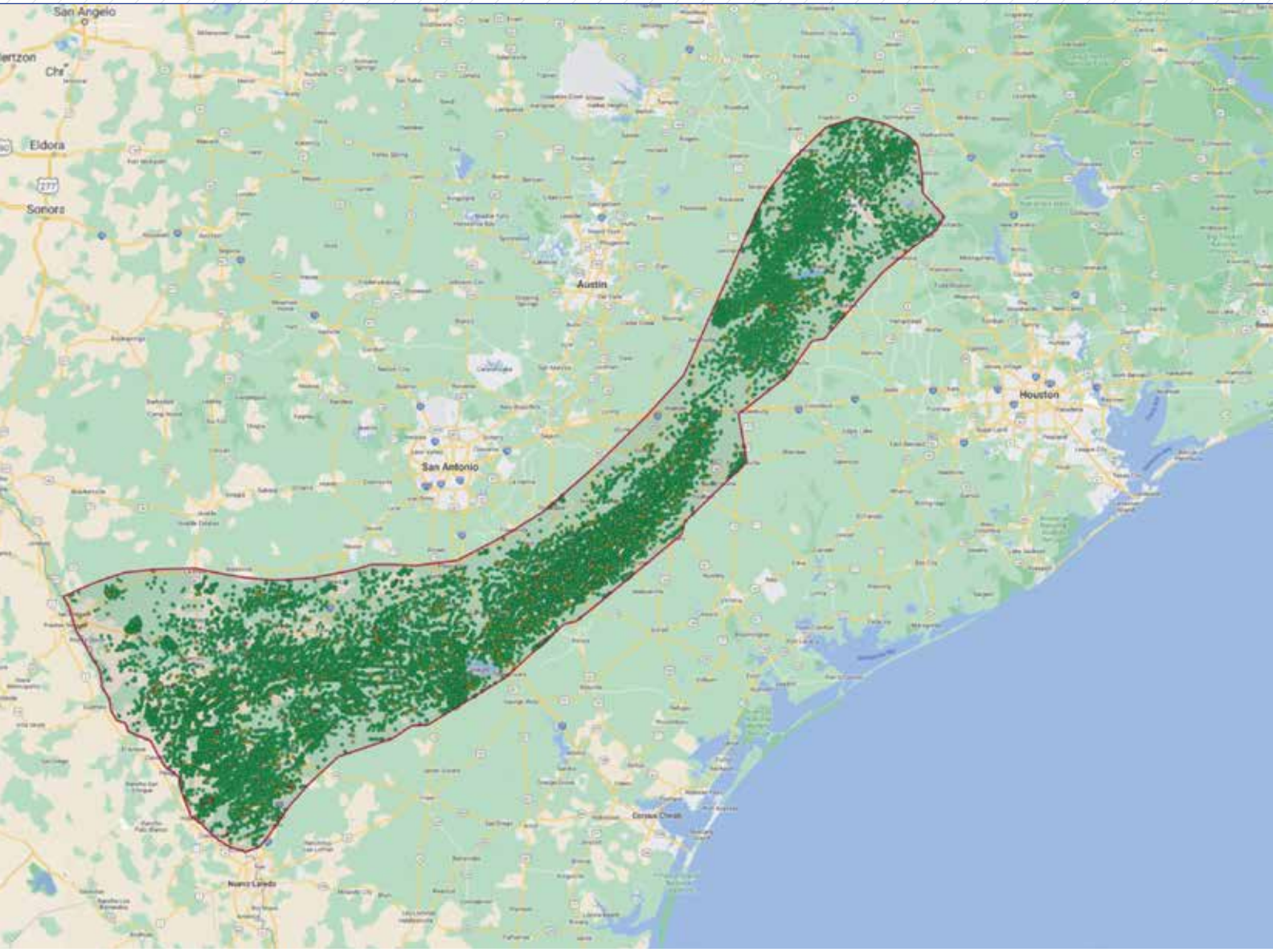
UPP was created in 2019 through the combination of long-life assets in Tarrant, Johnson and Sutton counties. Most of the firm's wells are connected to electronic measurement equipment to enable constant monitoring of wells and facilities. UPP currently operates about 1,095 wells across 99,000 net acres.

Crescent City is managed by private-equity group KKR's energy real estate team.

"We are excited about the potential for continued value creation as we expand Crescent Energy. Executing our strategy over the last decade, we've built a unique platform with financial strength, asset scale and flexibility that we believe is well-positioned to be a leader in a consolidating market," said CEO David Rockecharlie.

The firm joined the Oil & Gas Methane Partnership 2.1 Initiative in February.

"Crescent Energy is meeting today's energy needs while focusing on a cleaner tomorrow," he said. ■



Source: Rextag

The Eagle Ford Soars

BY DEON DAUGHERTY | EDITOR-IN-CHIEF

Often cast in the shadow of the mighty Permian Basin, the South Texas Eagle Ford Shale began showing signs of a resurgence in 2022.

By proximity alone, the Eagle Ford offers several advantages for potential investors, researchers at East Daley Analytics said.

"Producers in South Texas are closer to Gulf Coast industrial demand centers and export terminals, resulting in higher realized prices for crude oil, natural gas and NGL. And unlike the Permian, producers in the Eagle Ford aren't plagued by significant takeaway constraints for natural gas," analysts said in late November.

Indeed, the Eagle Ford was adding rigs in November, peaking at 97 by Dec. 1, with a gain of five rigs added across four weeks. That figure represents the highest count since March 2019.

By contrast, the Permian in West Texas and eastern New Mexico shed 23 rigs during the same period.

But it's more than players in the basin getting busier that suggests a revitalization is in play.

The third largest player by volume in the Eagle Ford, ***Marathon Oil Corp.***, acquired basin pure-play Ensign Natural Resources in a $3 billion cash deal in November. The transaction included assets comprising 130,000 net acres, more than 600 undrilled locations and 67,000 net boe/d of production spanning Live Oak,

Bee, Karnes and Dewitt counties.

Marathon is hardly the only large independent taking notice of what's happening in South Texas.

Its announcement followed the September closing of Devon Energy Corp.'s purchase of Validus Energy for $1.8 billion. Meanwhile, Chesapeake Energy Corp. is shopping its Eagle Ford assets in a deal that Enverus said in July could fetch between $4.6 billion and $5.9 billion, based on strip prices at the time.

EAGLE FORD ACTIVITY

Dealmakers appear to be excited at the potential sale of several private companies in the Eagle Ford. Possible targets include BlackBrush Oil & Gas LLC, GulfTex Energy LLC and 1776 Energy Operators LLC among others.

Marathon's is the second deal in the Eagle Ford to potentially set the stage for buyers' willingness to pay more for potential upside.

During Marathon Oil's Nov. 3 earnings call, CEO Lee Tillman said the Ensign deal found a "sweet spot" between immediate cash flow accretion and inventory that competes for capital within the company's portfolio.

"On the value component, when we think about the valuation, I would say in general we would kind of put it almost 50:50 between PDP and future undrilled development opportunities," he said. "That was one of the unique opportunities about the deal."

The largest producer in the Eagle Ford, ***ConocoPhillips Co.***, was one of the first companies to invest intensively in the liquids-rich play. In 2009, ConocoPhillips began exploring its development potential and by the end of 2021, it held about 200,000 net leasehold and mineral acres, mostly in DeWitt, Karnes and Live Oak counties. ConocoPhillips has drilled more than 1,600 wells in the field through the years, representing 40% of its potential drilling inventory, and built infrastructure capacity with central facilities and pipelines, with an emphasis on liquids value optimization through the operation of two condensate processing facilities, according to company data. Its current focus is on full-field development in the Eagle Ford, its second-most prolific unconventional resource holding.

At ***EOG Resources Inc.***, the second-most prodigious producer in the play, executives have pointed out the financial benefits and efficiencies that come from steady work in a basin.

"We started drilling Eagle Ford wells, 8,500-foot laterals at $12 million a well. We're down to $4 million or $5 million a well at this point in time," Ken Boedeker, EOG's executive vice president for E&P, said in November during the BofA Securities Global Energy Conference in November. "That's that continual improvement."

Boedeker also said the location of EOG's assets in the Eagle Ford present new opportunities in the wake of global desire for LNG.

"We have a significant amount of flexibility on what we can take with LNG," he said. "The majority of our gas out of the Eagle Ford ... obviously goes into [Corpus Christi]. We do have an increased exposure to LNG. We have 140 million a day now exposed to international pricing with LNG. And that goes up to 420 million a day in 2025 with Cheniere Stage 3 coming on. There's an additional 300 that's linked to Houston Ship Channel, just to make sure there aren't any differentials at that point in time."

But it's not just the large public indies playing in the Eagle Ford. Rounding out the top five operators is ***Verdun Oil Co.*** and ***SilverBow Resources***, two private producers.

Verdun owns more than 177,000 net mineral acres in the trend across Dimmit, La Salle, Frio, McMullen, Live Oak, Atascosa, Karnes, Gonzales and DeWitt counties. As of April 2022, the company was operating more than 1,200 wells in the region.

SilverBow upped the ante in the Eagle Ford during the spring of 2022. The Houston-based firm closed its cash-and-stock acquisition valued at roughly $71 million of SandPoint Operating LLC, marking the company's latest purchase in the Eagle Ford Shale. It was the fourth expansion deal for SilverBow's footprint in less than a year. ■

Top Eagle Ford Producers
(1H 2022 Average)

Rank	Company	boe/d	bbl/d	Mcf/d
1	CONOCOPHILLIPS	77,387	48,918	170,813
2	EOG RESOURCES	25,014	13,989	66,150
3	MARATHON	19,077	12,608	38,811
4	VERDUN OIL CO.	17,916	11,734	37,091
5	SILVERBOW RESOURCES	14,064	340	82,343

Source: Enverus

TOM FOX

Bakken EOR Trial Increased Output by 25%

Pilot project shows alternating produced gas with water/surfactant EOR mix boosts production and cuts costs in the Bakken Shale.

BY PAUL WISEMAN | CONTRIBUTING EDITOR

Much as the development of hydraulic fracturing enabled the shale revolution, new EOR techniques are poised to revitalize those quickly-depleting wells.

Shale's tightness renders useless traditional EOR methods like waterflood and CO_2 flood, so each well must be treated separately. According to Gordon Pospisil, development adviser for Denver-based Liberty Resources II LLC, implementing EOR for these wells is vital because producers can only reach about 6% of a field's capacity with the approach he called "drill, frac and drain."

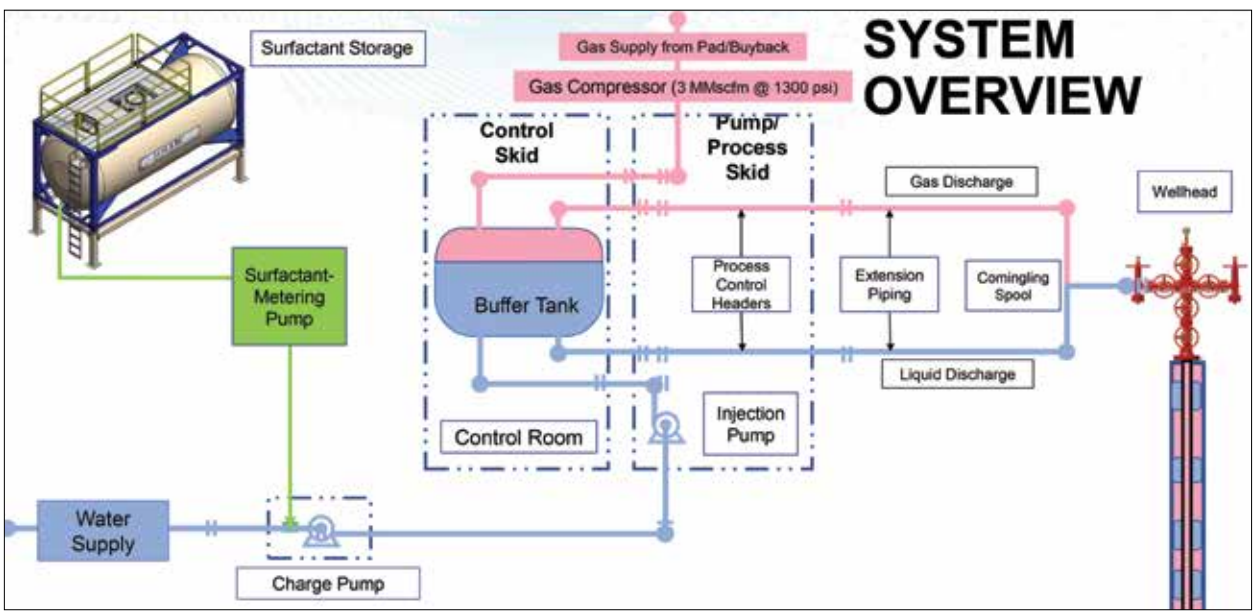
Liberty Resources II produces about 10,000 boe/d from wells in the Bakken and Three Forks basins of North Dakota.

The best shale wells have already been drilled, so to continue to increase—or even maintain—oil production, new development must be accompanied by enhancing existing wells. EOR is also much more cost-effective.

About 10 years ago, producers began developing a well-by-well EOR system known as Huff n' Puff (HnP). With HnP, the operator injects a gas, typically site-produced natural gas, into an existing well at high pressure, then lets the well "soak" for a few days before returning it to production.

While this has proven beneficial, it requires extremely high pressures involving large and expensive compressors, and the actual production boosts are small. Looking to reduce both the cost and safety issues associated with high pressures while further enhancing production, Pospisil and others teamed up for a Bakken test in Mountrail County, N.D., in 2021. Their method involved alternating the gas injection with water, or water alternating gas (WAG).

The pilot was designed, permitted and conducted by Liberty in partnership with the Energy & Environmental Research Center (EERC) and EOR ETC. According to the abstract of a paper authored by Pospisil and a team of experts, "The objectives were to 1. repressure the reservoir above the minimum miscibility pressure



Source: Liberty Resources II LLC

Instead of using high-pressure pumps to inject just natural gas into the Huff n' Puff EOR method for tight Bakken shales, this system alternated gas with surfactant-laden water, known as water alternating gas, or WAG.

CONOCOPHILIPS CO.

(MMP); 2. prove the concept of using water co-injection to build hydrostatic pressure to inject gas at low surface pressures and to improve gas conformance; and 3. use a surfactant to enhance oil recovery through rock wettability alteration and interfacial tension reduction."

Because the Bakken formation has more interwell communication than some shale plays, maintaining each well's pressure required finding a way to contain the gas near the treated well. "We were focusing on using water injection as well as gas injection to build pressure, and include the conformance along the wellbore," he said.

Water's low compressibility allowed pressure to build quickly compared to injecting just gas. This was designed to reduce the surface horsepower required, mitigate costs and improve safety. The water also provided a vehicle for inserting surfactant.

The test was on a single well. Full commercialization involves an ongoing cycle starting with one well in the shutdown/injection/restart process, then moving across the field one well at a time.

THE PROCESS

"We essentially met all our objectives," Pospisil said. "We were able to inject gas and water to target volumes and build pressure in the reservoir, adding energy. Then we saw an oil response when we returned the well to production."

They also contained the gas and water in the drill spacing unit, eliminating concerns about migrating off-lease or interacting with nearby wells.

"We were able to inject gas and water to target volumes and build pressure in the reservoir, adding energy. Then we saw an oil response when we returned the well to production."

—GORDON POSPISIL, Liberty Resources II LLC

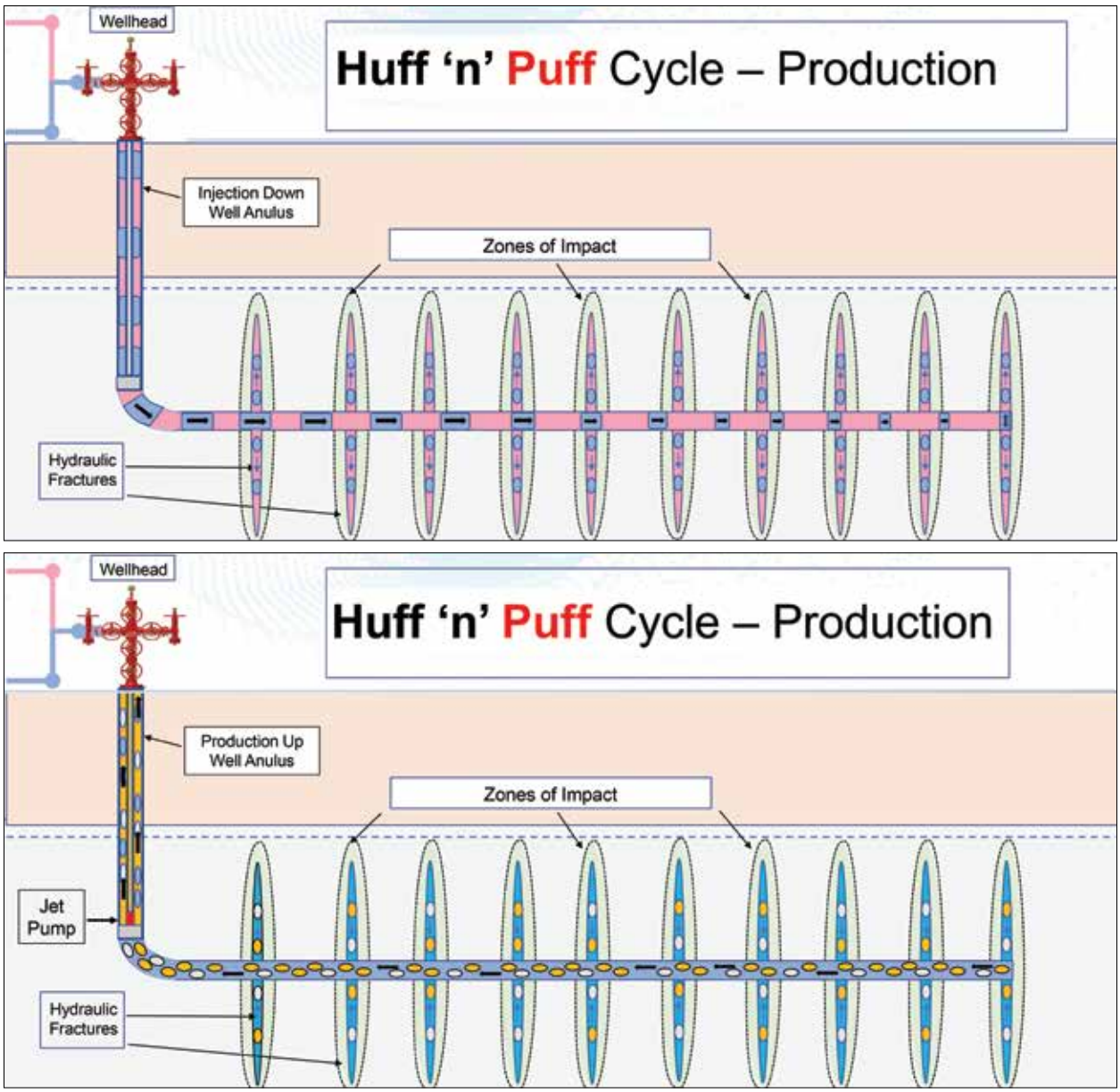
In addition, they observed "much higher efficiencies in regards to oil response we saw versus the amount of gas we injected." Those increases were compared to previous field research, by other producers, which used very high gas injection rates instead of WAG.

RESULTS: MORE OIL, LESS COST

"We were able to generate about 8,000 barrels of incremental oil after the injection of this single slug. We were able to do that with about 4 to 5 Mcf per incremental barrel," he said, and that this was an increase of about 25% over the previous production rate.

Eagle Ford projects by other entities required two to five times as much gas, Pospisil noted.

The key to the test was EOR ETC's unit that provided for



Source: Liberty Resources II LLC

These graphics compare injection with production cycles in the WAG Huff n' Puff system.

continuous injection of water alternating with gas.

"This allowed us to rapidly switch between water and gas injection," removing delays involved in disconnecting and reconnecting gas and water sources, he said. WAG allowed them to use a much smaller and less costly compressor.

IMPLEMENTATION

Pospisil and the team are pleased with the results, but some improvements are needed before it is scalable. One would be making it viable using produced water instead of fresh water, which they used in the tests. That change would make the solution more cost effective.

Once the procedure is commercially available, the producer would do the WAG injection for seven days, then produce the well for 30 days. The injection equipment would continuously rotate from one well to the next.

"You might repeat five to 10 cycles on one pad before moving to the next," stopping once the returns began to diminish, he said.

That could effectively raise the well's total production by 80% to 100%, he noted. And it delivers ESG benefits, he added.

"It's a great ESG benefit," Pospisil said, "from the standpoint of less surface impact, better utilization of the gas, water and all the infrastructure. We see that as part of the future." ■

Where Carbon Capture and Storage Fits Into the Fuel Future

Companies from Chevron Corp. to Oxy dive head-first into the carbon capture market and the potentially profitable CO_2 industry.

BY RYAN RAY | CONTRIBUTING EDITOR

Billionaire Bill Gates' recent book, "How to Avoid a Climate Disaster," suggests that the world should aim for a "zero" carbon policy. Gates understands it is impossible to prevent the industrialized world from producing CO_2, as even the act of capturing the gas creates more of it. Still, according to Gates, the world should strive to reach a preindustrial level when "the earth's carbon cycle was probably roughly in balance." If the world is to get to a "near net zero," as Gates suggests we should, there is little doubt that companies will have to do more.

He's not alone in his quest to reach a near net zero. Fellow billionaire Elon Musk is also in the carbon capture industry. In 2021, Musk announced a $100 million prize called XPRIZE, aimed at "fighting climate change and rebalancing Earth's carbon cycle."

So far, Musk's group has awarded $15 million and will award the rest in 2025.

Both Gates and Musk's rhetoric are in line with the Paris Agreement, which calls "to reach global peaking of greenhouse-gas emissions as soon as possible to achieve a climate neutral world by mid-century."

It's not just billionaires and governments backing the near net-zero initiative. Oil and gas companies are rolling out new carbon capture and storage (CCS) operations worldwide.

Earlier this year, Exxon Mobil Corp. along with CNOOC and Shell Plc announced they had signed a memorandum of understanding to "evaluate the potential for a world-scale carbon capture and storage project to reduce greenhouse-gas emissions at the Dayawan Petrochemical Industrial Park in Huizhou, Guangdong Province, China."

Per the announcement, the project could capture up to 10 million metric tons (MMmt) of CO_2 annually. The progress is only a small percentage of the estimated 36.4 Bmt emitted yearly. Even if Exxon Mobil's effort in China will not move the needle, it is one step in the global plan to reduce emissions. With a similar strategy deployed in the U.S., Exxon Mobil and other oil and gas companies could play a key role in eliminating U.S. energy-related emissions, which, per the Energy Information Administration, average about 5.13 MMmt.

"This new low-carbon energy project will help us leverage those strengths for the next chapter of the energy transition."

—DAVE LAWLER, bp America Inc.

Like any daunting task, one company cannot do it all. According to the Global CCS Institute (GCCSI), only 30 commercial facilities are capturing and injecting CO_2 globally, with 153 in development. Although that number may seem low, during the past 12 months alone new facilities brought online represent a 44% increase in carbon catching capacity.

THE ENERGY CAPITAL

It should be no surprise that Houston, the energy capital of the world, is the home of a significant CCS initiative. Some 14 companies, including Exxon Mobil, Chevron Corp., Marathon Oil Corp., Phillips 66 Co. and others, are evaluating how to best implement proven CCS technologies near Houston.

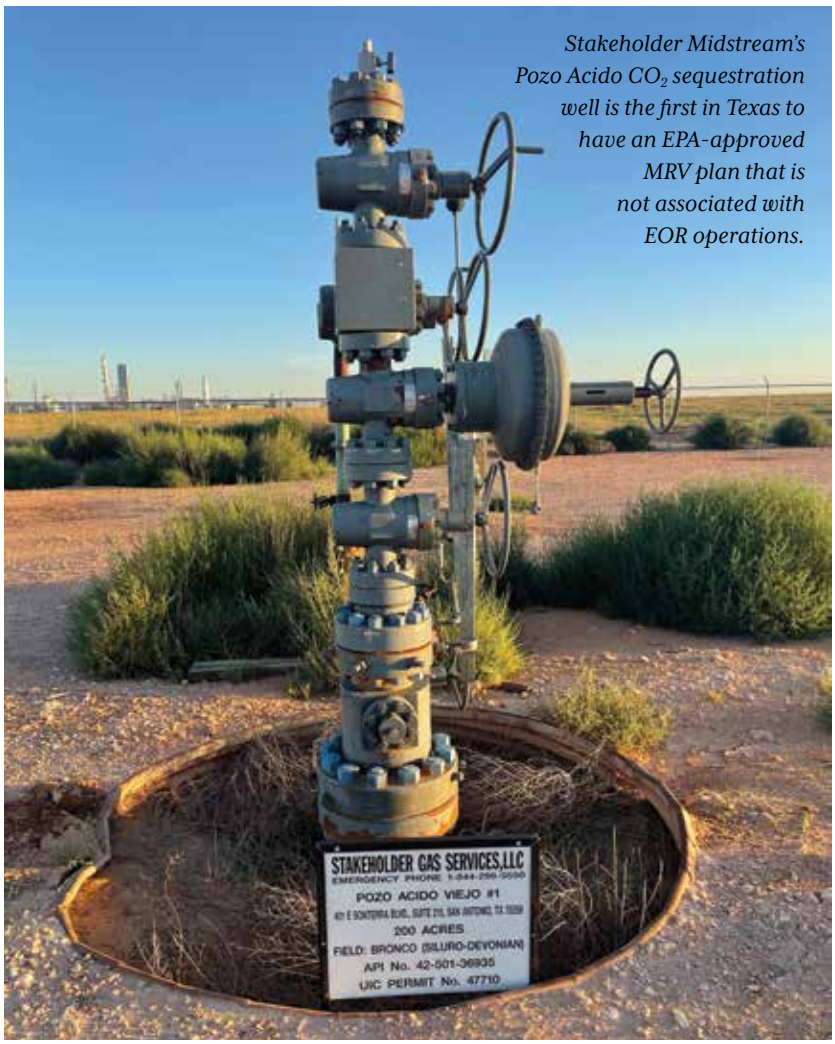
If successful, these efforts could safely store up to 50 mt of CO_2 by 2030 and 100 mt by 2040, according to Exxon Mobil.

Additionally, bp Plc and Linde plan to store 15 mt of CO_2 annually by 2026 in the greater Houston area. Under this partnership, Linde will provide the proprietary technology to capture and compress, and bp will leverage its trading and shipping unit to gain the permits required for permanent sequestration.

Speaking on the partnership, Dave Lawler, chairman and president of bp America Inc., said, "The energy expertise in Texas and strong supply chains have been

generations in the making. This new low-carbon energy project will help us leverage those strengths for the next chapter of the energy transition. In particular, it can help decarbonize hard-to-abate industries for the greatest potential impact on emissions while protecting jobs. bp is proud to support this project as we continue delivering on our own strategy and net-zero ambition."

If this project is successful, both companies have indicated that similar projects could be done elsewhere in the U.S.



Stakeholder Midstream's Pozo Acido CO_2 sequestration well is the first in Texas to have an EPA-approved MRV plan that is not associated with EOR operations.

STAKEHOLDER MIDSTREAM

MONTEREY SHALE

Chevron announced a new project at its San Joaquin Valley, Calif., facility in May 2022 through its Chevron New Energies Division.

Chevron sees this as beneficial to the community in multiple ways.

"As Chevron advances to a lower-carbon future, we're identifying ways to advance our operations as well, so we can continue to provide local jobs, support the local economy, and generate local government revenue that supports critical community services," said Molly Laegeler, vice president, San Joaquin Valley, Chevron. "We are excited about this Chevron New Energies project and fostering continued collaboration with local regulators throughout this process, not only to position the region to benefit from these lower carbon solutions, but that we continue to protect people and the environment. We believe this project has the potential to benefit the region on many levels and that Kern County is an ideal location for carbon capture and storage."

The project in Kern County has received local support from Kern Economic Development Corp. president and CEO Richard Chapman.

"We have a long history of working with Chevron and have appreciated their significant involvement in our community and the role they have played in Kern County," Chapman said. "We are excited to see their commitment to lowering the carbon footprint of their local operations and look forward to seeing the innovation and technology they plan to deploy. These efforts aim to ensure job security and workforce development opportunities and maintain the quality of life we enjoy here."

California Sen. Anna Caballero also openly backed the project. "As we enter our hottest time of the year, we need to be sure we have enough energy to prevent brownouts and blackouts," she said. "This project is designed to serve a dual purpose: ensure we have electricity when we need it and help provide climate action for our Central Valley and California."

PROGRESS IN THE PERMIAN

In August 2022, Occidental Petroleum Corp. (Oxy) and its subsidiary, 1PointFive, announced plans to create their first large-scale direct air capture (DAC) plant, which will be built in Ector County, Texas.

Per the announcement, the plant should be operational in late 2024 and would be the largest DAC plan in the world. Oxy plans to capture 550,000 mt of CO_2 annually. The plant can also expand up to 1 mt annually. 1PointFive has plans to deploy 70 DAC facilities worldwide by 2035, based on current compliance and market conditions.

This aligns with what Oxy executives told analysts on a March 23 conference call. CEO Vikki Hollub said President Joe Biden's 2021 trillion infrastructure bill and the state of the voluntary and involuntary carbon market allowed the company to pursue this path.

Oxy's strategy has expansion beyond the Permian Basin in mind. CFO Robert Peterson said, "Sequestration hubs, which will be located in the U.S., support our direct air

capture and point source capture development by serving as an accessible location for the safe and economical storage of CO_2 in saline formations."

DAC is just one of the methods companies are exploring. In September 2022, Stakeholder Midstream announced it received approval from the Environmental Protection Agency (EPA) for its plan to sequester CO_2 by injecting it into the company's Pozo Acido well located near the Texas-New Mexico border.

This plan would allow Stakeholder Midstream and companies that contract with Stakeholder to sequester the CO_2 in the aforementioned Pozo Acido well permanently. The business here is not reselling but taking advantage of the 45Q tax credit.

Like Oxy, Stakeholder Midstream believes the market is expanding.

"Carbon and emissions management is an integral focus and business segment for our company," said Stakeholder Midstream chief commercial officer Brett Baker. "We believe that by offering these services to third parties, including other gas processing plants in the Permian region and beyond, we can provide an environmentally responsible solution for CO_2 emitters to reduce the carbon intensity of their oil and gas operations and to meet their ESG goals. Our vision is to become one of the leading carbon solutions providers in the United States by helping producers and like-minded midstream companies across multiple basins decarbonize their operations."

Stakeholder has been strategic in selecting its primary location. According to the company, the well is adjacent to the Kinder Morgan Cortez Pipeline, which can transport 1.5 Bcf/d of CO_2. The nearby Oxy Bravo and Sheep Mountain, Kinder Morgan Central Basin and Trinity CO_2 pipelines could also prove valuable to the company's strategy.

As partnerships are formed and tax credits are issued, companies in the Permian will look to follow Oxy's model or possibly ship their CO_2 to Stakeholder to be sequestered. As long as the market stays competitive, other Permian companies will look for ways to monetize CO_2, whether its own or its competitors.

SEQUESTERING IN THE BAKKEN

In the Bakken Shale play, Summit Carbon Solutions is getting support from Continental Resources Inc. to the tune of $250 million during the next two years.

Summit's plans expand beyond just the Bakken, though. As it is currently planned, Summit would gather CO_2 from ethanol plants and other industrial sources from Iowa, Nebraska, Minnesota, North Dakota and South Dakota. After being collected by a pipeline system, the CO_2 would be stored in the Bakken permanently.

According to North Dakota Gov. Doug Burgum, the geology in the Bakken has considerable potential "because of the incredible geology that we have that would allow us to store all the nation's CO_2 for the next 50 years."

"Carbon and emissions management is an integral focus and business segment for our company."

—**BRETT BAKER,** Stakeholder Midstream

It's not just money that Continental is bringing to the table. As one of the leading companies in the Bakken formation, Continental will be able to provide valuable expertise in directing where best to inject and sequester the CO_2.

There is another player in the Bakken, namely Red Trail Energy. In June 2022, the company announced that it officially began the process of CCS at its facility near Richardton, N.D.

Red Trail Energy CEO Gerald Bacmeier, who spoke on the launch, said, "After six years of research, development and investment Red Trail Energy is celebrating this historic moment in North Dakota and United States history of becoming the first facility permitted under state primacy to capture and store CO_2. Our success establishes a trail for other industries in the state to follow."

According to the GCCSI, Indiana, West Virginia and Wyoming have enacted legislation or policies covering CO_2 storage. It also noted that Wyoming and North Dakota "have primacy for issuing permits under the Underground Injection Control Program, which covers injection wells for geologic storage of CO_2."

In regards to permitting and the Red Trail CCS project, Department of Mineral Resources director Lynn Helms said, "North Dakota regulators and policymakers have long seen the importance of creating a regulatory framework that complies with the federal rules while managing the pore space resource for the benefit of North Dakota property owners. Receiving primacy from the EPA paved the way for projects like this one to become operational in the state, and this is a large step toward making North Dakota a leader in carbon neutrality and a showcase for the rest of the world on how to treat carbon."

SHALE AND CCS

The Shale Revolution changed the oil and gas industry forever. Now, as the world looks for the best way to capture carbon, there is little doubt whether it is permanent sequestering or capturing to be repurposed. The future of carbon capturing technology will be developed and implemented across the shale plays. Companies utilizing prime market conditions, favorable permitting and tax credits will no doubt find new and creative ways to monetize the CO_2 industry. ■

Argentina's Vaca Muerta Aspires to Permian 2.0

The Vaca Muerta Shale is actively engaged in large-scale hydraulic fracking projects and the most likely to replicate the West Texas success story.

BY PIETRO D. PITTS | INTERNATIONAL MANAGING EDITOR

The North American fracking boom seemingly converted a number of U.S. shale plays, especially the Permian Basin, into household names across the global energy patch due to the use of a controversial, but effective, drilling technique.

The U.S. shale boom has the energy sector and world leaders talking about hydraulic fracturing as some miracle life-saving drug due to its ability to boost non-conventional production while contributing to energy security and LNG exports. That discussion is front and center in numerous countries across the Americas from Argentina to Colombia and Mexico. However, in Argentina, the discussion radiates the most from oil and gas C-suite executives and petroleum engineers to the presidency of the South American country.

While the question at the moment in the U.K. and other nations is to frac or not to frac, that's not the case in Argentina where the question government officials are asking companies is how to frac more to boost oil and gas production.

Argentina has estimated technically recoverable shale gas resources of 802 Tcf, according to the U.S. Energy Information Administration (EIA), ranking the country only second to China with its massive 1,115 Tcf. The Vaca Muerta is the main drilling target for companies and home to 308 Tcf, thus putting it on par with the Permian, which holds roughly 297 Tcf, according to Rystad Energy.

Situated in Argentina's Neuquen Basin, the Vaca Muerta is located far from the country's principal consumption centers, such as Buenos Aires. This is good socially and bad logistically as the Vaca Muerta holds 53% of the basin's resources and 38% of Argentina's resources.

REVIVING THE 'DEAD COW'

Headwinds from political uncertainties, infrastructure bottlenecks and a slow development pace continue to hamper the hopes of companies such as Pan American Energy, Tecpetrol, TotalEnergies and state-owned YPF, as well as government efforts, to attract interest to revive the "dead cow" shale play.

The major headwind remains above ground and relates to political uncertainties that seem to never vanish. This has impacted financing and investments in production, infrastructure and pipeline takeaway capacity. Smaller headwinds relate to an unstable regulatory framework, frac fleet availability and the need for incremental rigs, energy sector pundits argue.

From financial and economic perspectives, mass development of the Vaca Muerta has the potential to significantly boost oil and gas production and produce major improvements in the country's trade balance, according to YPF, the country's largest oil and gas producer and the largest shale producer outside North America.

Beyond the revenue boost to companies and government, ongoing development of the Vaca Muerta can reduce the need to import energy, especially LNG and piped gas from Bolivia. Further development could open

Vaca Muerta and U.S. Formations Comparison

	Total Organic Content (%)	Thickness (m)	Depth (m)	Area (km2)	Reservoir pressure (psi)
Vaca Muerta	3.0-10.0	50-450	1,700-3,500	30,000	6,500-9,500
Delaware (Permian)	1.0-8.0	30-1,200	60-30,000	26,000	7,500-9,000
Midland (Permian)	1.0-9.0	45-450	700-2,300	36,300	2,000-5,500
Eagle Ford (oil window)	3.0-5.0	30-100	1,200-4,270	5,200	4,500-8,500
Bakken	4.0-20.0	30-40	1,300-3,000	51,800	2,200-4,600
Barnett	4.0-5.0	60-90	1,700-3,000	18,000	3,000-4,000
Haynesville	0.5-4.0	60-90	3,200-4,200	23,300	7,000-12,000

Source: McKinsey & Co.

Key geological data

Least desirable — Most desirable

The Vaca Muerta's geology is comparable to the main formations in the U.S., particularly the Permian Basin.

WATERBRIDGE

Essential Partner for Smarter Energy.

WaterBridge is the largest pure-play water midstream company in the US. We are leading the pack in innovation, technology and services that support safer and more sustainable practices for our customers and community.

WaterBridge Operating LLC

Three Memorial City Plaza, 840 Gessner Road, Suite 100 Houston, Texas 77024
713 230 8864 · www.h2obridge.com

SHUTTERSTOCK/SOBREVOLANDO PATAGONIA

the door for Argentina to become a sustainable year-long exporter of LNG, an idea the country has flirted with for some time now.

Amid the country-specific uncertainties and Russia's war in Ukraine, which has peaked interest again in LNG, the Argentine government is eyeing small LNG projects of roughly 1 million tons per annum over the short to near term. The government does not expect a serious sizable LNG project of scale to emerge until around 2030, Neuquen Province energy minister Alejandro Monteiro told Hart Energy in early October in Houston.

SLOW DEVELOPMENT PACE

The slow development pace in the Vaca Muerta is a telltale sign of just how far Argentina needs to go to achieve sustained double-digit production growth over the near to medium term or to aspire to something that could be dubbed "Permian 2.0."

Argentina's unconventional oil and gas resources are the fourth-most and second-most abundant in the world, respectively, and overwhelmingly found in the Vaca Muerta, according to the EIA. The geology is comparable to key U.S. formations, in particular, the Permian and its sub-basins, the Delaware and Midland.

However, a look at the horizontal wells completed in the Permian compared to the Vaca Muerta in the early development years reveals a large contrast between the two shale plays.

The numbers of horizontal wells completed in the first six years of development in the Midland and Delaware were a whopping 3,275 and 4,211, respectively, with exponential year-over-year growth, according to Rystad's 2018 Vaca Muerta study. In contrast, the number of horizontal wells completed in the Vaca Muerta during the same six-year period numbered just 402.

While horizontal well data are one focal point, on a number of other fronts, the Vaca Muerta goes head-to-head with the best of the best U.S. shale formations. The shale play offers comparatively high productivity rates and technical breakeven prices of $36/bbl for oil and $1.60/MMBtu for gas—both in line with U.S. formations—while higher drilling costs are seemingly offset by higher well productivity, which translates into higher initial production peaks and longer, sustained production levels, McKinsey & Co. revealed in an October 2022 study.

Impressively, the Vaca Muerta is within the desired lighter range of crude oils and has low sulfur content (less than 0.5% compared to a typical 1% to 3%), while the formation's production processes have an oil carbon intensity of 15.8 kilograms (kg) of CO_2/boe, which is among the lowest carbon intensities for oil and gas operations worldwide and well below the global average of 23 kg CO_2/boe, according to McKinsey.

Argentina's oil and gas production is expected to grow in coming years as the country moves the number of rigs from about 30 to 70 during the next four to five years, according to the consultancy.

Argentina's oil and gas production between January and October averaged 577,000 bbl/d and 4.59 Bcf/d, according to Argentina's energy secretariat. By 2026, these figures could rise to between 1 MMbbl/d and 1.1 MMbbl/d and 5.65 Bcf/d to 6 Bcf/d, respectively, according to estimates from YPF. By 2032, these figures could climb further to 1.73 MMbbl/d and 6.36 Bcf/d, respectively, according to McKinsey's long-term forecasts.

The Vaca Muerta's charm is hard to overlook despite the country-specific uncertainties because it offers short-cycle opportunities to boost both oil and gas supply over the near-to-medium term, which would be good for companies, the Argentine government and global energy markets scrambling to cover the lost of gas molecules and oil barrels due to Vladimir Putin's aggressions in Ukraine.

For now, it appears the "dead cow" is far from dead, but it is not completely revived either. ■

CUDD
ENERGY SERVICES

Custom Solutions to Optimize Production.

Cudd Energy Services offers fully customized reservoir stimulation that ensures you meet your production goals. We're able to successfully execute a full range of stimulation services designed specifically for your operation—including acidizing treatments for maintenance operations and complex multi-stage vertical and horizontal fracs for completions.

We combine our high-performance equipment and innovative technology with extensive operational experience to deliver a complete line of services for conventional and unconventional fields.
Our professionalism and in-depth knowledge throughout the major shale plays and basins help us understand the challenges that may arise and design the optimal plan to meet the objectives safely and efficiently.

Hydraulic Fracturing | Acidizing | Water Recycling | Well Remediation | Cementing

PROVEN EXPERIENCE. TRUSTED RESULTS.®

CUDD
ENERGY SERVICES

1.832.295.5555 | cudd.com

Improving Completions Through Better Near-Wellbore Conditions Knowledge

Drill2Frac's FlowFX solution helps finetune completion designs by modeling parameters such as the number of perf clusters and length of stages.

JENNIFER PALLANICH | SENIOR EDITOR, TECHNOLOGY

A solid understanding of near-wellbore conditions is a key component for successful completions.

Operators could use trial and error to test completions effectiveness, but without understanding near-wellbore conditions,that is a costly and time-consuming approach. So, obtaining wellbore conditions using pre-existing data and simulating different completion designs is a better, noninvasive option, according to Drill2Frac.

The company developed its FlowFX near-wellbore fluid distribution solution over a period of years.

Kevin Wutherich, Drill2Frac CTO, started his career as a completions engineer and understands the importance of getting flows right.

"I realized early on that the near wellbore is where everything happens," he said. "If you can get what happens in the near wellbore right, then you can have a good effect on the rest of the job. You can't control what happens after the fluid leaves the wellbore, but you can change what's happening in the near wellbore."

Rock properties in the near wellbore can change foot-by-foot, he noted, meaning clusters can be placed in different types of rocks.

"If you can get what happens in the near wellbore right, then you can have a good effect on the rest of the job."

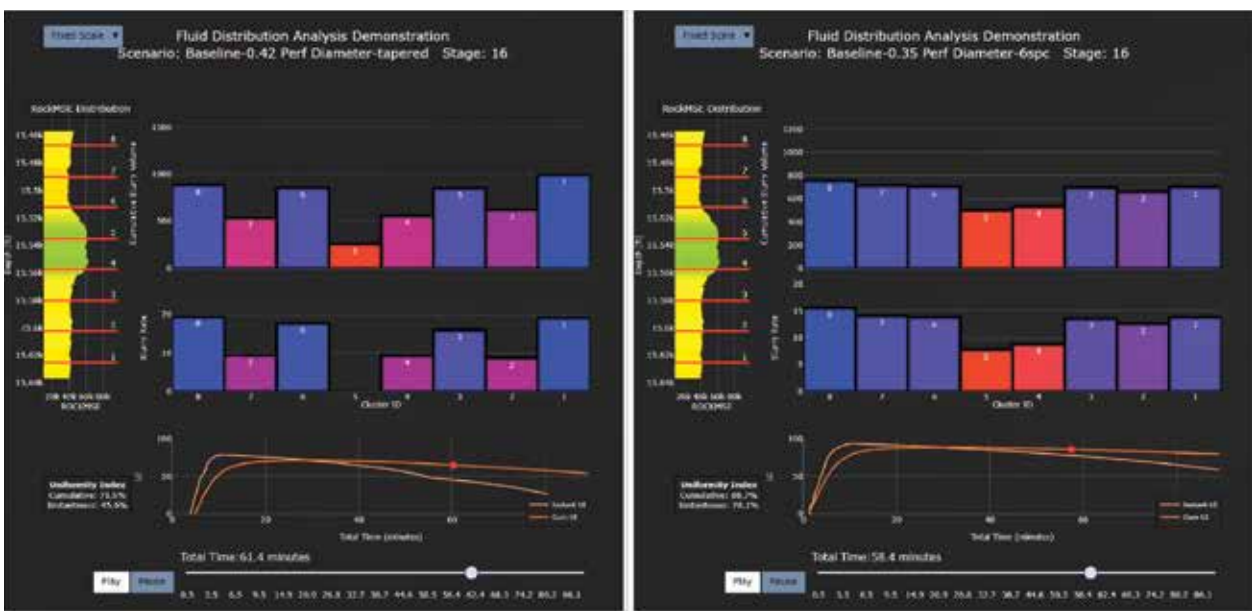
—**KEVIN WUTHERICH,** Drill2Frac

To adapt to the near wellbore, it is important to understand what the initial conditions are, he said.

"There have been models built to understand fracture efficiency, but they haven't been able to effectively take into account near-wellbore rock properties," Wutherich said.

Between 2016 and 2019, Drill2Frac president Dharmesh Mehta said the company focused on improving the process it uses to characterize rock properties in the near wellbore, leveraging drilling data and other information operators had obtained, such as via downhole cameras or fiber optics.

The entire focus is to use data the customer already has instead of requiring them to collect new data, he said.



Source: Drill2Frac

The FlowFX simulation demonstration on the left shows how insufficient perforation friction allows intra-stage stress shadowing to dominate. However, when sufficient pressure drop is used, as shown on the right, a much better distribution occurs.

"Our entire focus is to use data the customer already has."

—DHARMESH MEHTA, Drill2Frac

But data alone is not enough, Mehta added.

"That left the last frontier, understanding things like erosion and stress-shadow models," he said.

Integrating those models with customer data was the next step.

With digital solutions for fluid distribution in place and the ability to detect depletion using data and processes, Drill2Frac's data and analytics help operators fine tune completion designs by modeling parameters such as number of perf clusters and length of stages, he said.

The result is a cloud-based solution designed as noninvasive in nature to help operators achieve more consistent and productive wells.

PLAYING WHAT-IF

FlowFX allows completion engineers to visualize frac plans and quickly simulate the effects of different designs, Mehta said.

It may seem reasonable to think that 1,000 lb of proppant pumped into eight clusters in a stage will distribute equally, he said. "The reality is that is not the case. You never get equal distribution."

As Mehta puts it, FlowFX provides a visualization of how the proppant is going into each cluster for each stage.

From there, it is possible to play what-if and learn what might happen if an element of the completion is tweaked, he said. All the physics and modeling happen behind the scenes, he said.

Customers can "turn the knobs" on the completion design to see how variables like number of stages, stage length, number of clusters per stage, shots per cluster, perf diameter, orientation of perfs, pump rates and the volume of proppants may affect the completion's effectiveness.

Mehta said it makes it easy for customers to understand the effects of the near-wellbore conditions.

"[It makes] that process simpler, easier and leverages the data you already have instead of collecting new data," he said.

Wutherich said the process makes it possible to model many different scenarios to show what they can expect to happen during fracturing with any modification, which is more cost-effective than trial and error.

"It's a model. It's not going to be perfect, but it's based on solid physics and data." So, it makes it possible to predict how changes in completion designs will affect fluid distribution along the wellbore, he said.

Instead of running operational trials on 50 completion designs, FlowFX can shortlist those designs to the five most likely to succeed, he said.

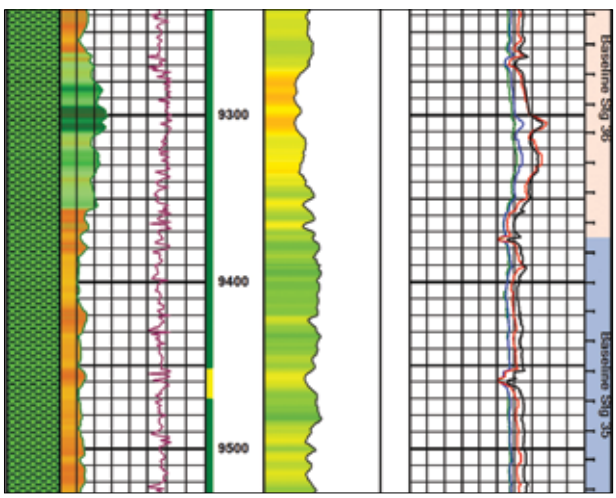
According to Wutherich, the model cannot take everything into account. Poor cement, for example, makes it hard to model what is going to happen because the cement is not fully controlling where the fluid will go.

Wutherich said Gordy Oil, a customer, made completion design decisions based on FlowFX for wells in the Delaware Basin. The ability to model different designs led to an optimized design that resulted in a significantly improved completion and production increase, he said.

Drill2Frac announced the availability of FlowFX during URTeC 2021 and has been using it internally for customers. The FlowFX 2023 update, which will be launched in the first quarter of 2023, incorporates feedback from customers.

One of the biggest changes is that it will be cloud-based, which will allow Drill2Frac customers to work directly with the digital solution and run simulations themselves. ■

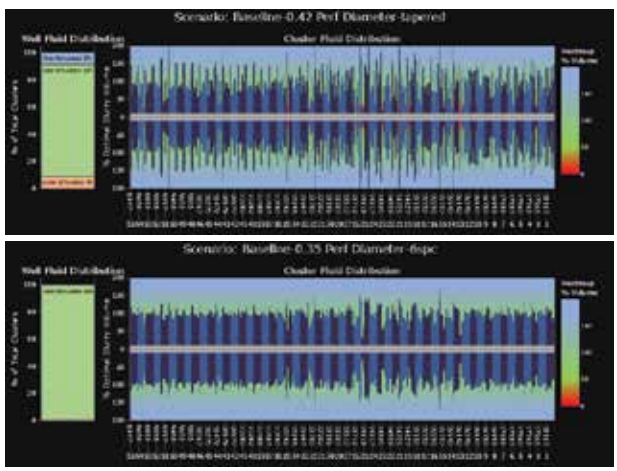
Drill2Frac OmniLog Example



Source: Drill2Frac

Some rock properties can be ascertained from drilling data as shown in this log. From left to right, mud log lithology, gamma ray, rate of penetration, OmniLog RockMSE, gas composition, stage and cluster design.

FlowFX Near-Wellbore Fluid Distribution Model Comparison



Source: Drill2Frac

FlowFX models how fluid will be distributed among perforation clusters for differing completion designs.

Autoblend, Top Fill Support Completions Operations

New electrical blender has higher up time than its traditional counterparts, while a mobile bucket elevator speeds up the sand delivery process.

BY JENNIFER PALLANICH | SENIOR EDITOR, TECHNOLOGY

Cutting the time to complete wells has driven innovation throughout the process, and Solaris Oilfield Infrastructure has turned its inventive engineering focus toward moving, storing and blending sand.

"What we're trying to do is help our customers be more efficient," said Scott Lambert, vice president of engineering at Solaris.

But a host of factors can contribute to nonproductive time (NPT), including blender repair and inefficiencies in transferring sand from trucks into storage silos.

Solaris wanted to find more ways to reduce NPT from equipment and a lack of stand, Lambert said.

So, Solaris developed the "AutoBlend," which is an integrated electric blender with a solid uptime record and the "Top Fill" bucket elevator for transferring sand into each company's vertical silos.

"There's been a push in the industry for electric blenders," Lambert said.

That is because conventional blenders powered by diesel engines are prone to issues that cause NPT, he said. Problems include engine failure, motor failure and hydraulic failure.

Lambert said the AutoBlend's electrical design means the mechanical parts are simpler because drive lines, gear boxes and other components are not required.

"It really simplifies things on the blender itself," he said.

The blender can be powered by a diesel generator, natural gas or field gas.

The AutoBlend design places an electronics room outside the blender that houses the controls, the high-power switchgear and drives for the motor.

"We stripped down the blender to what a blender does. Blend water and sand," Lambert said.

And because the AutoBlend was designed to operate in conjunction with Solaris' vertical sand silos, the blender does not require sand screws or a hopper. The blender has three tubs, which are supported by the company's six-pack silo design.

"You don't have to keep the hopper full. Our 2.5-million-pound storage system, that is our hopper," Lambert said.

And without the presence of sand screws, there is no worry about bearings going bad, he said.

In fact, sand screws are one of the leading causes of NPT for blenders, he said.

Because of how common blender problems are, it is not uncommon for operators to have multiple blenders on standby while one blender is pumping.

These blenders are working harder than ever, he said, because the total volumes previously pumped in a year

SOLARIS

"There's been a push in the industry for electric blenders."

—SCOTT LAMBERT, Solaris

may now be pumped in just a month with wells drilled horizontally rather than vertically, he said.

"It's much harder on frac equipment now than it was in the '90s or even the early 2000s," Lambert said.

AutoBlend has been available for about 18 months, and down time related to the AutoBlend has been in single-digit hours per month, Lambert said.

"We've faced some headwinds in adoption, much like we did when the sand storage happened," he said.

The pushback comes from the fact that pressure pumping customers already own blenders. And, if a customer has three to four blenders supporting every frac fleet, "a lot of capital is invested in those blenders," Lambert said.

He said Solaris understands the pushback, but also sees the value of the AutoBlend. It is available on a lease basis.

"For every four blenders working, we want one spare in the field but that's on us. The customer is not having to pay for that," he said.

LOADING UP

The six-pack silo system can now be filled using Solaris' Top Fill mobile bucket elevator, and the method saves time and money, Lambert said.

The challenge is how to get sand from bottom-drop trailers up to the top of a 50-foot silo without using long conveyor belts.

"If the silo is 50 feet tall, you've got a 100-foot-long conveyor belt feeding it from the ground. It takes up a lot of space," Lambert said.

Bottom-drop trailers can offload 55,000-pound payloads using the Top Fill elevator in just over four minutes.

"If you have the trucks lined up, we can deliver sand into the sand silo faster than the sand is being delivered to the blender," Lambert said. "It's a real space-saving piece of equipment. It's really compact."

Solaris' first Top Fill unit came out in January 2022. More than 20 have been manufactured, working in South Texas, the Permian Basin, Wyoming and the Rockies, and Solaris has more Top Fill units planned in its 2023 build program.

Development of the Top Fill started when Solaris considered the possibility of top-loading wet sand as the last mile of sand delivery became increasingly critical.

Top Fill is moving normal dry frac sand every day, "but we're performing tests with wet sand now," Lambert said. ■

Researchers are placing a sample in the chamber to prepare for the elemental analysis of the composition of the oilfield water sample.

Produced Water Research Advances

The University of Texas Permian Basin's Texas Water and Energy Institute is analyzing data to potentially make predictions about the behavior of produced water.

TWEI

BY JENNIFER PALLANICH | SENIOR EDITOR, TECHNOLOGY

When a barrel of oil comes out of the ground, it may be accompanied by 5 bbl of water or more. All that produced water needs a productive destination.

The University of Texas Permian Basin's Texas Water and Energy Institute (TWEI) is researching ways to treat produced water to be reused at construction sites, irrigate crops, support power generation and potentially recharge aquifers or add to surface water. The TWEI has two promising research projects underway and has already developed a database that companies can consult with to determine if their technology is capable of treating produced water from certain locations.

TWEI director and dean of the College of Engineering George Nnanna said the institute aims to find ways to use renewable energy-based sources to treat produced water and to increase water intelligence through data analytics.

The oil and gas industry produces so much water, but it must first be treated before it can be reused if it's not reinjected into the original reservoir. Different uses of the water have different treatment requirements.

In the Permian Basin, total dissolved solids can reach 200,000 mg/l, which makes treatment challenging.

"Eventually, if it's well-treated, I think it might not be far off to recharge the aquifer," Nnanna said. "In the California area, where the produced water has low dissolved salt, they are discharging it into the surface water."

FLOATING SYSTEM

One of the efforts underway at TWEI is a floating membrane system. The porous membrane design features nano-sized particles, and it floats on the surface of the produced water tank.

When the water permeates through the membrane, it evaporates. The clean water vapor is then collected and condensed into purified water.

Nnanna said the membrane enhances evaporation, which "we have been perfecting that."

The process, which Nnanna calls Enhanced Evaporation using Solar Umbrella, has "worked perfectly" at lab scale and has tested well at the pilot scale. It has drawn industry interest, and TWEI has been working toward an

additional pilot at life scale for the past six months.

During that pilot, TWEI would seek to gather and analyze data that will help determine the parameters that affect the membrane's performance.

The lab test, which lasted a few weeks, generated a 17% to 20% enhancement in the evaporation rate, Nnanna said.

"We have ongoing experiments," he said. "We are still getting temperature, humidity and other data."

The material for the membrane is inexpensive, so the economics should not make treatment cost-prohibitive, he said. The membrane has been continuously used over six weeks without performance degradation issues.

DISSOLVED AIR FLOATATION

TWEI is also researching the viability of a pre-treatment system that injects tiny air bubbles into the bottom of produced water tanks. As the bubbles rise through the water, they can pull particulates to the surface of the water for skimming.

Following the initial pre-treatment, chemicals could be added to the water to help particulates coagulate before running the produced water through a series of filters to "produce a much cleaner water," Nnanna said.

TWEI has a 1,900-sq-ft facility to house the dissolved air floatation system. The next step for the research is to have the industry test produced water for effectiveness.

WATER INTELLIGENCE

TWEI has built a produced water database using more than 23 million data points collected from the U.S. Geological Survey and 45 different industries.

Nnanna said the data is being analyzed to see if it is possible to make projections about the behavior of produced water in the future. The database is available from TWEI and is accessible via subscription. A group within TWEI maintains the database.

"With our database, you can look at the water chemistry in a certain location and make a judgment if your technology is capable of treating the produced water from that place," he said. "Instead of going to the field to test it, you can look at this database, and it will give you an indication of the range of total dissolved solids."

The database has also made it possible to establish an empirical correlation between total dissolved salts and sodium and chloride.

"Instead of doing a laboratory characterization of produced water to get information on the total dissolved solids, if you know the concentration of sodium and chloride, you can use this equation to establish what the total dissolved solids will be," Nnanna said. ■

An aerial view of a ProPetro frac job in the Permian Basin.

PROPETRO

ProPetro's Low-Carbon Future

The oilfield service company is shifting its mindset from aggressive growth to sustainability.

BY JENNIFER PALLANICH | SENIOR EDITOR, TECHNOLOGY

Hot on the heels of a divestiture and an acquisition, ProPetro CEO Sam Sledge's high convictions for the company focus on resiliency and sustainability.

Founded in 2005, ProPetro grew from a frac fleet and a half in 2010 to 27 frac fleets in 2019.

"It was massive, aggressive growth," said Sledge, who joined the company in 2011 and was named its CEO a decade later. "We were built to do that very well."

But, the company has shifted focus to ensuring it's equipped with the right resources to be very successful in the long run, he said.

"As a public company, you get pushed to manage on a quarter-by-quarter basis by investors," he said. "But our highest priority is evolving and building a company that can sustain whatever future cycles are to come and take advantage of the tighter times like we're seeing right now."

That means optimizing the current business, transitioning the company's assets for a lower carbon future and making strategic and opportunistic investments and partnerships.

"We are internally shifting our mindsets and our processes toward being more sophisticated, more efficient internally than we were in the past when it was just more focused on adding the next crew, the next piece of equipment [or] the next team," Sledge said.

Part of optimizing the business included selling the company's noncore coiled tubing assets to STEP Energy Services in an equity transaction with a small cash component deal ProPetro announced in September 2022.

Another part is the twofold Regen and Defend program.

PROPETRO

ProPetro performs on location for a customer in the Permian Basin.

"We are internally shifting our mindsets and our processes toward being more sophisticated, more efficient internally than we were in the past when it was just more focused on adding the next crew, the next piece of equipment [or] the next team."

—SAM SLEDGE, ProPetro

Regen focuses on efficiently moving equipment out of the shop, while Defend focuses on preserving and lengthening the life of equipment on location through consistent maintenance practices in the field.

"It's fixing it faster at the shop, and it's breaking it slower in the field," Sledge said.

At the same time, ProPetro is winding down its investment into equipment that burns only diesel in favor of a "pretty aggressive" increasing investment into dual-fuel that also burns natural gas, as well as electric equipment.

At the end of 2021, ProPetro had 12 fleets running diesel only and one dual-fuel fleet. By the end of 2022, the composition was 10 diesel-only fleets and five dual-fuel fleets. Sledge said by the third quarter of this year there will be eight that are diesel only, two electric and seven dual-fuel. The goal is that over time, 80% or more of the fleet on offer will be electric or dual-fuel, he said.

SILVERTIP PURCHASE

In November, ProPetro announced the $150 million acquisition of Silvertip Completion Services Operating LLC, which has 23 wireline units that provide wireline perforating and pump down services. Like ProPetro, the cased hole wireline business works solely in the Permian Basin.

Sledge said ProPetro has avoided, to a certain extent, moving into the wireline side of the services sector, partly due to wanting to avoid downtime on location.

"Wireline downtime has been more or less engineered out of the system," he said.

Advances in wireline technology coupled with the maturation of completions programs with larger pad sizes have "helped us warm up to having a complementary service line," he said.

The purchase will help ProPetro produce more sustainable, consistent profits. And because ProPetro has not been involved in cased hole wireline work in the past, the integration will be straightforward, he said.

"When you're talking about integration and service businesses, you're talking about people," Sledge said.

Silvertip's management team has been encouraged to come aboard and bring along the team they have built, he said. There will be some back office integration on the administrative front, he said.

"We continue to ask ourselves with this very positive backdrop for oil and gas in general, what other opportunities are there like Silvertip to add complimentary service lines or businesses, and what other opportunities are there to continue to add scale to our business," he said.

Sledge said the question comes down to what a pressure pumping services completion-oriented service company should look like in five to 10 years. "Is it more diversified and more integrated or less? It's likely the prior. It's likely more diversified, more integrated and probably bigger as well."

With that in mind, ProPetro is "analyzing everything that's complimentary to us from a horizontal and vertical integration standpoint."

GEOGRAPHICAL SPOTLIGHT

From the outset, ProPetro is focused on operations in the Permian Basin, and according to Sledge, the company is open to expanding in other basins.

He said ProPetro has considered other locales, but the Permian has provided so much business that the company hasn't felt compelled to expand its footprint. The Permian "remains the lowest cost place to produce a hydrocarbon molecule on this side of the world, and it's become the most productive oil field in the world," he said. "We haven't had to go anywhere else."

The fact that the company focuses on its own backyard, so to speak, also helps make for happier personnel, Sledge said.

"We're not asking a team of people to go to the Bakken or to South Texas or East Texas on a whim to go help us with another project. So our employees are working basically within a hundred miles of where we're sitting every day," he said. "One of our competitors might need to fly a crew on a whim across the country to help with a certain project. That's not even an option from us." ■


Simplicity.
Introducing a direct line to the industry's most cost-effective, expertise-backed answers.
SLB brings its best-in-class E&P software to your project, combines it with our renowned in-house expertise into one convenient, pay-as-you-go package. Accelerated by artificial intelligence and machine learning, the result is the most efficient path to better performance outcomes. And the freedom to tackle even more complex challenges.
Services Include:
Reservoir Analytics
Reservoir Modeling and Simulation
Midstream Water
Shale Well Flowback
Production & Process Engineering Consulting
PIPESIM Python Coaching
Completion Design Advisory
Lateral Landing Point Advisory
Learn more at commerce.slb.com/EPsolutions
slb

THE TEXAS GRID IS STILL NOT FIXED

ED HIRS
CONTRIBUTING EDITOR

The Public Utility Commission (PUC) of Texas is considering market reforms for the electricity market administered by the Electric Reliability Council of Texas (ERCOT). The suggested approaches will not fix the problem they hope to solve. Why? Because they have not addressed the root problem, that the regular ERCOT market does not allow generators to earn a competitive return on capital.

All electricity markets in the U.S. are government-administered constructions. In Texas, ERCOT administers an "electricity only" market in which the generator companies are only paid when they generate electricity for the grid. Because an electron is an electron, and ERCOT first accepts the lowest-cost electricity offered by generators, many older generating plants with higher-cost operations are priced out each day. They do not earn revenues to offset their payrolls and maintenance expenditures. They do not pay their shareholders a return on capital.

In fact, for eight of the 10 years prior to 2021, the wholesale price in ERCOT was not enough to cover the cost of building new generation capacity or, especially with respect to 2021, reinvesting and maintaining the current generation fleet. In 2021, apart from the price gouging during the winter freeze, ERCOT's Independent Market Monitor reported that the wholesale price was too low to support the construction of new natural gas generation, the least expensive option for generation that can be turned on when needed—the definition of reliably dispatchable electricity.

Rather than addressing the primary problem, the PUC's consultants have recommended that Texas add a "capacity" market on top of the electricity-only market. A capacity market would make consumers pay idle generators to be ready. To support their recommendation, the consultants noted the capacity markets employed by other grids including those serving California, New York, New England and substantial portions of the Midwest and Atlantic coast. However, they did not consider that these capacity markets do not work very well.

Look at California's historic grid failures. After the deadly 2020 grid fires, California took action to address its failed electricity market design by acquiring 5,000 megawatts of new natural gas power plants and even hijacking some of Arizona's electricity.

"Because an electron is an electron, and ERCOT first accepts the lowest-cost electricity offered by generators, many older generating plants with higher cost operations are priced out each day."

The immediate future for the ERCOT grid is not bright. Everyone knows wind and solar power plants have no fuel costs, few employees and enjoy generous federal tax breaks—as do oil and gas producers. As ERCOT admits more wind and solar, the 50-year-old coal and 30-year-old natural gas power plants that are already at the end of their operational lives will find fewer and fewer hours available for them to operate each year. But reliability requirements mean they cannot be replaced by wind and solar energy. Battery technologies and installations are years away from being able to backstop the grid for more than a few hours. This is the major problem facing the Texas grid over the next several years.

Not under consideration by the PUC is the solution provided by traditionally regulated electricity markets. In these markets, portfolios of wind, solar, coal, natural gas and nuclear generation assets with obviously different operating costs combine to provide reliable electricity because the states and grid operators make sure power plant owners achieve a fair return on capital. ERCOT and the PUC cannot persist in their unsubstantiated belief that short-term price spikes provide the "economic signals" that encourage the commitment of long-term capital. This is not the way Wall Street operates.

Shortly, just in order to get by, Texas will have to ransom the continued operation of the old higher-cost power plants just like other states with failed grid markets—California, New York, Connecticut, Illinois and Ohio. For Texans, it will not matter if the bill falls to consumers or taxpayers, they are all the same voters. OGJ

NORTH AMERICAN MIDSTREAM GOES GLOBAL

What used to be a domestic business is now the key to worldwide energy security.

GREGORY MORRIS
CONTRIBUTING EDITOR
gmorris@hartenergy.com

The sale of U.S. LNG is surpassing volume and earning records this year, and there is little expectation of any near-term slowdown. Total U.S. LNG exports increased almost 11% during the first 10 months of 2022 compared to the same period last year, according to data from commodity analytics firm Kpler.

But in Europe, the volume imported from outside the continent has dramatically grown almost 150% as desperate buyers pay top dollar to replace reduced supplies from Russia.

"Looking at the latest Energy Information Administration numbers, U.S. LNG has taken over the world, and that is just going to increase," said Clark Sackschewsky, lead for global oil and gas and U.S. national natural resources at advisory firm BDO. "North America is closer to Europe than is any other major LNG exporting region, and European demand for gas is likely to be sustained."

While growing European LNG was sudden and large as a result of Russia's invasion of Ukraine, a reduction of similar proportions and speed is unlikely, he said.

U.S. LNG export volumes for this year will be 12 Bcf/d and about the same for next year, said Kate Hardin, executive director of Deloitte's Research Center for Energy and Industrials. "There are no incremental additions of note for 2023, but by 2025, [it] could be close to 20 Bcf/d and [eventually] nearly double to 28 Bcf/d, pending permitting and approvals."

Hardin said that within that total, average annual exports from the U.S. to Europe were 3.5 Bcf/d in 2021 and will likely be about 7.5 Bcf/d in 2022.

"It's difficult to say what those numbers will be in 2023," she said. "That will depend on factors such as Asian demand, especially from China, European weather and operating rates, but it likely won't be much higher than this year."

Russian natural gas and oil have not disappeared from the world market, they are just going to other buyers, said Sackschewsky.

The deepsea LNG market has become much more liquid, like the global crude market. That makes it unlikely that an end to hostilities in Ukraine is going to flip the switch back.

"Russian gas has not gone away, it has just gone somewhere else," said Sackschewsky.

"Even if Russia wanted to resume large sales to Western Europe, those former buyers have taken energy security to heart. They know now to do business with reliable suppliers."

"Looking at the latest Energy Information Administration numbers, U.S. LNG has taken over the world, and that is just going to increase."

—**Clark Sackschewsky,** ***BDO***

That is about as much assurance of demand as any commodity market is going to provide. Given the willingness of capital providers to fund further North American LNG export capacity, the attention falls on the midstream to get the molecules to liquefaction.

"LNG terminals take about five years to build, [although] there is a push to get at least incremental capacity into service sooner," he said. "The questions become the regulatory environment in which brownfield and greenfield pipe can be added. We will definitely need new lines, there is only so much that midstream operators can do to increase throughput on existing pipe. Greenfield is going to have to be the way we go."

For midstream operators that have slogged through permit applications that often in the past several years, a speedy turnaround would be a relief.

Sackschewsky said there has been a subtle, but substantial, change in the popular and political perception of energy infrastructure.

Energy security lessons

"Lessons have been learned in the last few years. There is a better understanding of energy security. Eyes have been opened in the U.S. and worldwide," he said. "European governments have had to think about keeping houses warm in the winter for the first time in more than half a century. That has hit home."

In short, carbon fuels have a long-term place in the economy, Sackschewsky said.

"We have to have safe and reliable ways of delivering those while we develop non-carbon energy. There is a more realistic understanding, even an expectation, that the world and even the most advanced industrial nations are going to need carbon fuels for the next several decades at least," he said. "The midstream is the key to that."

Hardin is sanguine that capital formation will be enough to get sufficient molecules to market.

"Investments for upstream and midstream don't compete with each other, and the investor base is different," she said. "Upstream projects, nowadays, are primarily funded from internal accruals, and the investor base of upstream companies is largely growth-oriented."

On the other hand, midstream projects are 40% to 50% funded through debt.

"Their investors are primarily yield/pension-fund oriented. So, investments in the two segments complement each other. If U.S. upstream companies are cautious—being capital disciplined—it means that they are selecting only those projects where productivity/production is more economical and certain, which bodes well for midstream gathering companies," she said.

Additionally, that cautiousness helps ensure that midstream companies don't overbuild the infrastructure especially meant for exports.

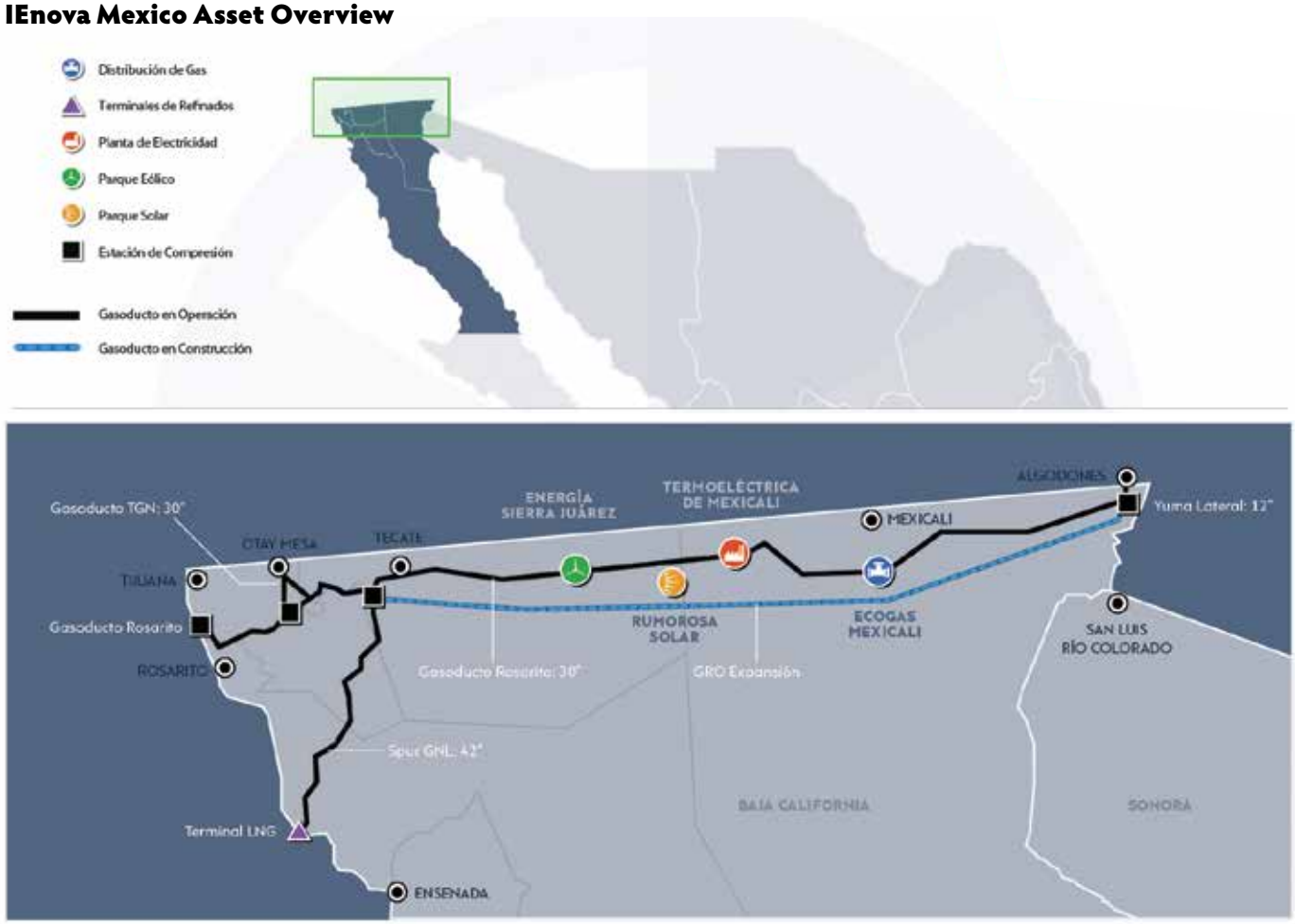
"The stock of Cheniere Energy, the largest exporter of LNG in the U.S., for example, has increased by 50% in 2022 on rising LNG exports to Europe, despite negative profits over the past two or three years," Hardin said.

More specifically, there are opportunities across the midstream value chain: installing or expanding gathering networks for gas-heavy basins, monetizing widening gas-to-oil/NGL price ratio, offering integrated infrastructure services to super majors, partnering in CO_2/carbon capture and storage/hydrogen projects and building export infrastructure.

Beyond the four major long-haul projects planned in the next year or two to expand transportation from the Permian Basin, Hardin said there are other important midstream efforts. Several pipeline projects are planned or under construction for the Haynesville Shale. Most of those are either gathering pipelines or will bring volumes from the Haynesville to the Gulf of Mexico for LNG export, such as Gulf Run.

But, she said, "They aren't the large long-haul projects like in the Permian."

IEnova Mexico Asset Overview



Source: Sempra

Canada and Mexico are intent on joining the LNG bonanza. The $2 billion, 2.5-million-mt/year Costa Azul export terminal in Baja California, Mexico, is due in service in late 2024. The joint venture between Sempra Energy and Infraestructura Energética Nova (IEnova) will eventually be expanded to 3.25 million metric tons per year (MMmt/year).

In the Pacific Northwest, the $32 billion LNG Canadian project at Kitimat, British Columbia, is now expected to have its first liquefaction train in operation by the end of 2027. Four trains of 6.5 MMmt/year each are planned based on Canadian gas.

"Investments for upstream and midstream don't compete with each other, and the investor base is different."

—**Kate Hardin,** ***Deloitte's Research Center for Energy and Industrials***

Asia remains major market

The Costa Azul project may seem counterintuitive because Mexico already imports vast volumes of U.S. gas. But Robert E. Brooks, founder and chief executive of analytics research and development firm RBAC, said the project is actually quite logical for both Mexico and for Permian producers.

"It's a good way to ship U.S. gas directly as LNG in the Pacific," he said. "It is a brownfield project, so there are already pipelines in place; some need to be reversed, and some compression will have to be added, but there is infrastructure."

Brooks also said that California has stated its intention to reduce consumption of gas.

"That means that more is going to be available in the El Paso system. Long term, North American gas demand is expected to decrease, so the supply will be there for exports. Mexico has four different export projects planned for the west coast. And there is a lot of pipeline in place to get U.S. gas to them," he said. "Given the long-term supply outlook, it is a win-win: Mexico gets U.S. investment and earns incremental revenue, while U.S. producers get direct access to Asia."

Expanding on that theme, Brooks said that Asia, and not Europe, remains the major LNG import market. He elaborated that U.S. LNG is making an important geopolitical and economic difference in the scrambled European energy situation, but even if Russian gas returns to Western Europe someday, the focus will return to Asia.

While Russian oil excluded from Europe is now flowing to India and China, gas pipelines in western and eastern Russia are not well connected, so the Russian gas that had been going to Europe is mostly shut in. That has led some midstream investors to fear a surge at some point, but Brooks said he does not anticipate that as a major concern.

"In three or four years, Europe may not even need Russian gas. In addition to the planned increase in LNG exports from the U.S., and entries by Canada and Mexico, there is a huge building program in Qatar, as well as several in Africa," Brooks said. "Also, is Europe going to make the same mistake again to rely on Russian gas? Even if Russia wanted everyone just to forget Ukraine and go back to the way things were, Europe would say, 'fool me once, shame on you; fool me twice, shame on me.'"

Brooks said that while a return of Russian gas to global markets elsewhere would cause prices to fall, in the long term the goal is for LNG to replace coal in India, China and Southeast Asia. That can only happen if gas can be landed at a price that is competitive with coal in those markets.

"It is also important to remember that a big part of the LNG picture is NGL. The ethane from wet gas and associated gas is a petrochemical feedstock, but propane and butane make LPG, and there is a huge potential market for that to replace wood, charcoal and other heavily polluting fuels for cooking and heating in developing countries. The LPG distribution system is already well established in Latin America and relies on local logistics: trucks or even scooters. This means business and jobs for developing countries," he said.

Regardless of the molecules, "North America will need some additional pipes," said Brooks. "The trunk lines from the Appalachians to the Gulf Coast are at maximum capacity. We will need more. For capital providers, it is now clear that the world will need LNG for a lot longer than just the next 20 years, so the investment case remains sound. There are also opportunities in small-scale LNG for the Caribbean and archipelago countries such as Indonesia and the Philippines." OGI

"In three or four years, Europe may not even need Russian gas."

—**Robert E. Brooks,** ***RBAC***

25 INFLUENTIAL

WOMEN IN ENERGY

powered by HARTENERGY LIVE

Meet the Influential Women in Energy for 2023

Networking Luncheon

February 7, 2023

10:30 AM - 2:00 PM

Hilton America's - Houston

Now in its sixth year, the 25 Influential Women in Energy awards luncheon has quickly established itself as the blue ribbon awards program for women in the energy sector.

Hart Energy's Oil and Gas Investor holds its 2023 Women in Energy luncheon on February 7th at the Hilton Americas- Houston downtown. The gala lunch will showcase the accomplishments of 25 distinguished women who have influenced all aspects of the oil and gas industry, rising to the top of the industry.

Mark your calendar and join us as we raise a glass and toast these amazing women.

Hosted by:

Oil and Gas Investor

REGISTER HERE

DATA IS MORE THAN ITS WEIGHT IN OIL

Advances in drone technology and services aim to create a safer world for operators and the environment.

JAXON CAINES
TECHNOLOGY REPORTER
jcaines@hartenergy.com

Historically, outsiders have viewed the oil and gas industry as one whose sole focus is turning a profit without much regard for the industry's impact on workers and the environment. However, in recent years this perception has changed as a new focus on safety and sustainability has risen to the forefront. This new agenda has caused the industry to adapt and has spurred technological advances to help achieve the goal of safety and sustainability. One such advance has been drone technology.

Although drones can be incredibly expensive, their true value lies in the data collected. Because of this, many companies have emerged to offer drone services that provide consulting, training and more support. Drone services are critical as without a way to understand the data collected, the information is useless, according to Brian Grant, director at Consortiq, a U.K. and Maryland-based drone services company.

"The sensors on the drone are what's important because it's the sensors that get the data, which is ultimately what the prize is at the end," Grant said. "That's what the customer wants. That's what they can make their decisions based on."

Consortiq focuses on drone consultancy, drone training, aerial inspections, hardware and software. As a consulting firm, it helps companies set up drone programs. As a Trusted Operator Program certified by the Association for Unmanned Vehicle Systems International, Consortiq trains pilots to understand "not only the drone itself, but the power system around it, as well as the weather and the regulations the aircraft has to perform in," Grant said.

But Consortiq's calling card is the field services it offers.

"The sensors on the drone are what's important because it's the sensors that get the data, which is ultimately what the prize is at the end."

—**Brian Grant,** ***Consortiq***

"The data that's collected could be thermal images, it could be LiDAR images [or] it could be high-resolution RGB [red, green, blue] images," Grant said. "It really all depends on what the customer's looking for. And that's why we have to be flexible; we're offering all these services."

Safely remote

These solutions can help keep operators out of harm's way. Keeping people out of the field and allowing them to perform inspections remotely is one of the easiest ways to keep them safe.

Another company that prioritizes remote inspections is Cyberhawk.

Cyberhawk is a drone inspection and data software company that conducts inspections of difficult-to-reach structures both onshore and offshore. The company uses its iHawk solution to visualize assets and synthesize data collected into a solution for whatever issues a company may be having.

"They will fly the drone, capture images or collect data depending on what the deliverable will be … and then compile a technical report, detailing any faults that they find or any defects and report back to the client," said Callum Kottis, technical manager at Cyberhawk. "Aside from that, we can also collect data to visualize or digitize assets, which essentially looks into converting the captured images into a 3-D model representative of real life."

The iHawk mitigates many issues when it comes to the safety of both the environment and the operators.

"In terms of people, it reduces the need for working at height activities. It eliminates the need for scaffolding and the reliance on the

CONSORTIQ

A Consortiq operator inspects data gathered from a drone.

rope access teams," Kottis said. "You can log into iHawk, load the 3-D mesh model and have a detailed look at those hard to reach areas and do an inspection while sitting at your desk."

Additionally, the drones are able to live stream back to emergency services when a situation goes awry, providing a direct line of communication. This can help "determine the source of a fire or gas leak, use heat signatures to locate missing personnel and monitor spills offshore," he said.

When operators use iHawk, they are also able to diagnose potential problems and equipment failures sooner, which can prevent the asset's integrity from deteriorating, according to the company.

"Protect the environment by monitoring gas emissions … identifying the areas where onsite you may have a gas leak or you might have high levels of methane present or other hazardous gasses that you might not even have been aware of. [We are] using a drone or drone technology to be able to pinpoint those leaks and then obviously take corrective action," Kottis said.

"You can log into iHawk, load the 3-D mesh model and have a detailed look at those hard to reach areas and do an inspection while sitting at your desk."

—**Callum Kottis,** ***Cyberhawk***

Bird's eye view

Another company that specializes in drone services and inspections via hi-tech cameras is Flogistix.

Flogistix's AirMethane solutions uses optical gas imaging cameras to pinpoint methane leaks throughout a site. Originally, this type of detection was done with handheld cameras, but using drones allows operators to detect "really small, minute leaks," with "easier repeatability," David Martinez, Flogistix's AirMethane operations manager, said.

"It's a bird's eye view. So with that bird's eye view, you have that more consistent inspection than anything else," Martinez said. "The handheld guys won't even get one frame or view like this. I'm getting an aerial view, and I'm getting 360 degrees around everything else."

AirMethane's OGI cameras fulfill a plethora of uses, as they not only use sniffer and laser technology to detect leaks, but they also help operators monitor and meet OOOOa (the EPA's CFR 40 part 60 subpart OOOOa) standards and can create 3-D models of sites as well. To be able to handle all of this data, AirMethane has its own free online cloud-based portal to view all the data gathered in one spot.

"Our customers get access into their portal so they can see the reviews and everything else. So we're able to upload all of our data and everything else into the portal, and then they can view it as their customer," Martinez said.

So far, AirMethane has a large client base, as it's able to leverage Flogistix's normal, everyday clientele. Companies using these services include DCP Midstream, Seneca Resources, Earthstone Energy, Medallion Midstream and Matador Resources. OGI

The American Robotics Scout drone takes off on site at an oil field.

THE DRONE REVOLUTION

Drone technology is transforming the way the oil and gas industry operates, allowing for faster and more frequent inspections.

AMERICAN ROBOTICS

JAXON CAINES
TECHNOLOGY REPORTER
jcaines@hartenergy.com

Drone technology is the future of the energy industry, and embracing it will keep operators safe and allow for more accurate data collection. Drones are able to enter harder to reach places, travel farther distances and move faster than the normal human.

Drone company Flyability specializes in inspections in confined spaces. Each drone the company has is equipped with a cage-like barrier that acts as a bumper, protecting it from running into harm.

"Our drone has a cage around it, and it has several collision tolerant features that allow it to fly indoors in confined spaces," Zacc Dukowitz, senior communications manager at Flyability, said. "Places like boilers, pressure vessels, nuclear reactors … if inspectors didn't have the drone, they'd have to go into that dangerous confined space themselves and collect that visual data with the camera. The drone means they can stand safely outside, fly the drone in and get all the visual data they need."

The Elios 3, Flyability's new drone, comes equipped with simultaneous localization and mapping (SLAM) technology that makes the drone both stable and easy to operate, so much so that "people pick it up without ever having flown and can fly an inspection mission the same day."

The drone is also equipped with computer vision, LiDAR [light detection and ranging] technology and an NVidia graphic engine. With these, the Elios 3 is able to make "centimeters accurate" 3-D models of its environment in real time.

"Our drone has a cage around it, and it has several collision tolerant features that allow it to fly indoors in confined spaces."

—Zacc Dukowitz, *Flyability*

"For an industry like oil and gas, you can get your inspection data and know using the 3-D model that you've got full coverage," Dukowitz said. "So if you're inspecting like an FCC [fluid catalytic cracking] unit at a refinery, you can see the whole unit in the 3-D model and know we didn't miss anything, we did our inspection

[and] we got full coverage. And what that ultimately means is you're keeping people out of dangerous scenarios."

Flyability's drones can also help speed up operations. According to Dukowitz, their drones significantly cut down the time it took to conduct a scrubber inspection with the Tennessee Valley Authority from 480 hours to just 10 hours.

Flyability's drones are proven commodities, and they can still improve as drones are able to carry more sensors than just the LiDAR. Adding ultrasonic thickness sensors, gas sensors or any sensor will be of interest for inspectors using drones in the near future.

Drones can also improve on their autonomous functions, as it is already "autonomous-ready," according to Dukowitz, meaning that the drones don't need to be radically changed for it to fly on its own.

Auto-pilot engaged

Drone company American Robotics has already taken the next step into the world of self-piloting drones.

Jason Cornell, vice president of product at American Robotics, describes the standard inspection process as "manual" and "expensive." Using the standard approach, human error is more likely to contribute to mistakes, and inspections might not occur as frequently as one would want.

Using American Robotics' Scout System, a completely autonomous, self-charging, self-navigating drone equipped with high-resolution visual and thermal cameras, as well as sensors to detect methane leaks, these issues can be mitigated.

"You schedule the inspection to happen, the drone will automatically take off from the bay station, it will execute its mission and when it's completed its mission, it will use our precision landing system to land," Cornell said. "The platform that it lands on will lower, the doors will close and depending on whether it's hot or cold, the HVAC system will kick on to optimize the battery charging speeds to accelerate the time to the next inspection.

"While the battery is charging, the data begins transfer from the drone to our edge processing computer which generates a model and identifies anomalies that you care about on your assets. We then transfer the data from the bay station up to our industrial inspection portal in the cloud, and that's where customers go to access that inspection imagery, view the anomalies and plan their operations and maintenance activities accordingly."

"We are the first vendor approved by the FAA to fly fully automated operations beyond visual line of sight 2 miles out from the base station without requiring humans on site."

—**Jason Cornel,** ***American Robotics***

The Scout System not only safeguards employees and the environment but also drastically reduces operational expenditure. Its customer interface software, ScoutView, allows for accurate data to be collected and disseminated to customers all for the cost of a drone and subscription. The procedure even reduces reputational risk as it is federally approved.

"We are the first vendor approved by the FAA to fly fully automated operations beyond visual line of sight 2 miles out from the base station without requiring humans on site," Cornell said.

While drone technology is advancing at a rapid rate, the oil and gas industry is advancing with it. OGJ

FLYABILITY

Flyability drones map out their environment and send a 3-D model to give operators a precise view of the inside of their asset.

DOUBLE EAGLE UNVEILS PERMIAN FOOTPRINT

Double Eagle has garnered almost $2 billion in equity commitments for its Double Eagle IV partnership.

ARNALDO LARIOS/HART ENERGY

Double Eagle Energy CFO Joshua Gregg said Double Eagle IV, which was formed in June 2022, looks to end this year with about 20,000 to 25,000 net acres mostly in the Midland Basin but also on the Delaware side of the Permian.

PIETRO D. PITTS
INTERNATIONAL MANAGING EDITOR
@PietroDPitts
pdpitts@hartenergy.com

Double Eagle Energy has amassed almost a couple billion in equity commitments for its Double Eagle IV strategic partnership, which could have around 25,000 net acres by year-end, the company's CFO Joshua A. Gregg announced Nov. 16 during Hart Energy's Executive Oil Conference in Midland, Texas.

"We have close to $2 billion of equity committed between our sponsors and our management team, of which the management is putting in $150 million," Gregg said.

The executive said Double Eagle IV, which was formed in June 2022, looks to end this year with about 20,000 to 25,000 net acres mainly in the Midland Basin but also in the Delaware side. The company has two rigs running and is looking to go to four by year-end, he said.

"It's going to go back to what we were doing at Double Eagle III," Gregg said.

Fort Worth, Texas-based Double Eagle has been one of the largest independent purchasers of oil and gas leasehold interests across Texas, the Rockies and the Midcontinent. The recently created Double Eagle IV partnership will primarily focus on investing in oil and gas properties in the Permian Basin, while Tumbleweed IV will focus on royalty and mineral investments across the same basin.

Double Eagle IV

Double Eagle IV aims to follow a similar path as previous developments now divested, including Double Eagle I, Double Eagle II and Double Eagle III, but on a much larger scale. The newest venture will require substantial more upfront commitment from funds managed by EnCap Investments LP along with Apollo Global Management LLC, Magnetar Capital and the Double Eagle management team, according to Double Eagle.

"I think a few differentiating aspects of Double Eagle IV versus Double Eagle III, is

that as we look at the way the market is going, we know that this is more of a long-term hold, that we want to create the cash returns. And so, we are now underwriting a much, not different, but a more focused strategy," Gregg said. "So, we're looking to build less acreage, less inventory and just kind of have a just-in-time effect where we can keep rigs running, create cash flow, reinvest that cash flow into the assets and create a return that way. It's been successful so far."

Gregg said the plan for Double Eagle IV was more long-term "focused on putting together enough acres to keep four rigs running, to keep that cash flow going" while also moving from the Midland Basin into the Delaware Basin. The company has also entertained entering the Bakken, Eagle Ford shales and Niobrara but remains focused on the Permian, which it knows well, the executive said.

The "Delaware has fantastic returns," Gregg said, adding the company was "excited to get a leg into the Delaware and realize some returns." With a longer-term focus, the company has more flexibility to invest in nonoperated opportunities in the Delaware Basin with potential to reinvest capital elsewhere, Gregg said.

The Permian Basin is one of the hottest basins in the U.S. and a steadfast supplier among growing gas markets, Rystad Energy senior vice president of consulting Rob Cordray said during his participation at the event. Permian production grew at a rate of 15.3% per annum between January 2018 and June 2022, he said.

Double Eagle deals

Double Eagle IV was formed by the same management team that successfully oversaw the three predecessor companies, with John Sellers and Cody Campbell continuing to serve as co-CEOs. Over the past seven years Sellers and Campbell have participated in three Double Eagle deals with a combined value from the past two deals almost approaching $10 billion.

"At the end of the day, [Sellers and Campbell] want to do deals that make money," Gregg added.

In 2021, Double Eagle III Midco 2 LLC, wholly owned by DoublePoint Energy LLC, divested all its leasehold interests, subsidiaries and related assets to Pioneer Natural Resources Co. in a deal valued at $6.4 billion. The deal consisted of 27.2 million shares of Pioneer common stock, $1 billion in cash and $900 million in debt and liabilities, according to Double Eagle.

With "Double Eagle III, we were operating seven horizontal rigs before we sold to Pioneer, and we were close to 100,000 bbl/d of production," Gregg said. OGJ

E-FRACS 'BETTER AT BEING A NEIGHBOR'

Changing capital cost models make e-frac systems within reach for more operators, according to Baker Hughes' Steve Goldstein.

JENNIFER PALLANICH
SENIOR EDITOR, TECHNOLOGY
jpallanich@hartenergy.com

Turbine-driven electric fracs are reducing emissions and delivering massive fuel savings to operators.

E-frac technology has continued to improve, and mobilization and demobilization times are much faster than in years past, according to Steve Goldstein, the unconventional growth and strategy leader for Baker Hughes industrial energy and technology.

Speaking at Hart Energy's Executive Oil Conference on Nov. 16, Goldstein told attendees turbine-driven e-fracs are reducing both fuel use and emissions by as much as 90% over traditional diesel-powered frac fleets, decreasing noise levels by 20% and dropping the footprint by 40%. And with vendors increasingly willing to lease e-frac systems, the economics of switching from traditional systems to turbine-driven systems mean operators won't have to outlay a lot of capex to acquire access to the equipment.

In short, e-fracs use mobile gas turbines or engines instead of conventional diesel engines to generate the power that runs the process equipment used for hydraulic fracturing. Goldstein focused his comments around using a turbine distributed to an electric motor to drive the power.

Better 'workhorses'

Historically, mobile turbines were bulky, said Goldstein. "They were slow to be deployed. You got all these other economic savings, but you lost a lot of time in the field because it would take you days to set up."

Now, e-frac companies are mobilizing and demobilizing in less than 24 hours, he said.

"You can go out and see videos on the internet of e-frac power units being mobilized very quickly without cranes, without forklifts, without a lot of manpower and low-maintenance intervals," he added.

Compared to reciprocating engines, turbines can run about 35,000 hours before needing the first major maintenance. Reciprocating engines "are really good workhorses, but every couple hundred hours you're going to have to take them offline, overhaul them [and] replace parts."

By contrast, he cited one turbine that had recently been taken offline for the first time after eight years of frac activity.

"All they did to this turbine throughout the years was change the filters on the package, and made sure the fluids were OK," he said. "Occasionally, they do what's called a borescope, where you look inside the turbine to make sure there's no damage happening.

"On top of that," he said, "you can actually do condition monitoring through remote diagnostics where someone sitting in a control room thousands of miles away can actually use, watch the performance of that turbine, compare it to other turbines in the fleet or in the database and really understand how that turbine's performing."

Lab results using the same frac profiles as field jobs indicated a significant decrease in emissions when using turbines for e-frac, according to Goldstein.

"Things like methane leak aren't going to happen. There's no pistons in the turbine, so there's no place for that methane slip to happen," he said. And the turbine-powered e-fracs are quieter than traditional systems.

They're much better at being a neighbor," Goldstein said.

Looking toward the future, he said turbine technology is 100% hydrogen capable. While no companies are currently fracking with hydrogen, the ability to do so will be there, he added.

Money saver

One study indicated using an e-frac system can save over $1 million a month on fuel costs because it allows the use of field gas rather than diesel, Goldstein said. That study was done when diesel was priced at an average of $2.75/gallon.

"What are we playing now? Six, five bucks a gallon for diesel?" he said.

Additionally, he said, when looking at the total cost of ownership from original capital purchase through operating costs, turbine-driven frac through power generation has the lowest total cost of ownership.

In the past, there was a challenge because upfront costs were higher because a company wanting to use turbine power technology would typically need to replace all of its additional equipment, he said.

Goldstein said that's no longer much of an issue as companies are willing to lease the power equipment as well as the e-frac pumping equipment.

"You're taking something that was initially thought of as a very intense capital purchase and converting it into something that is more of an operating cost where you can easily match your cost with your revenues," he said. OGI

PERMIAN RESOURCES COULD ENTERTAIN VALUE PROPOSITIONS

Recently formed Permian Resources isn't averse to looking at value propositions but at the moment, the company is focused on driving synergies and creating shareholder value, says co-CEO Will Hickey.

PIETRO D. PITTS
INTERNATIONAL MANAGING EDITOR
@PietroDPitts
pdpitts@hartenergy.com

Permian Resources Corp. isn't counting out another asset deal if it would drive shareholder value.

"I think it's prudent for us to keep our heads down and really focus on driving the synergies as part of this deal for the near term," the company's co-CEO Will Hickey said during Hart Energy's Executive Oil Conference. "But, at the same time, we don't want to overlook or miss a great opportunity to add incremental value to our shareholders via A&D or other mergers by not keeping an eye on what's around us."

Will Hickey

Permian Resources, a mid-cap Permian Basin pure play, was created on Sep. 1, 2022, when Centennial Resources Development Inc. and Colgate Energy Partners II merged. The newly formed company has 180,000 net acres, and production was expected to reach nearly 150,000 boe/d in fourth-quarter 2022.

The new company has an enterprise value of about $8.5 billion and a deep inventory and is less than one time levered. "This is a true business that is sustainable and we have lots of options for how to take this going forward," Hickey said, adding that creating value was part of a balancing act.

"Right now, we are hyper-focused on driving synergies, reducing cost and creating value for our shareholders," Hickey said. "But it's not without looking around … we're kind of keeping our eyes open and maybe sometime next year we might be ready. If there's another deal like this or another that helps drive value to shareholders, we'd absolutely consider it."

Permian Resources isn't looking to immediately bring in a drilling partner either.

"We've got the capital, we've got the balance sheet [and] we've got the people to execute on that. I don't see anything in the near term where we bring in a partner per se," Hickey said, reiterating the company would surely look at proposals.

"With our asset base, there are not a lot of fringy areas that we would want to bring in a partner to help us accelerate value," he said. "We really feel that all 180,000 acres are in the good spot [in] the Delaware and assets that ultimately compete for capital with the rest of our footprint.

"As such, there's not an obvious place that we want to bring in a partner or sell off some of that value, at least as we see it today," he said.

Building investor confidence

Permian Resources' vision aims to fill the gap of a Permian pure-play with size and scale to have sustainable operations, a balance sheet to be able to pay dividends and ultimately return a meaningful amount of cash flow to its investors. This while remaining small and still being able to make quick decisions to maximize value, the executive said.

Hickey believes demand for hydrocarbons is still there amid limited investment capital, which should work well for the company to generate returns for its investors.

The management team of Permian Resources owns approximately 12% of the company. The top executives believe the alignment between the team and its investors is key.

"Our investors can feel confident every day that we are focused on doing what's best for the shareholders because we are the shareholders," Hickey said.

Over 50% of Permian Resources' production is oil and really one of the major differences in the amount of deep inventory and equity the company has in the Permian Basin. The company believes the Delaware Basin is the most productive, offers the best returns and has the deepest onshore-based U.S. inventory.

In the Permian Basin, the company's assets are concentrated in Reeves and Ward counties in West Texas and New Mexico's Eddy and Lea counties. The Permian Resources portfolio also includes 40,000 net royalty acres.

"It felt like for us this was both the platform that allowed us to continue to create value like we had on the private side, but also do it in a way that was constructive to what the public markets wanted," Hickey said. OGJ

Events Calendar

Scan me

The following events present investment and networking opportunities for industry executives and financiers.

EVENT	DATE	CITY	VENUE	CONTACT
2023				
IPAA Private Capital Conference	Jan. 19	Houston	Post Oak Hotel	ipaa.org
NAPE Summit	Feb. 1-3	Houston	George R. Brown Conv. Ctr.	napeexpo.com
Women In Energy Luncheon	**Feb. 7**	**Houston**	**Hilton Americas-Houston**	**hartenergy.com/events**
SPE A&D Symposium	Feb. 8	Houston	Petroleum Club of Houston	spegcs.org
GoM Energy Transformation Conference	**Feb. 21**	**Houston**	**Norris Conference Centers**	**hartenergy.com/events**
The Energy Venture Investment Summit	Feb. 22-23	Golden, CO	The Colorado School of Mines	theenergyventuresummit.com
LOGA Annual Meeting	Feb. 27-28	Lake Charles, LA	Golden Nugget Casino	loga.la
CERAWeek by S&P Global	March 6-10	Houston	Hilton Americas-Houston	ceraweek.com
The Energy Summit of Texas	March. 21	Tyler, TX	Green Acres Crosswalk Conf. Ctr.	tylertexas.com
DUG Haynesville	**March. 28-29**	**Shreveport, LA**	**Shreveport Convention Center**	**hartenergy.com/events**
Mineral & Royalty Conference	April 10-11	Houston	Post Oak Hotel	mineralconference.com
Global Energy Forum	April 11-12	Houston	Petroleum Club of Houston	usenergystreamforums.com
Energy Infrastructure Conference	**April 12-13**	**Houston**	**Norris Conference Centers**	**hartenergy.com/events**
SPE Innovation & Entrepreneurship Summit	April 26	Houston	Norris Conference Centers	spegcs.org
Energy Workforce & Technology Council Annual Mtg.	April 26-27	Austin, TX	Omni Barton Creek Resort & Spa	energyworkforce.org
Offshore Technology Conference	May 1-4	Houston	NRG Park	2023.otcnet.org
Williston Basin Petroleum Conference	May 2-3	Regina, Saskatchewan	Delta Hotels Marriott Regina	wbpc.ca
ASA Energy Valuation Conference	May 11	Houston	The Briar Club	houstonappraisers.org
AGA Financial Forum	May 20-23	Fort Lauderdale, FL	Ft. Lauderdale Marriott Harbor Beach	aga.org
DUG Permian/Eagle Ford/Midcon/Bakken	**May 22-24**	**Fort Worth, TX**	**Fort Worth Convention Center**	**hartenergy.com/events**
Louisiana Energy Conference	May 31-June 2	New Orleans	Ritz-Carlton New Orleans	louisianaenergyconference.com
Energy Cyber Security Conference	**June 7**	**Houston**	**Norris Conference Centers**	**hartenergy.com/events**
Texas Energy Forum	Aug. 23-24	Houston	Petroleum Club of Houston	usenergystreamforums.com
SEG/AAPG IMAGE Conference	Aug. 27-Sep. 1	Houston	George R. Brown Conv. Ctr.	imageevent/org/2023
Carbon Management Conference	**Aug. 30**	**Houston**	**Norris Conference Centers**	**hartenergy.com/events**
America's Natural Gas Conference	**Sept. 6-7**	**Houston**	**Hobby Center**	**hartenergy.com/events**
GPA Midstream Association National Convention	Sep. 17-22	San Antonio	Marriott Rivercenter Hotel	web.coga.org
Energy ESG Conference	**Sep. 19**	**Houston**	**Hobby Center**	**hartenergy.com/events**
Monthly				
ADAM-Dallas	First Thursday	Dallas	Dallas Petroleum Club	adamenergyforum.org
ADAM-Fort Worth	Third Tuesday, odd mos.	Fort Worth, TX	Petroleum Club of Fort Worth	adamenergyfortworth.org
ADAM-Greater East Texas	First Wed., odd mos.	Tyler, TX	Willow Brook Country Club	etxadam.org
ADAM-Houston	Third Friday	Houston	Brennan's	adamhouston.org
ADAM-OKC	Bi-monthly (Feb.-Oct.)	Oklahoma City	Park House	adamokc.org
ADAM-Permian	Bi-monthly	Midland, TX	Petroleum Club of Midland	adampermian.org
ADAM-Tulsa Energy Network	Bi-monthly	Tulsa, OK	The Tavern On Brady	adamtulsa.com
ADAM-Rockies	Second Thurs./ Quarterly	Denver	University Club	adamrockies.org
Austin Oil & Gas Group	Varies	Austin, TX	Headliners Club	coleson.bruce@shearman.com
Houston Association of Professional Landmen	Bi-monthly	Houston	Petroleum Club of Houston	hapl.org
Houston Energy Finance Group	Third Wednesday	Houston	Houston Center Club	hefg.net
Houston Producers' Forum	Third Tuesday	Houston	Petroleum Club of Houston	houstonproducersforum.org
IPAA-Tipro Speaker Series	Third Tuesday	Houston	Petroleum Club of Houston	ipaa.org

Email details of your event to Jennifer Martinez at jmartinez@hartenergy.com.
For more, see the calendar of all industry financial, business-building and networking events at HartEnergy.com/events.

SAVE THE DATE

DUG | HAYNESVILLE

powered by HARTENERGY LIVE

MARCH 28-29, 2023

SHREVEPORT CONVENTION CENTER | SHREVEPORT, LA

Hart Energy LIVE will present the DUG Haynesville Conference & Exhibition which will focus on:

- Massive dry natural gas formations in Northwest Louisiana and East Texas
- How the Haynesville will grow in prominence as the rise in LNG export facilities increase

DUG Haynesville speakers are:

- Elite executives
- Decision-makers - chairmen, CEOs and presidents
- All with tangible experience in the region

Sponsorship and Exhibit Opportunities

Before, during and after conference sessions, exhibitors have ample opportunities to meet these speakers and network with over 800 hundred industry peers.

When you sponsor a Hart Energy LIVE Conference and Exhibition:

- Your brand is visible to more than those in attendance
- Our entire multi-channel network promotes your message alongside our content before, during, and after each event
- Exhibitors gain access to senior level management and executives in a relaxed, social environment

Let us help you build a multi-channel sponsorship package that meets your marketing goals and budget.

LEARN MORE & CONTACT:
Rob Cravaritis, Chief Revenue Officer | rcravaritis@hartenergy.com | 713-260-1063

DUGHaynesville.com

Get a glimpse into who attended DUG Haynesville in the past!

Hosted by: Oil and Gas Investor

Oil and Gas Investor

COMPANIES IN THIS ISSUE

This index refers to the pages of the story or news item in which the company is first mentioned. Advertisers are in boldface.

JOIN HARTENERGY LIVE 2023

Hart Energy Live in-person events provide attendees, sponsors and exhibitors with unrivaled content and networking opportunities across the upstream oil and gas industry. They are designed to facilitate interaction with industry leaders, policymakers and experts in a professional environment.

Please keep these opportunities top-of-mind when you plan your 2023 calendar.

NEW OFFSHORE
GoM ENERGY TRANSFORMATION
Feb. 21
Norris Centers
Houston, TX

SHALE
DUG HAYNESVILLE
March 28-29
Shreveport Convention Center
Shreveport, LA

SHALE
DUG PREMIUM
May 22-24
Fort Worth Convention Center
Fort Worth, TX

SHALE
EXECUTIVE OIL
Nov. 16
Midland County Horseshoe Arena
Midland, TX

SHALE
DUG EAST
Nov. 29-30
David L. Lawrence Convention Center
Pittsburgh, PA

NATURAL GAS
AMERICA'S NATURAL GAS
Sept. 6-7
Hobby Center
Houston, TX

ESG
25 INFLUENTIAL WOMEN IN ENERGY
Feb. 7
Hilton Americas-Houston
Houston, TX

ESG
CARBON MANAGEMENT
Aug. 30
Norris Centers
Houston, TX

ESG
ENERGY ESG
Sept. 12
Hobby Center
Houston, TX

INVESTMENT
ENERGY CAPITAL
Oct. 2
Statler Hotel
Dallas, TX

INVESTMENT
A&D STRATEGIES & OPPORTUNITIES
Oct. 3
Statler Hotel
Dallas, TX

NEW TECHNOLOGY
ENERGY INFRASTRUCTURE & TECHNOLOGY
April 12-13
Norris Centers
Houston, TX

NEW TECHNOLOGY
CYBERSECURITY IN ENERGY
June 7
Norris Centers
Houston, TX

NEW TECHNOLOGY
CLEAN ENERGY TECHNOLOGY
Oct. 23-24
Marriott Rivercenter Hotel
San Antonio, TX

REV: 12/16/22

VIEW EVENTS

For more information, visit **HartEnergyConferences.com**

FORT WORTH BARNETT, 2023

@CLOSING

NISSA DARBONNE
EXECUTIVE EDITOR-AT-LARGE
@NissaDarbonne
ndarbonne@hartenergy.com

Upcoming tests of the Midland Basin's deep Barnett Shale made headlines this past fall. But work continues in the original Barnett play in the Fort Worth Basin, including making the largest operator, BKV Corp., IPO-ready.

BKV CEO Chris Kalnin and its 96.1% owner, Thailand-based energy conglomerate Banpu Pcl's Banpu North America Corp., filed an S-1 in November to offer a to-be-determined number of public shares in the gas producer.

Having some operations already in Appalachia, Denver-based BKV entered the Barnett in October 2020, with a $570 million cash acquisition of Devon Energy Corp.'s upstream exit from the play.

The 289,000 net acres included legacy leasehold Devon gained from buying Mitchell Energy & Development Corp., the pre-horizontal play's founder, in January 2002.

It also came with 3,850 operated, producing wells.

While natural gas prices were still in a COVID-related demand slump in 2020, Kalnin and the team got to work on a different tack: increasing Barnett production and EURs from existing wells rather than drilling new wells.

Through September-end this past year, the Barnett refracs have added 491 Bcfe of proved reserves, BKV reported in the S-1, "with an estimated 516 Bcfe of probable reserves and 167 Bcfe of possible reserves."

The average finding and development cost for the additional reserves is 70 cents/Mcfe.

BKV estimates it has 294 additional horizontal Barnett refrac candidates, including within its newly acquired Exxon Mobil Corp. leasehold.

BKV bought the supermajor's Barnett upstream and midstream assets in June last year for $750 million that included the legacy leasehold of Fort Worth, Texas-based XTO Energy Corp., an early Barnett operator Exxon Mobil bought in 2010.

The BKV buy this past summer came with some 175,000 net acres and 2,100 operated wells as well as 778 miles of gathering, compression and processing infrastructure.

It now holds some 468,000 net Barnett acres, 99% HBP, 96.1% working interest and 80.4% net revenue interest. Wells total 6,975 gross; 5,702 net.

Its Barnett proved reserves total 5.4 Tcfe (75% gas). Average five-year PDP annual decline is 7.3%; 10-year, 6.5%.

"More than a decade of technological advancements since the discovery of the Barnett, combined with significant remaining gas and NGL resources in place, have created a highly capital-efficient opportunity to restimulate legacy wellbores to meaningfully increase production and enhance recovery factors and reserves," it reported.

Shale-gas producers went to school on the Barnett play in the aughts, taking the concept to gassy, tight rock in the Fayetteville, Marcellus and Haynesville shales.

In the past decade, Fort Worth Basin operations have consolidated into about a dozen producers. BKV is at top, making 731 MMcfe/d net (869 MMcfe/d gross). The No. 2 Barnett producer, TotalEnergies, is surfacing 443 MMcfe/d gross.

Others are Bedrock Energy Partners (172 MMcfe/d), Javelin Energy Partners, Diversified Energy Co., United Production Partners (each with between 162 and 146), EOG Resources Inc. (132), Eagle Ridge Energy (129), Sage Natural Resources (108) and ConocoPhillips Co. (39).

The 10 producers' combined 2,356 MMcfe/d is roughly 94% of total Barnett production of some 2.5 Bcf/d.

The play's gross output peaked in the past decade at 5 Bcf/d, according to Rob Clarke, Wood Mackenzie vice president of upstream research. Clarke took a new look in 2021 at the Fort Worth Basin while examining the original Barnett well, C.W. Slay #1, upon the well's 40th anniversary. The vertical produced a Bcf in its first four years, more than 2 Bcf in its first 40 and is still producing today.

"Cumulative production from the Barnett is roughly 26 Tcfe," he told *Oil and Gas Investor*. "Daily production is still circa 2.5 Bcfe/d. Incredible."

Entering the Barnett in 2020, BKV didn't pick up a rig for the property until this past year, landing nine new wells and completing four by September-end.

Barnett-wide, the rig count was roughly five at year-end 2019; this past fall, it was 12, according to Enverus data.

BKV's view of gas markets? There's U.S. power-gen, which is fueled 38% by natgas these days, up from 12% in 1990.

And there's LNG export. U.S. LNG plants are running at 91% capacity, another 4 Bcf/d is in construction and the U.S. has permitted another 27 Bcf/d. The EU bought 74% of U.S. LNG in the first nine months of 2022, up from 34% in 2021.

Some 90% of existing LNG capacity is on the Gulf Coast and, BKV noted, the Barnett is just 300 miles away. OGI

PCC

PRIVATE CAPITAL CONFERENCE

– A Premier IPAA Event –

January 19, 2023
THE POST OAK AT UPTOWN HOUSTON

Register to attend
ipaa.org/events

IPAA's Private Capital Conference is the annual marketplace convening producers and capital providers. Accessing oil and natural gas capital can be a complex process, particularly in a highly dynamic market environment, and this trend is set to continue into 2023.

This year's PCC will explore capital structures that address the needs of both producers and investors while positioning the industry for growth amidst continued global geopolitical and economic turbulence.

KEYNOTE SPEAKER
Jill Lampert
Chief Financial and Administrative Officer - NGP

Meet Industry Leaders at our 29th Annual Event

2023 Conference Chair
Buddy Clark
Haynes and Boone

Capital Markets Committee Chair
David Baggett
Opportune

Matt Marshall
AEGIS Hedging

Mari Salazar
BOK Financial

Joaquin Anderson
BP

Kristin Kelly
EIG Partners

Nicholas Fersen
EOC Partners

Thomas Kleiderer
Fifth Third Bank

Aimee Carroll
Goldman Sachs

Anuj Bhartiya
Guggenheim Securities

Dan Naatz
IPAA

Josh Schmidt
Juniper Capital

Henry Makansi
Kimmeridge

Nicole Jasper
Macquarie Group

Ajay Jegadeesan
Oaktree Capital Management

Daniel Kohl
Opportune

Dan Pickering
Pickering Energy Partners

Ty Harrison
PureWest Energy

Rusty Stehr
WaFd Bank

Rob McLean
Wells Fargo

IPAA
INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA

Don't miss your chance to sponsor this must-attend event!

Contact Nikki Thomas
nthomas@ipaa.org
202-857-4742

Thank you to our Premier Sponsors:

Diamond:
Opportune

Platinum:
Baker Botts · BOK Financial · Haynes Boone · Latham & Watkins · White & Case

Gold:
Holland & Knight

Silver:
Comerica Bank · IOG Resources · Leyendecker Executive Search

Bronze:
Blackbay Energy Capital

We are proudly independent. And fiercely pro American energy.

American produced oil & natural gas will play a critical role in America's and the world's energy future.

So will we.

On November 22, 2022 we declared independence. We will begin a new chapter in our company's history, one built on our early experience as a private company and the discipline we maintained as a public company. As we exit the public markets, we do so with a great sense of pride and accomplishment over the past 15 years, for our company, for our industry and for our country.

Operating as a private company enhances our ability to do what we do best and unlocks endless possibilities. We will continue to grow our company and our culture with the goal of playing an essential role in meeting the world's energy challenges.

Continental RESOURCES

America's Energy Champion