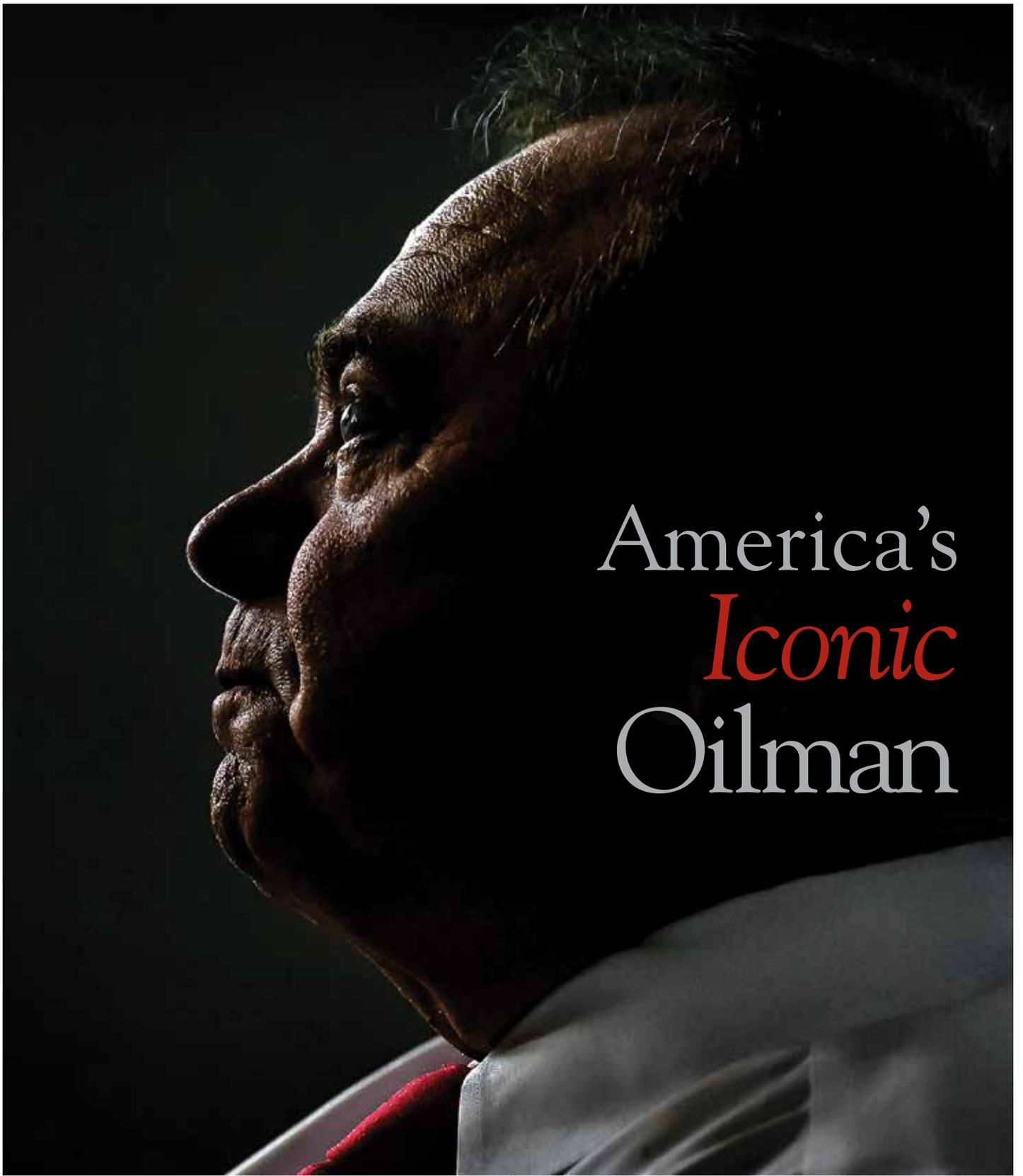


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OCTOBER 2019



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Why Continental Resources' Harold Hamm believes in U.S. energy.

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HAROLD HAMM: ENERGY WHISPERER

Continental Resources CEO Harold Hamm has taken on many challenges, including lifting the oil export ban and proving the viability of the Bakken Shale. But his latest may be his most daunting: explaining Trump.



OF CAPITAL AND CONSOLIDATION

The CEO of Houston energy-focused investment bank Tudor, Pickering, Holt & Co. says it's not time to panic as investors flee the oil and gas space, but structural change is inevitable to adapt to the new marketplace.

THE WYOMING D-J EXPANDS

Operators are drilling what they call "a bigger, better Codell" in Wyoming.

THE DILEMMA OF DIFFS

Differentials between basins are subject to wide swings as new pipeline capacity comes online.

MIDSTREAM BRUISED BUT BIG POTENTIAL

Cheap metrics and simpler structures mean midstream names offer attractive total returns.



GLOBAL OIL SUPPLY SEEMS BULLISH

Shale has relegated peak oil supply concerns to the dustbin of history; now worries are focused on the potential for peak demand.

T. BOONE PICKENS

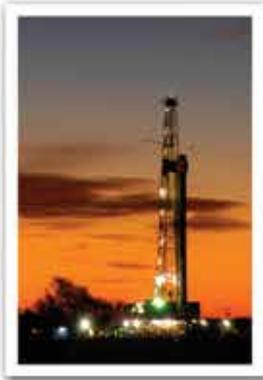
The oil and gas industry has lost one of its most colorful, controversial and successful icons, a huge advocate of natural gas and U.S. energy independence.

DEBUNKING THE NEW ENERGY ECONOMY

While a groundswell rises worldwide to replace hydrocarbons with renewable energies—and sooner rather than later—do physical realities support such a revolutionary change to energy domains? The short answer is no.



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ABOUT THE COVER: Harold Hamm pauses to think about a question he was asked during an interview in his Oklahoma City offices. Hamm is CEO of Continental Resources Inc. in Oklahoma. Photo by Michael S. Williamson/The Washington Post via Getty Images.

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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 (prepayment required). Denver residents add 7.3%; suburbs, 3.8%; other Colorado, 3%.

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LATEST CONTENT

Redburn Says Big Oil No Longer A 'Buy' As Peak Demand Looms

Redburn, the equity research house, has removed all "buy" ratings from the biggest integrated oil companies, arguing that the industry faces an "existential risk" as long-term forecasts for oil demand are up to 30% too high.

Rice Brothers Boost Investment In Fracking Software Company

Rice Investment Group, formed by Daniel, Toby and Derek Rice, made its initial investment in the fracking software company Cold Bore in October 2018.

Alta Mesa Succumbs To Bankruptcy; Names Mark Castiglione CEO

Alta Mesa Resources, a Houston-based independent which bet big on Oklahoma's Stack, joins a growing number of U.S. shale producers that have filed for bankruptcy this year.

Sharp Rise In Number Of Investors Dumping Fossil Fuel Stocks

Climate group 350.org cites the Paris accord as a major driver in discouraging investment.

McRock Launches \$100 Million Industrial IoT Venture Capital Fund

McRock Capital has held an initial closing on its second venture capital fund, McRock Fund II LP, dedicated to investing in the global trend around the Industrial Internet of Things (IoT).

U.S. Shale Firms Cut Budgets, Staff As Oil Price Outlook Dims

The slowdown in drilling is spurring cost-cutting in oilfield services, including staff cuts and restructurings at top firms Schlumberger and Halliburton Co.

ONLINE EXCLUSIVES

Bigger Market, Tougher Forecast

Global gas trade impacts domestic natural gas markets now more than ever.



ConocoPhillips, Private Equity See Shale Growth Opportunities

Technology could help unlock more barrels from shale plays, as it has in the past, but comfort levels pose challenges amid tough market conditions.



Planning For Production In A Cost-cutting Environment

To maintain production, operators must drill new wells or optimize production on their existing ones.

Videos



Who Is Doing The Deals?

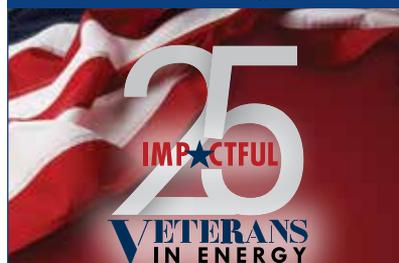
We've covered the deal market, what deals are getting done and how. Now we talk about who is actually making these deals happen.

www.HartEnergy.com/videos

What's Trending

- 1 Energy Transfer Signals Course Change With SemGroup Acquisition
- 2 Saudi Attacks Raise Spectre Of Oil At \$100/bbl
- 3 Pennsylvania High Court Hears Marcellus 'Rule Of Capture' Fracking Case
- 4 Diamondback's Viper Continues Growth Spurt With Santa Elena Deal
- 5 ExxonMobil-led Consortium Strikes Oil Again Offshore Guyana

Awards Program



Nominate military veterans who demonstrate leadership and make significant contributions to the energy industry. Hart Energy will honor industry veterans' continued service in civilian life at a luncheon on Dec. 5.

The deadline for nominations is Oct. 15, 2019.

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STEVE TOON,
EDITOR-IN-CHIEF

Maybe you haven't noticed, but three of the leading Democratic presidential candidates are vigorously campaigning to straight out ban hydraulic fracturing within the oil and gas industry nationwide if elected in 2020. Sens. Bernie Sanders, Elizabeth Warren and Kamala Harris—Nos. 2, 3 and 5 in the polls, respectively—say they will outright eliminate the technology that has driven America's oil and gas renaissance.

"On my first day as president, I will sign an executive order that puts a total moratorium on all new fossil fuel leases for drilling offshore and on public lands. And I will ban fracking—everywhere," said Warren in a Sept. 6 tweet.

"Any proposal to avert the climate crisis must include a full fracking ban on public and private lands," Sanders tweeted on Sep. 4. "When we are in the White House, we will end the era of fossil fuels, and that includes fracking."

"There is no question I'm in favor of banning fracking," Harris said during CNN's town hall on climate change on Sept. 3.

Six other candidates also would ban "all fracking," per a Washington Post poll.

What if one of these candidates wins and actually does what they say they will do?

Current frontrunner Joe Biden takes a softer stance, promising to limit or further regulate the practice. But the fact remains that an entire American major political party stands opposed to and ready to go to battle against the industry that fuels the nation—and the proposal has popular groundswell support.

The very existence of the oil and gas industry in the U.S. is now a major political discussion point in the election of our president. That should wake you up.

The issue, of course, is climate change, aka global warming, and the fear that human activity is pumping greenhouse gases into the atmosphere, which will eventually and cataclysmically alter the earth's climate. Whether or not you believe the science behind that is irrelevant. Enough people do, and more and more so, and are willing to take or enforce drastic actions to stop it at all costs, figuratively and financially.

Take freshman Congresswoman Alexandria Ocasio-Cortez' proposed Green New Deal, a utopian mission to remove America from all hydrocarbon energy reliance in 10 years. Many scoff at the absurdity and impossibility of such a feat, not to mention the Herculean cost. But look before you dismiss. The *idea* of it is what attracts believers. The

legislation has found traction in Congress, and it is the foundation of all the Democratic presidential candidates' energy platforms.

Preceding the Democratic debate in Houston, Greenpeace protesters dangled from a bridge spanning the Houston Ship Channel from climbing ropes, disrupting shipping traffic and specifically oil tankers.

A Greenpeace spokesman explained: "We are in a climate emergency, created by the fossil fuel industry and made worse by Trump. We have little more than a decade to take ambitious action to cut fossil fuel use in half and transition to renewable energy. We can either take the bold actions necessary to stave off the climate crisis today, or suffer the radical consequences of climate-fueled disasters—more floods, more megastorms and more fires—for years to come. We're here because there's no time to waste."

This view is quickly becoming the majority.

But what might be some unintended consequences should well stimulation be banned?

Essentially all domestic oil and gas exploration and new production would come to a halt. As about two-thirds of electric power generation is gas-, oil- or coal-fired, coal would likely fill the void, unless additional anti-coal laws scuttle it as well. In that case, the U.S. would need to import the difference. Oil and gas exports would dry up, and we'd once again be reliant on imports from and dependent upon some fairly seedy suppliers.

Costs of electricity and transportation would skyrocket, along with all the goods produced using them. Some 10.3 million jobs would evaporate, per the American Petroleum Institute. Russia and OPEC nations would gain political advantage globally as the primary suppliers of both oil and gas. And, ironically, greenhouse gases would likely increase as U.S. gas supplies are removed from domestic and world markets.

Renewables aren't going to immediately or likely ever fully replace hydrocarbons, but legislation can still be passed without understanding the consequences. Or caring.

Can a president do that with the stroke of a pen, per Warren? Not likely, as it would take the help of Congress to wipe out an entire industry. But a progressively leaning uprising could shortly gain the advantage in both chambers with noble aspirations to save the planet.

If so, then dust off your seismic or learn a foreign language for new exploration, because political risk is now a factor of operating in the U.S. Don't underestimate it.



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RAKING THROUGH THE WRECKAGE



CHRIS SHEEHAN, CFA
SENIOR FINANCIAL
ANALYST

So first, what happened? The XOP, or S&P Oil & Gas Exploration & Production ETF, slumped by more than 20% in July-August, touching an *all-time low* on Aug. 27. As pointed out by Simmons Energy, just one of the so-called FANG stocks, Facebook, now has a market cap—\$525 billion as of mid-August—larger than the entire E&P sector, from ConocoPhillips Co. at the high-end all the way down to micro-cap E&Ps.

Oh, and by the way, you could add in 90% of Chevron Corp.'s market cap, to top it off, added Simmons.

The sell-off leaves the energy components of the S&P at about 4.4%, down from 5.3% at the end of 2018.

In part, the downward rerating of energy reflects fears of a protracted period of trade tensions or a possible recession. Under these circumstances, “risk-off” or “haven assets” (U.S. Treasuries, gold) do better, while “risk-on” or “growth assets” (energy, copper) perform poorly.

But wasn't the energy sector making progress toward meeting the market's mantra of capital discipline and free-cash-flow (FCF) generation?

“E&Ps returned to capital discipline in the second quarter of 2019,” according to Bernstein's report, “State of the E&P Business.” The report, in which Bernstein aggregated data from 54 E&Ps, showed the sector's organic capex (ex-acquisitions) fell by 1.4% from the prior quarter, while cash flow from operations rose 27%. This resulted in E&Ps spending just 75% of cash flow (80% with acquisitions).

Second-quarter FCF followed a gain in the oil price realization of slightly over \$5 per barrel (bbl) from the first quarter to just shy of \$60/bbl, at \$59.88. However, the natural gas price realization fell by 36 cents per thousand cubic feet (Mcf) to \$2.56/Mcf, pulling down the *blended* rise in price to \$2.54 per barrel of oil equivalent (boe). In turn, the sector registered increases of 73 cents/boe in EBITDA and 47 cents/boe in net income.

With the marginal cost of oil at close to \$60/bbl West Texas Intermediate (WTI), according to Bernstein, the E&P sector is capable of generating FCF. “The key then becomes to return enough of it to shareholders to (a) please them, and (b) not flood the market with production and push down price,” the report said. “That goal is within the reach of the sector.”

So what explains the ongoing deteriora-

tion of the sector—described by Bernstein as “more discipline,” but “worse multiples and sentiment”—as price-to-trailing cash-flow multiples fell to about 4 times?

The quarters ahead “look tougher,” with July through August prices of around \$56/bbl for WTI and \$2.30/Mcf for natural gas, noted the Bernstein report. However, projections of the rig count and frack spreads “suggest capex is down, so discipline should hold,” it said. “A potential test of the sector would be a commodity sell-off into the fall.”

In a second-quarter earnings review, Credit Suisse estimated that organic FCF for the sector (before dividends and ConocoPhillips) could reach \$2 billion in 2019, similarly assuming a then prevailing WTI futures strip of \$56/bbl. While up from “essentially zero” FCF in 2018, this nonetheless implied a “paltry median FCF yield of 2% for large-cap E&Ps,” observed Credit Suisse.

For 2020, with a WTI strip of about \$52/bbl as of its report, Credit Suisse forecast the FCF yield would “fall to 1% for large caps ... far off the S&P 500 yield of about 5.5% and highlighting the group really needs WTI of over \$60/bbl to generate attractive free cash flow.” And even with lower capex, E&Ps are “limited as to how much they can cut spending given the high PDP decline rates in U.S. shale plays.”

Simmons similarly summed up the “sober realism” aired at its recent European conference, saying “durable investor sponsorship” of energy may remain “challenged.”

“Fifty-dollar oil prices might be high enough to allow companies to generate a small amount of FCF and deliver sub-2% dividend yields,” it said, “but that is not enticing enough for investors, especially with limited conviction on oil prices given recessionary worries and ongoing demand concerns.”

For E&Ps, the focus is on reducing costs, lowering FCF breakevens, bolstering balance sheets, lengthening liquidity runways and returning cash to investors through dividends and share buybacks, said Simmons. “The hope for a V-shaped recovery of cycles past has evaporated.”

Where's the good news? “Oil markets may be overreacting to the bad news on demand, and seem to have lost focus on the constrained backdrop for supply,” said one source.

Not always right, could an oft-used observation—“It's the darkest before the dawn”—be right?

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A WELCOME DIS-TRANSACTION



DARREN BARBEE,
SENIOR EDITOR

Maybe buying Greenland isn't such a bad idea.

For those just joining our parallel universe: Sometime in September, the president of the United States, the media, etc., went bananas over weather maps, Sharpies and Hurricane Dorian. That diverted the country's earlier focus on President Donald Trump's overtures to buy Greenland.

Alas, the deal was not to be.

On Aug. 20, Trump tweeted that he was canceling a trip to Denmark because "nasty" Prime Minister Mette Frederiksen said she "would have no interest in discussing the purchase of Greenland."

"I will be postponing our meeting scheduled in two weeks for another time..." Trump wrote.

Apparently, one sticking point was that Frederiksen is convinced that "Greenland is not Danish. Greenland belongs to Greenland." About 56,000 people live there, and some of them were also bound to notice.

But chewing over this deal is a lot more enjoyable and somehow feels less ridiculous than the current state of A&D out in oil and gas land.

On Aug. 21, the day after Trump's first known rebuff to anything Danish-related, Cowen Equity Research produced statistics that show just how unkind the market has been to U.S. upstream M&A.

"Since 2015, E&P companies that engaged in corporate acquisitions have underperformed the XOP by an average of 13% after one year and 20% after two years," Cowen analyst David Deckelbaum said, referring to the index of oil and gas producers. "Still, investors clamor for M&A to help correct the space."

Cowen referred to this phenomenon as "M&A rears head, mallet drops." It may be slightly more accurate to say, "M&A offers head, guillotine drops."

Consider Callon Petroleum Co.'s July 15 offer to buy Carrizo Oil & Gas Inc. for \$3.2 billion. Callon share prices fell 16% by market close that day, Deckelbaum said. On Sept. 9, billionaire hedge fund manager John Paulson fired off a letter to Callon's board noting that his company, Paulson & Co. Inc., owns 9.5% of the company's stock and that his 21.6 million shares currently have lost 36% of their value.

Paulson was unable to wrap his mind around a pure-play Permian Basin company buying what he termed "a primarily Eagle

Ford producer" and suggested a plan would be for Callon to sell itself.

Indeed, in many corners, deals remain in suspended animation or at least slow motion, with companies hoping to be revived sometime after the malaise has passed.

Others find themselves struggling to make good deals in a bad market. On Sept. 5, Tudor, Pickering, Holt & Co. (TPH) reflected on the stalemate that Chesapeake Energy Corp. finds itself in. With a dynamic deal to buy WildHorse Resource Development Corp. wrapped up in February, the company added a lot more oil production to its largely gassy portfolio for \$4 billion. But Chesapeake is still mired in the now years-long Battle of the Balance Sheet, which has left the company "in a precarious position," TPH said.

Chesapeake may ultimately sell its assets in the Marcellus and Haynesville shales, but with a raucous market, the assets are unlikely to command anything beyond bare-bones PDP value. For the highly leveraged company, sales could ultimately extend the company's liquidity runway through 2024 but won't "solve the bigger problem," TPH said.

Devon Energy Corp., which has been kicking around a second Barnett Shale divestiture since at least September 2018, said it's been progressing in its sale process. The company expects initial bids by the end of the third quarter and an exit by the end of the year.

Mizuho managing director Paul Sankey said in August that Devon's future viability still rests, to some degree, on successfully selling the Barnett for enough proceeds to reduce its fixed cost base.

In August, Sankey also addressed the Greenland purchase—the hypothetical distraction-transaction the oil and gas world needed.

"While rich in resource, there is no major mineral production there," Sankey wrote. "Exports are 90% fish."

The world's largest island has strategic value—the Air Force established a base there in 1941. Maybe the rent has gone up.

Greenland is rich in rare-earth metals, which are used in electronics and medical devices.

Minik Rosing, a University of Copenhagen professor, told the Los Angeles Times Greenland's mineral deposits "are huge, but also unconventional, and require special metallurgy for processing."

Unconventional? That's our specialty.

EVENTS CALENDAR

The following events present investment and networking opportunities for industry executives and financiers.

EVENT	DATE	CITY	VENUE	CONTACT
2019				
A&D Strategies and Opportunities	Oct. 22-23	Dallas	The Omni Dallas	adstrategies.com
Executive Oil Conference	Nov. 4-6	Midland, Texas	Midland County Horseshoe Pavilion	executiveoilconference.com
IPAA Annual Meeting	Nov. 6-8	Washington, D.C.	Fairmont, Georgetown	ipaa.org
DUG Midcontinent	Nov. 19-21	Oklahoma City	Cox Convention Center	dugmidcontinent.com
Marcellus-Utica Midstream	Dec. 3-5	Pittsburgh	David L. Lawrence Conv. Center	marcellusmidstream.com
Privcap Game Change	Dec. 3-4	Houston	The Houstonian	energygamechange.com
Veterans in Energy Lunch	Dec. 5	Houston	Marriot Marquis Houston	impactfulveteransinenergy.com
2020				
Private Capital Conference	Jan. 23	Houston	JW Marriott Houston	ipaa.org
NAPE Summit	Feb. 3-7	Houston	George R. Brown Conv. Center	napeexpo.com
DUG Rockies	Feb. 18-19	Denver	Colorado Convention Center	dugrockies.com
Energy Capital Conference	Mar. 2	Dallas	Fairmont Hotel	energycapitalconference.com
Women in Energy Luncheon	Mar. 4	Houston	Hilton Americas-Houston	womeninenergylunch.com
EnerCom Dallas	Mar. 4-5	Dallas	Tower Club	enercomdallas.com
CERAWeek by IHS Markit	Mar. 9-13	Houston	Hilton Americas-Houston	ceraweek.com
DUG Permian	April 6-8	Fort Worth, Texas	Fort Worth Convention Center	dugpermian.com
OGIS New York	April 20-22	New York	TBA	ipaa.org
Offshore Technology Conference	May 4-7	Houston	NRG Park	2020.otcnet.org
DUG Haynesville	May 19-20	Shreveport, La.	Shreveport Convention Center	dughaynesville.com
Midstream Texas	June 2-3	Midland, Texas	Midland County Horseshoe Pavilion	midstreamtexas.com
CIPA Annual Meeting	June 4-7	Santa Barbara, Calif.	TBA	cipa.org
AAPG Annual Conv. & Exhibition	June 7-10	Houston	George R. Brown Conv. Center	ace.aapg.org/2020
DUG East	June 16-18	Pittsburgh	David L. Lawrence Conv. Center	dugeast.com
Unconventional Resources Tech. Con.	July 20-22	Austin, Texas	TBA	urtec.org/2020

Monthly

ADAM-Dallas/Fort Worth	First Thursday	Dallas	Dallas Petroleum Club	adamenergyforum.org
ADAM-Greater East Texas	First Wednesday, even mos	Tyler, Texas	Willow Brook Country Club	getadam.org
ADAM-Houston	Third Friday	Houston	Brennan's	adamhouston.org
ADAM-OKC	Bi-monthly (Feb.-Oct.)	Oklahoma City	Park House	adamokc.com
ADAM-Permian	Bi-monthly	Midland, Texas	Midland Petroleum Club	adampermian.org
ADAM-Tulsa Energy Network	Bi-monthly	Tulsa, Okla.	The Tavern On Brady	adamtulsa.com
ADAM-Rockies	Second Thurs./Quarterly	Denver	University Club	adamrockies.org
Austin Oil & Gas Group	Varies	Austin	Headliners Club	coleson.bruce@shearman.com
Houston Association of Professional Landmen	Bi-monthly	Houston	Houston Petroleum Club	hapl.org
Houston Energy Finance Group	Third Wednesday	Houston	Houston Center Club	sblackhefg@gmail.com
Houston Producers' Forum	Third Tuesday	Houston	Houston Petroleum Club	houstonproducersforum.org
IPAA-Tipro Speaker Series	Second Wednesday	Houston	Houston Petroleum Club	tipro.org

Email details of your event to Brandy Fidler, bfidler@hartenergy.com.

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 <p>Divestiture of 50% Ownership Interest in POGIBV</p>  <p>\$1,530,000,000 Exclusive Advisor Pending</p>	 <p>Advised on the Acquisition of Gulf of Mexico Assets from</p>  <p>US\$1,375,000,000 Financial Advisor June 2019</p>	 <p>Acquisition of 51.74% WI In the Frade Field from</p>  <p>Undisclosed Exclusive Advisor March 2019</p>	 <p>Advised on the Combination with</p>  <p>\$7,700,000,000 Advisor February 2019</p>	 <p>Divestiture of Delaware Basin Water Infrastructure Assets</p>  <p>Up to \$325,000,000 Financial Advisor December 2018</p>	 <p>Corporate Simplification</p>  <p>C\$22,730,000,000 Financial Advisor December 2018</p>
 <p>Farm-out of Block 2 in Offshore Mexico</p>  <p>Undisclosed Exclusive Financial Advisor October 2018</p>	 <p>Advised on the Combination with</p>  <p>C\$1,900,000,000 Financial Advisor August 2018</p>	 <p>Advised on the Divestiture of Delaware Basin Assets to</p>  <p>\$544,500,000 Exclusive Financial Advisor August 2018</p>	 <p>Acquisition of gathering and processing assets in the Delaware Basin as part of a \$1.75 billion transaction.</p>  <p>\$250,000,000 Exclusive Financial Advisor May 2018</p>	 <p>Advised on the Divestiture of 50% interest in Scarborough gas field to</p>  <p>\$744,000,000 Exclusive Financial Advisor March 2018</p>	 <p>Advised on the Divestiture of Eagle Ford Assets to</p>  <p>\$765,000,000 Exclusive Financial Advisor March 2018</p>

Capital Markets

 <p>Senior Notes</p> <p>\$2,000,000,000</p> <p>Joint Bookrunner August 2019</p>	 <p>Senior Notes</p> <p>\$1,250,000,000 \$1,250,000,000</p> <p>Joint Bookrunner June 2019</p>	 <p>Senior Notes</p> <p>\$1,000,000,000</p> <p>Joint Bookrunner June 2019</p>	 <p>Senior Notes</p> <p>\$650,000,000</p> <p>Joint Bookrunner June 2019</p>	 <p>Senior Notes</p> <p>\$500,000,000</p> <p>Joint Bookrunner May 2019</p>	 <p>Senior Notes</p> <p>\$700,000,000</p> <p>Joint Bookrunner April 2019</p>
 <p>Senior Notes</p> <p>\$500,000,000</p> <p>Joint Bookrunner April 2019</p>	 <p>Senior Notes</p> <p>\$500,000,000</p> <p>Joint Bookrunner March 2019</p>	 <p>Senior Notes</p> <p>\$500,000,000</p> <p>Joint Bookrunner March 2019</p>	 <p>Senior Notes</p> <p>\$1,000,000,000</p> <p>Joint Bookrunner March 2019</p>	 <p>Senior Notes</p> <p>\$4,000,000,000</p> <p>Joint Bookrunner January 2019</p>	 <p>Has sold its shareholding in Canadian Natural Resources Limited</p>  <p>\$3,300,000,000</p> <p>Joint Bookrunner May 2018</p>

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NewsWell

RayJay bullish on oil supply, less on demand

Preqin: Institutional investors still look to natural resources

Institutional investors think equity markets have peaked, hedge fund returns haven't met expectations and other alternatives such as real estate are overvalued—but they continue to want natural resources in their investment portfolios.

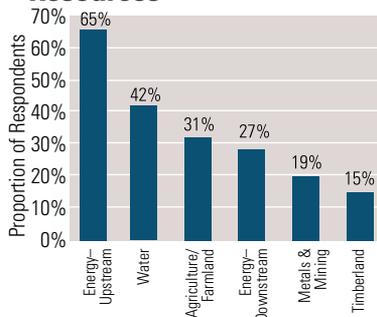
They especially favor upstream energy ideas, as opposed to water and agricultural investments found in the broader natural resource category.

That's according to a July survey of 117 institutions by research firm Preqin.

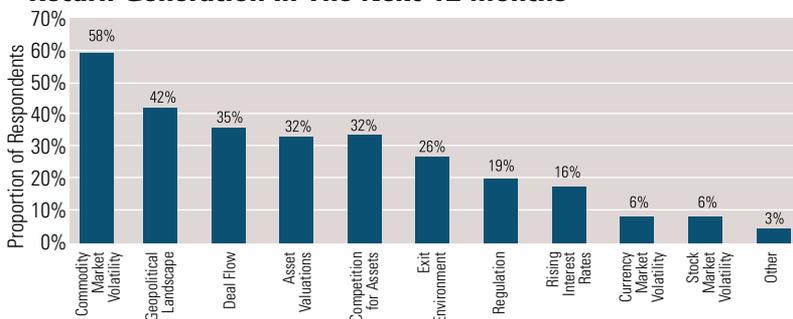
Some 47% of respondents said they would commit the same amount of capital to natural resources in the next 12 months as compared to the prior 12 months. Another 28% said they'd place less capital than before, and 25% said they plan to make larger commitments than before.

Commodity price volatility was cited by 58% of the investors as the biggest challenge to return generation among natural resources investment. Global geopolitical

Investor Views On Fund Types Presenting The Best Opportunities In Natural Resources



Natural Resources Investor Views On Key Challenges For Return Generation In The Next 12 Months



Source: Preqin Investor Interviews, June 2019

concerns also weighed heavily, cited by 42% of the respondents.

Despite these challenges, 65% of these investors said they favor natural resources, while 42% said they prefer water-related ideas and 31% said they would select agriculture or farm land investments.

Some 37% of those surveyed said they think natural resources failed to meet expectations over the past 12 months, but 53% said these types of investments did meet expectations. Only 10% said that natural resource-related investments have exceeded their expectations.

“More generally, investors in private equity and private debt are the most satisfied with the performance of their portfolios in the past 12 months to July, with 93% and 88% respectively saying performance met or exceeded expectations. By contrast, 46% of hedge fund investors and 37% of natural resources investors were dissatisfied,” Preqin said.

For infrastructure and natural resources, a majority of investors believe assets are fairly valued and, notably, 27% of natural resources investors say assets are undervalued, with room for further price rises, Preqin said.

Many investors are dissatisfied with the performance of the natural resources asset class in recent months and, for the second consecutive year, the proportion looking to invest more capital in the asset class over the next 12 months has fallen. “Although high returns are not the primary motivation for a natural resources allocation, a notable 28% of investors plan to invest less capital in the year ahead,” it said.

—Leslie Haines

At a recent energy summit held in Aspen, Colo., in late August, Raymond James stood by its incrementally bullish outlook for global oil supply and said that more industry players are “coming around to our view.”

Supporting the outlook is “a greater consensus from those in attendance that Saudi is incentivized to push Brent prices higher;” to around \$75 a barrel, said Marshall Adkins, head of Raymond James’ energy research team, in a note recapping the highlights from the firm’s summit.

Demand appeared to be more of a conundrum for conference attendees. Raymond James characterized its outlook on demand as “already below consensus, but arguments suggest we may still be too high.” There was no consensus on whether demand issues were “transitory or structural” or on why demand is weakening outside of the U.S.-China trade war.

In the note, Adkins said that global supply appears to be weakening. Raymond James’ 2020 total liquids growth forecast is below consensus. The firm expects slowdowns in capital flow to U.S. shale and large-scale international projects will begin to exact more of a toll on supply levels in the coming year as well.

As for U.S. well productivity going forward, the analysts said that the “bigger hammer” approach is reaching its limits as may also be the case for downspacing and multibench drilling efforts. Strategies to continue to expand core inventory may also have limited success.

Midstream takeaways from the conference were generally more benign. The pipeline bottlenecks that had a stranglehold on Permian crude during the past couple of years have for the most part lessened considerably, as have concerns around export bottlenecks.

“There will be inefficiencies, but nothing to drive Permian-Brent diffs like we saw in 2018,” Adkins wrote.

On climate change and environmental, social and governance (ESG) criteria, the industry has been reticent to be in the forefront of communication and the analysts suggest that must change. Those

who are proactive in ESG and climate change messaging “will likely be rewarded,” Adkins wrote.

Governance/alignment issues are another area where the industry may benefit from having “skin in the game,” according to the note.

The greatest challenge for industry executives is how to lure investors back to the sector after the exodus prompted by the severe downturn beginning in 2014. Raymond James analysts said they are “incrementally bullish” on the issue.

“The industry has a fundamentals—rather than ESG—problem,” Adkins wrote. “Focusing on ROIC and free cash flow [to above market levels] should improve investor views.”

He added that supply-side discussions suggest “a structural change to an inflationary environment may be nearing,” which could again attract the interest of value-driven investors to the space.

—Susan Klann

NAPE: Upside remains in Permian’s ‘overlooked,’ emerging plays

The Permian Basin’s Wolfcamp, Bone Spring and Spraberry formations are known for being top areas for horizontal drilling.

But there is another top formation that Michael Party, owner and president of Midland, Texas-based Beryl Oil and Gas, believes is overlooked for horizontals—the San Andres/Grayburg. With most operators already locked into their positions—now just swapping acreage amongst themselves or consolidating—the San Andres is among the formations left where \$20,000 an acre isn’t needed for entry, he said.

“It is developed. ... There are some really good results in places,” Party told attendees of Summer NAPE’s Business Conference in August. He referred to the Platang oil field, drilled by Manzano LLC and later sold to Steward Energy, in the Northwest Shelf/Central Basin Platform in Yoakum County, Texas. The field has produced 10 million barrels since 2014, he said. He also noted a rise in horizontal wells being drilled in the area.

But there are some risks.

“I think the problem with the San Andres is it’s not ubiquitous,” Party added before noting structural components aren’t really

visible in this area. “The formation is, but the play isn’t everywhere. That play has some defining limits, and we’ve actually looked at it. We think there are some things that high-grade the areas you want to be in.”

In the San Andres, Party said, “You want to get rock that has 40-50% oil saturations. You depressurize it. You get the pressure down. The oil moves out, and these wells will develop some pretty good production profiles.”

Emerging plays like the Barnett/Mississippian are also getting attention, with companies including Elevation Resources LLC, Diamondback Energy Inc., Occidental Petroleum Corp. and ExxonMobil Corp. drilling wells in Andrews County.

“This is a play where you’ve got to have geology matching the thermal maturity in the area,” he said.

Just above the Barnett formation is the Atoka, a smaller zone which has been drilled vertically in Midland County in the past. “I think as the Barnett gets wings, this one is going to come back,” Party said.

Midland-based Reliance Energy Inc. drilled a well in the Atoka in 2013 using gel fracks, and it has produced 229,000 barrels and 1.1 billion cubic feet of gas, he said. “With new technology and new fracks, that could be a play that comes out of the development of the Barnett because people are going to start seeing it when they drill through it.”

Bad news is that most of the acreage containing this play is already HBP.

“So, it’s going to be hard to get a position in it unless you own that position already,” he said.

Other notable areas include the Yeso Formation, which also contains the Paddock, Blinberry and Drinkard, in New Mexico’s Northwest Shelf. The Delaware Basin’s Yeso is the slope-to-basin equivalent of the Bone Spring and Spraberry/Dean. Concho Resources Inc. is among the area’s players. “It has some legs on it,” Party said of Yeso. But development here is slow as focus remains high on bigger plays in the basin, he said.

Development continues in the Bone Spring, Spraberry and Wolfcamp.

Wolfcamp, located in both the Delaware and Midland sub-basins, leads the pack in terms of

horizontals, accounting for 52% of all horizontals drilled, according to Party. The trio plus San Andres/Grayburg and Devonian account for nearly 90% of the horizontal wells drilled in the Permian, he added.

Party shared the insight during a presentation on the Permian Basin’s journey from conventional to unconventional. The basin, he said, was considered a “graveyard” in 1920, as operators found water but no oil and gas. But it has transformed, producing more than more than 4 million barrels of oil today.

Key to the success is geology.

“We can sit there and talk about the technology, the fracks, the horizontal drilling and everything like that. It’s useless without the geology,” said Party, who also serves as president of the American Association of Petroleum Geologists. “The geology makes the Permian Basin, and the technology helps us get the oil out.”

But there are also some geological features that drillers should approach with caution.

Party singled out the Grisham Fault in the Delaware Basin and shears near Martin and Dawson counties in Texas as examples.

“As you get near it the wells tend to have a lot more water associated with them on both sides of the fault,” Party said referring to Grisham. “You get some fracturing that kind of adds to that.”

In the Midland Basin, north of Martin County and into Dawson County, possible shears could impact how operations are carried out.

“The heat just hasn’t transferred across where shear zones possibly exist and you go from about a .84 to .64 RO value,” he explained. “So, you lose about a quarter of your heat when you cross that boundary. Wells to the north have performed poorer than the wells to the south.”

For those targeting the Spraberry, Party warned of sands while approaching the Horseshoe atoll, described by the U.S. Geological Society as an “arcuate mass of deeply buried fossiliferous limestone of Pennsylvanian and early Permian age” in the Midland sub-basin.

“The Spraberry picks up a lot more sands. You need a structural component to help those trap and be productive,” Party said. “They

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carry water, and you're going up dip to the north. ...Wells typically drilled in the Spraberry in the southwest corner of Dawson County will have very low oil numbers—like 5% or less of the volume.”

—Velda Addison

Earthstone Energy CEO actively looking to be Permian consolidator

A terminated merger in the Permian Basin in late 2018 hasn't deterred oil and gas industry veteran Frank A. Lodzinski from dealmaking.

Far from it, actually. The CEO of Earthstone Energy Inc. was upfront about his intentions at the Leaders in Industry Luncheon held at the Petroleum Club of Houston in August: Earthstone is actively looking for deals ranging from acquisitions and trades to business combinations.

“I'm going to blatantly conduct a commercial here and tell you all that we're looking for deals

and that we're open for business,” Lodzinski told attendees of the luncheon hosted monthly by the Independent Petroleum Association of America and Texas Independent Producers & Royalty Owners Association.

Lodzinski has over 47 years of oil and gas industry experience including multiple ventures and business combinations. He joined Earthstone in 2014 following the company's reverse-merger combination with Oak Valley Resources LLC—a private Eagle Ford-focused company Lodzinski had formed following the sale of GeoResources Inc. to Halcón Resources Corp. in 2012.

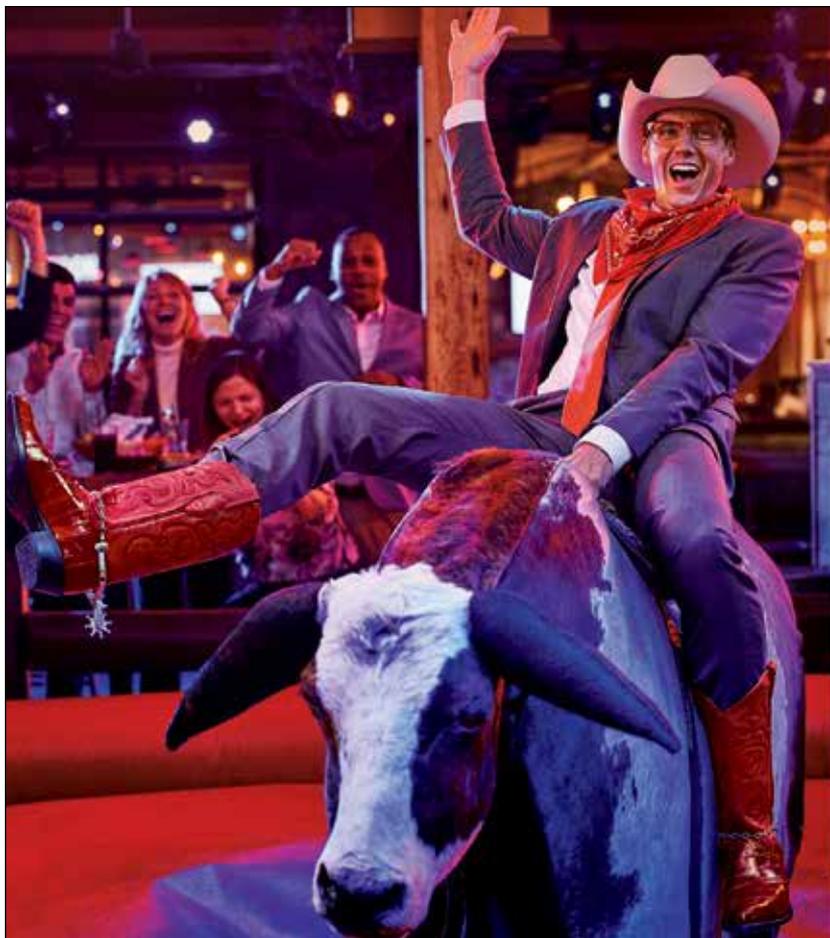
During his presentation, Lodzinski described Earthstone as a growth story and a leader among other Permian E&Ps within its peer group.

Based in The Woodlands, Texas, Earthstone has primary assets in the Midland Basin of West Texas, which the company has been “piecing together” since first entering the Permian in 2016, Lodzinski said.

Initially, Earthstone's position in the Midland Basin was on a nonoperated basis through its acquisition of Lynden Energy Corp. Soon after the Lynden deal, the company added an operated position in the Midland Basin with its acquisition of Bold Energy III LLC. The all-stock acquisition of Bold, worth about \$324 million, closed May 2017.

Backed by EnCap Investments LP, the acquisition of Bold included about 20,000 net acres in Reagan, Upton and Midland counties, Texas. According to a research note by Baird Equity Research from when the deal was announced in late 2016, Earthstone paid roughly \$15,000 per acre for Bold—a surprisingly low price for Permian acreage at the time.

In October 2018, Earthstone was on the path to double its Midland Basin position through the acquisition of another EnCap-backed company, Sabalo Holdings LLC. The transaction was set to cost Earthstone roughly \$950 million in cash and stock—marking the company's largest acquisition to date.



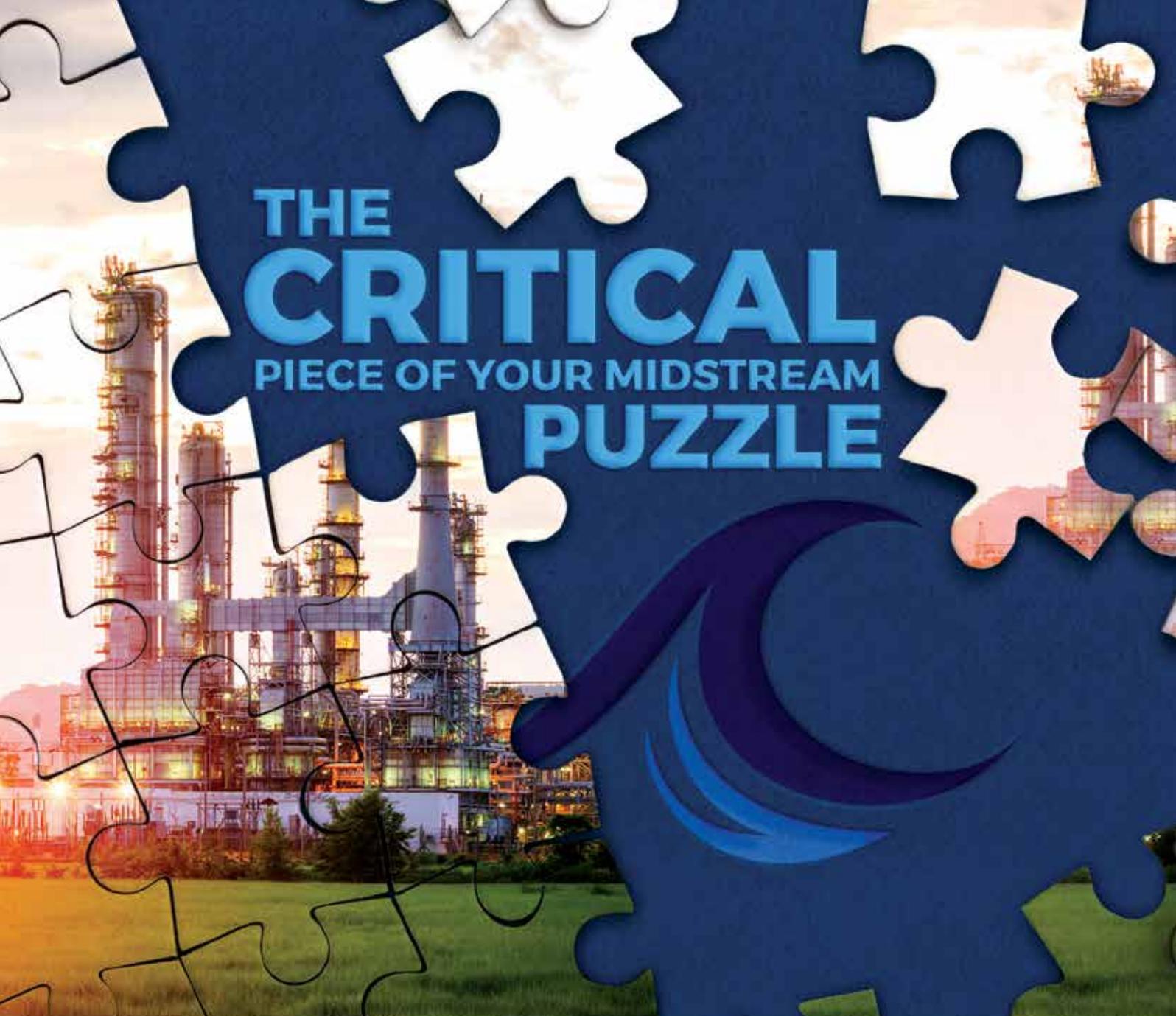
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However, a plunge in oil prices during fourth-quarter 2018 derailed the deal. By late December, both companies agreed to terminate the acquisition agreement, citing “the recent significant decline in commodity prices and the related adverse effect on the debt and equity markets.” Despite the stumble, Lodzinski said on Aug. 14 that Earthstone is actively looking for another business combination.

“If there is a consolidation wave that happens amongst the smaller guys, I want to be one of the consolidators, and the attributes of how we run our company is the reasoning for why we think we can be successful,” he said.

In addition to business combinations, Earthstone is looking in the Midland Basin “extensively for additional things to do through acquisitions, through trades [and] through drillbit organic growth,” he said.

Most recently, Earthstone closed a wellbore development agreement in July set to accelerate development in its Midland Basin position. The

company revealed the agreement with “an unaffiliated industry partner” during its second-quarter earnings report in August.

Structured as wellbore-only, the agreement covers the development of an eight-well program during 2019 in central Reagan County, Texas, with an option for up to 11 additional wells next year. In return for paying a higher portion of the capital cost, Earthstone’s Drillco partner will earn 35% of the working interest in the wells.

Lodzinski voiced his eagerness for Earthstone’s next deal, urging the luncheon attendees multiple times to “bring us deals.” He also told the crowd that he wasn’t afraid to venture outside Earthstone’s core basin to grow.

“I hope I don’t startle some of our investors by saying what I’m going to say next,” he said. “While we have been focused clearly on the Midland Basin, the market doesn’t seem to care anymore about a single basin.”

Instead, he said investors are pushing for scale and efficiency. As a result, Earthstone would not

rule out an acquisition in the Eagle Ford where the company also has a position of 14,300 net acres in the core of the South Texas shale play, according to Lodzinski.

Regardless of the company’s growth story and its drive for more deals, Lodzinski said an important strength to note about Earthstone is its leverage.

“We have never been overleveraged [and] I will never be overleveraged,” he said, adding that Earthstone still doesn’t “borrow money for acreage, and we still do not borrow money for G&A [general and administrative] and never will.”

As of June 30, Earthstone had \$5.8 million in cash and \$110 million of long-term debt outstanding under the company’s credit facility with a borrowing base of \$325 million. In total, the company’s liquidity was roughly \$220.8 million.

Lodzinski noted that due to the company’s financial prudence and cost control, Earthstone has traded above its broader and higher-graded peer group despite

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overall market price declines—something that he said he’s “pretty proud of.”

“All we do is control what we can,” he said. “And that’s our balance sheet, our operations and our cost. What else can you control, right? If you control your costs and you operate efficiently and you don’t get overlevered, you should be able to survive these downturns that we’ve been in for an extended period of time.”

—Emily Pasty

Shale cedes employment dominance to offshore oil sector

Offshore is taking the lead from shale in oilfield employment, according to recent analysis by Rystad Energy.

The global research consultant analyzed the oilfield service sectors having the highest percent change in employment between 2016 and 2018. The results showed that “the main driver of employment is shifting from shale to offshore,” according to a July report.

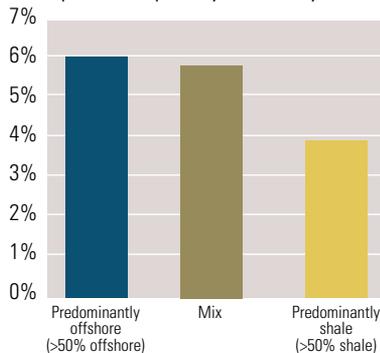
“This is a clear effect of the increase in offshore sanctioning,” said Matthew Fitzsimmons, vice president on Rystad Energy’s oilfield service team. “We expect offshore commitments to nearly double from 2018 to 2020 and sustain high levels of spending over the next five years.”

While the Permian Basin dominated shale activity in the U.S. in recent years, adding ballast to oilfield hiring, it was the headcount of the top 50 oilfield service companies that took the lead from 2017 to 2018. Given the more recent struggles of oil prices this year, however, whether the oil service sector can continue to maintain this growth seems in question unless offshore potential truly proves robust.

Rystad’s forecast for offshore services demand suggests a 45% jump from 2018 to 2025, representing \$442 billion in the latter year. The outlook comes after the offshore industry suffered a significant fall-off in activity from 2015 to 2017, prompting companies to pare their workforces by more than a third.

The service companies registering the most substantial gains in workforce from 2017 to 2018 were “primarily exposed to the offshore

Change In Workforce 2017-18 (Top 50 service companies split by industry)



Source: Rystad Energy

industry,” according to the report.

Among those was Norwegian shipping company Solstad Offshore ASA, Rystad reported, which “nearly doubled its workforce ... a significant staff ramp-up which bet on the long-term improvement of market conditions.”

Also boosting its workforce was drilling contractor Seadrill Ltd., which posted a 15% overall rise in employment, sparked by contracts with Saudi Aramco and Equinor ASA. But looked at in the light of longer-term trends, the numbers appear less positive.

Seadrill’s 2018 year-end headcount “is only 100 people more than after massive layoffs in 2016, and remains just over half of what it was in 2014,” the Rystad researchers noted. Still, the company is expected to continue to grow its workforce through 2022 if offshore markets continue to expand.

As in past downcycles, many workers have left the industry since 2014, and oilfield companies are finding it difficult to find experienced personnel whom they can lure back to take advantage of offshore growth. Fitzsimmons noted it hasn’t been easy to attract new professionals either.

“History would show that to bring back experienced professionals into an industry, higher wages will be required,” he said.

Overall, the data analysis showed that from 2017 to 2018, for the top 50 service companies, those having more than 50% of their work offshore grew their workforce by about 6%. Meanwhile, those with a mix of work grew by nearly the same amount and companies with more than 50% of their business focused on shale grew their

workforces by less than 4%.

In early August, Rystad also released a note expressing concerns about oil demand in light of the worsening trade war between the U.S. and China, with both economies showing signs of deceleration.

“Continuing worsening of U.S.-China trade relations could lower demand growth by 200,000 barrels per day (bbl/d) to 1 million bbl/d in 2020,” according to the report. The consultants also warned of downside risk to 2020 prices due to excessive supply growth.

—Susan Klann

Study: Permian paradigm shifting on majors, infrastructure

In April 2019, the Permian Basin became the highest producing field in the world—pumping about 4.2 MMbbl/d. Production in the shale play continues to grow thanks to cost-saving advances in shale drilling technologies.

To study the impact of the Permian’s continued production growth, Hastings Equity Partners commissioned a whitepaper in partnership with the University of Houston Energy Research Park titled, “Opportunities and Challenges in the Permian.”

“We wanted to understand the takeaway capacity of the Permian and where the incremental oil will end up,” Ted Patton, founder and managing partner of Hastings Equity Partners, told Hart Energy.

“Clearly, the Permian Basin has defined our students’ careers in the industry. So the research was largely driven by the motivation to create awareness among faculty on educating the students on the Permian,” said Dr. Ramanan Krishnamoorti, chief energy officer at the University of Houston and co-author of the research.

The report disclosed a few unanticipated findings including the industry consolidation in the Permian Basin and the transportation challenges.

Major operators are estimated to produce more than half of the oil in the Permian Basin during the next four years, representing “a historic shift in economic power,” according to the study. As Patton pointed out, oil majors such as ExxonMobil Corp. and Chevron Corp. have designed aggressive strategies to



SPECIAL REPORT COMING JANUARY 2020



THE
PERMIAN BASIN
1920 - 2020

The Play That's Changing Everything



HARTENERGY



1920

An Invitation to
Celebrate This

February 1920

W. H. Abrams #1: the first commercial discovery of oil in the Permian was in Mitchell County, Texas. It began production in June, 1920 with 20 barrels per day, and marked the opening of Westbrook Field.

— Source: The Petroleum Museum, and Midland Reporter-Telegram, June 2009

100th
ANNIVERSARY

COMING
2020

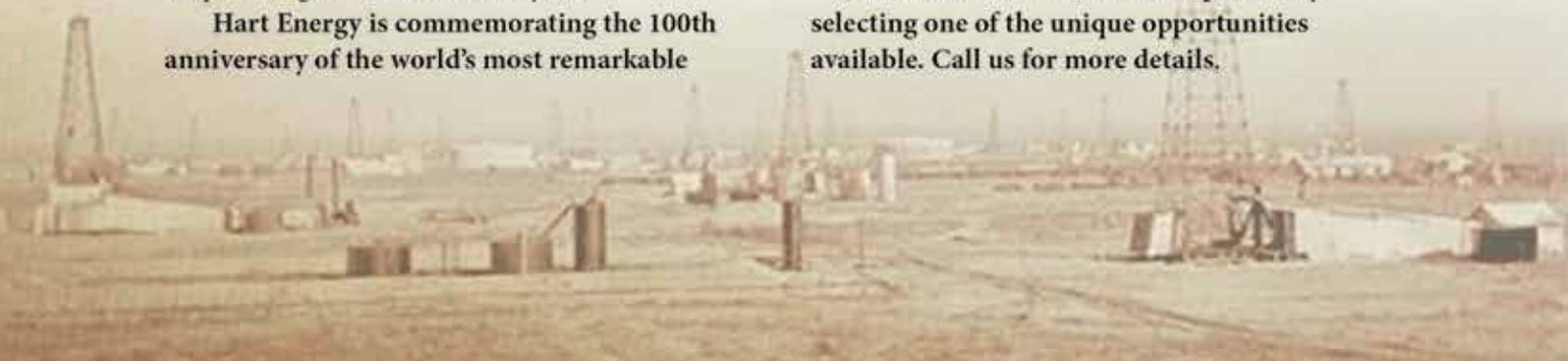
THE
PERMIAN BASIN
1920 - 2020

The Permian Basin is like none other. It has played a major role in U.S. oil production for 100 years. Now it's contributing to exports—and it's not done yet. "The Permian" promises to sustain production for many years to come. In April 2019, U.S. oil production topped 12 million barrels a day for the first time—and Permian Basin production contributed 4.2 million barrels of that volume. What's more, experts now forecast Permian crude output will grow another 50% by 2025.

Hart Energy is commemorating the 100th anniversary of the world's most remarkable

oil basin with a special, coffee-table book by the editors of *Oil and Gas Investor* and *E&P* magazines. This special commemorative book will showcase the basin's proud past, its current activity and its extraordinary significance to U. S. energy production and independence. It is sure to delight the most seasoned professional and intrigue young engineers, geologists, entrepreneurs and investors who are leading the industry in the 21st century.

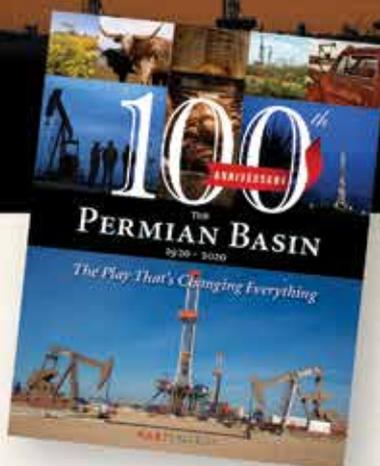
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Remarkable Play

2020



January 2020

Hart Energy publishes a Centennial special issue to celebrate The Permian Basin's 100th Anniversary.

Featured Chapters:

From the Office of...

U.S. President Donald Trump, Secretary of Energy Rick Perry, Texas Governor Greg Abbott, New Mexico Governor Michelle Lujan Grisham, former Secretary of Commerce and Permian Strategic Partnership Chairman Donald Evans, former President George W. Bush, Midland Mayor Jerry Morales and Odessa Mayor David Turner (*Requested)

Chapter 1 – History 1920 – 2020

The incredible ride through the booms and busts of oil and gas development in the Permian Basin has spanned a century. It's a story of constant change and innovation that has been essential to America's prosperity.

Chapter 2 – Drilling Activity

Current activity trends across the Northwest Shelf, Delaware Basin, Midland Basin and Central Basin Platform are captured, including rig deployment, major reservoir targets, early to full-field development plans, and oilfield service technology and logistics challenges.

Chapter 3 – Giving Back

Social responsibility, sustainability, environmental protection and strong corporate governance are crucial values that companies are embracing to address development issues and create lasting relationships between the industry and the region's residents.

Chapter 4 – Will To Succeed

The giants of the Permian Basin are those individuals who persevered through adversity, who disrupted tradition with new ideas, and who pioneered many innovations that have changed the worldwide industry.

Chapter 5 – Serving Up Technology

Operators and service providers are working together to rapidly evolve new and ever more effective technologies that aid in the discovery, production and transportation of Permian Basin oil and gas.

Chapter 6 – The Infrastructure Take-Away

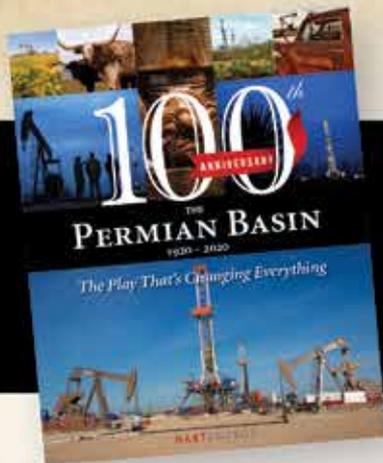
The midstream sector is working flat out to connect the Permian Basin's bountiful oil and gas production to domestic and international markets.

Chapter 7 – Capital Investment

Local lenders, friends and families often provided the seed money for early Permian Basin explorers. Now Wall Street and private equity are all-in on this amazing play.

Chapter 8 – The Future

The future is bright for economic development and job growth across the Permian Basin communities. The industry is working hard on workforce development and community projects, and Texas and New Mexico will unequivocally lead the way in America's energy independence story for decades to come.



The Permian Basin has given us so much to be grateful for, so let's do our part to accurately educate those who will lead our industry into the next 100 years.

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MARKETING: Year-long visibility

Hart Energy will also deploy a robust marketing campaign throughout 2020 promoting this report on social media, and in banners on HartEnergy.com. Each article will be posted in editorial cycles, and on a purpose-built microsite with open access that will house the digital copy of the special issue, plus all videos, profiles and participating sponsor logos. The special issue will be available for purchase online at the Hart Store.

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DEADLINES: ■ Publishes: ■ Commitment: ■ Materials Due:
 January 2020 November 1, 2019 November 4, 2019

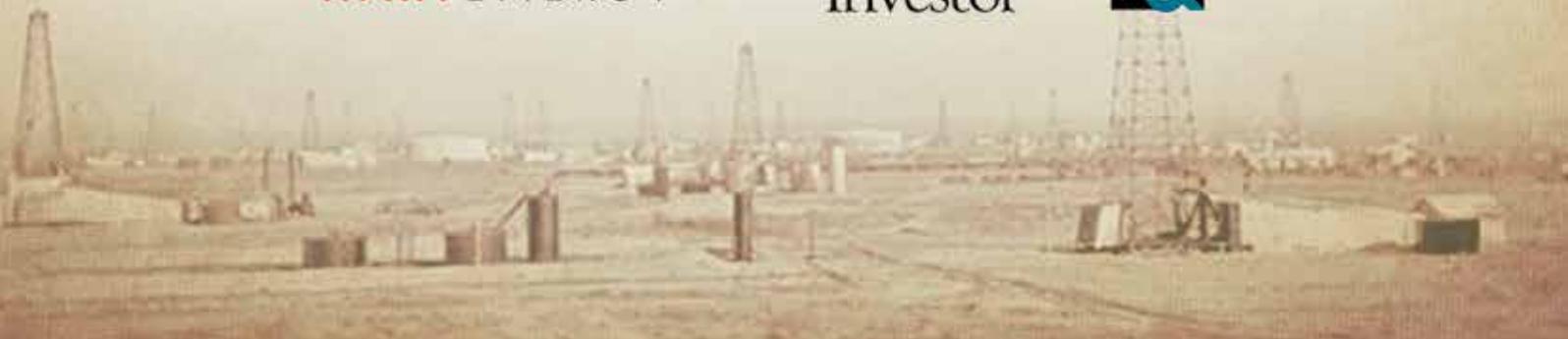
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A Supplement To

**Oil and Gas
Investor**

E&P



consolidate production, resources and supply chains that will meet the majority of the domestic needs.

Consolidation by majors and increased pressure on the independents will lead to the gradual erosion and ultimate destruction of enterprise value among many oilfield service companies due to the lack of pricing power, said Krishnamoorti. If major operators continue acquiring acreage in the Permian Basin, as well as ownership stakes in the pipelines, downstream refineries and petrochemical facilities, independent producers who traditionally sell to the majors will need to market internationally and export overseas, according to the findings of the study.

“The Permian Basin used to be a place where wildcatters reigned, and now, with technology, the economy is being driven by manufacturing,” Patton said.

He added that independents are facing new limitations from the investment community to limit production volume to what can be achieved with cash on hand. At the same time, both ExxonMobil and Chevron have each announced plans to produce 1 MMbbl/d. The inevitable result will be mergers by independents in an effort to survive, he said.

The study also revealed that although more than \$90 billion is currently invested in construction projects for terminals, LNG, refining and petrochemical facilities along the Texas and Louisiana Coast, with another \$200 billion planned for the next decade, construction can’t keep the pace with the supply of oil coming out of the Permian Basin, said Krishnamoorti.

“The majority of the recent incremental capacity is and will continue to be directed at the Port of Corpus Christi,” he said.

The research also recognized the need to address sustainability issues including natural gas flaring and water management. Moreover, the associated gas cannot be appropriately valorized because of the absence of gathering and transportation pipelines and the reluctance of operators to invest significantly in gas infrastructure when the resource plays have rapid decline rates such as those seen in the Permian. Additionally, the technology to reinject the gas into the formation has not been

fully developed to make it a viable option to handle the associated gas.

According to the findings of the study, another bottleneck facing the Permian over the coming years is the inability of very large crude carriers to navigate Gulf Coast waterways to refill for export. The demand for U.S. crude has highlighted the need for deepwater terminals off the coast of Freeport, Texas City, Corpus Christi, Brownsville and Louisiana. These projects have been proposed, but permitting and execution permissions will delay progress, thereby creating additional bottlenecks.

—Faiza Rizvi

Shale gas producers help fuel U.S. LNG exports rise

North America’s prolific natural gas fields likely won’t have difficulty producing enough gas to meet domestic demand and the world’s burgeoning LNG needs, according to analysts, but uncertainties—including those surrounding infrastructure—still exist.

“If it were a country on its own, it would actually be the world’s third-largest gas producer,” Alastair Nojek, analyst for McKinsey & Co., said of the Appalachia Basin during a recent North American gas perspectives webinar. “However, new pipelines will be needed in the long term or production will again become constrained.

“Given the difficulty seen during the last wave of pipeline buildout, Appalachia infrastructure remains a key uncertainty for the North American gas market,” he added.

Gas production in Appalachia, home of the Marcellus and Utica

shale formations, was projected to hit 32.6 billion cubic feet per day (Bcf/d) in September, up 367 million cubic feet per day (MMcf/d) in August, according to the U.S. Energy Information Administration’s latest Drilling Productivity Report. The top-producing U.S. gas basin is followed by the top oil-producing one, Permian Basin, where gas production could near 14.9 Bcf/d next month.

Increased LNG flows from the U.S. are expected to come as global demand grows in other parts of the world, particularly Asia and Europe, and the world turns toward cleaner sources of fuel such as natural gas.

Together, Appalachia and Permian are expected to supply about 53% of the North American gas market by 2030 and represent about 83% of the growth, according to McKinsey.

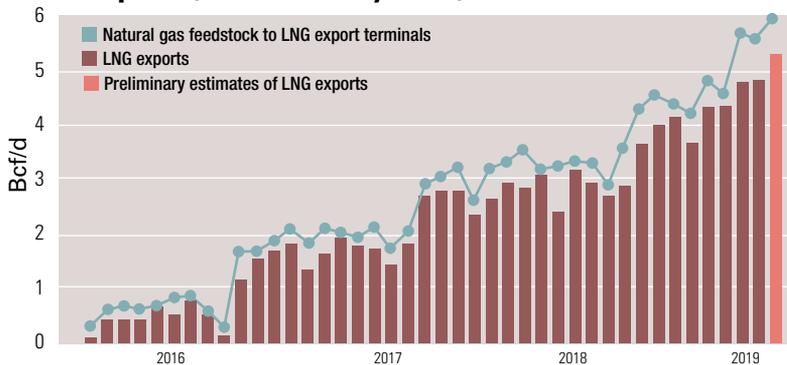
Associated gas from the Permian Basin, which has also faced infrastructure challenges, could see its production grow by about 7.2 Bcf/d to 2030.

While Appalachia and Permian are seen as the drivers of North America gas growth, others are also expected to play notable roles. These include Oklahoma’s Scoop/Stack and the Haynesville, given their proximity to Gulf Coast export facilities.

But don’t count out the Western Canada Sedimentary Basin (WCSB), where the firm said Montney gas production is growing with Western Canadian LNG providing possible upside.

However, as Appalachia has debottlenecked, gas flows have changed across North America, McKinsey & Co.’s Jamie Brick pointed out. He explained how Midwest-destined volumes from

Monthly U.S. Natural Gas Feedstock And LNG Exports (Jan. 2016-July 2019)



Source: U.S. DOE, LNG Reports, Bloomberg

Appalachia have displaced some supply from WCSB and the Rockies, “which must now compete for a shrinking market along the West Coast and have resulted in lower gas prices.”

Appalachian gas is also flowing to the Gulf Coast, as LNG exports drive demand for associated gas. But its flow to the south has also been limited primarily due to the better-positioned Permian and Scoop/Stack, which happens to also be ceding some of its traditional upper Midwest market to Appalachia, Brick said.

“In short, Appalachia will supply an increasingly large part of the continent, limiting the WCSB and Rockies, while associated gas from the Permian and Scoop/Stack are supplying nearby growing demand in the Gulf Coast,” he said.

McKinsey & Co. forecast gas demand in the U.S. Gulf Coast will grow by about 17 Bcf/d by 2030 on global LNG exports, including to Mexico. The growth means new pipelines to the coast will be needed not only in Appalachia but also in West Texas.

If that doesn't happen, WCSB would be the “primary beneficiary,” given its plentiful resources and existing pipeline capacity, Brick said, adding “WCSB could increase production by over 6 Bcf/d and conserve its traditional markets in the upper Midwest.”

Plus, higher production could also be in store if LNG Canada decides to expand trains 3 and 4, he added later. LNG Canada joint venture partners Royal Dutch Shell Plc, Petronas Gas Bhd, Mitsubishi Corp. and Korea Gas Corp. took a final investment decision in 2018 to build the export facility in Kitimat, British Columbia.

The Rockies, which could see its production grow by 1.6 Bcf/d, would also benefit, Brick said, noting a “modest resurgence” of the Fayetteville as well.

Though increasing demand is seen coming from Mexico and the power and industrial sectors, LNG leads the anticipated percentage of overall growth demand through 2030 at 58%, according to Dumitru Dediu, the McKinsey partner who leads the global gas and LNG team.

Citing data from OPIS Point-Logic Energy, the EIA on Aug. 19 said natural gas deliveries to U.S. facilities producing LNG for export reached an average 6 Bcf/d, a monthly record, in July. The amount equated to 7% of the total U.S. dry natural gas production.

“We expect demand in North America to increase by roughly 30 Bcf/d from 95 Bcf/d today to 125 by 2030,” said Dediu. “Of that, roughly two-thirds will be driven by gas exports, especially LNG.”

LNG export capacity could surpass 10 Bcf/d by 2020 through 2021 and reach more than 20 Bcf/d by 2026 through 2027, he said, adding that most of the additional capacity required is already under construction.

But the U.S. is still considered a high-cost supplier of LNG, despite its ample resources with gas below \$3. Dediu explained that unlike conventional integrated LNG projects, U.S. LNG projects have a high cash cost for feed gas and liquefaction charge. In addition, shipping costs due to the U.S.' distant proximity to destination markets such as

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“With North America becoming one of the largest LNG exporters in the next five years, Henry Hub will become an important price marker for marginal LNG supply,” according to Dediu’s presentation.

In July, the International Energy Agency’s senior gas analyst said the U.S. would pass Australia and Qatar to become the world’s biggest LNG exporter with exports of more than 100 billion cubic meters in 2024, Reuters reported. The biggest importer is expected to be China.

—Velda Addison

Subdued Summer NAPE provides for ‘quality’ dealmaking

Mirroring upstream A&D market trends so far this year, the mood at Summer NAPE could be summed up in one word: subdued.

The annual expo, focused on the buying, selling and trading of oil and gas prospects, attracted more than 2,500 oil and gas professionals to the George R. Brown Convention

Center in downtown Houston in August. Across the board, the number of attendees and exhibitors this year dropped from the previous year, but so has deal flow.

Rex Stahla, an exhibitor, agreed that this year’s Summer NAPE had a different atmosphere. He told Hart Energy that his company, Woodbury Resources LLC, has also seen a recent slowdown in dealmaking.

“That’s what we’re seeing,” said Stahla, who has been coming to NAPE for roughly six years. “Money is tight.”

Despite Occidental Petroleum Corp.’s multibillion-dollar takeout of Anadarko Petroleum Corp., A&D activity for upstream oil and gas companies has been on a decline.

Still, Stahla said to successfully do a deal, “you just need the right person.”

At the conference, Woodbury Resources was marketing its North Park Basin position in northern Colorado. The acreage is overlying the basin’s overpressured oil window and also offsets activity by SandRidge Energy Inc.

“We have a lot of people looking

at it. It has gotten a lot of interest,” he said, adding, “Good deals get looked at.”

In addition to Woodbury’s offering, this year’s expo featured more than 2.5 million prospect acres from 18 states.

Though, according to NAPE, numbers for its summer event were down. The crowd of 2,500 attendees decreased by 300 year-over-year. The number of exhibitors at the expo also dropped to 185 from 225 the year prior.

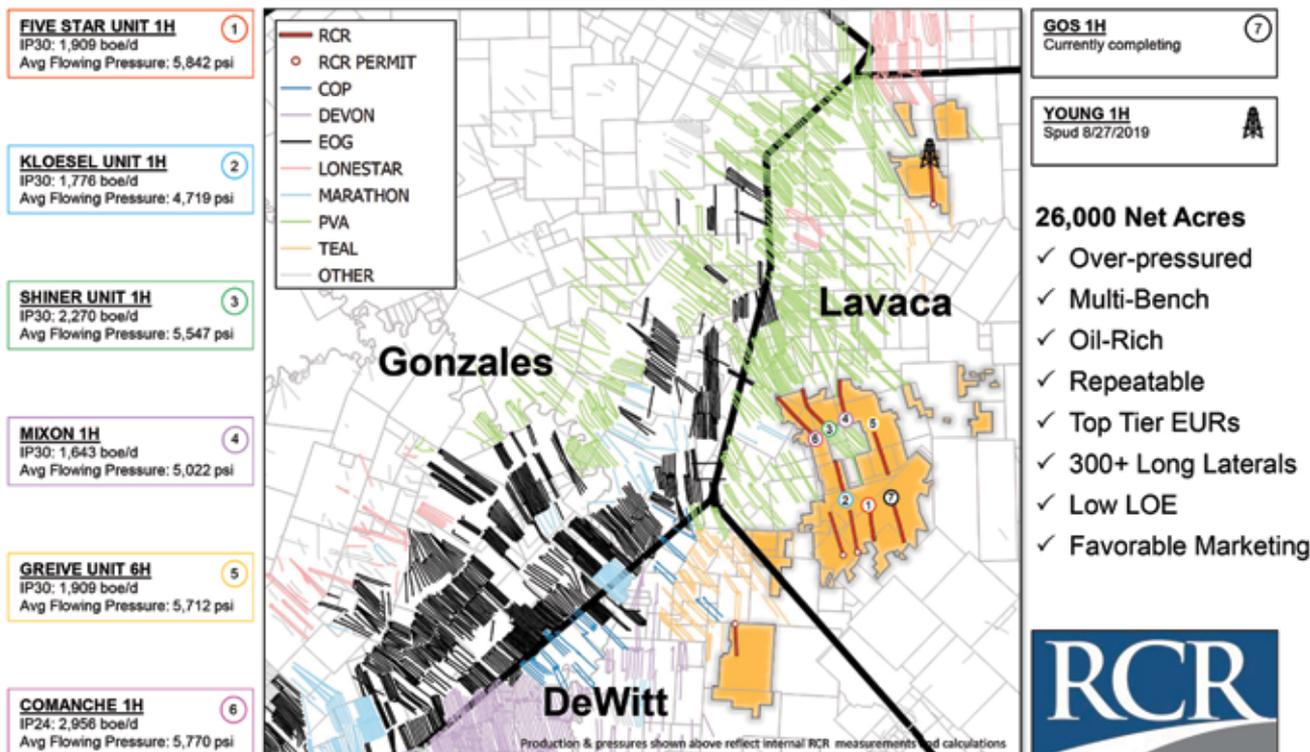
“This is kind of a light crowd, it seems like to me,” Dexter Harmon, exploration manager for Fasken Oil and Ranch Ltd., told Hart Energy. “A lot of empty booths here.”

Harmon, who has only “missed a few” NAPE expos since its launch in the early 1990s, said regardless of the crowd size he’s always seen a benefit in coming to NAPE.

“You see absolutely everybody you need to see, and you hear about little deals walking around,” he said.

Harmon also added that he prefers the intimacy of Summer NAPE compared to NAPE Summit, the larger of the two expos which

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annually runs in February. This year's NAPE Summit hosted about 12,360 attendees, roughly 80% more than the group's summer event.

"It's crowded, and it's hard to get up and down the aisles and see everyone there," he said of NAPE Summit. "But [Summer NAPE], pretty much, I talk to everyone that is here."

Going into Summer NAPE, Ryan Childs, principal of Production Lending LLC, said his firm—one of the few capital providers exhibiting at this year's expo—knew the crowd would be a little bit smaller than in previous years.

"While that was true, we also found that the quality of conversation was actually quite high," Childs told Hart Energy.

Founded in 2016, Production Lending is a Houston-based specialty finance capital provider catering to small oil and gas companies. The firm focuses on deals less than \$10 million in size.

Childs, who also presented during the NAPE Capital & Service Provider previews in August, said Production Lending chose to

exhibit at this year's expo because it gave them the opportunity to tell smaller E&Ps that there are options.

"Given the climate of where we are today, we obviously understand that a lot of capital has been pulled away from the larger players in the industry, but that's also affected the smaller companies too," he said. "I think it's important for a lot of these companies to be aware that there are still capital providers out there that are willing to support U.S. onshore conventional deals."

—Emily Patsy

Permian well spacing: Finding the right balance

The search for the best distance between wells is pushing some operators to wider spacing to avoid interaction between parent and child wells in cube developments, which could impact production and ultimately returns in the Permian Basin.

Several operators spoke on the topic during Barclay's 2019 CEO

Energy-Power Conference. Their insight and experiences were shared amid continued shareholder pressure to deliver returns while maintaining capital discipline and efficiency.

"Well spacing and density are one of the great balancing equations of the shale revolution," Tim Leach, board chairman and CEO of Concho Resources Inc., told conference attendees. "The balance is between rate of return and recovery. So clearly, the higher the density the more molecules we would ultimately recover."

Concho, a Permian Basin pure-play that operates more than 6,000 wells, decided to make spacing changes after wells drilled as part of tests underperformed in the Delaware Basin.

Many shale players have targeted higher production by placing wells closer together. But that has resulted in less output, in some instances, leading to more conservative spacing.

Concho's spacing tests included the ambitious 23-well Dominator project, which used seven rigs and five frack spreads in a 1-mile

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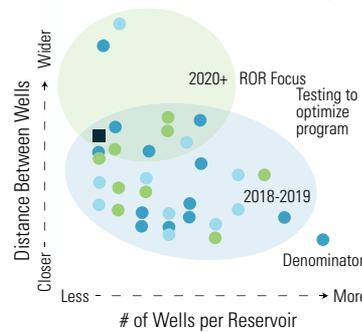
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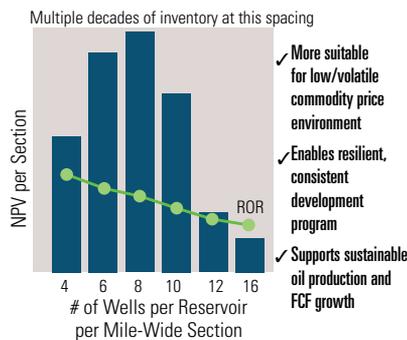
Concho Resources' Spacing Tests

2018-19 Project Development Wells per reservoir vs. spacing



Source: Concho Resources Inc.

Go Forward Plan: Prioritize Returns Optimizing Spacing—Illustrative Example



section. The company first shared results during its second-quarter earnings, saying initial rates were solid but performance data later indicated the Upper Wolfcamp wells were too densely spaced. The wells, which were completed and put on production, were spaced about 50% tighter than Concho's traditional spacing. The average lateral length was about 4,400 feet.

Concho has made changes to its development program by taking

learnings from the test along with others performed in the Delaware Basin

"The data generated in these tests will make our development program better," Leach said during the conference.

In second-half 2019, Concho is planning fewer wells per reservoir and spaced farther apart.

"We've plotted our projects with a number of wells for the reservoir on the X-axis and the distance between wells on the Y-axis. The

shaded region for 2020 highlights that we'll increase the distance between wells," Leach said, referencing a chart depicting well spacing changes.

"Project size is an important variable. Clearly, Dominator was an outlier. And we'll develop fewer wells per project on average in 2020, which will improve cycle times and reduce concentration risk. ... These efforts are already in motion."

Leach later pointed out how the rate of return for the project goes down with each additional well drilled. "There is an optimal balance. ... We will be moving that balance to higher rate of return next year," he said.

"As we move back to wider spacing, we expect to continue to generate strong well performance," he said later in his presentation.

Others have been in positions similar to Concho's.

Barclays analyst Jeanine Wai said spacing appears to be a "bad penny in E&P these days, but there's also a lot of different views on the right way to do things."

—Velda Addison

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HAROLD HAMM

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Continental Resources CEO Harold Hamm has taken on many challenges, including lifting the oil export ban and proving the viability of the Bakken Shale. But his latest may be his most daunting: explaining Trump.



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Harold Hamm paused, considering the question. What's the best advice he'd given President Donald J. Trump?

Quiz Hamm on the date he drilled his first well in Montana, and the chairman and CEO of Continental Resources Inc. can instantly fire back, "April 7, 1995."

But here he takes his time.

From early June through mid-August, from Oklahoma to Colorado, Hamm spoke to *Investor* about the state of the oil and gas industry, his thoughts on politics, ethanol, trade wars and how pipelines ought to be approved. And he spoke about his role as informal adviser, and friend, to the president.

Over the years, Hamm has accumulated as many titles as he has billions of dollars: industry titan, wildcatter, Bakken pioneer, executive of the year, philanthropist.

At 73, he's been one of the most successful and influential oil and gas executives in America. In Washington, he's been a prominent energy evangelist, leading efforts to lift the oil export ban in 2015. He's carrying on the same work in a far more important, behind-the-scenes role, today. The Financial Times once described him as "Trump's oilman." But his role is far more nuanced than that.

A half-minute later, Hamm is ready. "OK, OK. Let me answer that."

'Cowboyistan'

A security officer pulls out from Will Rogers Airport and steers the black SUV toward downtown Oklahoma City. The landscape is more than picturesque; it's like a screensaver: shamrock-green fields stretch out, pancake-flat, below azure blue skies.

The lyrics of a Three Dog Night song come to mind: *Well I've never been to heaven, but I've been to Oklahoma ...* The driver says that the previous day, heavy rains flooded out parts of the city. Cars were submerged and even a UPS delivery truck was stranded.

The SUV pulls up to the nearly 40-year-old Continental Resources Inc. building. Chairman and CEO Harold Hamm's office is 14 stories above.

On the floor, the interior décor is modest, but a blown-up magazine cover, slightly out of line of sight of the elevator doors, is eye-catching. Hamm poses on the cover of *Forbes*, wearing a dark blue suit and a light-blue Trump tie that gleams, perhaps from the photographer's flash. The date on the magazine is May 2014.

The headline proclaims Hamm as "The Man Fueling America's Future." But in a matter of months, the oil and gas industry would be faced with an OPEC wrecking ball and a miserable downturn, resulting in a stagnant market.

In a nook outside Hamm's office hang photos of Hamm and President Trump as well as framed letters. One, written in April 2014, congratulates him on the *Forbes* magazine cover. Another, written in October 2017, bears the presidential seal.

Hamm exits his office—the same space vacated by former Devon Energy Corp. executive chairman Larry Nichols when Continental bought the building eight years ago. He wears a dark suit, his light blonde hair parted left.

But the *Forbes* portrait, and that tie in particular, hold a special significance. The tie did, after all, help forge a relationship with a New York real estate developer who is now the most powerful man in the world.

Hamm and Trump's relationship sprang out of the Romney campaign. Trump invited Hamm to visit him and, in 2014, Hamm was in New York and stopped by. Even then, Trump was considering a run for the presidency.

"Have you thought about running for governor?" Hamm asked.

Trump was adamant about running for the White House. And he wanted Hamm to explain everything he knew about the shale energy renaissance and what it meant for the nation.

On the way out, Hamm met a few of Trump's family members, and Trump handed him a rainbow of ties, including the one he would eventually don for his *Forbes* photo shoot.

After seeing the cover, Trump sent a box of ties to Hamm.

Trump told him, "You're the best model I've got," Hamm recalls.

In the 2016 election cycle, Hamm initially supported Florida Sen. Marco Rubio, but by late April 2016 he had thrown his support behind Trump. That same month, before officially endorsing Trump, Hamm spoke at a Hart Energy event. It was clear even then that he was on Team Trump.

"People would like to say he's a buffoon," he told the audience. "Sometimes he says things off the wall for entertainment."

But Hamm also told the audience that he saw in Trump someone "we can reason with ... who sees how great America can get" with its energy resources.

Hamm's inroads have allowed him to give Trump advice. What he considers **his wisest counsel** was simply giving the president the facts about U.S. oil and gas.

"I started advising the president early about the American energy renaissance," Hamm said. "What we had as far as natural gas, crude oil supplies, natural gas liquid supplies, all those things.

"First of all, it was hard for our governmental officials to come around to the fact that we weren't in the same position and dependent upon the Middle East as we once were," he said. "That we didn't have to lean on them for all the supplies that the U.S. needed. That we were in a totally different position."

All that proselytizing paid off in July.

Breakthrough

President Trump's July 23 speech to a conservative student group in Washington D.C. derailed, ultimately, over a spoof presidential seal.

Trump spoke for 93 minutes, flitting from topic to topic. He derided a group of freshman Democratic congresswomen. He touted

"By then, we were calling it the American Energy Renaissance, and we had turned some phrases like Cowboyistan, indicative of Montana and North Dakota, even Oklahoma."



PHOTO BY JOHN TAGGART/BLOOMBERG VIA GETTY IMAGES

Harold Hamm
speaking at the
2016 Republican
National
Convention.



Continental Resources is one of the largest independent oil and gas producers in the U.S., with operations in the Williston and Anadarko basins.

PHOTO BY BRIAN NADURAK/COURTESY CONTINENTAL RESOURCES

his success in his trade war with China. He branded Iran's leadership liars.

But what grabbed headlines was the seal, which briefly flashed on a screen behind Trump. It featured a set of golf clubs, a double-headed Russian eagle and a Spanish phrase that translated to "45 is a puppet."

Still, some, Hamm among them, listened intently to what the president had said. And Hamm liked what he heard.

More than an hour into the speech, Trump addressed tensions with Iran, including the seizure of civilian tankers in the Strait of Hormuz. He questioned why the U.S. continues to police the strait for wealthy countries such as China and Japan. Japan's constitution bars its military forces from being deployed to resolve international disputes.

"We're the ones that, for many, many decades, we're the ones that policed it," Trump told students at the Turning Point USA's Teen Student Action Summit. "We never got reimbursed. We police it for all these other countries, and I said a while ago, I said, 'Why are we policing for China? Very rich. For Japan? Very rich.'"

In 2018, the waterway served as the passage for more than one-fifth of the world's global petroleum liquids supply, or about 21 million barrels per day (MMbbl/d), according to the U.S. Energy Information Administration (EIA). About 76% of the crude oil and condensate that flowed through the Strait of Hormuz went to Pacific Rim markets, including China, India, Japan, South Korea and Singapore.

"We hardly use it," Trump said of the strait. "We're getting 10% [of oil supplies] only because we sort of feel an obligation to do it. We don't need it. We've become an exporter. Can you believe it? We're an exporter now. We don't need it. And yet, we're the ones that, for many, many decades, we're the ones that policed it."

While the president's statistics were low—in 2018, the EIA estimated about 18% of imported crude oil and condensate traveled to the U.S. via the waterway—the point Trump had made publicly was a victory, as Hamm saw it, for U.S. energy.

Trump's remarks were a remarkable departure from his predecessors, who have viewed an open, stable Strait of Hormuz as an important conduit for world oil supplies. They were also an affirmation for the U.S. oil and gas industry and the diminished importance of Middle Eastern oil producers.

The U.S. is no longer dependent on Middle Eastern crude.

"He made that statement, I mean, how far has our presidency come in the belief of where we are?" Hamm said. "I mean that's tremendous. And, so, you know, we have a president that's pro U.S. energy that believes in what we're doing here."

"And we're going to have that supply without sending our troops to every skirmish in the Middle East. We can conduct ourselves totally different. So, I think that's maybe the biggest help that I've been."

A JUST (TRADE) WAR?

In the first five months of 2018, China imported an average 359,000 barrels of oil per day from the U.S. and eclipsed Canada as the largest market for the nation's crude.

As the trade war heated up, China has sometimes gone months since then without buying a drop of U.S. oil. In the first five months of this year, the country has imported about 111,000 barrels per day, according to U.S. Energy Information Administration data.

Harold Hamm, chairman and CEO of Continental Resources Inc., said he believes President Donald Trump is taking the right steps to confront China's trade practices.

But he acknowledged at EnerCom's The Oil & Gas Conference in Denver that the trade battle with China "is a biggie."

"That's the one that hurts our business probably as bad as anything right now," he said. "That certainly needs to get solved."

Beginning in June, the Chinese Finance Ministry said it would increase levies on U.S. LNG exports from 10% up to 25%.

Ed Longanecker, president of the Texas Independent Producers & Royalty Owners Association, said in July he views resolving the trade conflict with "skepticism."

"China was the third-largest buyer of U.S. LNG before the trade war started, but now we are lucky if they rank in the top 25," Longanecker said. "And though the Chinese government has not yet applied tariffs to imports of U.S. crude, U.S. oil exports to China also have essentially dried up."

But the short-term pain may be worth it if trade between the U.S. and other nations can be rebalanced, Hamm said in an interview. Trade is "certainly important to us [in the industry], but it's more important to have fair trade rules. Trump is doing the right thing in making it tough on them," he said. "I think it will be solved sooner rather than later."

The mid-September attack on Saudi Arabia's oil processing facilities caused oil prices to spike, but Hamm said the health of the domestic U.S. oil and gas would act as a steady force.

"While the current situation should prove to be somewhat temporary, weeks or months, it drives home the need and importance for an energy independent America, particularly with crude oil production and supply," Hamm told *Investor* on Sept. 16.

Before the attack, Hamm believed the market-embedded risk premium had gone away. While the attack will affect prices by about \$10 to \$15/bbl, he said that ample inventory will provide "stability to the market."

The advent of horizontal drilling, the American energy renaissance and ample inventory allows U.S. producers "to address disruptions like this around the world, while protecting American energy needs."

"Thank God for the U.S. energy renaissance," he said, adding that "15 years ago you would have seen a much more drastic market response."

Hamm also credited Trump, who he said had "unleashed American energy in a way that provides stability to the rest of the world."

'Grinding us up'

Hamm's private conversations with Trump turn to topics few, particularly the president's critics, might imagine.

"Coming from Lexington and working like we did on the farm, doing everything, we grew up without anything. But that was OK. There's so much opportunity in this country today."

RUEFUL STANDARDS

It's safe to say Harold Hamm, chairman and CEO of Continental Resources Inc., is not the world's biggest fan of ethanol. It's particularly bad for lawnmowers and boat motors.

"Do not put it in a marine engine," Hamm said.

More than any other time in the past century, oil and gas companies face challenges from a fuel federally mandated by the Renewable Fuel Standard.

Hamm sees the debate over ethanol as much ado about nothing and defends Trump's decisions, which have caused heated disagreements.

In May, the Environmental Protection Agency (EPA) finalized regulatory changes to allow gasoline blended with up to 15% ethanol, as well as the ability to sell it year-round.

While the corn-based fuel will be available, Hamm said there are no obligations for gas stations to sell it.

The ethanol used now is the result of the government's role in the free market, Hamm said.

"Really what drives that 10% [ethanol blend] are those mandates. Those go off, those are set to start reducing and that's happening," he said. "I think beginning this year, that reduction starts occurring."

He added that while ethanol can now be sold in the summer months, "nobody is going to jump from 10% to 15% [ethanol] just because it's good stuff."

Energy and agriculture industry groups have both been angered by the administration's moves. The EPA has granted 31 exemptions to small refineries totaling 1.43 billion gallons of fuel, Simmons Energy analyst Patrick J. Flam wrote in August.

"Tensions even escalated as far as the EPA cancelling an event in response to a threat against a staffer," Flam said Aug. 23. Two of Trump's major constituencies (oil and agriculture) have been facing off, and it has been coming to a head recently.

On Aug. 16, Iowa Sen. Charles Grassley went further, saying that farmers were "screwed" by the Trump administration, The Associated Press reported.

Trump is "kind of in between a rock and a hard place," Hamm said.

Sometimes, Hamm said, Trump wants to know how things are going generally in business and the economy.

In July, on his most recent trip to the White House, the president wanted to talk about medicine, Hamm said.

"Last time I was there, we talked about the need in this country for generic insulin production," Hamm said. "It's very, very necessary. People are having to ration this chemical that saves their lives. They can't afford enough insulin to basically take care of all their needs."

Hamm established the Harold Hamm Diabetes Center in 2007 with a goal to cure diabetes. In 2018, he donated \$34 million more to the center, according to the University of Oklahoma.

Hamm considers himself part of a network of trusted friends of the president.

"Does he ask for advice on some things? Certainly. And he's a very good listener. Many people do not know that," Hamm said. "To answer your question, am I a sounding board? I certainly am in some areas, I think."

That Hamm is a Republican is clear. He was a speaker at the 2016 Republican National Convention. Before Trump, he advised Republican presidential nominee Mitt Romney's 2012 campaign. He has donated millions of dollars to national and state party committees

in Louisiana, California, Alabama, Wisconsin and Tennessee and other states, as well as to party leaders such as Senate Majority Leader Mitch McConnell.

But Hamm said his political leanings are, in part, a necessity.

"You started out saying you're a longtime Republican," Hamm said. "Most oil and gas operators are, No. 1, businesspeople, and of most businesspeople, about 80% are Republican. And their [Democrats'] whole view is of a whole bunch of Republican businessmen they don't like. So, the whole thing is political."

Democrats have painted business owners, and particularly oil and gas entrepreneurs, as a sort of public enemy despite the necessity of hydrocarbons to support every facet of daily life, from clothing to using the Internet, he pointed out.

Hamm said initiatives, such as the Green New Deal, aren't realistic. But Democratic presidential candidates know they play well to their base.

"It's not that they can ever get away from oil and gas in their lifetimes or even several generations beyond them," he said. "They know they can't. But they play to their base by talking to people about grinding us up and doing away with us."

In the early stages of the Democratic primaries, capitalism itself has come under scrutiny from presidential hopefuls such as Sen. Elizabeth Warren of Massachusetts.

In a 2018 bill, Warren proposed giving workers the right to elect at least 40% of their corporation's board of directors and implementing a five-year wait on the sale of shares by directors and officers of U.S. corporations. In an echo of that policy, the Business Roundtable on Aug. 19 released an updated statement of purpose for corporations that moves away from "shareholder primacy" to companies that benefit customers, employees, suppliers and communities as well.

Hamm sees only opportunity in the country today. The youngest of 13 children to sharecropper parents, Hamm raised livestock and picked cotton before moving away from his home in Lexington, Okla., at around 17 years of age.

"Coming from Lexington and working like we did on the farm, doing everything, we grew up without anything," Hamm said. Sometimes he went shoeless. "But that was OK. There's so much opportunity in this country today."

Hamm started his first company at 21. For his 2011 induction into the Oklahoma Hall of Fame, a prominent physician said of him, "If Harold Hamm did not exist, Oklahoma would have to invent him. Because I can think of no one who better personifies the virtues of our state—hard work, vision, perseverance and public service."

Hamm believes presidential candidates, such as Sen. Bernie Sanders, aren't a realistic threat to Trump because of their extreme policies.

"I think when you compare Trump with Bernie, I know that Bernie's way down the list ... hell, he just turned into this old guy, an old madman. A screamer. I think Trump will definitely prevail," Hamm said. "He's certainly done the

"If you look at the U.S. rig count projection, this thing is headed down to probably 800 rigs. Maybe by next February we're going to reach that point where prices stabilize. Perhaps that's an optimistic view."



right thing for America in so many places it's unreal. And people realize it."

Capitalism, he said, is also still alive, well and full of opportunity.

"I think that Bernie is just wrong. We don't have class warfare here in America, thank goodness. It's totally different than those countries in Europe that were locked into serfdom and everything there that our forefathers put up with. We have a wonderful country. We just need to realize it and recognize it."

Could Hamm do it all again—build a massive oil and gas company, find fantastical financial success—in the current environment? Hamm believes anyone with the zeal, drive and intellectual ability can.

"Gosh, I can point out hundreds of young people that have done virtually the same thing," he said. "They have excelled greatly in different walks of life."

Hamm said the Democrats are simply engaged in political theater.

"As long as you know it's rhetoric, as long as you know it's political, then you take it with a grain of salt and go on," he said.

Of markets and men

At the conference table on the top floor of the Continental Resources building, Harold Hamm and his executives eat salads. A selection of the Bakken's finest oil has been brought out one or two samples at a time: jars that range in color and viscosity from a thick Guinness-like lager to a jar of what looks like olive oil. He considers the low-sulfur oil the best oil in the world.

Hamm spent untold hours in the nation's capital, in face-to-face meetings, trying to persuade Congress to let him get the oil out to the rest of the world. His efforts culminated in December 2015 with President Barack Obama lifting the 40-year export ban.

Hamm said that President Obama played hardball, agreeing to sign the bill in exchange for an extension of renewable energy subsidies.

"The wind boys got their wish. We got exports," he said.

Hamm foresaw that the U.S., the world's largest producer of oil, would need an outlet for its oil. From 2015 to 2018, oil exports more than tripled to nearly 2 MMbbl/d of oil. Through the first five months of 2019, exports averaged 2.8 MMbbl/d, according to EIA data.

But unlike any time in the past century, oil and gas companies face new challenges. The capitalism that Hamm avows has also forced the oil and gas industry to change.

Growth at all costs has been thrown by the wayside as investors have started demanding balance sheet prudence and free cash flow.

"That entire model that they [E&Ps] were using was broken," he said.

Still, industry observers have pointed out the double standard to which the industry is held. Ride-sharing service Uber, for instance, lost \$1 billion in first-quarter 2019, yet its market cap is about three times that of Continental.

Critics of shale production have emerged even from the oil and gas industry's own ranks. In July, former EQT Corp. CEO Steve Schlotterbeck spoke at the 2019 Northeast Petrochemical Conference in Pittsburgh and unloaded.

"The shale gas revolution has frankly been an unmitigated disaster for any buy-and-hold investor in the shale gas industry with very few limited exceptions," said Schlotterbeck, who resigned from EQT in March 2018 over a pay dispute.

The industry, he added, "is self-destructive."

Hamm said he's heard such lamentations and prognostications before. He recalled one critic who, several years ago, lamented over the capital destroyed in natural gas production.

"I think that [Sen. Bernie Sanders] is just wrong.

We don't have class warfare here in America, thank goodness. It's totally different than those countries in Europe that were locked into serfdom and everything there that our forefathers put up with.

We have a wonderful country. We just need to realize it and recognize it."

Harold Hamm formed the Shelly Dean Oil Co. in 1967 and rebranded to Continental Resources in 2000, which he then took public in 2007.

After leading the effort to persuade Congress and the Obama administration to revisit oil exports for the first time in 40 years in 2015, Hamm became the most influential energy advisor to Donald Trump during his presidential campaign and remains an advisor to him while president.



PHOTO BY BRIAN NADURAK/COURTESY CONTINENTAL RESOURCES

None of it, the man contended, was going to work out.

But oil and gas investors, as Hamm sees it, have done well putting their money behind Continental and similar producers.

“If you look at our company ... we’re up from 2007 to today by 700%,” he said. “That’s not too bad. That’s a pretty good return.”

He sympathizes with some long-holding investors who haven’t reaped the benefits of shale production, “and there [are], for sure,” he said.

“They may have invested in the wrong companies along the way and not done the right things,” he said. But for most oil and gas stakeholders, including royalty owners, company shareholders, lenders and others, “you just have to realize, boy, there’s been a lot of value created, and the expansion of the industry has just been tremendous.”

And the shale industry has not exactly been a bust. In 2018, shale gas made up 70% of total production compared to 16% a decade earlier, according to EIA statistics.

“And with crude oil, actually, you’re up about 125% from where you were at 5 million barrels a day to here you’re at 12 million barrels a day,” he said. “Obviously, it’s a tremendous amount of value and to everybody along the way.”

Still, the path forward looks difficult. For companies with big debts and no easy way to an exit from their investments, the future may even be bleak. Hamm said some private-equity funds are unlikely to generate returns, and public companies, as well, may find difficulty in being competitive.

“I think that the end of the road is there,” he said. “There are a few public companies

that also are probably incapable of going to the new model, if you will, and making sure they get a return to investors and have ... real returns to the investors through dividends and you name it.”

Hamm said companies such as Continental that have worked to keep general and administrative and operating costs down will again attract investors.

As for worries about peak oil demand and its possible effects on investors, Hamm said that people are often quick to make predictions beyond their lifespan.

“I think those will be just as far off base as the peak oilers were on peak supply,” he said.

Continental has worked to keep investors happy by tamping down general and administrative and operating costs. On June 3, the company announced a dividend and a \$1 billion share-repurchase program while battling down speculation that it was contemplating an M&A transaction.

“We think there’s more value there than doing some other things” through deals, he said. “So that’s a good place to put our earnings and free cash flow.”

Continental also increased its five-year free-cash-flow outlook to \$5 billion at \$60 West Texas Intermediate prices, an increase of \$1 billion.

Holding court

About 20 minutes before lunch begins at the Westin Denver Downtown, two lines form on either side of the hotel’s central escalator.

Hamm sits in front of a black curtain at EnerCom’s The Oil & Gas Conference and offers diners his thoughts on trade wars, rig counts and oil production.

“You just have to realize, boy, there’s been a lot of value created, and the expansion of the industry has just been tremendous.”

“Every time U.S producers got on their feet just a little bit, they’d open up the taps and drown us. That was [OPEC’s] favorite deal.”

In an interview a few weeks before, Hamm had offered his thoughts on the slow erosion of the U.S. rig count. Since the first week of January, rig counts were down by 15% to 916 as of Aug. 23, according to Baker Hughes data.

Partly the steady ticking down of four or so rigs a week can be explained by increased E&P efficiency in drilling. Continental itself has recently laid down seven rigs.

Hamm told *Investor* that, in context, the steady drop in drilling rigs doesn’t concern him.

“If you look at the U.S. rig count projection, this thing is headed down to probably 800 rigs. That may be the equilibrium point,” he said. “Maybe by next February we’re going to reach that point where prices stabilize. Perhaps that’s an optimistic view.”

That will require a significant reduction in supply or, less likely, a spike in demand. OPEC—and Saudi Arabia in particular—still hasn’t cut enough production.

“We’ve seen gas being vastly oversupplied, and we’re about to fall in the same boat with oil. Probably [we] are there,” he said onstage in Denver. “The OPEC cuts, I don’t think, were enough back in 2016. They expected maybe that it would make up all the difference. It hasn’t.”

Hamm’s views on OPEC have evolved as the organization has changed. Stretching back to the 1970s, he recalled in an interview, “every time U.S producers got on their feet just a little bit, they’d open up the taps and drown us. That was their favorite deal.”

But in 2014, OPEC’s go-to maneuver—flooding the market—backfired. The U.S. industry survived. But stagnant oil prices continue to cloud the industry.

“I think they underestimated the potential of U.S. shale, and I think they’ve come to realize that it’s more than they first thought.”

Since 2014, Hamm and other oil and gas leaders have met with OPEC officials and representatives of Saudi Aramco.

Hamm said there’s no coordination between the U.S. and OPEC, but there is clearly a recognition that producers have to be more disciplined. For OPEC, that’s meant a remarkable stretch in which its members have adhered to oil quotas. For U.S. E&Ps, the discipline has been “imposed on us by the market and by investors.”

“We run our business and they run theirs,” Hamm said. “One thing I guess we can appreciate them for today is they’ve been fairly open with their reasons for maintaining world supply at different levels.

“The good thing about it is we don’t have to, and we’re not called upon to coordinate with them at all.”

In Denver, Hamm does warn his fellow oil producers that OPEC cannot, by itself, be the answer to the overabundance of oil.

CLEAR THE AIR

Once upon a time, Continental Resources Inc.’s production consisted of about two-thirds natural gas. As the regulatory environment changed in the 1980s, Continental chairman and CEO Harold Hamm switched his focus to oil.

Natural gas should be a vital component in the U.S. strategy toward climate change and geopolitical conflicts, Hamm said.

Hamm speaks often of the importance of preserving the environment but sees hypocrisy in nations that have signed on to the Paris Agreement climate accord that are mainly concerned with air quality.

Nations committed to the agreement continue to dump trash in the ocean, he said.

“Nobody thinks about the oceans as being a part of this environmental situation very much,” he said. “That’s what we ought to be concerned about as much as the air.”

Natural gas can also be a tool helping the nation’s democratic goals in Europe, particularly in Germany and Poland, which are beholden to the Russian Federation for much of their supply.

“That’s a very, very important goal. Nobody should be held hostage over the natural gas it’s going to take to heat your home in the winter,” Hamm said. “Certainly, LNG can alleviate that, thank goodness.”

More importantly, the ability to export the cleanest fuel in the world will cut down on the particulates in the air in China and India, Hamm said.

“With climate change, that is the most important thing that’s going on today,” he said. “We need to clean up the air around the world the same as we have in the U.S.”

“We should not be depending strictly on OPEC. We need to learn to row our own boat,” he said. “Yeah, they’re going to be a player out there. But we need to make sure we don’t oversupply the market.”

Flights of fancy

It’s a quiet moment in Oklahoma City.

Hamm comes out of his office, where his window blinds are closed, and large paper rolls, they might be maps, are lined against the wall in banker’s boxes. For the next three hours he will talk about the Bakken, about politics, about his life.

He smiles, shakes hands and noting the interest in the Forbes cover asks an assistant to fetch a copy.

Hamm’s top communications officer had to persuade him to put the Forbes cover on the wall. And he’s been on a slew of covers, including a 2012 Time magazine cover that named him one of the 100 most influential people in the world.

He signs the copy of Forbes, adding, “best wishes.”

Yet for all of his success, his relationships and the company he started at 21, he remains disarmingly self-effacing at times.

In an elevator, Harold Hamm presses a button and the lift begins to ascend five stories to the conference room.

Hamm, one of the wealthiest people in Oklahoma and the U.S., doesn’t have the highest perch in the building.

Not yet, at any rate.

“I’m working my way up,” he says. □

OF CAPITAL AND CONSOLIDATION

The CEO of Houston energy-focused investment bank Tudor, Pickering, Holt & Co. says it's not time to panic as investors flee the oil and gas space, but structural change is inevitable to adapt to the new marketplace.

INTERVIEW BY
STEVE TOON

PHOTOS COURTESY
TUDOR, PICKERING,
HOLT & CO.

The offices of Tudor, Pickering, Holt & Co. feature a 49th story unobstructed, panoramic view of Houston's Buffalo Bayou Park stretching upstream into the distance of the lush west side. TPH, as it is colloquially known, is an investment bank, advisory firm and provider of research, sales and trading services to institutional investors. Maynard Holt, CEO, strides into the corner lounge and settles on a couch before announcing, "They made me wear a tie."

While the capital markets remain quiet, the Houston-based firm has stayed active on several fronts. One area in particular is minerals, where it recently advised Viper Energy Partners in a dropdown from parent company Diamondback Energy Inc., was a senior co-manager for mineral-focused special purpose acquisition company Switchback Energy Acquisition in its \$300 million IPO and advised Desert Royalty Co. in its combination with Kimmeridge Energy Management Co. to form Desert Peak Minerals.

"Minerals are hot," he said, ticking off recent engagements. "People still want basic oil and gas exposure, and you can get exposed to the top line in these mineral deals. Individuals and institutions are drawn to that."

This summer, TPH also served as co-manager to Rattler Midstream LP's \$665 million IPO and advised artificial intelligence provider Tachyus on its \$15 million funding round, two energy sectors that still attract investor interest. And though A&D is tepid, the company represented privately held Spur Energy Partners in September in its \$925 million acquisition of Concho Resources Inc.'s Northwest Shelf assets, a bloom of a deal in a desert of dealmaking.

TPH's other transactions this year include two midstream sales (Eureka Midstream Holdings LLC and Whitewater Midstream), assisting Murphy Oil Corp. on its strategic exit from Malaysia and a \$6 billion MLP simplification transaction for AmeriGas. In the area of upstream consolidation, it advised Energen Corp., RSP Permian Inc. and Wild-

"It's really just a supply/demand thing.

It's not the end of the age of oil. It is not the end of fossil fuels. It's just we've found so much."

horse Resource Development Corp. in their mergers with Diamondback Energy, Concho Resources Inc. and Chesapeake Energy Corp., respectively.

Of particular interest, in August, the bank represented Occidental Petroleum Corp. in its \$1.5 billion joint venture (JV) with Colombian producer Ecopetrol SA in the Midland Basin, a deal that harkens back to the early days of shale when JVs were rampant and went almost unnoticed as Oxy closed its megamerger with Anadarko Petroleum Corp.

"You can still make good cash-on-cash returns with the drillbit," Holt said, "and this was undrilled acreage. Ecopetrol had the strategic interest, and Oxy had the properties."

And the last time the JV structure was popular, he noted, capital markets were shut down as well. "The industry is going to find new ways to capitalize itself."

With a view that oil and gas companies are struggling to source capital presently, Investor visited with Holt in early September to gauge his thoughts on current issues and the financial state of the industry.

Investor Oil and gas stocks are in the red year-over-year and most dramatically so—is it time to panic?

Holt No, let's don't try to overcomplicate it. Sometimes we can get all fussed about climate change, electric vehicles, encroaching regulation, but the reality is we just have too much oil and we have too much gas. And we have too much oil and too much gas because we're darn good at finding it and getting it out of the ground. The success of the industry has become one of its worst enemies.

Tudor, Pickering, Holt & Co. CEO Maynard Holt says the pullback in capital from public and private-equity investors could lead to a rise in true private companies amassing oil and gas assets for long-term holding. "People are recognizing the opportunity because this is a stunning thing."



“Right now it’s a buyer’s market for oil and gas properties. ... There is long-term buy-and-hold money re-emerging because [investors] recognize these values don’t make sense.”

What’s happened now is it’s just really hard to find anybody that thinks oil or natural gas are going up much anytime soon. And if they do go up, the view is we could quickly get more oil or gas if we needed it. So the ability to invest in oil and gas by saying, ‘I think oil and/or gas are going up (and staying up), and now I’ve got to pick a stock’; You can’t do that anymore.

The other way you used to zero in on stocks was a company might be drilling some new well or delineating a new play. So even if you didn’t think prices were going up, these guys were suddenly going to announce more resource with the latest well results and that meant you could multiply it out over a bunch of potential drill sites. We’re not really doing that anymore either. If anything, investors today are worried there could be less resource than what conventional wisdom says.

So investing in a stock because you think oil or gas is going to go up or because you think suddenly they’re going to find a whole bunch more, that’s not what we’re doing anymore. One of the best performing stocks this year is Hess (Corp.) and it’s because of Guyana (offshore oil discoveries), but it is a really rare thing anymore to have stocks like that. So that makes oil and gas investing hard; which of these companies should I really own?

The other thing that makes this hard is the oil and gas industry, if it was a restaurant, we’ve put so much on the menu. There are so many companies to choose from that it gets hard to sort them out. So you’ve got a huge selection at the same time that the basic or simple logic of why you should own it has been taken away. If you’re a smaller company below \$10 billion market cap, it’s kind of hard right now to get attention from institutional investors.

And so it looks and it feels bad, and CEOs and boards are like, wow, this is not fun and they don’t necessarily see something that’s going to change it dramatically near term. So that’s frustrating. But I think it’s really just a supply/demand thing and we shouldn’t overcomplicate it. It’s not the end of the age of oil. It is not the end of fossil fuels. It’s just we’ve found so much.

Investor Is there a silver lining in there somewhere?

Holt If you were being positive just on the oil macro in particular, everything we’re doing right now is pulling money out of the business. Public investors aren’t giving you more money. Private equity is very selectively putting more money to work. Some people are not going to invest because of whatever reason, such as ESG [environmental, social and governance]. But you add all this up, money’s coming out of the business. And what happens when we do that? You’re setting up for an oil price rebound in the next few years.

Investor So is this an unprecedented market environment?

Holt I think so. This one has a lot of things in it

that I would dare to say maybe others have not. Obviously, it has a supply/demand situation, but it also has an abundance of energy companies to choose from, like we didn’t have in 1986, to pick a time.

It has this feeling where your average investor is saying, ‘I don’t know if I need to do this anymore.’ If you think back to the middle of June ’14 through to last fall, there have been about five times when oil price got a lift and looked like it was going to go back to something pretty good. And it pulled money into the sector and then all those people lost money because it fell again. So we’ve had five times where the market’s been burned. And last fall was really rough. We got to \$76 in early October 2018, and then we ended the year around \$46. It was punishing.

Also, the U.S. independents used to be just price takers, and when it came to oil, there was no way these guys could affect the oil price, right? In that way, it was a safer business. But now they contribute so much to production and to sentiment that they have a lot to do with price. And so it’s just a very, very different business right now.

The last one is the thinking around climate, the development of alternatives, and this little chorus of ‘is this industry even around in 20, 30 or 40 years?’ That’s a new thing to have thrown into the mix. You hear that comment in New York and Boston a lot, not to mention Europe. That’s an important part of the sentiment equation. That’s just the mentality that exists.

But when you take a step back and look at the dynamics of the world, the fuels that supply global power and what their market shares really are, the population growth that’s coming and the fact that we’re underinvesting in oil right now, boy, that’s just got to mean that oil has another pretty strong day.

I would never bet against any kind of technology, but that includes technologies we have going in oil and gas too. A decade or more out it’s all about technology, but in the next five years I think oil has another good run.

Investor With the energy sector representing about 5% of the S&P 500 currently, do you think it can find new buyers through the balance of this year or next year?

Holt It’s probably going to be hard to find new buyers in real volume. You can make good money in oil and gas; you can make good cash-on-cash returns. But the whole world is really fussy about yield right now—where can you get good yield?

The problem right now is that a lot of people have lost a lot of money. But if the industry shows it can make money for people, whether it’s in a stock or a direct asset investment, I think people will come back to that. They’re just hesitant to do so because they’ve been burned. I do think in a yield-hungry world, energy could be a very attractive place for capital to come.

Interestingly, our research guys have been talking for a while now about the dawn of the “super private,” which would be capitalized differently than a public company or from a

private-equity company. It would take money directly from institutions or family offices and wealthy individuals and will run the business in a way that's more like a family owned private. They don't spend a dollar unless it's going to make more than a dollar.

It is expensive to be public and that comes with its own share of other obligations. That the industry might become increasingly in the hands of long-term private owners is quite possible. That's something that we're watching and thinking through.

A fascinating deal that I think is representative of that is Hilcorp (Energy Co.) buying BP (Plc) out of Alaska. That's a really large \$5 billion-plus deal. Wow. There's a one-time absolute legacy asset that's going to be in the hands of a big private company. Hilcorp would have clear capabilities to do what's needed to make the assets perform. They bought Conoco out of the San Juan Basin for \$3-plus billion, and now they've bought this for over \$5 billion.

So with the combination of private, long-dated equity with maybe public bonds, there's probably a different way to do this than the way we've been doing it, and that's probably where we're headed.

Investor Could you elaborate?

Holt Forever in our business people would say, 'Should I go public or should I sell the company?' We would always answer, 'It depends on what you are trying to do.' If you're trying to get liquidity for your shareholders, you should sell the company. If you're trying to finance the company, that's why you'd go public. The reason why is they were providing you capital. But they're no longer providing you capital. The deal has broken down for a vast majority of the companies. Only an elite group is still

drawing strong interest.

You hear a lot about investors losing interest in energy companies, but energy companies are losing interest in investors too. It's a relationship.

If you had an asset you wanted to buy, you would be drawn to capital that is interested in cash dividend returns, where fundamentally they're interested in just dividends. That's the money you would go after. You wouldn't go after money that says, 'Hey, we need to sell it or IPO pretty soon,' because that doesn't sound good. And you wouldn't go after public money that's going to give you a terrible valuation, and there's a limited pool of it.

The one way in which the industry could push more assets into the hands of private capital is more and more buyers emerge that are backed by that capital. CPP (the Canada Pension Plan) is kind of doing the Hilcorp model. CPP has money in a number of places, like Crestone Peak Resources, Encino Energy and a number of Canadian companies. That's big, long-dated capital.

Investor But they're not an E&P.

Holt They back them. They can be the capital to make those super privates. That's the way in which we might get more and more private money into the space.

Investor So you're seeing a trend not toward private-equity-backed companies as acquirers, but true privates?

Holt People are recognizing the opportunity because this is a stunning thing. Right now, it's a buyer's market for oil and gas properties. Public companies are not buying, and they were always a traditional big source of capital. The private-equity guys are being re-



“That the industry might become increasingly in the hands of long-term private owners is quite possible. That's something that we're watching.”

"M&A is really about company building right now. As a board, you've got to think about which management team is going to deliver. It's not just what the premium is."

ally judicious.

We're just seeing more capital returning and saying, 'I recognize the opportunity, I want to buy it and I want to hold it.' That can be minerals, that could be properties, so far it's not stocks. But there is long-term buy-and-hold money re-emerging because they recognize these values don't make sense.

Investor Are we still in an era where you can get big returns for opportunistic deals?

Holt What's striking is not the opportunity to make a 10 bagger, but the opportunity to make a double with very little risk. I understand why we're here—everybody has fatigue—but it's definitely an oversold market. Very oversold.

Investor Some people suggest that mergers are not an option, but are necessary, for small- to mid-cap names to survive. Do you agree? If so, how much M&A is necessary?

Holt I'm not someone who has always been crazy about M&A, because historically, there's probably a good chunk of M&A that hasn't worked out well. But my recent view, particularly in the shale era, is if you're merging similar flavors, there is a lot of expense that you can eliminate, with efficiencies of scale, large contiguous acreage blocks and a lot of synergies. M&A actually can create some real value.

And particularly if it gets more assets into the hands of the most capable managers. If we're consolidating assets into the hands of the better managers, that's going to create value.

But M&A is not an auction business. It's not just a business of who offered the most. It's a business of which combination is going to create the company with the best team, the best culture, the most synergies and the highest probability of delivering real value over a longer period of time. M&A is really about company building right now.

As a board, you've got to think about which management team is going to deliver. It's not just what the premium is. We believe that one-day premiums, particularly in stock deals, don't tell the whole story. I think we're starting to develop the formula, which is the pro forma company is just better than either of its two contributor companies. The new balance sheet and cash-flow profile are better, and nobody on either side got an undue amount of the pro forma company.

Investor Do you think M&A is a necessary growing pain for the industry?

Holt I think we're going to have to go through it. If you said, what's the scenario where things started turning around pretty good, you of course solve the China problem and then you would start having some really smart M&A. Investors would be drawn to that and say that could be a good space to be in if I pick the right horse. And so if you got improvement in the macro and you got some positive M&A that creates real value, I think the space could get another look.

A client told me the other day we have too

much of every flavor. I think he is right.

Investor Is there a minimum enterprise value that you think is required to make an E&P viable these days?

Holt We keep talking about that you need to be \$10 billion or more to feel like you're in the game, on the menu. Honestly, there's a ton of companies below \$10 billion, but you do need to be that size, unfortunately, to get a serious look in upstream. You can get a look between \$5- and \$10 billion if you are really good, but size matters right now.

Investor Do you think consolidation is going to materially change the landscape to get to that \$10 billion valuation?

Holt It could. If you think out five years, what is the chance that we have even 80% of the number of companies we have now? That feels pretty small. The conditions are ripe for it and there are some good deals to be done.

Investor Is there a place in today's world for a small independent?

Holt I think so. As you get bigger, smaller things start becoming 'not material.' You just focus on a lot of big things. As you get bigger, honestly, the other odd thing that happens is your ability to take risk goes up, but your willingness somehow seems to go down.

So the small entrepreneurial company that grabs ahold of something that no one else is paying attention to and is willing to take risk even though they don't have a huge balance sheet, I think there's always going to be a role for that company. We got the whole shale revolution because of those companies. Without these entrepreneurs, we'd be in big trouble because we've got to have that innovative spirit.

Investor If you were given \$500 million in capital today, what would you do with that?

Holt Three things. One, I'd go buy mature oil assets, PDP, to own it for the long haul. Two, I'd wade into the high-yield market, and I'd selectively buy some of that poorly trading debt. That looks like opportunity too. And opportunity three is I would invest in any company that had some size that helps oil and gas get cleaner and more efficient.

That's the wave of the future. Oil and gas is going to get cleaner and more profitable. We have no choice. Things like electric frack fleets are fascinating. We are seeing companies all the time that have innovative software, unique chemicals, that do great things with natural gas so you don't have to flare it, methane detection through cameras, hydrogen and the list goes on.

It's almost impossible to say what the world looks like in 10 years given our ability to innovate and improve. Would anyone 10 years ago have predicted that the U.S. was going to become the largest hydrocarbon producer in the world? We're excited about the possibilities.

Some people want to say oil and gas are like buggy whips, but they're not like buggy whips; they're like semiconductors. We just got so good at making it that we flooded the market. Don't call us yesterday's news. We're a tech behemoth that overdid it. □

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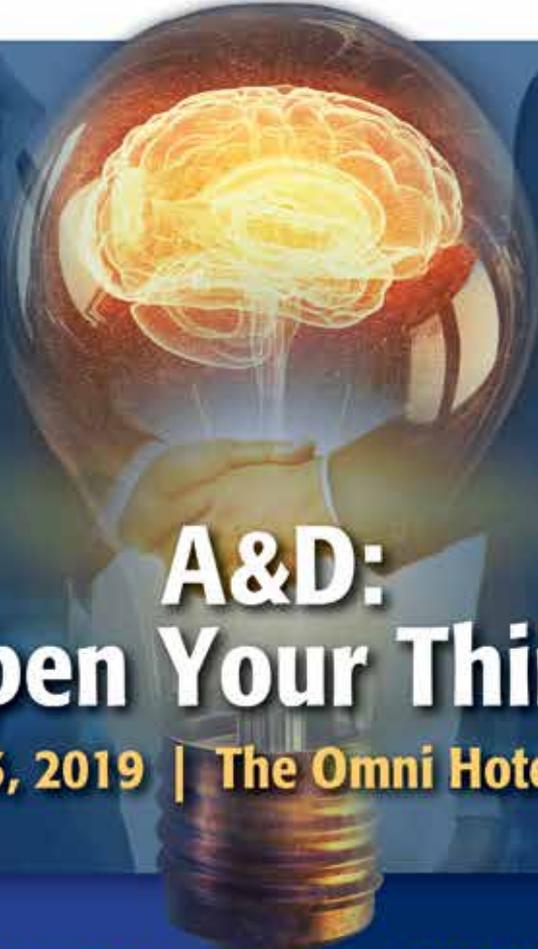
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THE WYOMING D-J EXPANDS

Operators are drilling what they call “a bigger, better Codell” in Wyoming.

ARTICLE BY
LESLIE HAINES

**Facing page,
lightning strikes
near North Silo
Resources LLC’s
Harding Ranch
1-CH well in
Wyoming.**

What could be better than drilling for the prolific Codell Sand in Weld County, Colo.—one of the most heavily drilled counties in the oil patch? Look north, young man.

A confluence of events is making a Codell play gather momentum in Laramie and Goshen counties, Wyo., east of Cheyenne, as drilling activity in the venerable Denver-Julesburg Basin moves across the state line. This northern extension of the basin is unpopulated compared to the suburban sprawl northeast of Denver that has led to regulatory headaches as housing developers and drillers compete for air time.

Here in Wyoming, one finds windswept plains and roaming pronghorn. But there’s plenty of action too, as lease prices in Laramie County have risen tenfold in the past 12 months, sources told *Investor*. Due to recent drilling success in the area, leases have sold for as much as \$1,500 per acre in auctions during the past year. In the state lands sale in March, several tracts in Goshen County, township 19N, 64W, went for more than \$1,000 an acre, topping out at \$1,502 per.

Wyoming production rose 20% in 2018 from 2016 levels, the Wyoming State Geological Survey said in a report. Although much of that increase came from the Powder River Basin, some of it came from the northern extension of the D-J Basin, primarily in Laramie County.

Several factors are at work to propel activity. Plays gain steam when a few E&Ps bring in big wells in an overlooked area, or in one that was believed not to be commercial. Or, maybe it’s that geological understanding changes based on new data, or because the new play isn’t as expensive, or doesn’t suffer from take-away or permitting problems seen elsewhere. Next thing you know, leasing activity and costs per acre pick up and a flock of mostly private E&Ps are scouring the landscape for opportunities. Some well results have been quite good, in several cases better than in Colorado—after all, the Codell’s thickness and porosity here are equal to or better than in Colorado, and it thickens even more as one moves through northernmost Laramie County.

All of the above are pushing operators to take another look, especially at the Codell fairway that runs through Laramie County and extends into Goshen. The application of modern horizontal drilling and completions in this established reservoir is only about a year old; however, some of these earliest wells are setting production records for the entire D-J Basin. Some of the wells pay out in less than a year, even if oil is below \$40, sources said.

“As operators expand into more areas of the basin, they will continue to test the hypothesis that where a Codell Sandstone well is drilled is less important than how it is drilled,” said a January 2019 report by the Wyoming State Geological Survey.

Data bases and new analytics help all sorts of players in the Cowboy State. “We have the ability to analyze anyone’s drilling technology and optimized engineering data, even with a small staff. We have 12 employees,” said Michael Rozenfeld, partner with North Silo Resources LLC in Houston. The company, backed by private-equity provider Juniper Capital, is operated by Boomtown Oil Co.

North Silo recently fracked the first of its four extended-reach lateral horizontal Codell wells in Laramie County and at press time was about to receive IP results. (Under a sister company, Longs Peak Resources LLC, it also operates Codell wells in northern Weld County, so it can make comparisons between the two areas.)

Industry players are closely monitoring well performance by two prominent operators who deploy all the latest technology.

In the past several years, industry bellwether EOG Resources Inc. listed its Codell wells in this area as part of its “premium inventory” (locations that can generate a minimum 30% after tax rate of return at \$40 oil and \$2.50 gas), with 88,000 net acres under lease. The company completed 48 Wyoming Codell wells in 2018 and turned to sales 20 of them in the fourth quarter alone. It plans to drill 35 net wells in the Wyoming Codell this year, using two rigs.

EOG’s investor slide deck indicates its Codell wells in this part of Wyoming have an EUR of 560,000 barrels of oil equivalent (boe)



Areas once thought to be mostly water are clearly oil saturated in the Codell, said John Obering, Helm Energy LLC president.



PHOTO BY KENDALL DURHAM, COURTESY BOOMTOWN OIL CO.

after royalty, costing about \$4 million to drill and complete. This kind of performance has attracted plenty of attention—the average initial production over 30 days (IP-30) for these wells was 800 barrels per day (bbl/d) in second-quarter 2019.

But soon, the value of this play will become even more apparent as a few companies seek to monetize their positions. One of the leaders in terms of the best Codell wells yet, New Orleans-based Helis Oil & Gas LLC, is marketing Laramie County holdings, including over 4,000 boe/d and 40,000 net acres, according to industry sources. The company has a track record of proving up assets in unconventional plays, then selling. (For example, in 2012 it sold its Williston Basin Bakken assets to QEP Resources Inc. for \$ 1.4 billion.)

Another longtime private company, Kaiser-Francis Oil Co., recently began marketing its assets in Laramie County, including 50,000 net acres and over 3,000 boe/d. In April in a separate package, it said it would sell 1,378 net nonproducing acres with 300 wells that are producing—and 861 offset wells that are already permitted. (That sale closed but no deal details were made public, according to A&D sources.)

Other operators with activity or permits include Elk Mesa Energy LLC, Samson Exploration LLC, Clear Creek Resources and Ossidiana Operating LLC.

The spark to look again

Several operators cited Helis' well performance as an important impetus to look again at this area of Wyoming. Its Hodges 1-CH well in Laramie County's sections 3 and 10, township 16 N-63 W, IP'd at a rate of 655 bbl/d over 30 days. It was fracked with 60 stages. The EUR

was about 1 MMbbl of oil. The Hodges 6-CH performed equally well. Both wells have produced over 200,000 bbl since coming online in 2017, according to public data.

Better yet, the company's nearby Sandberg 1-CH showed an IP-30 of 1,468 bbl/d and averaged over 1,300 during the first 90 days. That well's EUR is 1.9 MMbbl of oil.

"The geology here is interesting; it's had the industry intrigued for quite a while, but seeing the Helis wells is believing," Rozenfeld said.

The team saw that the geology gets better as you move to the north, and that EOG's designated Tier 1 Codell wells were in Wyoming, not Weld County. The Codell here is about 75% sand and 25% clay, so Rozenfeld calls it "a shaley sand or a hybrid," but with more natural permeability than a true shale. That has resulted in a generally slower decline curve than found in equivalent wells to the south in Colorado, or in other shale plays.

"We saw that this was potentially the next big play as the Codell went north from the Hereford and Silo fields," he said. The porosities in the area are generally 12% to 15%, and the thickness of the Codell's productive interval can exceed 40 feet, providing a large "tank" for hydrocarbons, he added.

"Some of the Helis' wells might be the most economic unconventional wells ever drilled in the Rocky Mountain region, and that's including the best Bakken, Powder River Basin and Colorado D-J wells drilled to date," echoed John Obering, president of Helm Energy LLC. (In partnership with Nebraska's Evertson Cos., the Denver company has acquired more than 150,000 net acres in Kimball and Banner counties just over the state line in western Nebraska, where no horizontal Codell production is present—yet. See sidebar.)

"More importantly, Helis forced a change in the basin mindset, which previously lumped the Codell in as almost another bench of the Niobrara. The Codell is completely separate from the Niobrara," Obering said.

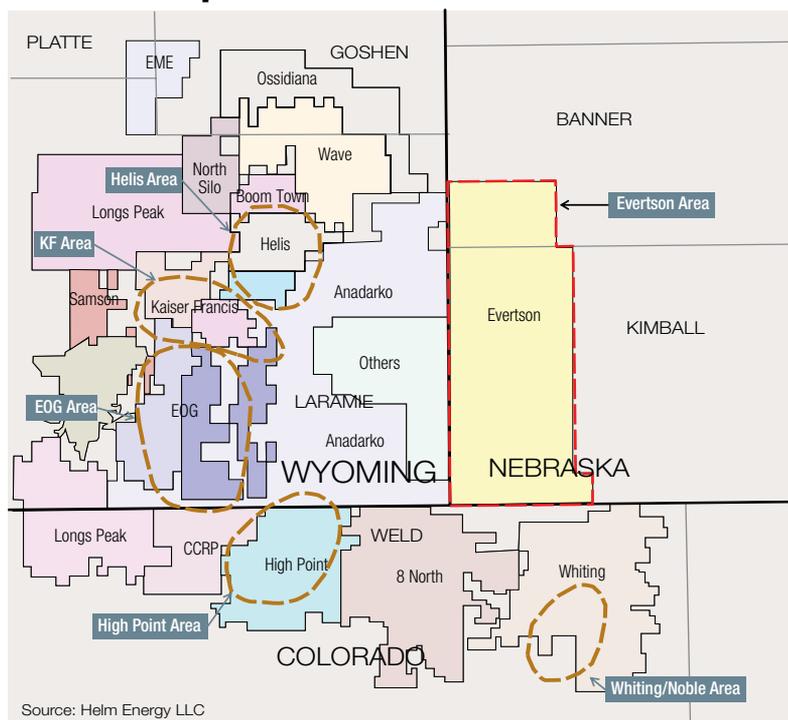
"You talk to all the best technical people in the basin, and they thought the area where Helis was drilling was going to be mostly water, when in fact it is low-resistivity oil pay. Clearly the Codell oil window goes way beyond what we all thought. If Helis had drilled a couple of marginal wells, that wouldn't have changed people's thought process, but Helis has some of the best horizontal wells ever drilled in the D-J Basin, if not in all the Rockies. People said, 'Hey, wait a minute. What's happening?'"

Although the geological picture is coming into focus, there is still ongoing debate in the industry about whether the Codell was sourced from the Niobrara or migrated from the Greenhorn Formation. Some, including the team at Evertson, vote for the Greenhorn, thinking the Greenhorn extends the play northeast.

A two-play area

Another operator with its eyes on the prize is Elk Mesa Energy LLC, currently with about 40,000 net acres, the majority in Goshen County with some in Laramie and Platte counties as well.

Selected D-J Operators' Positions



“This is not a wildcat play,” said Nick Manuel, chief commercial officer for the Yorktown Energy Partners-backed company, which is based in a Denver suburb.

“Chesapeake Energy Corp. and Devon Energy Corp. came through this area some 10 years ago and did a lot of leasing, so there is a lot of technical data available (cores, seismic etc.). There’s a lot more data than people think,” he said.

“But new frack technology is blowing this wide open.”

He said the company’s focus is in the thick of this competitive northern D-J extension, based on a grassroots leasing effort on its part. But it was an idea that president and CEO Bob Gardner had in 2017 from his experience drilling the Codell in Colorado. “A couple deals were being shown around, we worked up the geology and geophysics to identify the sweet spots, and then we started leasing those.”

Gardner has 28 years of Rockies experience, including with a major, Amoco Production Co., and with independents such as Aspect Energy LLC, Barrett Resources Corp., Ute Energy LLC and others. He led the formation of Elk Mesa in second-half 2017. The whole Elk Mesa team has drilled hundreds of Codell and Niobrara wells on the Colorado side of the D-J. Part of that experience was realized at Tekton Energy LLC, which drilled 60 horizontals in Weld County and later was divested to Extraction Oil & Gas Inc. for \$230 million.

The previous round of development in this area of Wyoming had been done with directional drilling and some nascent horizontal stimulation methods, but that was nearly 10 years ago—an eternity given the fast-paced assault of better completion techniques. “Looking back to 2010 and 2011 are valuable data points, but we see a lot that can be improved, based on our experience drilling more than 150 wells in Weld County,” Gardner said. He was drilling vertical Codell wells there as far back as 1998.

“Today we know that the Niobrara is the source rock for the Codell, but the Codell is much better, so it’s the primary target now. The Niobrara will also be good in some areas, so we think this will become a two-play area in the next 12 months. We’re on the cusp of seeing a major increase in development drilling, I’d say.”

Gardner said he looked at the area back in 2014 when fracking was on its second major iteration, but by 2017, he started looking much more seriously and began discussions with private-equity provider Yorktown. At that time, the first Hodges well had been made public after being held tight for a long time; people knew Helis had drilled a good well, but didn’t have any details until late 2017. By that time Elk Mesa was well underway on its leasing program when information on another Hodges well came out. It turned out Helis had drilled six wells almost simultaneously right after its first Hodges well.

Gardner thinks that, based on thermal maturity and petrophysical and geophysical data on the company’s leases, the geology under Elk Mesa’s leases is as good as or better than

NEBRASKA CALLING

In western Nebraska, just over the Wyoming line, where Denver-Julesburg Basin drilling started decades ago, the Evertson Cos. and its Denver partner, Helm Energy LLC, have more than a 150,000 net acre block. No horizontal Codell wells have been drilled there—yet. As a longtime Nebraska Panhandle operator, Evertson knows the area very well.

In August, the partnership started marketing its position from the Greenhorn to the surface, including the Codell and Niobrara zones. “Our goal is to sell the horizontal Codell rights lock, stock and barrel, but we’ll retain rights below the Greenhorn for vertical exploration,” said Helm president John Obering. “Our acreage starts at the Wyoming-Nebraska line—but it’s all the same rock!”

Partner Phil Kriz of Evertson said the partners are strictly vertical players in the D and J sands, and too small to drill \$4 million horizontal wells. Evertson, which was started in 1974 by Bruce Evertson, has no debt and has always drilled out of cash flow. Its vertical dry-hole wells only cost about \$400,000.

The opportunity is that the Codell oil has migrated from the Greenhorn so the areal extent of the Codell is more than experts once believed, and it is a blanket sand, not just a bench of the Niobrara, he explained. “We believe the oil is charged more to the east and north; our mud logs show that. It’s in our home base where we have historically been active and have first-hand knowledge from our vertical drilling.”

Obering called the area a “no man’s land.” First, there is a gap between where EOG has drilled in eastern Wyoming and the Nebraska border. Anadarko Petroleum Corp. has the leases in this area and has filed thousands of drilling permits to hold them, but it is not drilling. Its famed Union Pacific strip of checkerboard royalty acreage goes right through here. “That will probably take a couple years to sort out since Oxy [Occidental Petroleum] has bought Anadarko,” he said.

Second, “Luckily, we think Nebraska is the single best state in the U.S. in which to conduct oil and gas business due to its positive regulatory environment, and it hasn’t been exploited horizontally like the Colorado D-J. It’s kind of weird—it’s not exactly the Rockies and not really the Midcontinent either, so people tend to not pay attention to it. But Nebraska had tremendous activity in the 1950s, ‘60s and ‘70s. In Kimball County alone, almost 189 MMbbl have been produced.”

that under EOG’s position in Laramie County, which is south of the Hodges wells.

‘Moving on up, to the north side’

“Folks who might have decided to duke it out in Weld County before have now decided to come up here. It’s already a tough enough business. It’s no surprise that an anti-industry environment has pushed some people to redirect their attention away from Colorado to Wyoming’s side of the D-J,” said Manuel. “As more well results come out, you’re going to see strong results that will attract a lot more people.”

Denver’s Ossidiana Operating has staked 13 horizontal wildcats to the Codell-Niobrara in Goshen County, Wyo. The High Noon lease is in section 17-20n-64w. These wells will go to about 8,000 feet vertically and then out about 10,000 feet.

And it has proposed a joint-interest, 2-mile lateral after recently drilling a vertical well to take core, Gardner said. North Silo also has proposed to drill two vertical tests to take core. Gardner said he thinks that over the next 12 months, as many as a half dozen more wells with 2-mile laterals will be drilled to the Codell and the pace will pick up from there as well results come in.

The thorny regulatory environment that is bedeviling the Colorado D-J has indeed

prompted many E&Ps, in addition to Elk Mesa, to travel to townships north and east of Cheyenne. Numerous operators have been acquiring acreage in Laramie, Goshen and Platte counties.

With about 10 years of hindsight, these companies believe they can bring new frack techniques to this new theatre of operations. Midstream infrastructure is starting to get built out also, with much of the infrastructure that originates in the Bakken running through here.

“Several midstream entities are out there looking—they’ve seen what we see and it’s not like we have to drill 20 more wells to get their attention.”

What’s next for Elk Mesa, which is nearing the end of its leasing campaign, but has no production here yet? Gardner said the company has applied for more than 300 well permits already and has another 300 planned after that, with a vertical strat test in this year’s fourth quarter, and the first horizontal wells next spring. The company has been analyzing 93 square miles of 3-D seismic as part of its well planning.

“We think the science says four Codell and four Niobrara wells can be drilled per 1,280-acre spacing unit. We know some of our competitors have applied for greater well density than that but no one has tried it yet in our immediate project area,” Gardner said.

Favorable geology

It turns out that the geology here is quite favorable, with better porosity. There is less natural gas and fewer NGL than in Weld County’s Codell wells. There is a more hospitable political climate. Good infrastructure. Compelling well economics.

“Two years ago, everyone thought the area north and east of Silo Field was 100% water and the play would be limited to the areas where the Codell was only 10 or 20 feet thick along the Wyoming-Colorado border,” said Helm’s Obering.

“Helis has proved that low resistivity Codell can be prolific. Areas once thought to contain

100% water or to be outside the Niobrara maturity window can clearly be oil saturated in the Codell. Because the Codell thickens dramatically as you move north and updip to the east, the size of the tank is much larger as you move towards the northeast,” Obering explained.

Boomtown’s hopes

Houston-based North Silo Resources is focused on this area as well. The state has granted the company 175 permits to the Niobrara-Codell in the county: it’s applied for over 550. Most will be 2-mile laterals drilled with a north-south orientation.

Hopes are high, bolstered by the good geology as evidenced by some excellent wells drilled in offset locations by Helis, EOG and others, including the former Anadarko Petroleum Corp. (now those leases come under the purview of new owner Occidental Petroleum).

“To date, the very best wells in the entire D-J Basin have been drilled here,” said Boomtown partner Rozenfeld, who also cited the Hodges wells as an important marker.

The Codell Formation is anywhere from 20 to 40 feet thick here, or up to twice as thick as the Codell that is so actively drilled in Weld County. Also, there is more storage capacity with equivalent or better porosity, he said. “We call it the bigger, better Codell,” Rozenfeld said.

That aspect has led to a backlog of more than 25,000 applications for permits to drill. Wyoming law gives drilling authority to the first company to get a permit in a section so even companies not ready to drill yet apply to secure a permit before other firms do so. In May 2019, the Wyoming Mineral and Surface Owners Association was formed to educate and motivate mineral owners, given the permitting war going on east of Cheyenne. Meanwhile, the state is trying to address the backlog.

“Wyoming is a big deal,” summed up Elk Mesa’s Manuel. “Everyone recognizes the operator-friendly environment and prospectivity, which is driving a frantic amount of permitting activity.” □



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THE DILEMMA OF DIFFS

Differentials between basins are subject to wide swings as new pipeline capacity comes online.

ARTICLE BY
CHRIS SHEEHAN, CFA



“The Permian is an oil basin,” said Rob McBride, senior director, market intelligence at Enverus. “If you’re still making money on your oil, you will pay someone to come in and take your gas from you. You can continue at really big differentials on gas.”

They say that “timing is everything,” and certainly that can be the case with the differentials, or “diffs,” prevailing between basins. Producers obviously want to capture higher realized prices when they can. But adding pipeline capacity may at times have the effect of eroding the price advantage that was initially sought, ending up in a “Catch 22” situation.

That said, who doesn’t want a sophisticated network of interlocking pipelines that can efficiently carry crude, natural gas and NGL to market?

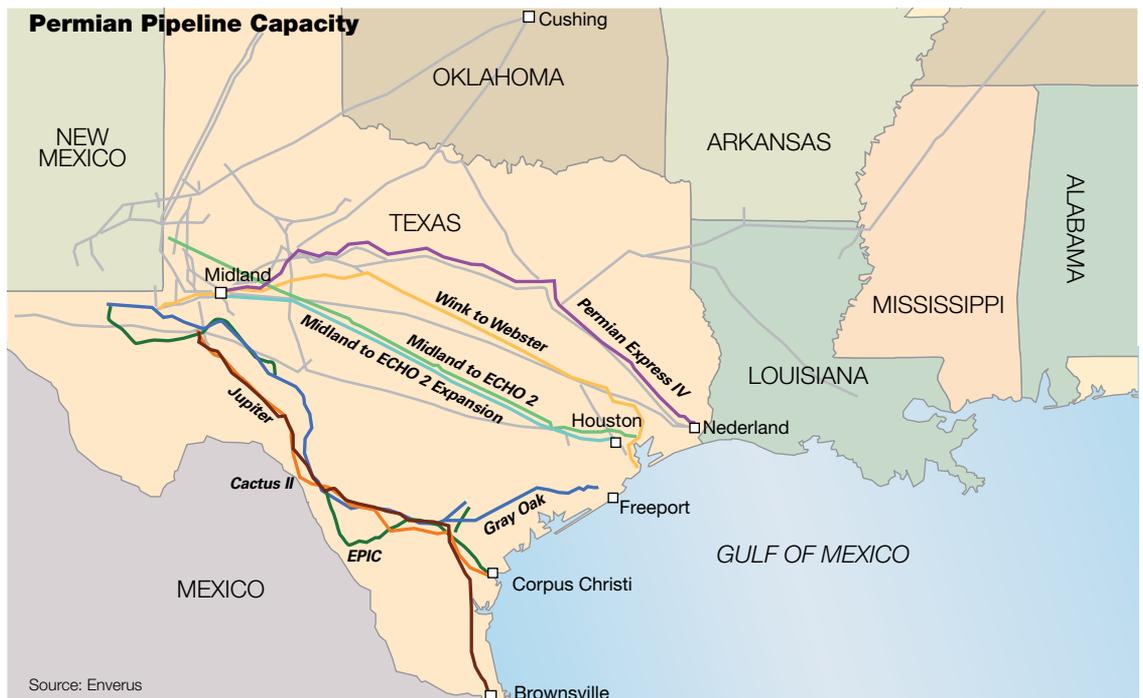
In the case of natural gas, where price variations are termed “basis,” one producer recently suffered a price swing of about \$1.95 per thousand cubic feet (Mcf) for its natural gas produced in the Permian Basin. The producer’s average realized price in the Permian fell to a negative price of roughly 45 cents/Mcf in the second quarter, down from just under \$1.50/Mcf in the year earlier period.

Rob McBride, senior director, market intelligence, at Enverus pointed to several instances in which unexpected outcomes have followed plans to alleviate basis blowouts on the natural gas side. In each case, the plans seemed sound at inception—and may have been if conditions had remained unchanged—but ran afoul of changing market dynamics and/or truly unanticipated events.

The Rockies Express Pipeline, or REX Pipeline, was designed to improve Rockies gas prices by selling to the Northeast—until the vast reserves of gas from the Marcellus Shale emerged, he noted. And, with a growing glut of gas in Pennsylvania, traditional long-haul pipelines serving Northeast markets from the Gulf Coast ended up being reversed to carry gas to Gulf Coast and, in time, overseas LNG markets.

A third iteration

Today, in terms of gas produced in the Permian Basin, “we’re on at least the third similar it-



Pipeline capacity out of the Permian Basin will increase by just under 2.1 MMBbl/d in 2019.



"You can think about the differential between market hubs as being the implied free market value of pipeline space," said Jesse Mercer, senior director of crude market analytics at Enverus. "They'll move incremental barrels at somewhere close to what their marginal cost to ship is."

eration of where this story has played out in the gas market," according to McBride. However, there is a critical difference to account for the recent "explosion of gas that can't get out of the basin." This time, he noted, the underlying market fundamentals are essentially driven by crude oil, not natural gas.

"What distinguishes the Permian from the Rockies and Marcellus is that the latter are both natural gas basins. And when the basis got really bad, there was a pain point at which producers would say, 'I can't take it anymore. I've hit that breakeven price, these prices are too low, I have to stop.' They'd endure it for a day, and then they'd start to shut in their wells," he said.

"But the Permian is an oil basin," he continued. "For a gas producer, gas is its key product. For an oil producer, gas is a nuisance; the gas is a cost to the oil producer. But if you're still making money on your oil, you will pay someone to come in and take your gas from you. You can continue at really big differentials on gas. You can continue at seriously negative outright pricing."

On some days, the Waha price in the Permian fell to more than \$9/Mcf off Henry Hub, recalled McBride.

For Permian gas, McBride is far from optimistic about a near-term price rebound.

Gas is just 'collateral damage'

"It's a disaster, pricing-wise, right now," he said in mid-July. "It was anticipated, and the conditions will likely continue through the balance of the year. And, depending on how much drilling takes place there, it may persist for another year. Oil is the real story in the Permian; gas is just collateral damage."

However, there are two pipeline projects underway with enough capacity that they may be able to relieve conditions to some extent, said McBride. These are the Gulf Coast Express, due to come online this month, and the Permian Highway Pipeline, expected to be in service in late 2020, subject to regulatory approval. Each has capacity of 2 billion cubic feet per day (Bcf/d).

The Gulf Coast Express, sponsored by Kinder Morgan, is designed to transport gas from the Permian to Agua Dulce. The Permian Highway Pipeline, backed by Kinder Morgan and Eagle-Claw Midstream Ventures with each holding 40%, is being built to serve "growing market areas along the Texas Gulf Coast," as well as markets in Mexico.

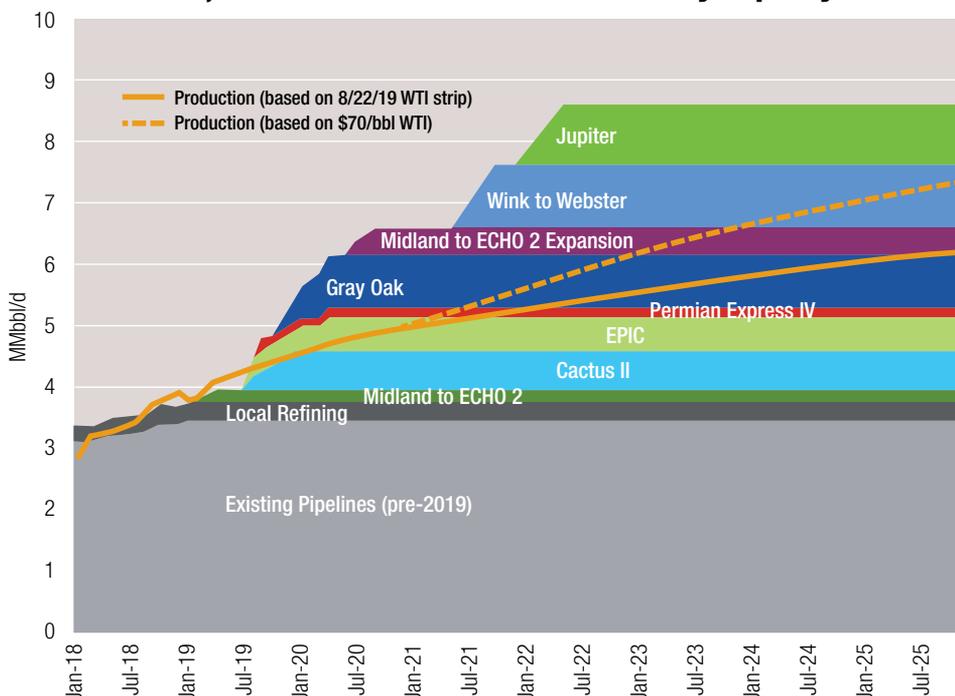
"There is spare capacity to deliver into Mexico, but they aren't taking it right now, because there is not enough demand in Mexico for infrastructure projects currently," commented McBride.

If the overall impact of these various take-away projects is considered, "the gas story in the Permian does resolve itself over time," he said. "We're expecting some relief by the end of 2019. But if production continues to grow, I expect the whole of 2020 will see depressed prices there. On average, the gas price could easily be close to zero."

One of the key questions on Permian differentials, according to McBride, relates to operators' threshold to pain: "How well are you doing on your oil operations that you'll continue to take the pain on gas? To keep producing oil, how much are you willing to pay to have someone take gas away? Everyone is going to have a different pain point as gas disposal costs keep rising on them."

On the crude side in the Permian, you don't have to look back far to find a tumultuous period for differentials. Only last year, with pipelines in the Permian running at capacity, differentials in the basin blew out to over \$17 per barrel (bbl) below benchmark West Texas Intermediate (WTI) at Cushing, which in turn traded at \$6/bbl below Brent, recalled Jesse Mercer, senior director of crude market analytics at Enverus.

Permian Crude, Condensate Production Vs. Takeaway Capacity



Source: Enverus

As long-haul takeaway capacity is added in the coming months, Midland differentials are likely to gain support (i.e., narrow), according to Enverus.

Pipeline deficit to surplus

"We go through these cycles of pipeline deficit to pipeline surplus," observed Mercer. "The pipelines running at capacity in the Permian have spurred a wave of new investment in pipeline projects, many of them starting up now, in the second half of this year. More often than not, when that happens, there's an overbuild and not enough supply to fully meet all the shipper commitments."

With new pipeline capacity coming online "over a relatively

short period of time, from August of this year through the first half of 2021,” said Mercer, “that’s the situation that we’re looking at right now. You have all these pipeline shippers who have made commitments, usually up to 90% of new capacity, but potentially don’t have enough crude to meet those pipeline commitments.”

Much of the new wave of pipeline capacity is headed to Corpus Christi, Texas, and nearby areas as its primary destination. One such project is Cactus II, due to add 670,000 bbl/d of capacity in two stages, starting in the fourth quarter of this year and the first quarter of 2020. Backers are Plains All American Pipeline LP, Occidental Petroleum Corp. and physical commodity trader Trafigura.

Other projects include EPIC NGL, backed by Ares. With a capacity of 400,000 bbl/d, due to come online in the third quarter, the line is carrying crude for an initial period pending completion of a parallel crude line. As its name suggests, it will then carry NGL. Meanwhile, Gray Oak is scheduled to be in service by the end of this year with capacity of 900,000 bbl/d. Its principal sponsor is Phillips 66 Partners, which will operate the pipe.

Also notable is the mega Wink to Webster Pipeline, which is due to come online in the first half of 2021. Capacity is expected to be at least 1 MMbbl/d. Initial backers of the project include ExxonMobil Corp. and Plains All American Pipeline, who were recently joined by MPLX LP, Delek US Holdings Inc. and Rattler Midstream. The pipeline plans to serve the Houston area, including Webster and Baytown.

“What you have is a supply/demand imbalance—now you have too much pipeline,” commented Mercer. “The supply of pipeline space is greater than the demand for pipeline space. And just like in every other commodity market, under those circumstances we have a situation in which the price of pipeline space comes down, because you can effectively sell it, you can trade it.”

Try to mitigate sunk cost

In a market that is clearly oversupplied, terms to acquire pipeline space can quickly fall to far below a posted tariff—viewed as a “sunk cost” at that point—as shippers try to mitigate their losses, said Mercer.

“You can think about the differential between market hubs as being the implied free market value of pipeline space,” he said. “Shippers can’t monetize whatever unused space they have, so they’ll move incremental barrels at somewhere close to what their marginal cost to ship is. And that is not the initial tariff; it’s a handful of smaller items, including the ‘pipeline loss allowance.’”

The pipeline loss allowance is usually on the order of 20 cents to 30 cents/bbl at current crude

Midland-Cushing Differential, Individual Contract Tenors



Source: AEGIS Energy Risk LLC

The September 2019 Midland-Cushing differential widened sharply last year, later narrowing as new pipeline projects advanced.

prices. This very modest amount makes it easy for non-shipper third parties to take advantage of any spare capacity, provided the shipper—trying to mitigate its ‘sunk cost’ losses—can make enough margin to cover the pipeline loss allowance by buying the crude and then selling it back to third parties at its destination.

“That’s how you get to ‘convergence’ between market hubs,” explained Mercer. “If there is too much pipeline space, the economics quickly move to the marginal cost to ship. As long-haul takeaway capacity is added in the coming months, Midland differentials are likely to gain support [i.e., narrow],” he said. “And in a prolonged \$50 to \$55/bbl flat price environment, in-basin supply may not be enough for all committed shippers to fulfill their commitments. This is a recipe for tight differentials.”

Of course, the reverse imbalance can also exist, although the Permian Basin is not such a case today.

“When you have a different situation, in which you don’t have enough pipeline space, that space becomes very valuable. And it can be ‘sold’ by buying crude from a third party and selling it back to them at a much higher price at its destination,” said Mercer.

Full price difference

The initial Keystone Pipeline, for example, had anchor shippers that had 10-year take-or-pay contracts, he noted. “You would have done great over the past 10 years until production curtailments started in January of this year,” he explained. “Committed shippers captured the full price difference between Hardisty and Cushing.”

Matt Marshall is director, market analytics, with AEGIS Energy Risk LLC, headquartered in Houston. The company deals with some 150 upstream entities, spanning a variety of sizes and strategies. It has trading relationships with roughly 40 counterparties, mainly banks and a number of merchant traders, in-



“One of the things we recently flagged was that the middle part of 2020 was at risk of becoming much worse,” said Matt Marshall, director of market analytics with AEGIS Energy Risk. “There’s a lot of flared gas in West Texas that, once it has a pipeline to carry it, will probably be collected rather than flared.”

cluding subsidiaries of BP Plc, Royal Dutch Shell Plc and Cargill.

Marshall describes diffs, or basis, as a recurring issue, reflecting the fact that U.S. producers can respond to market signals much faster than a pipeline connecting markets can be built. Dealing with regulatory issues, filing for rights of way, ordering steel for the pipe, embarking on a marketing process, etc., all add up to “a much more complicated process” than building a pad and drilling wells.

“Rigs can typically be deployed within three months of a price signal. And production can either reverse a decline, or start to grow at a faster rate, some six to nine months after that price signal,” he observed. “The cycle time is much shorter than for a pipeline, which may take several years. And that leads to situations where there’s more supply than was expected.”

AEGIS works with clients to position them advantageously, if possible, ahead of such market imbalances.

“We help clients not just hedge their benchmark risk at Henry Hub, for example, but also help them to manage their locational risk in terms of basis,” said Marshall. As an example, he pointed to the gas basis blowout at the Waha Hub in West Texas last year.

“A lot of the weakness started happening in late 2017 and into early 2018, as more gas from Appalachia started to flow westward toward the Chicago market and beyond into the Gulf Coast market,” he recalled. “So there was just a lot more supply going into the Midwest in what had traditionally been a fairly large demand market.”

“It’s old news now. Producers are past that,” acknowledged Marshall. “But we issued early warnings about Midcontinent basis and about West Texas basis there at the end of 2017 and during 2018. And, of course, Waha ended up being a whole lot worse than the Midcontinent because gas production growth was really, really strong in West Texas.”

Waha forward curve improves

In term of hedging basis at Waha, the forward curve for West Texas basis at Waha currently “improves rapidly as you go into October and November of this year due to the Gulf Coast Express Pipeline coming into service early in the fourth quarter,” said Marshall. As you get into winter, the Waha forward price narrows considerably to a discount of near 60 cents off Henry Hub, he noted.

However, basis remains “elevated” for the summer of 2020, at about \$1.30 off Henry Hub. As more pipeline capacity brings relief, the outlook and forward prices improve again in the winter of 2020 and 2021, according to Marshall.

“One of the things we recently flagged was that the middle part of 2020 was at risk of becoming much worse,” he said. “We know there’s a lot of flared gas in West Texas that, once it has a pipeline to carry it, will probably be collect-

ed rather than flared. We’ve observed in other basins, such as Appalachia, that when a pipeline comes online, there’s production waiting to make use of the new capacity.”

In addition, volatility in the daily, or cash, market in West Texas may be due to competing wind power.

“There’s quite a bit of wind power in West Texas that can affect the daily, or cash, market,” Marshall said. “If the wind is blowing, that wind will displace some of the demand for natural gas-fired power generation. And, therefore, on some days you’ll have dramatically less local demand to be able to absorb some of the gas.”

However, hedging in the forward market tends to offer a greater degree of stability. “When you look into the forward months, what you’re doing there is calculating what you would expect to be an average of all 30 or 31 days in the month, and so there is less volatility and there are fewer of those really heavily discounted prices.”

As the winter of 2020 and 2021 approaches, the forward curve “improves rapidly,” observed Marshall. “Once you get past October of 2020, when the Permian Highway Pipeline by Kinder Morgan is due to be in service, Waha basis tightens up very strongly to close to a 65-cent discount to Henry Hub,” he said.

Of course, much of the West Texas gas projected to come online is headed to markets on the Gulf Coast. How will it change markets and basis, including these trends in the Haynesville?

Haynesville: Does demand measure up?

“Haynesville basis isn’t going to be too much affected by West Texas gas flowing toward the Gulf Coast,” offered Marshall. “The reason is because the pipelines that connect the Haynesville to Henry Hub are north of Henry Hub, whereas the pipes that are affected by West Texas gas are to the west of Henry Hub. So, figuratively, they are on opposite sides of the fence.”

Instead, he continued, West Texas gas will become part of “a pool along the Texas Gulf Coast. And that pool will be dished out to whichever demand pays the highest price for it. It’s not like those molecules are earmarked for a specific location.”

However, the timing of the new gas supply—and even more so the timing of demand—will be critical.

“Is demand going to grow at the same rate as the new supply that will be flowing in from West Texas? That’s a legitimate question,” said Marshall. “It’s very possible that it will be mistimed such that the gas from West Texas arrives not at the same time as the demand. Depending on which one happens first, and in greater volumes, it could cause some increases in some basis values or decreases in basis values.”

“What we’re saying to our clients is that, if you have exposure to South Texas basis, you should look to protect yourself because there’s more downside risk if the supply comes faster than the demand,” he advised. “The upside is not as pronounced. Forward curves already reflect some of that risk.” □



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MIDSTREAM BRUISED BUT BIG POTENTIAL

Cheap metrics and simpler structures mean midstream names offer attractive total returns.

ARTICLE BY
CHRIS SHEEHAN, CFA

The recent stock market disdain for seemingly all things energy has left midstream securities less scarred than their E&P cousins, but, nonetheless, badly bruised. However, what's gone largely unnoticed in the recent angst over global recessionary fears are some of the very positive changes undertaken by the sector to make midstream players more attractive to investors, including those looking for yield.

Confusing corporate structures and incentives that did little to align the interests of managements and investors, such as incentive distribution rights, have gone out the door. Instead, midstream strategies aim to be self-funding, with reduced capex and little or no equity issuance and management incentives based on returns rather than growth, said Pearce Hammond, senior research analyst with Simmons Energy.

The result has been that, "overall, the midstream companies have better distribution coverage, lower leverage and less reliance on equity markets than they did a few years ago," he observed.

In addition, in the event that construction of new energy infrastructure faces ongoing obstacles, due to "keep it in the ground" opposition, those midstream companies that already have large established infrastructure should see their assets grow in value, said Hammond. Recreating large legacy assets positions would be "very difficult" given what are "essentially closed" capital markets, he added.

For those looking for income, there is a yawning gap between yields offered by the midstream sector and competing sectors, notably real estate investment trusts (REIT) and utilities, Hammond pointed out. For example, the midstream MLP group offers yields averaging 7.8% as compared to 3.9% and 3.1%, for REITs and utilities on average.

Midstream metrics

Moreover, midstream sector participants tend to trade at lower valuations and carry less leverage than REITs and utilities. The midstream sector trades at an enterprise val-

ue-to-EBITDA (EV-to-EBITDA) of 10.4 times, on average, with debt-to-EBITDA of 4.1 times. This compares to EV-to-EBITDA valuations of 19 times and 12.4 times for REITs and utilities, respectively, with debt-to-EBITDA of 6 times and 5.6 times.

If investors "dispassionately examined the quality and consistency of midstream cash flows," without focusing on cash flows coming from the energy sector, "investors might be willing to pay up for the higher yields," offered Hammond. Over time, the discounted valuations, return of cash to investors and attractive risk-reward proposition should help drive interest in the sector, he said.

Against an energy tape that has been less than friendly—to say the least—Hammond pointed to three midstream names he believed would run ahead of the pack and make money for investors.

At the top of his list is Enterprise Products Partners LP, followed by Plains All American Pipeline LP and Energy Transfer LP. If the first two recommended stocks hit their target prices, they would both offer over 30% returns, before dividends. The third, Energy Transfer, has been trading cheap to its peers on valuation and, with a rerating, would offer upside of well over 50% if it reached its target.

All three recommendations by Hammond have continued to operate as MLPs rather than switch to become C corps, as, for example, Kinder Morgan Inc. and several others have elected to do.

Hammond has a target price for Enterprise Products Partners of \$37 per share. This compares to a price of \$27.92 per share when he initiated coverage of the midstream sector. Hammond is quick to emphasize that Enterprise is his top recommendation.

Wellhead to water

"I really think it's the top company I cover," he said. "Enterprise has a very advantageous position. They have a great set of assets. They touch the molecules from wellhead to water. They're a first mover on this VLCC offshore terminal to be built off Freeport. There's a real



"Overall, the midstream companies have better distribution coverage, lower leverage and less reliance on equity markets than they did a few years ago," observed Pearce Hammond, senior research analyst with Simmons Energy.

“We like the toll road approach whereby a midstream company collects a fee at each stage of the process of its operations.”

—Pearce Hammond,
Simmons Energy

advantage if they can be the first, because there are a number of proposals, and they won’t all get built. The trick is to get there first.”

The series of assets built by Enterprise exemplifies a “classic toll road mentality,” observed Hammond. “We like the toll road approach whereby a midstream company collects a fee at each stage of the process” of its operations, he continued. “Enterprise can essentially offer a solution from wellhead to the water. The end-to-end solution is critical in maximizing producer netbacks.”

As an example, Hammond pointed to the ability of Enterprise to collect fees at each of these steps: gathering the gas; processing the gas; transporting the NGL Y-grade stream to Mont Belvieu; fractionating Y-grade into purity products; and storing the purity product. If export markets are involved, fees can then also be collected for transporting to a dock and shipping overseas.

Leader in exports

Enterprise is a leader in the export market, holding “the No. 1 position in oil and No. 1 in liquefied petroleum gas [LPG] exports,” according to Hammond. The company is estimated to handle through its terminals about half of all LPG exported from the U.S. Compared to the earlier stages in midstream operations, it “wants to play where there is less competition,” he commented.

The Sea Port Oil Terminal, called SPOT, is one such project likely to enjoy an advantage due to few competing offshore terminals. The facility is designed to load one very large crude carrier per day. Plans call for constructing a 50-mile pipeline from the company’s ECHO storage facility south of Houston to Freeport,

with two 36-inch diameter lines then extending offshore to the SPOT terminal.

“You’ll probably get better rates [from SPOT], because there’s likely less competition,” said Hammond.

The company already has existing export capacity amounting to about 5 million barrels per day (MMbbl/d). This breaks down to about 1.4 MMbbl/d for crude exports and 3.3 MMbbl/d for crude or LPG, with the balance used for ethane. It has 18 deepwater docks spread between the Houston Ship Channel, Beaumont, Freeport/Texas City and Morgan’s Point.

Enterprise has a record of 10 consecutive years of distribution growth. Distribution coverage is a solid 1.7 times, as of the first quarter, with a 6% distribution yield and projected growth in the distribution of 2.3% this year. The free-cash-flow yield is estimated at 4.3% in 2019 and 5.2% in 2020, according to Hammond, while return on invested capital is estimated at 15% this year.

‘Superb’ management team

The Enterprise management team is described by Hammond as “superb.” The chairman of the board is a member of the Duncan family, which collectively owns roughly 30% of the units. The \$37 target price is based on a “premium” multiple of 13 times 2020 EBITDA, which Hammond said is justified by “the quality of Enterprise’s business and management.”

Hammond has a target price for Plains All Ameri-

MLPs Vs. Other Sectors

Sector	Yield (%)	Valuation (EV-to-EBITDA)	Leverage (Debt-to-EBITDA)
Midstream MLPs	7.80%	10.4x	4.1x
REITs	3.90%	19.0x	6.0x
Utilities	3.10%	12.4x	5.6x

Source: Bloomberg, as of 07-16-2019; REITs from MSCI REIT Index, Utilities from DJ Utility Index



“The current valuation for Energy Transfer does not adequately reflect the fact that it has eliminated its incentive distribution rights that benefited the general partner,” said Ethan Bellamy, senior research analyst with Baird. “The stock looks like it is still being valued with a Kelcy discount.”

can LP of \$30 per share, which is based on a 12 times multiple of 2020 EBITDA. Plains is well-positioned in the Permian Basin, which is “the primary growth engine for U.S. hydrocarbons,” noted Hammond. Not surprisingly, Plains is a sponsor of several key Permian projects, including the Cactus II and Wink-to-Webster pipelines.

As of its second-quarter results, Plains indicated Cactus II was mechanically complete from Wink to Ingleside, with partial service that was due to begin in mid-August and full service in the first quarter of 2020. The Wink-to-Webster project is targeting an in-service date of early 2021. Capacity is put at 1 to 1.5 MMbbl/d. Other sponsors are ExxonMobil Corp., MPLX LP, Delek US Holdings and Rattler Midstream LP.

Plains provides access to multiple end markets for its customers, including St. James, La., and Nederland, Houston and Corpus Christi in Texas. As an example, the Cactus II pipeline is designed to connect to docks in Corpus Christi used by Buckeye Partners LP and physical commodity trader Trafigura, as well as NuStar Energy LP. The Wink-to-Webster project will be able to connect to docks in Beaumont.

Positives on the financial side are that Plains has eliminated incentive distribution rights, is generally self-funding and is targeting lower leverage. Plains is aiming at long-term distribution coverage in a range between 130% and 190%. It expects to exit 2019 with distribution coverage of more than 190%. Plains is targeting distribution growth of 5% per annum.

‘Compelling upside’

Energy Transfer LP has tended to trade at a lower multiple than its peers, providing investors with an opportunity to buy a midstream security that is “deeply undervalued with compelling upside,” according to Hammond. Plains has recently been trading at a multiple of 8.8 times EV-to-EBITDA, based on 2020 metrics, vs. an average 10.4 times multiple for its large-cap peers.

Hammond’s target price of \$23 per share is based on 10.5 times multiple applied to 2020 EBITDA, essentially rerating the stock in line with its peers. Factors that may have held back Energy Transfer to date include somewhat higher leverage, although debt-to-EBITDA has come down to 4.4 times from 6.1 times at

2017 year-end, said Hammond. The company also has greater exposure to natural gas in the Marcellus, he added.

However, Energy Transfer’s assets do not differ that much from Enterprise in terms of quality, according to Hammond, and the distribution yield of over 8% is “extremely attractive.” Long-term distribution coverage is solid at 1.7 to 1.9 times and exceeded 2 times in the first quarter. Hammond projects a free-cash-flow yield of 5.2% for 2019 and 4.9% in 2020.

Energy Transfer also earns an outperform rating from Baird’s senior research analyst, Ethan Bellamy. Bellamy’s target price for the stock is \$21 per share, which is calculated using four components. These are an EV-to-EBITDA multiple; a price-to-discretionary cash-flow multiple; a dividend discount model; and the yield spread-to-U.S. Treasuries.

“Energy Transfer is a massive, diversified logistics conglomerate,” said Bellamy. “Historically, it has been one of the most active—if not the most active—in midstream M&A. Its CEO, Kelcy Warren, has built an empire. It’s highly diversified, and its stock is very cheap. And it’s cheap because of a legacy of prioritizing the general partner first and the limited partner second.”

The reference to a legacy practice of prioritizing the general partner relates to an industry trend—now largely dropped—involving incentive distributions rights. These rewarded the general partner largely on the basis of growth in units outstanding, rather than returns flowing to unit holders, and have been eliminated by Energy Transfer and many other midstream MLPs.

Now pari passu

According to Bellamy, “the current valuation for Energy Transfer does not adequately reflect the fact that it has eliminated its incentive distribution rights that benefited the general partner. As a result, Kelcy Warren is now pari passu with the limited partners for the first time. But the stock looks like it is still being valued with a Kelcy discount. I think that that’s no longer valid.”

While Energy Transfer “is almost universally viewed as being cheap in midstream circles, one of the challenges it faces is that it will need new money to move it higher,” said Bellamy. “Most key investors in infrastructure already have a full position. But that can be solved, in my view, if they execute on their plan and are rewarded for their performance.”

Analysts’ Recommended Midstream Stock Picks

Analyst	Stock	Ticker	Price	Target
Pearce Hammond, CFA Simmons Energy	Enterprise Products Partners LP	NYSE: EPD	\$28.95*	\$37.00
	Plains All American Pipeline LP	NYSE: PAA	\$21.92*	\$30.00
	Energy Transfer LP	NYSE: ET	\$13.74*	\$23.00
Ethan Bellamy Baird	Energy Transfer LP	NYSE: ET	\$13.02**	\$21.00
	Tellurian Inc.	NASDAQ: TELL	\$6.70**	\$16.00

*At closing, Aug. 19, 2019. **At closing, Aug. 27, 2019.
Source: Oil and Gas Investor

“Overall, I’m very positive on the stock,” he continued. “In 2020, we have Energy Transfer generating free cash flow after distributions, which is a fairly compelling milestone and ought to screen well versus competitors. They’re on track to de-lever, produce more free cash flow and reap the benefits of all the capex they’ve spent. Now they’re in a good position to capture all the volume growth.”

Whether the market will recognize Energy Transfer’s good metrics and “relatively cheap” multiple in 2019 is “tough to say,” commented Bellamy. “But between now and 2020, the data will clearly show fundamental improvement. Determining when the market will respond to that is always difficult. But the performance should be self-evident.”

In terms of valuation, Bellamy said Energy Transfer trades at a multiple of EV-to-EBITDA of roughly 8.5 times, based on 2020 estimates. This is cheap compared to Williams Companies Inc., at 10.2 times; Kinder Morgan Inc., at 10.4 times; and ONEOK Inc., at 12.2 times. Leverage stands at about 4.4 times trailing EBITDA for Energy Transfer, compared to an average of 4.6 times for the sector as a whole, he noted.

Due to the “bad taste” of the earlier era, when incentive distribution rights encouraged acquisitions, “there may be some folks who still refuse to own Energy Transfer stock,” commented Bellamy. “But, over time, I believe the value proposition will ultimately win out.”

For those investors comfortable investing in a sometimes volatile small-cap name, Bellamy pointed to Tellurian Inc. Tellurian is developing an LNG production and export terminal, called Driftwood LNG, in south Lake Charles, La. The Tellurian management team, led by Charif Souki and Martin Houston, formerly worked at Cheniere Energy Inc.

Telluride’s ‘partner model’

Using experience gained at Cheniere, the Tellurian management has developed a “partner model” in response to LNG customer requests. The customers provide upfront capital for the construction of the terminal and associated pipelines. In exchange, customers have offtake agreements which give them

“In theory, if you have a stake in Driftwood, you should always have the lowest cost gas going forward.”

—Ethan Bellamy, Baird

a pro-rata stake in the LNG cargoes, which they will “effectively get at cost,” said Bellamy.

“In theory, if you have a stake in Driftwood, you should always have the lowest cost gas going forward,” according to Bellamy.

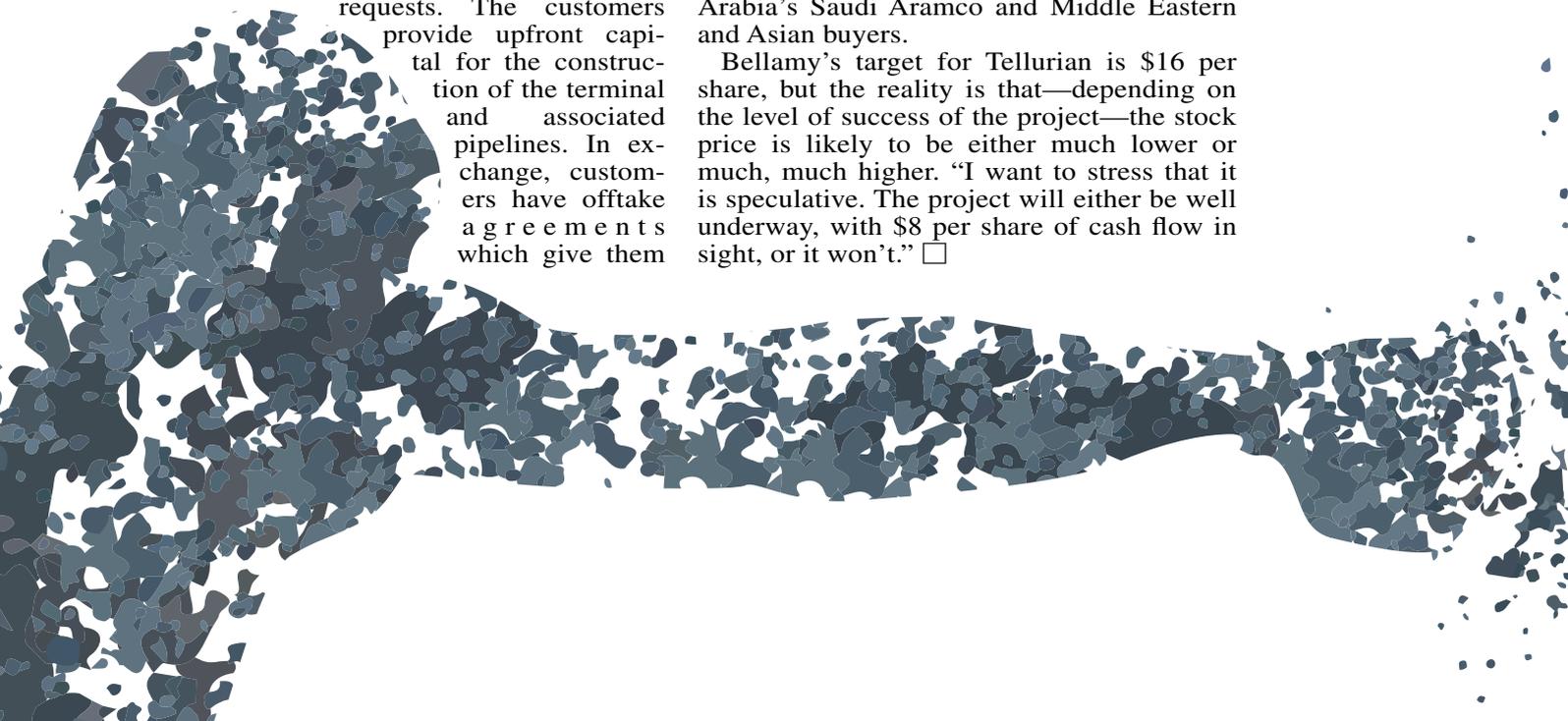
Tellurian took a step toward taking a final investment decision (FID) on the Driftwood LNG project when it finalized an agreement with French integrated producer Total SA to buy 1 million tonnes of LNG and to invest \$500 million in Driftwood Holdings LP. The two parties also entered into a sales and purchase agreement covering an additional 1.5 million tonnes from Tellurian’s offtake volumes.

Bechtel, the engineering and construction company in charge of the project under a turn-key contract, has an equity stake in the project in lieu of some of their fees, noted Bellamy. “That demonstrates their commitment to the project,” he observed.

“We’re very positive on Tellurian because of the management team and their track record of execution and expertise, the commitment to the project made by Total, and the relationship with Bechtel,” said Bellamy. “All of which has led to a model agreement that Total has approved, which will allow other potential buyers to take a stake in the project.”

Bellamy projected a FID may take place late this year or, more likely, in the first half of 2020. This assumes a half-dozen or so additional LNG customers come into the project under the “partner model.” Possible new partners to participate in the project include Petronet LNG, based in India, Saudi Arabia’s Saudi Aramco and Middle Eastern and Asian buyers.

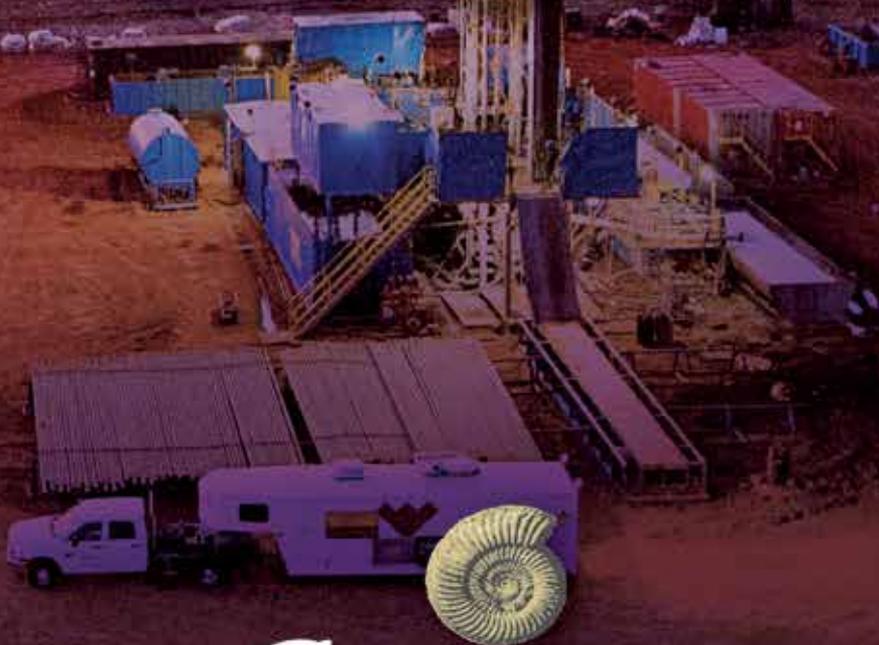
Bellamy’s target for Tellurian is \$16 per share, but the reality is that—depending on the level of success of the project—the stock price is likely to be either much lower or much, much higher. “I want to stress that it is speculative. The project will either be well underway, with \$8 per share of cash flow in sight, or it won’t.” □



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GLOBAL OIL SUPPLY SEEMS BULLISH

Shale has relegated peak oil supply concerns to the dustbin of history; now worries are focused on the potential for peak demand.

ARTICLE BY
GREGORY DL MORRIS

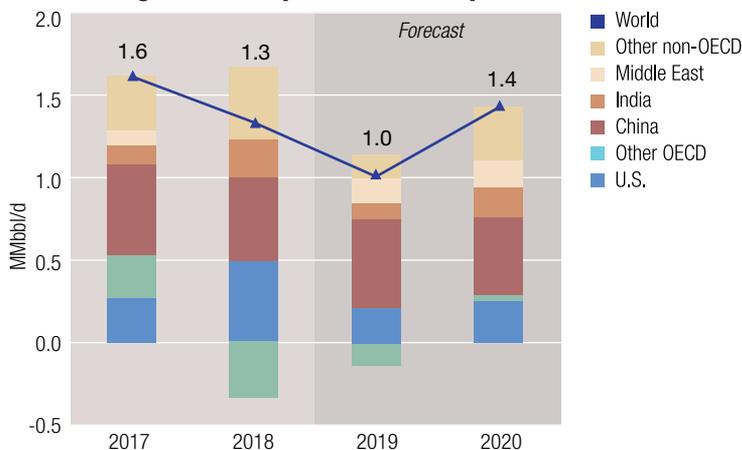
This should be a time of triumph in the oil patch. Even as economists and global majors were fretting over “peak oil” several years ago, independents were perfecting technology and techniques for unconventional development. That has come to full flower, proving that, as James Baldwin famously quipped, “Those who say it can’t be done are usually interrupted by others doing it.”

But with fears of peak oil *supply* vanquished, concerns about peak oil *demand* have emerged. Creeping over the assurance of Baldwin’s expression is the shadow of a grimmer outlook voiced by Wolfgang von Goethe: “Everything in the world may be endured except continued prosperity.”

At the same time, a different supply problem has come to vex producers, especially independents—the supply of capital. In an unexpected development, the supply of crude appears less connected to the supply of capital. Independents have overcome one round of bankruptcies already and may be in the early stages of another. The midstream sector has struggled to keep up. And yet the oil just keeps coming.

The consensus among analysts is that U.S. unconventional supplies will set the pace for the global market, if not strictly the incremental cost of production, for at least another decade. Other regions have had to or will have to adapt. The risk of supply exceeding demand is not great in the near term, but there is virtually no risk of the reverse.

Annual Change In World Liquid Fuels Consumption



Source: EIA Short-Term Energy Outlook 2019

OPEC concurs. In its outlook to 2040, published late last year, the cartel noted, “The concerns around global warming have accelerated the development of energy paths toward lower emissions. The ongoing, and at least already partially successful, introduction of electric vehicles as a complement to the internal combustion engine (ICE) is an important development for the energy market, although in many aspects ICEs still have substantial potential for further developments.

“Tight oil plays are also an area of intense technology developments. Impressive advances have also been achieved in wind and solar for power generation. The ongoing revolution in information technologies will impact both supply and demand, toward higher efficiency, lower emissions and lower costs.”

With those givens, OPEC’s reference case sees energy demand increasing from 274 million barrels of oil equivalent a day (MMboe/d) in 2015 to around 365 MMboe/d in 2040, with an average annual growth of 1.2%. Almost 95% of the increase is accounted for by developing countries, including China and India, with an average annual growth of 1.9%.

OPEC’s outlook suggests that oil will “remain the largest contributor to the energy mix throughout the forecast period, with a share of nearly 28% in 2040, higher than gas and coal. Despite relatively low demand growth rates, especially for coal and oil, fossil fuels are projected to remain the dominant component in the global energy mix, with a share of 75% in 2040, albeit a drop of 6 percentage points from 2015.”

In the nearer term, the July Oil Market Report from the International Energy Agency (IEA) projected that global demand growth is set to accelerate from an exceptionally weak 310,000 barrels per day (bbl/d) in first-quarter 2019 and 800,000 bbl/d in second-quarter 2019 to reach 1.8 MMbbl/d in the second half of the year as economic activity improves and petrochemical plants ramp up. For 2020, the pace of growth will average 1.4 MMbbl/d compared to 1.2 MMbbl/d this year.

For 2020, the IEA stated, “Our balances show the potential for oversupply next year, with a 2.1

MMbbl/d expansion of non-OPEC supply, led by the U.S., vs. 2 MMbbl/d in 2019. That will lower the requirement for OPEC crude, with the call on OPEC plunging to 28 MMbbl/d in first-quarter 2020. OPEC has not produced at such a low level since third-quarter 2003.”

Other people’s money

These forecasts put U.S. unconventional producers in the driver’s seat, but they hardly give them the whip hand. “After proving they can produce hydrocarbons in spades if given other people’s money via the capital markets, today independent shale producers are on a mission to grow production, and at the same time, achieve positive cash flow that can sustain operations and dividends. It’s a tall order,” said Greg Haas, director of integrated oil and gas at Stratas Advisors, a Hart Energy company.

After years of growth fed by cheap capital leading to a high production base, managing an exploration and production company for cash flow is proving to be very different than managing an E&P to flip or to maximize reserve-based valuations. “U.S. shale producers are trying to rotate toward a sustainable cash-flow model and that takes time,” said Haas. “They’ve been at it for a couple years now after investors began re-evaluating E&P firms, and as capital markets soured on energy production growth for growth sake.”

For all that time and effort, Haas indicated that progress has been slow. “It would be nice if the U.S. independent E&P industry was further along at this point,” he noted ruefully. “But achieving sustainable free cash flows takes even more time when commodity prices erode as we have seen for oil, gas and gas liquids across North America. And we see a multiquarter lag time associated with dialing back production.”

That response timing is at odds with volatile and skittish commodity markets that can swing prices significantly. “It seems that buyouts or even bankruptcies may be the disciplining blast of cold water in the face of management teams who may have not yet progressed fast enough toward a more sustainable model not dependent on debt or equity capital markets,” Haas added.

On the revenue side, U.S. shale has clearly hit foreign suppliers. That is true for both volumes sold as well as the price per barrel or cubic foot of hydrocarbon sent into commerce. “We see a consolidation in the U.S. as shale becomes the focus area of ever larger firms and even multinational super majors like ExxonMobil [Corp.], Chevron [Corp.] and others,” said Haas.

That trend is likely to put North American shale production into competition with production in other regions at the boardroom level, rather than at the trading desk. The global majors “will be ranking U.S. investments, returns and risks against global projects in their portfolio,” said Haas. “The Permian can win much of those contests especially for large firms with legacy Permian acreage acquired, operated and piped up prior to the shale revolution.”

Head to head with other regions, U.S. shale plays are considered to be strong competitors.



“If shale producers up their game with effective improvements in spacing, fracturing or other recovery techniques, the buffer provided by shale against global supply interruptions could expand through the end of the next decade,” said Greg Haas, director of integrated oil and gas, Stratas Advisors.

“We see the Permian and other glittering regions in the U.S. shale-oil crown like the Bakken as having enough resources to continue to grow production for several years with current technology,” said Haas. “If shale producers up their game with effective improvements in spacing, fracturing or other recovery techniques, the buffer provided by shale against global supply interruptions could expand through the end of the next decade.”

That buffer could also expand with higher oil prices because they could cover a multitude of independent producer ills and would enable more acreage and drilling areas to be economic.

Capital constraints on crude

“Shale is going to flow once a basin is established,” said Devin Geoghegan, global director of petroleum intelligence, Genscape. “Of course there is a decline curve, and production does deteriorate. But as long as a producer has enough Tier 1 and Tier 2 targets in inventory, they can keep declines at bay and sustain the ‘hamster wheel’ for production.”

Production is challenging enough in terms of modulating supply in response to real demand. Still, there could be ways for supply to be more responsive if operating companies felt more present need to do so. “The real problem is that most publicly traded producers don’t pay a dividend,” said Geoghegan. “Even the ones that do don’t pay very much. They need the financial discipline of having to return cash to shareholders vs. issue new equity, which is what many of them have done.”

Even the specter of bankruptcy is not a deterrent. If anything, it may help them re-establish themselves so they have a second chance at growth.

“If you look at the bankruptcies in 2013 to 2015, these didn’t actually curtail any substantial growth in production. Bankruptcies extinguish debt, which can allow the company to focus on operations rather than financial worries. If the company is able to get financing post-bankruptcy, either from investors or from the purchaser, then production can grow,” explained Geoghegan.

“The companies that sought to reorganize shed debt, allowing them to refocus on oper-

ations and resume production. In some ways, the process perpetuated growth. Bankruptcy is unlikely to reduce shale production in any substantial way. The only real brake on production is growth of supply.”

To be sure, management does have discretion to throttle back, “and the disciplined ones do just that,” said Geoghegan. “It seems that, at least until the last few years, investors in public companies demanded growth. Recently though, we are starting to hear more investors wanting returns. They are also asking why SG&A [selling, general and administrative] costs are so high if shale production has become a manufacturing process.”

He stressed that some producers have reined in costs. “Those who have, performed relatively better and are likely to continue to do so,” said Geoghegan.

Indeed, a structural change has been underway among investors in energy. Of the 10 major segments in the S&P 500 Index, energy has performed the worst during the past 10 years. In seven of the past eight years, energy has underperformed the broader index. As a result, energy’s share of the broader index has been slashed by almost two-thirds, from 13.1% to 4.99%. Clearly, investors are not just migrating away from energy in a cyclical way that implies return, but shifting away over time in a structural way.

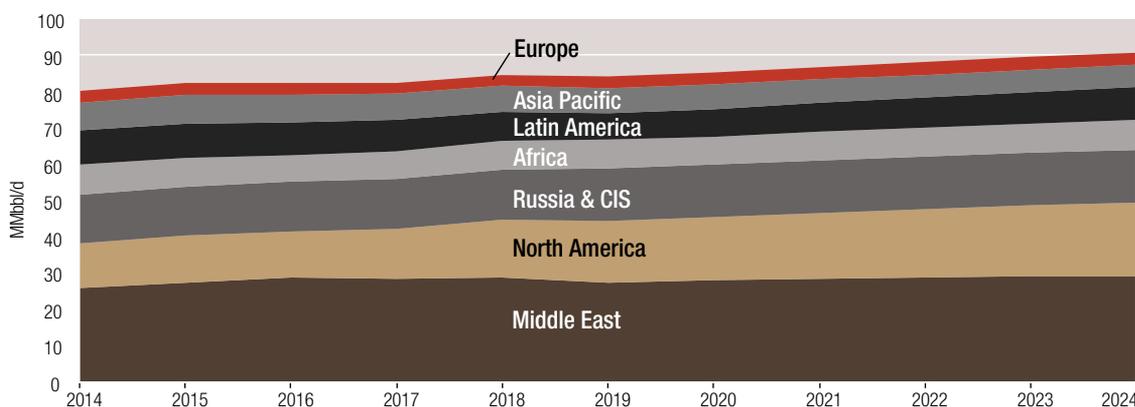
At first glance, global demand for liquids looks steady, if not robust, growing at a little more than 1 MMBbl/d a year. But, “some of that is NGL for petrochemicals,” said Geoghegan, “and once this is stripped out we are often looking at less than a million barrels a day of annual growth in supply for black oil, crude and condensate for refineries. That is within reach of U.S. production growth at a slightly higher forward price curve, so the U.S. could supply all the global growth in demand all by itself in many years.”

That is lovely for U.S. producers, but a chilly outlook for the rest of the world, especially OPEC, or countries like Norway or Canada, which also rely heavily on oil exports. Indeed those exporters are not backing



“With sanctions and other issues in Venezuela, sanctions on Iran and production declines in Mexico, a significant amount of the world’s heavy and heavy-medium crude supply is constrained,” said Devin Geoghegan, global director of petroleum intelligence, Genscape.

Global Oil Supply By Region



Source: Stratas Advisors

The extension of OPEC-plus cuts is set to curb global supply in 2019. The U.S. is expected to lead supply growth in the next five years.

away. Canada is pressing ahead to resolve its persistent pipeline problems, and a large new field is expected to come into service next year off Norway. "OPEC growth is necessarily limited at current price decks because the U.S. and a handful of other countries can provide necessary supply growth," Geoghegan added.

Demand growth 'crawling'

"The world's crude market is not short of supply," said Haas at Stratat. "U.S. unconventional hydrocarbon production growth is still occurring, and we expect it should likely continue into the mid-2020s." That is happening at a time when production elsewhere is held back by various edicts, agreements or circumstances in Canada, OPEC member nations, Venezuela and elsewhere.

"So with the prospect for millions of daily barrels of crude, as well as associated gas and gas liquids, returning if the spigots opened one way or another, it makes sense that the market is laser-focused on oil demand," Haas said.

"Of great relevance to global oil markets, we see global demand for refined products not peaking until the 2030s," Haas forecasted. "That said, we see petroleum-product demand growth crawling in the latter half of the 2020s and early 2030s until its plateau."

The main driver affecting petroleum product demand will be the rate of adoption of electric motors across all transportation classes from trucks to passenger cars, off-road uses and others, Haas explained. "Trillion-dollar questions will be raised and answered during the next few decades around the extent to which electric motors, batteries and charging stations develop to meet the needs in growth markets or to supplant incumbent technologies in existing markets using internal combustion engines, fuel tanks and refueling infrastructure across the planet."

The next question after total volume, explained Geoghegan at Genscape, is weight. "With sanctions and other issues in Venezuela, sanctions on Iran and production declines in Mexico, a significant amount of the world's heavy and heavy-medium crude supply is constrained. Because shale oil tends to be lighter, the U.S. cannot fulfill the world's demand for heavy crudes." That does not necessarily signal a problem, Geoghegan hastened to add. "We think that the world is relatively well supplied with heavy crude at today's prices. Russia can supply more, and if demand increases, then Saudi Arabia and Kuwait could produce more from fields in the Neutral Zone that have been shut in for years."

Small ironies

In a small irony, one major demand center for heavy sour crude is the string of massive refineries on the U.S. Gulf Coast. Refiners spent heavily over many years to equip those complexes for deep conversion, but now find

themselves with little need for the domestic bonanza of light, sweet shale oil.

In another small irony, that surfeit of light sweet crude actually increases demand for medium crudes, notably from offshore U.S. It might seem that if unconventional development can't help but grow inherent production, the first barrels displaced would be from the Gulf of Mexico. Why would majors spend billions on high-capital development when independents are drilling multiple laterals from single-well pads for a fraction of the cost?

"There are still economical projects in the Gulf of Mexico," Geoghegan explained. "There are some very tasty medium crudes there that are definitely needed for domestic refineries just on a dietary basis. Of course offshore development is slower in a lower-cost environment, but the big guys have been doing this for decades and are doing it properly."

A smaller variable in the demand for heavy crude is the new ultralow sulfur rules that the International Maritime Organization will begin enforcing on Jan. 1, 2020. It is widely expected that ship operators will meet the mandates with a wide range of approaches, from buying compliant fuels, to modifying engines to burn other fuels, to retiring old ships to cheating.

"It is unclear how much heavy crude will be needed in the next few years," said Geoghegan. "I don't see many refiners adjusting their processes just yet. Most likely a few would make incremental changes."

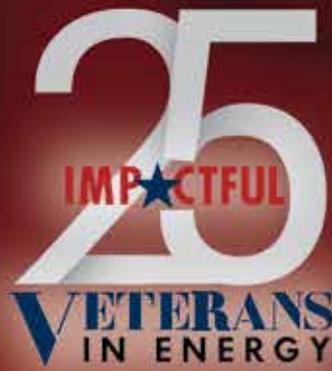
Current price ranges and production levels are essentially dependent on OPEC maintaining its self-imposed production cuts. "We have been saying since September 2018 that OPEC needs to extend their cuts through 2020, and then hold any moderate increases steady through 2021 and 2022."

That brings the conversation back to the point of true demand for black oil, ex-liquids for petrochemical manufacturing. "A continuation of the trade war could knock a year off demand growth," said Geoghegan. "Other than that, and barring a recession, we see growth in demand continuing, but it will be fairly lumpy."

The big known variable is the divergent demand growth rates in developed as compared to developing countries. The known unknown within that is the possibility that alternative-fuel vehicles will also gain traction in those developing countries.

"China and India are targeting cars for pollution reduction," said Geoghegan. "And everyone is trying to mitigate use of fossil fuels, especially for fleet vehicles. So long-term growth in demand for oil slows down. But I am dubious about the general idea of 'peak demand.' At least just yet. Fleet turnover among passenger vehicles and trucks has been about seven or eight years in the U.S., maybe a little longer now and elsewhere. So peak demand may be a factor in another 10 years given a lot of electric cars around the world would certainly punch a hole in oil demand." □

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After Bellavia left the Army, he returned to Iraq as an embedded reporter in 2006 and covered heavy fighting in Ramadi, Fallujah and Diyala Province. In 2007, he wrote a book, *House to House*, detailing his experiences in Fallujah.

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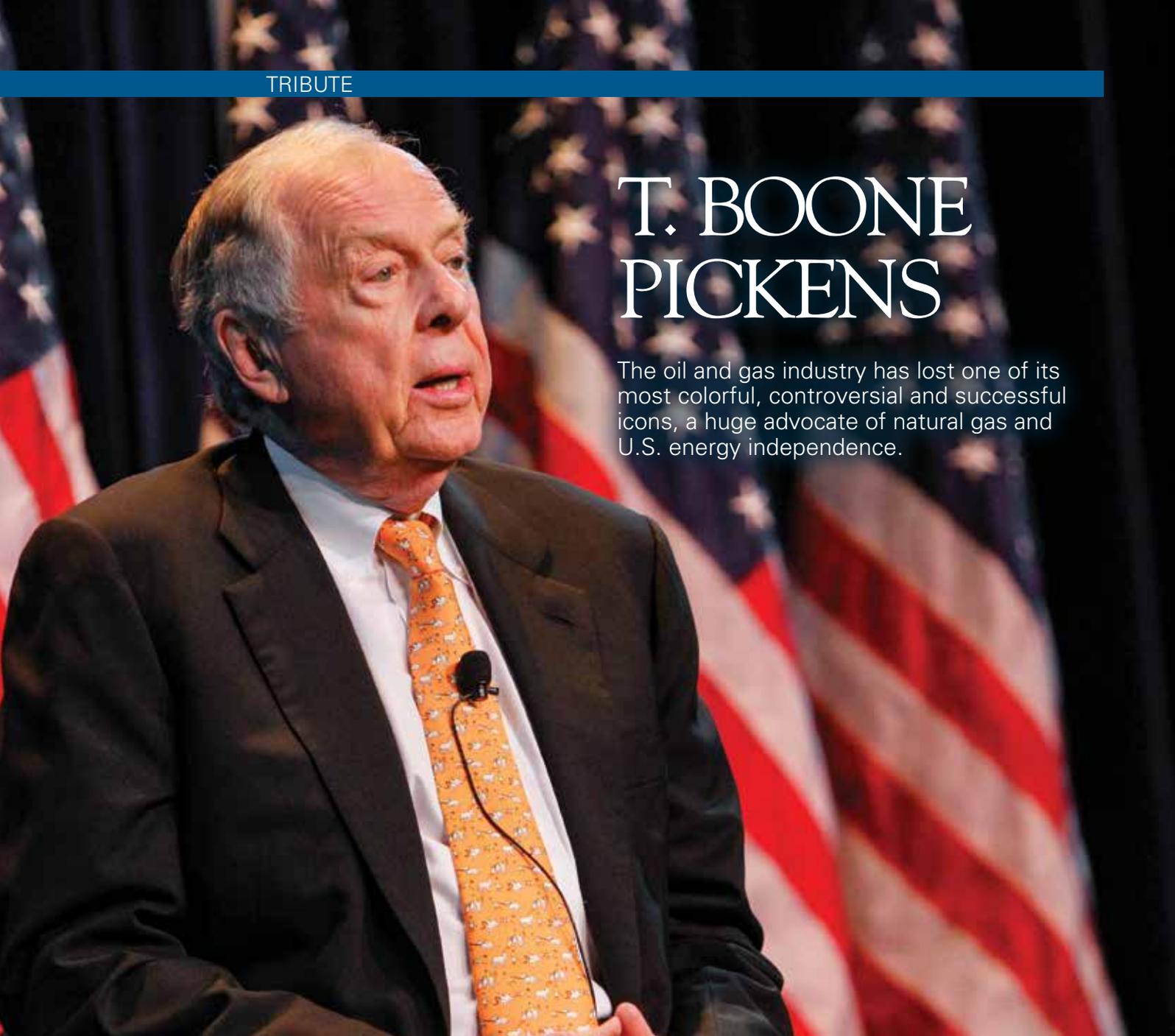
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T. BOONE PICKENS

The oil and gas industry has lost one of its most colorful, controversial and successful icons, a huge advocate of natural gas and U.S. energy independence.



ARTICLE BY
LESLIE HAINES

T Boone Pickens, the billionaire oilman and hedge fund owner, philanthropist and corporate raider, who touted the Pickens Plan for U.S. energy independence and cleaner energy from natural gas, passed away at age 91 on Sept. 11.

In his 2008 autobiography, “The First Billion is the Hardest,” he wrote: “Engagement. Involvement. Constant action. That’s the way to live your life.” And he followed that credo well into his 80s, working out every morning with a trainer and bragging about how much he could bench press. He was a frequent speaker on TV and at various energy industry forums.

Pickens was born in Holdenville, Okla., in 1928; his father was a petroleum landman. He was an entrepreneur early on, selling newspapers as a kid.

Pickens graduated with a geology degree in 1951 from what is now Oklahoma State

University, where the football stadium and a geology building bear his name. He donated an estimated \$500 million to the school over the years, as well as to many other charities, including M.D. Anderson Cancer Center in Houston, where a tower also bears his name. He used to joke that he had given away a billion dollars but also had lost a billion during his lifetime, given that he was an active commodities trader subject to the ups and downs of the oil and gas business. He had signed Warren Buffet’s Giving Pledge.

Always independent and creative in thought, after two years working at Phillips Petroleum Co., he left in 1956 to found Mesa Petroleum Inc. in Amarillo, Texas. It grew to become a large natural gas producer based in Dallas that was active in the Texas Panhandle and several other states, including the huge Hugoton gas field in Kansas, and in Canada. He also drilled in the U.K. North Sea, discov-

ering Beatrice Field in 1976, the company's largest find at the time.

From 1973 to 1981, Mesa was one of the largest independents in the world, at one time having \$2 billion of assets. But ultimately, after years of growth through drilling and corporate acquisitions (often of companies more than twice the size of Mesa), his company was stung by high debt and stubbornly low gas prices.

In August 1997, after negotiations with large shareholders, Mesa was merged with Parker & Parsley Petroleum Co. in Midland to form what is today Pioneer Natural Resources Co., becoming the third largest independent in the U.S. at that time. The deal combined Mesa's natural gas focus with Parker & Parsley's oil focus in the Midland Basin.

"For three years I had the honor to have Boone as a member of our board of directors. He was a great mentor," Pioneer CEO Scott Sheffield told Hart Energy upon learning of Pickens' death.

"He told me ... he did not like the Permian's Spraberry-Wolfcamp Field. However, he later confided in me that he was wrong. Over time he became a large Pioneer shareholder, and the Permian Basin has become the largest oil field in the world."

Pickens touted natural gas throughout his career, being one of the early chairs of the Natural Gas Vehicle Coalition. He co-founded Clean Energy Fuels Corp., which went public in 1970, selling natural gas and operating hundreds of natural gas fueling stations across the U.S. Pickens served on its board for 20 years.

Andrew J. Littlefair, co-founder, president and CEO, issued a statement, saying: "Words cannot express the sadness the Clean Energy family and myself feel at the loss of our co-founder, leader and friend. I worked closely with Boone for 32 years, and he became a father-like figure and true mentor to me.

"We will miss his devotion, humor, generosity and, most of all, love."

Raids and returns

Pickens was well known in oil and gas circles but he burst on the national scene in the 1980s, even making the cover of *TIME* in March 1985, when his actions and that of fellow investors such as Carl Icahn heralded the age of the corporate raider—and the beginning of shareholder activism. Today we live in a time of intensifying shareholder activism, but Pickens was a precursor. He was the person who, more than any other in the 1980s, made oil company executives think twice about shareholder value.

He formed the United Shareholders Association in 1986 and spoke out about corporate governance and shareholder returns. Partly because of these efforts, in July 1998 the SEC approved the one-share, one-vote rule, one of Pickens' goals.

Several corporate consolidations swept the

oil and gas industry at that time, and some were instigated by him. Pickens and an investor group would buy enough stock in an oil company target to have a voice, and then he used it, pressuring executives to create value by mergers—or he would try to buy the company himself, through Mesa. Often these attempts failed, but not before the target's stock price rose, making Pickens a lot of money.

It was called "greenmail," and many in the industry resented him for it. His attempt to take over Gulf Oil Co. of Pittsburgh in 1983 led to Gulf being acquired by Union Oil of California in 1984, becoming what is now Chevron—the largest oil company merger of the 1980s. Pickens' investor group made \$760 million on the merger.

Ironically, in 1984-85, his Mesa Petroleum made a run at Phillips Petroleum Co., Pickens' first employer out of OSU. The deal was rebuffed after an intense outcry, but Pickens made money anyway as the stock rose.

"Boone understood that companies are owned by their shareholders. Of course, everyone recognizes that today, but not many CEOs gave that notion more than lip service in the '80s," Bernard J. Picchi told Hart Energy. Picchi was one of the top award-winning E&P analysts on Wall Street during that era and manages his own fund today. "But Boone 'walked the talk' and put his money where his mouth was—and gave capital the respect it was due. He was an original, and will be remembered by all for many years."

Pickens was an innovator who loved to take risks and always saw opportunity. He formed one of the first master limited partnerships in the '80s, Mesa LP, betting that natural gas prices would rise. He was also the father of the modern-day oil and gas royalty trust. More recently, he promoted a water business and a wind farm in the Texas Panhandle. In 2008, Mesa Power LP ordered 667 wind turbines from GE to build what was touted as the largest wind farm in the world. He said at the time that this proposed business would become the biggest deal of his career, bigger than the Gulf Oil deal. Later it was scrapped due to economic challenges and lack of power transmission lines.

He was also the founder and force behind BP Capital Management in Dallas, a hedge fund that won and lost billions making bets on energy commodities. From 2000 to 2007, BP Capital made a total profit of \$8 billion.

He was most recently known for the Pickens Plan, a national, multimillion-dollar campaign he unveiled in 2008 to get us off foreign oil, and to urge the U.S. trucking industry to move away from diesel toward natural gas. His large group of online supporters was known as the Pickens Army.

In his 2008 autobiography, he described his career highlights, dares, setbacks and comebacks. It is filled with what he called Booneisms, such as this gem: "When you're hunting elephants, don't get distracted chasing rabbits."

Pickens was married five times and had five children. □



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DEBUNKING THE NEW ENERGY ECONOMY

While a groundswell rises worldwide to replace hydrocarbons with renewable energies—and sooner rather than later—do physical realities support such a revolutionary change to energy domains? The short answer is no.

PART 1 OF A THREE-PART SERIES

ARTICLE BY
MARK P. MILLS

ILLUSTRATION BY
ROBERT D. AVILA

A growing chorus of voices is exhorting the public, as well as government policymakers, to embrace the necessity—indeed, the inevitability—of society’s transition to a “new energy economy.” Advocates claim that rapid technological changes are becoming so disruptive and renewable energy is becoming so cheap, so fast, that there is no economic risk in accelerating the move to—or even mandating—a post-hydrocarbon world that no longer needs to use much, if any, oil, natural gas or coal.

Central to that worldview is the proposition that the energy sector is undergoing the same kind of technology disruptions that Silicon Valley tech has brought to so many other markets. Indeed, “old economy” energy companies are a poor choice for investors, according to proponents of the new energy economy, because the assets of hydrocarbon companies will soon become worthless, or “stranded.” Betting on hydrocarbon companies today is like betting on Sears instead of Amazon a decade ago.

“Mission Possible,” a 2018 report by the international Energy Transitions Commission, crystallized this growing body of opinion on both sides of the Atlantic. To “decarbonize” energy use, the report calls for the world to engage in three “complementary” actions: aggressively deploy renewables or so-called clean tech, improve energy efficiency and limit energy demand.

This prescription should sound familiar, as it is identical to a nearly universal energy-policy consensus that coalesced following the 1973–74 Arab oil embargo that shocked the world. But while the past half-century’s energy policies were animated by fears of resource depletion,

the fear now is that burning the world’s abundant hydrocarbons releases dangerous amounts of CO₂ into the atmosphere.

To be sure, history shows that grand energy transitions are possible. The key question today is whether the world is on the cusp of another.

The short answer is no. There are two core flaws with the thesis that the world can soon abandon hydrocarbons. The first: physics realities do not allow energy domains to undergo the kind of revolutionary change experienced on the digital frontiers. The second: no fundamentally new energy technology has been discovered or invented in nearly a century—certainly, nothing analogous to the invention of the transistor or the Internet.

Before these flaws are explained, it is best to understand the contours of today’s hydrocarbon-based energy economy and why replacing it would be a monumental, if not arguably an impossible, undertaking.

Moonshot policies and the challenge of scale

The universe is awash in energy. For humanity, the challenge has always been to deliver energy in a useful way that is both tolerable and available when it is needed, not when nature or luck offers it. Whether it be wind or water on the surface, sunlight from above, or hydrocarbons buried deep in the earth, converting an energy source into useful power always requires capital-intensive hardware.

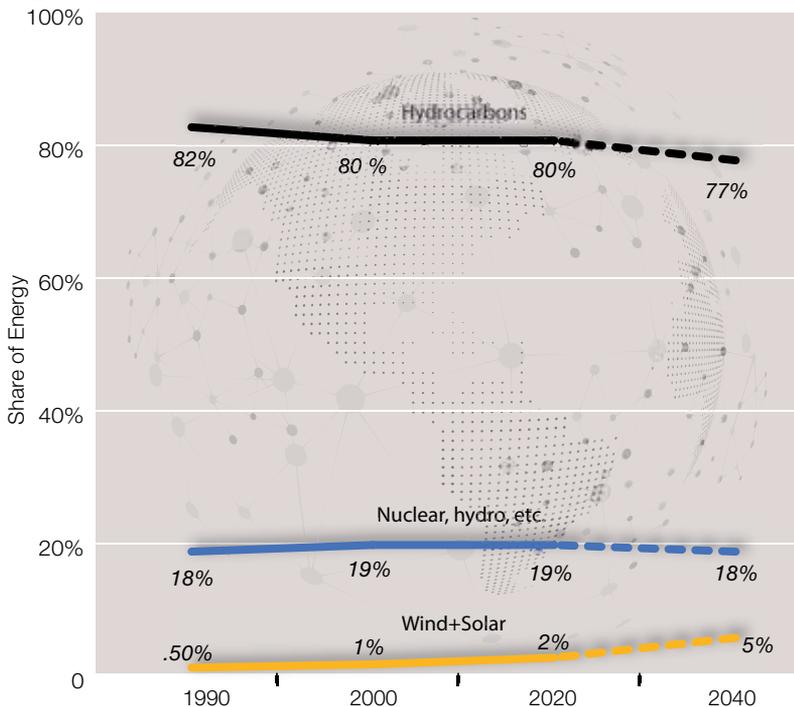
Given the world’s population and the size of modern economies, scale matters. In physics, when attempting to change any system, one has to deal with inertia and various forces of resistance; it’s far harder to turn or stop a Boeing than it is a bumblebee. In a social system, it’s far more difficult to change the direction of a country than it is a local community.

Today’s reality: hydrocarbons—oil, natural gas and coal—supply 84% of global energy, a share that has decreased only modestly from 87% two decades ago (Figure 1). During those two decades, total world energy use rose by 50%, an amount equal to adding two entire U.S.’ worth of demand.

The small percentage-point decline in the hydrocarbon share of world energy use required over \$2 trillion in cumulative global spending on alternatives during that period. Popular visuals of fields festooned with windmills and rooftops laden with solar cells don’t change the fact that these two energy sources today provide less than 2% of the global energy supply and 3% of the U.S. energy supply.

The scale challenge for any energy resource transformation begins with a description. Today, the world’s economies require an annual production of 35 billion barrels (Bbbl) of petroleum, plus the energy equivalent of another 30 Bbbl of oil from natural gas, plus the energy equivalent of yet another 28 Bbbl of oil from coal. In visual terms: If all that fuel were in the form of oil, the barrels would form a line from Washington, D.C., to Los Angeles, and that entire line would increase in height by one Washington Monument every week.

Figure 1: How The World Is Fueled



Source: ExxonMobil Corp.; EIA

Central to that worldview is the proposition that the energy sector is undergoing the same kind of technology disruptions that Silicon Valley tech has brought to so many other markets. Indeed, “old economy” energy companies are a poor choice for investors, according to proponents of the new energy economy, because the assets of hydrocarbon companies will soon become worthless, or “stranded.”

To completely replace hydrocarbons during the next 20 years, global renewable energy production would have to increase by at least ninetyfold. For context: It took a half-century for global oil and gas production to expand by tenfold. It is a fantasy to think, costs aside, that any new form of energy infrastructure could now expand nine times more than that in under half the time.

If the initial goal were more modest—say, to replace hydrocarbons only in the U.S. and only those used in electricity generation—the project would require an industrial effort greater than a World War II-level of mobilization. A transition to 100% non-hydrocarbon electricity by 2050 would require a U.S. grid construction program fourteenfold bigger than the grid build-out rate that has taken place during the past half-century. Then, to finish the transfor-

mation, this Promethean effort would need to be more than doubled to tackle nonelectric sectors, where 70% of U.S. hydrocarbons are consumed. And all that would affect a mere 16% of world energy use, America’s share.

This daunting challenge elicits a common response: “If we can put a man on the moon, surely we can [fill in the blank with any aspirational goal].” But transforming the energy economy is not like putting a few people on the moon a few times. It is like putting all of humanity on the moon—permanently.

The physics-driven cost realities of wind and solar

The technologies that frame the “new energy economy” vision distill to just three things: windmills, solar panels and batteries. While batteries don’t produce energy, they are crucial for ensuring that episodic wind and solar power is available for use in homes, businesses and transportation.

Yet windmills and solar power are themselves not “new” sources of energy. The modern wind turbine appeared 50 years ago and was made possible by new materials, especially hydrocarbon-based fiberglass. The first commercially viable solar tech also dates back a half-century, as did the invention of the lithium battery (by an Exxon researcher).

Over the decades, all three technologies have greatly improved and become roughly tenfold cheaper. Subsidies aside, that fact explains why, in recent decades, the use of wind/solar has expanded so much from a base of essentially zero.

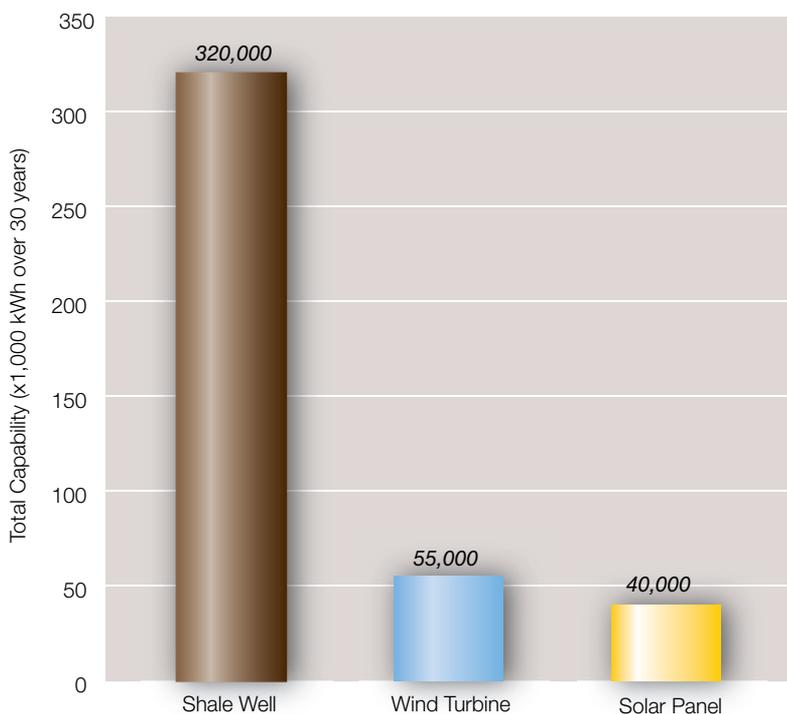
Nonetheless, wind, solar and battery tech will continue to become better, within limits. Those limits matter a great deal—about which, more later—because of the overwhelming demand for power in the modern world and the realities of energy sources on offer from Mother Nature.

With today’s technology, \$1 million worth of utility-scale solar panels will produce about 40 million kilowatt-hours (kWh) over a 30-year operating period. A similar metric is true for wind: \$1 million worth of a modern wind turbine produces 55 million kWh over the same 30 years. Meanwhile, \$1 million worth of hardware for a shale rig will produce enough natural gas over 30 years to generate more than 300 million kWh. That constitutes about 600% more electricity for the same capital spent on primary energy-producing hardware (Figure 2).

The fundamental differences between these energy resources can also be illustrated in terms of individual equipment. For the cost to drill a single shale well, one can build two 500-foot-high, 2-megawatt (MW) wind turbines. Those two wind turbines produce a combined output averaging over the years to the energy equivalent of 0.7 bbl of oil per hour. The same money spent on a single shale rig produces 10 bbl of oil, or its equivalent in natural gas, averaged over the decades.

The huge disparity in output arises from the inherent differences in energy densities that are features of nature immune to public aspiration

Figure 2: Total 30-Year Electricity Production From \$1 Million In Hardware: Wind Turbines, Solar Panels, Shale Rigs



Source: Lazard, “Lazard’s Levelized Cost of Energy Analysis,” 2018; Gulfport Energy, Credit Suisse Energy Summit, 2019; Cabot Oil & Gas, Heikkinen Energy Conference, Aug. 15, 2018

To completely replace hydrocarbons over the next 20 years, global renewable energy production would have to increase by at least ninetyfold. For context: It took a half-century for global oil and gas production to expand by tenfold. It is a fantasy to think, costs aside, that any new form of energy infrastructure could now expand nine times more than that in under half the time.

or government subsidy. The high energy density of the physical chemistry of hydrocarbons is unique and well understood, as is the science underlying the low energy density inherent in surface sunlight, wind volumes, and velocity. *Regardless of what governments dictate that utilities pay for that output, the quantity of energy produced is determined by how much sunlight or wind is available during any period of time and the physics of the conversion efficiencies of photovoltaic cells or wind turbines.*

These kinds of comparisons between wind, solar and natural gas illustrate the starting point in making a raw energy resource useful. But for any form of energy to become a primary source of power, additional technology is required. For gas, one necessarily spends money on a turbo-generator to convert the fuel into grid electricity. For wind/solar, spending is required for some form of storage to convert episodic electricity into utility-grade, 24/7 power.

The high cost of ensuring energy 'availability'

Availability is the single most critical feature of any energy infrastructure, followed by price, followed by the eternal search for decreasing costs without affecting availability. Until the modern energy era, economic and social progress had been hobbled by the episodic nature of energy availability. That's why, so far, more than 90% of America's electricity, and 99% of the power used in transportation, comes from sources that can easily supply energy any time on demand.

In our data-centric, increasingly electrified society, always-available power is vital. But, as with all things, physics constrains the technologies and the costs for supplying availability. For hydrocarbon-based systems, availability is dominated by the cost of equipment that can convert fuel-to-power continuously for at least 8,000 hours a year, for decades. Meanwhile, it's inherently easy to store the associated fuel to meet expected or unexpected surges in demand, or delivery failures in the supply chain caused by weather or accidents.

It costs less than \$1 a barrel to store oil or natural gas (in oil-energy equivalent terms) for a couple of months. Storing coal is even cheaper. Thus, unsurprisingly, the U.S., on average, has about one to two months' worth of national demand in storage for each kind of hydrocarbon at any given time.

Meanwhile, with batteries, it costs roughly \$200 to store the energy equivalent to 1 bbl of oil. Thus, instead of months, barely two hours of national electricity demand can be stored in the combined total of all the utility-scale batteries on the grid plus all the batteries in the 1

million electric cars that exist today in America.

For wind/solar, the features that dominate cost of availability are inverted, compared with hydrocarbons. While solar arrays and wind turbines do wear out and require maintenance as well, the physics and thus additional costs of that wear-and-tear are less challenging than with combustion turbines. But the complex and comparatively unstable electrochemistry of batteries makes for an inherently more expensive and less efficient way to store energy and ensure its availability.

Since hydrocarbons are so easily stored, idle conventional power plants can be dispatched—ramped up and down—to follow cyclical demand for electricity. Wind turbines and solar arrays cannot be dispatched when there's no wind or sun. As a matter of geophysics, both wind-powered and sunlight-energized machines produce energy, averaged over a year, about 25% to 30% of the time, often less. Conventional power plants, however, have very high "availability," in the 80% to 95% range, and often higher.

A wind/solar grid would need to be sized to meet both peak demand and to have enough extra capacity beyond peak needs in order to produce and store additional electricity when sun and wind are available. This means, on average, that a pure wind/solar system would necessarily have to be about threefold the capacity of a hydrocarbon grid: I.e., one needs to build 3 kW of wind/solar equipment for every 1 kW of combustion equipment eliminated. That directly translates into a threefold cost disadvantage, even if the per-kW costs were all the same.

Even this necessary extra capacity would not suffice. Meteorological and operating data show that average monthly wind and solar electricity output can drop as much as twofold during each source's respective "low" season.

The myth of grid parity

How do these capacity and cost disadvantages square with claims that wind and solar are already at or near "grid parity" with conventional sources of electricity? The U.S. Energy Information Administration (EIA) and other similar analyses report a "levelized cost of energy" (LCOE) for all types of electric power technologies. In the EIA's LCOE calculations, electricity from a wind turbine or solar array is calculated as 36% and 46%, respectively, more expensive than from a natural gas turbine—i.e., approaching parity.

But in a critical and rarely noted caveat, EIA states: "The LCOE values for dispatchable and non-dispatchable technologies are listed separately in the tables because comparing them

It costs less than \$1 a barrel to store oil or natural gas (in oil-energy equivalent terms) for a couple of months. With batteries, it costs roughly \$200 to store the energy equivalent to one barrel of oil. Thus, instead of months, barely two hours of national electricity demand can be stored in the combined total of all the utility-scale batteries on the grid plus all the batteries in the 1 million electric cars that exist today in America.

must be done carefully” (emphasis added). Put differently, the LCOE calculations do not take into account the array of real, if hidden, costs needed to operate a reliable 24/7 and 365-day-per-year energy infrastructure—or, in particular, a grid that used only wind/solar.

The LCOE considers the hardware in isolation while ignoring real-world system costs essential to supply 24/7 power. Equally misleading, an LCOE calculation, despite its illusion of precision, relies on a variety of assumptions and guesses subject to dispute, if not bias.

For example, an LCOE assumes that the future cost of competing fuels—notably, natural gas—will rise significantly. But that means that the LCOE is more of a forecast than a calculation. This is important because a

“levelized cost” uses such a forecast to calculate a purported average cost over a long period. The assumption that gas prices will go up is at variance with the fact that they have decreased over the past decade and the evidence that low prices are the new normal for the foreseeable future. Adjusting the LCOE calculation to reflect a future where gas prices don’t rise radically increases the LCOE cost advantage of natural gas over wind/solar.

And LCOE incorporates an even more subjective feature, called the “discount rate,” which is a way of comparing the value of money today versus the future. A low discount rate has the effect of tilting an outcome to make it more appealing to spend precious capital today to solve a future (theoretical) problem. Advocates of using low discount rates are essentially assuming slow economic growth.

A high discount rate effectively assumes that a future society will be far richer than today (not to mention have better technology). Economist William Nordhaus’s work in this field, wherein he advocates using a high discount rate, earned him a 2018 Nobel Prize.

An LCOE also requires an assumption about average multidecade capacity factors, the share of time the equipment actually operates (i.e., the real, not theoretical, amount of time the sun shines and wind blows). The EIA assumes, for example, 41% and 29% capacity factors, respectively, for wind and solar. But data collected from operating wind and solar farms reveal actual median capacity factors of 33% and 22%. The difference between assuming a 40% but experiencing a 30% capacity factor means that, over the 20-year life of a 2-MW wind turbine, \$3 million of energy production assumed in the financial models won’t exist—and that’s for a turbine with an initial capital cost of about \$3 million.

U.S. wind farm capacity factors have been getting better but at a slow rate of about 0.7% per year over the past two decades. Notably, this gain was achieved mainly by reducing the number of turbines per acre trying to scavenge moving air—resulting in average land used per unit of wind energy increasing by some 50%.

LCOE calculations do reasonably include costs for such things as taxes, the cost of borrowing, and maintenance. But here, too, mathematical outcomes give the appearance of precision while hiding assumptions. For example, assumptions about maintenance costs and performance of wind turbines over the long term may be overly optimistic. Data from the U.K., which is further down the wind-favored path than the U.S., point to far faster degradation (less electricity per turbine) than originally forecast.

To address at least one issue with using LCOE as a tool, the International Energy Agency (IEA) recently proposed the idea of a “value-adjusted” LCOE, or VALCOE, to include the elements of flexibility and incorporate the economic implications of dispatchability. IEA calculations using a VALCOE method yielded coal power, for example, far cheaper than solar, with a cost penalty widening as a grid’s share of solar generation rises.

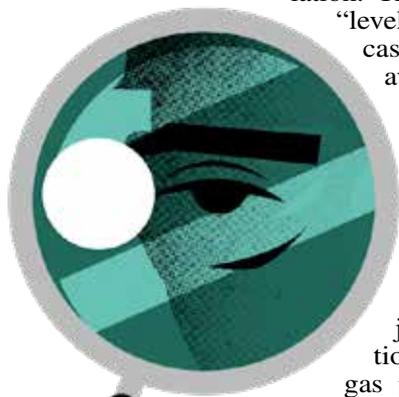
One would expect that, long before a grid is 100% wind/solar, the kinds of real costs outlined above should already be visible. As it happens, regardless of putative LCOEs, we do have evidence of the economic impact that arises from increasing the use of wind and solar energy.

The hidden costs of a ‘green’ grid

Subsidies, tax preferences and mandates can hide real-world costs, but when enough of them accumulate, the effect should be visible in overall system costs. And it is. In Europe, the data show that the higher the share of wind/solar, the higher the average cost of grid electricity (Figure 3).

Germany and Britain, well down the “new energy” path, have seen average electricity rates rise 60% to 110% during the past two decades. The same pattern—more wind/solar and higher electricity bills—is visible in Australia and Canada.

Since the share of wind power, on a per-capita basis, in the U.S. is still at only a small fraction of that in most of Europe, the cost impacts



on American ratepayers are less dramatic and less visible. Nonetheless, average U.S. residential electric costs have risen some 20% over the past 15 years. That should not have been the case. Average electric rates should have gone down, not up.

Here's why: coal and natural gas together supplied about 70% of electricity over that 15-year period. The price of fuel accounts for about 60% to 70% of the cost to produce electricity when using hydrocarbons. Thus, about half the average cost of America's electricity depends on coal and gas prices. The price of both those fuels has gone down by more than 50% over that 15-year period. Utility costs, specifically, to purchase gas and coal are down some 25% over the past decade alone. In other words, cost savings from the shale-gas revolution have significantly insulated consumers, so far, from even higher rate increases.

The increased use of wind/solar imposes a variety of hidden, physics-based costs that are rarely acknowledged in utility or government accounting. For example, when large quantities of power are rapidly, repeatedly and unpredictably cycled up and down, the challenge and costs associated with "balancing" a grid (i.e., keeping it from failing) are greatly increased. OECD analysts estimate that at least some of those "invisible" costs imposed on the grid add 20% to 50% to the cost of grid kilowatt-hours.

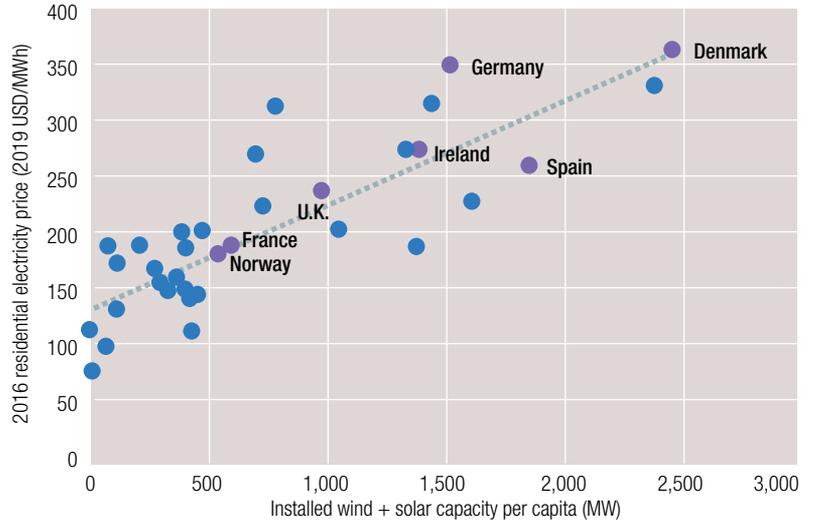
Furthermore, flipping the role of the grid's existing power plants from primary to backup for wind/solar leads to other real but unallocated costs that emerge from physical realities. Increased cycling of conventional power plants increases wear-and-tear and maintenance costs. It also reduces the utilization of those expensive assets, which means that capital costs are spread out over fewer kWh produced—thereby arithmetically increasing the cost of each of those kWh.

Then, if the share of episodic power becomes significant, the potential rises for complete system blackouts. That has happened twice after the wind died down unexpectedly (with some customers out for days in some areas) in the state of South Australia, which derives more than 40% of its electricity from wind.

After a total system outage in South Australia in 2018, Tesla, with much media fanfare, installed the world's single largest lithium battery "farm" on that grid. For context, to keep South Australia lit for one half-day of no wind would require 80 such "world's biggest" Tesla battery farms, and that's on a grid that serves just 2.5 million people.

Engineers have other ways to achieve reliability, such as using old-fashioned giant diesel-engine generators as backup (engines essentially the same as those that propel cruise ships or that are used to back up data centers). Without fanfare, because of rising use of wind, U.S. utilities have been installing grid-scale engines at a furious pace. The grid now has over \$4 billion in utility-scale, engine-driven generators (enough for about 100 cruise ships), with lots more to come. Most burn natural gas, and a lot of them are oil-fired. Three times

Figure 3: Correlation Between Average Electricity Costs And More Renewable Energy In Europe



Source: Eurostat, "Electricity Prices for Household Consumers—Bi-Annual Data (from 2007 Onwards)"

as many such big reciprocating engines have been added to America's grid over the past two decades as over the half-century prior to that.

All these costs are real and are not allocated to wind or solar generators. But electricity consumers pay them. A way to understand what's going on: Managing grids with hidden costs imposed on non-favored players would be like levying fees on car drivers for the highway wear-and-tear caused by heavy trucks while simultaneously subsidizing the cost of fueling those trucks.

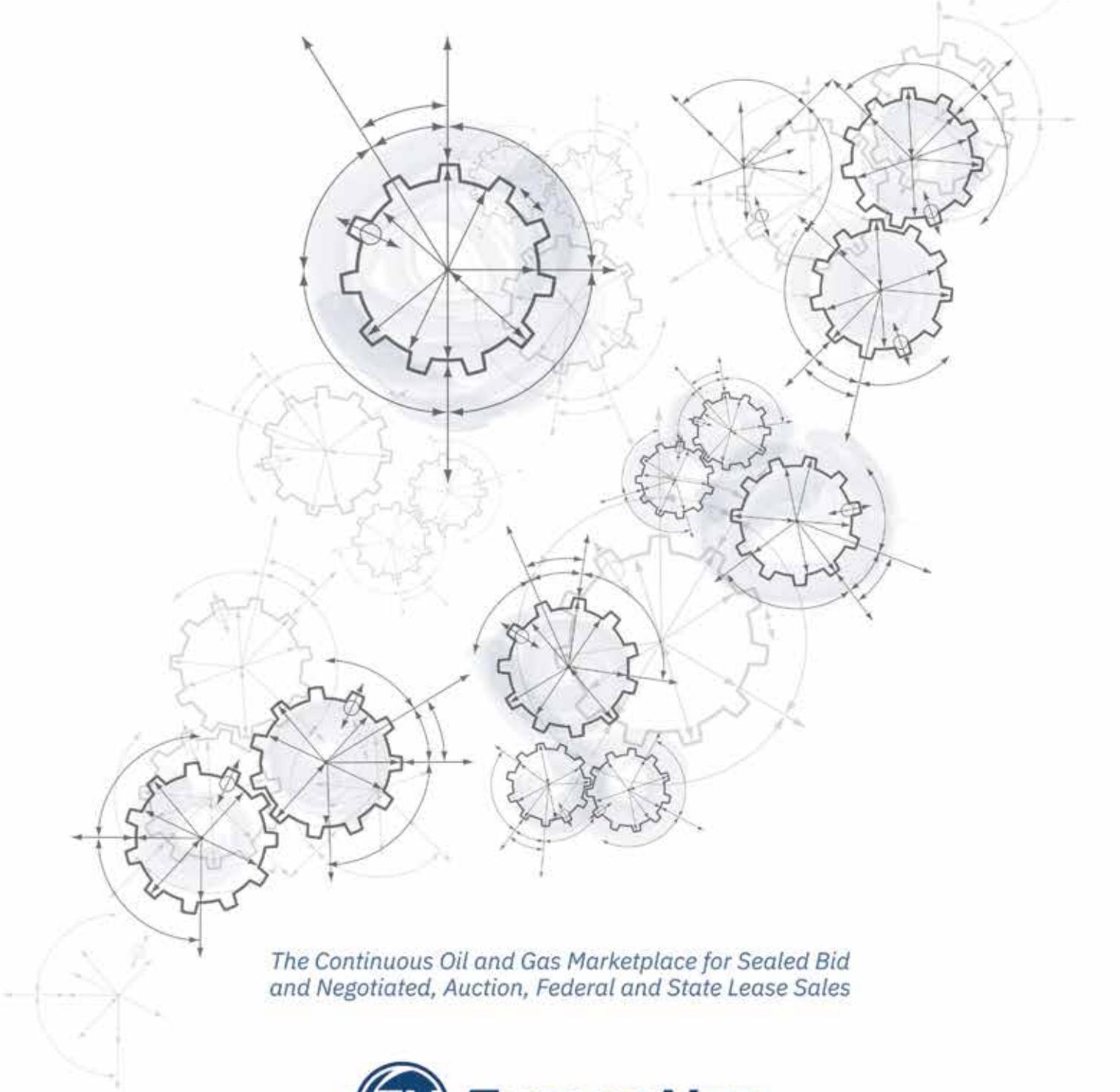
The issue with wind and solar power comes down to a simple point: Their usefulness is impractical *on a national scale* as a major or primary fuel source for generating electricity. As with any technology, pushing the boundaries of practical utilization is possible but usually not sensible or cost-effective. Helicopters offer an instructive analogy.

The development of a practical helicopter in the 1950s (four decades after its invention) inspired widespread hyperbole about that technology revolutionizing personal transportation. Today, the manufacture and use of helicopters is a multibillion-dollar niche industry providing useful and often-vital services. But one would no more use helicopters for regular Atlantic travel—though doable with elaborate logistics—than employ a nuclear reactor to power a train or photovoltaic systems to power a country. □

Mark P. Mills is a senior fellow at the Manhattan Institute and a faculty fellow at Northwestern University's School of Engineering and Applied Science. He is also a strategic partner with Cottonwood Venture Partners, an energy tech venture fund. He holds a degree in physics from Queen's University in Ontario, Canada.

Part two of this series, "Batteries Cannot Save The Grid Or The Planet," will appear in the November issue.

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Spur Pays Cash For A Third Of Concho's Wells

IN A RARE all-cash deal, Jay Graham's **Spur Energy Partners LLC** has agreed to buy **Concho Resources Inc.**'s New Mexico Shelf assets for \$925 million.

Concho will give up an average 25,000 barrels of oil equivalent per day (boe/d) and about 35% of its total operated wells to Permian Basin player Spur, founded by Graham after he sold **WildHorse Resource Development Corp.** earlier this year.

On Sept. 3, Concho said it agreed to sell the New Mexico Shelf assets to an affiliate of Spur Energy. The assets comprise about 70,000 net acres and 2,500 operated wells. Concho reported that the deal, expected to close in November, removes higher-cost vertical wells from its portfolio. The deal gives Concho flexibility to redirect capital to more profitable areas, said **Bernstein** analyst Bob Brackett. Concho plans to use the \$925 million in proceeds from the sale to pay down debt and initiate a \$1.5 billion share repurchase program the company's board of directors also authorized on Sept. 3.

The deal pays Concho about \$37,000 per acre, surpassing unconventional deals that have averaged about \$34,000 in the past two years, Brackett wrote in a Sept. 3 report.

For Spur, backed by private-equity fund **KKR**, the company's position grows to more than 90,000 net acres. The acquisition is Spur's second following its May agreement to buy **Percussion Petroleum LLC**, a private-equity-backed company focused in the Permian Northwest Shelf of New Mexico. The Percussion acquisition included 22,000 net acres in Eddy and Lea counties, N.M., within the core of the Yeso Formation. The purchase price was not disclosed.

Graham is co-founder and former CEO of WildHorse, which in February sold its Eagle Ford and Austin Chalk positions to **Chesapeake Energy Corp.** in a cash-and-stock transaction worth nearly \$4 billion.

In his latest venture, Graham is focused on delivering long-term investor returns by building Spur into a "large-scale business in the oil and gas sector," he said in a May company release.

Following the sale, Concho said it will maintain a large presence and development program in southeastern New Mexico and will continue to support the local communities in which its employees live and work.

Analysts with **Tudor, Pickering, Holt & Co.** (TPH) said in a Sept. 3



Jay Graham, chairman and CEO, Spur Energy Partners LLC

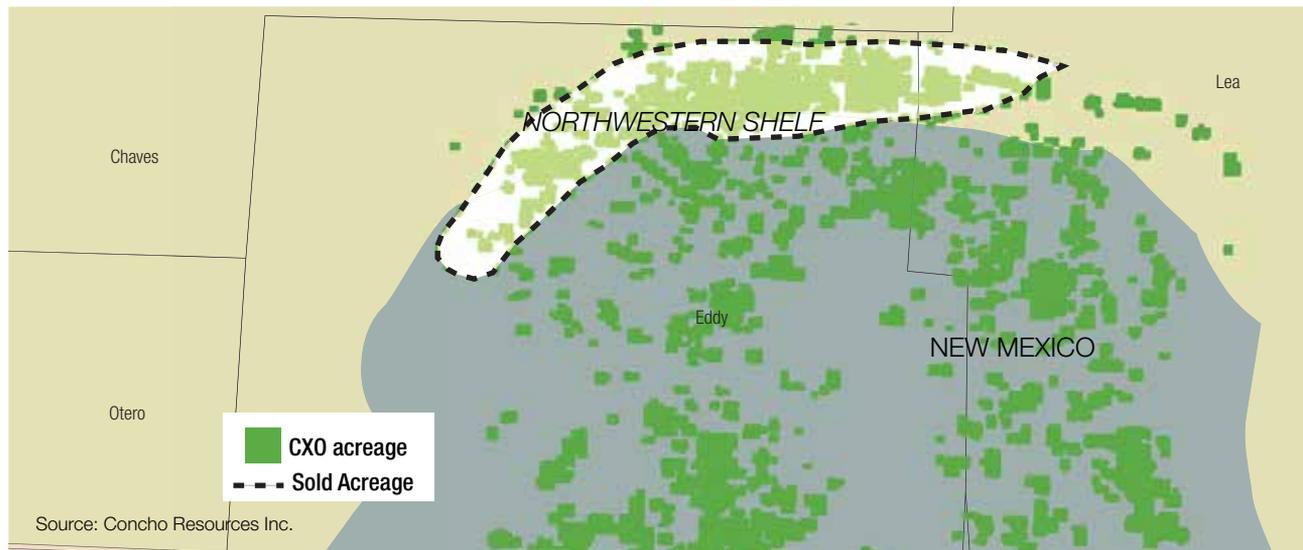
research note that the deal falls in line with management's desire to sell about \$1 billion of assets that "aren't competing for capital at the drillbit within their portfolio." In a statement, Concho CEO Tim Leach said the transaction reduces the company's cost structure while allowing it to achieve its leverage target.

"Proactively managing our asset portfolio has long been a key part of our strategy," Leach said. "Divesting our New Mexico Shelf position enables us to accelerate the value of these legacy assets, while focusing our portfolio on opportunities with the highest potential for strong returns."

RBC Richardson Barr served as Concho's financial adviser. TPH was financial adviser to Spur. **DLA Piper** was its legal adviser. **Kirkland & Ellis** advised KKR

—Emily Patsy and Darren Barbee

Concho Resources' Divested Assets



Hilcorp To Buy BP's Alaska Business For \$5.6 Billion

BP PLC IS EXITING Alaska through a \$5.6 billion sale of its entire business in the state on Aug. 27 to privately held **Hilcorp Energy Co.**

The deal for BP's conventional assets marks the largest oil and gas transaction in the U.S. so far this year and a shift from shale deals that routinely command massive payouts.

Upon completion, analysts expect Houston-based Hilcorp will become the second-largest E&P in Alaska. The sale will comprise BP's entire upstream and midstream business in the state, including **BP Exploration (Alaska) Inc.**, which owns all of BP's upstream oil and gas interests in Alaska, and **BP Pipelines (Alaska) Inc.**'s interest in the Trans Alaska Pipeline System (TAPS).

BP CEO Bob Dudley said the exit of BP from Alaska in no way represents a move away from the U.S. by the London-based oil major.

"We remain very bullish on the U.S. energy sector," Dudley said in a news release. "In just the last three years, we have invested more than \$20 billion in the U.S., and we will continue to look at further investment opportunities here."

BP has continued to develop its business in the U.S. during the past decade. Between 2005 and 2018, the company invested more than \$115 billion in the U.S., which includes the blockbuster purchase last year of U.S. shale assets from **BHP Group Plc.**

"However, we are steadily reshaping BP, and today we have other opportunities, both in the U.S. and around the world, that are more closely aligned with our long-term strategy and more competitive for our investment," Dudley added.

BP's net oil production in Alaska is expected to average nearly 74,000 barrels of oil a day, the company said.

Dudley also noted that the sale of its Alaska business underpins BP's two-year, \$10 billion divestment program.

"The majors are making progress with their divestment campaigns," **Wood Mackenzie** analyst Rowena Gunn said in an email. "This will mean long-held assets and territories will be let go."

BP began working in Alaska in 1959, drilling the confirmation well for the Prudhoe Bay oil field in 1968 and in the mid-1970s helped build the 800-mile

Trans Alaska Pipeline. BP had already made a series of regional asset divestments in Alaska since 2014—mostly to Hilcorp, Gunn said—as focus shifted to deepwater and tight oil assets.

Prudhoe Bay, which BP operates with a 26% working interest, is one of the most prolific oil fields in U.S. history. The oil field has to date produced over 13 billion barrels of oil and is estimated to have the potential to produce over 1 billion more.

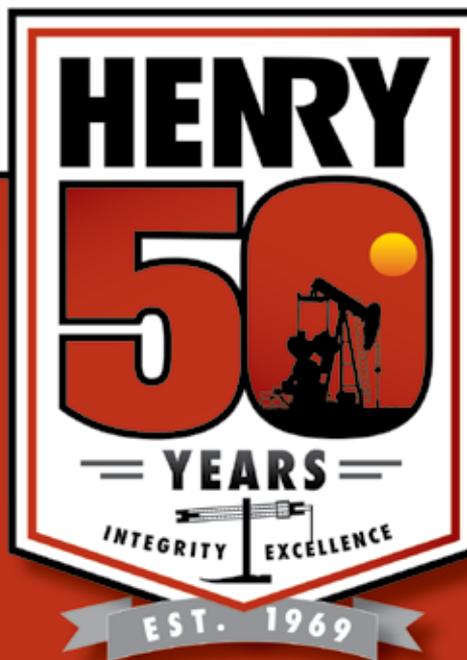
Wood Mackenzie values the BP Alaska assets at a slight premium to the \$5.6 billion consideration.

Hilcorp entered Alaska's Cook Inlet in 2011 and the North Slope in 2014. Hilcorp Alaska, an affiliate of Hilcorp based in Anchorage, already holds interests in 31 assets across the Cook Inlet and North Slope, producing 41,000 boe/d, according to Wood Mackenzie.

"This deal [with BP] vaults Hilcorp to be the second-largest Alaska producer and reserves holder, behind only ConocoPhillips," Gunn said.

The transaction is expected to be completed in 2020.

—Emily Patsy



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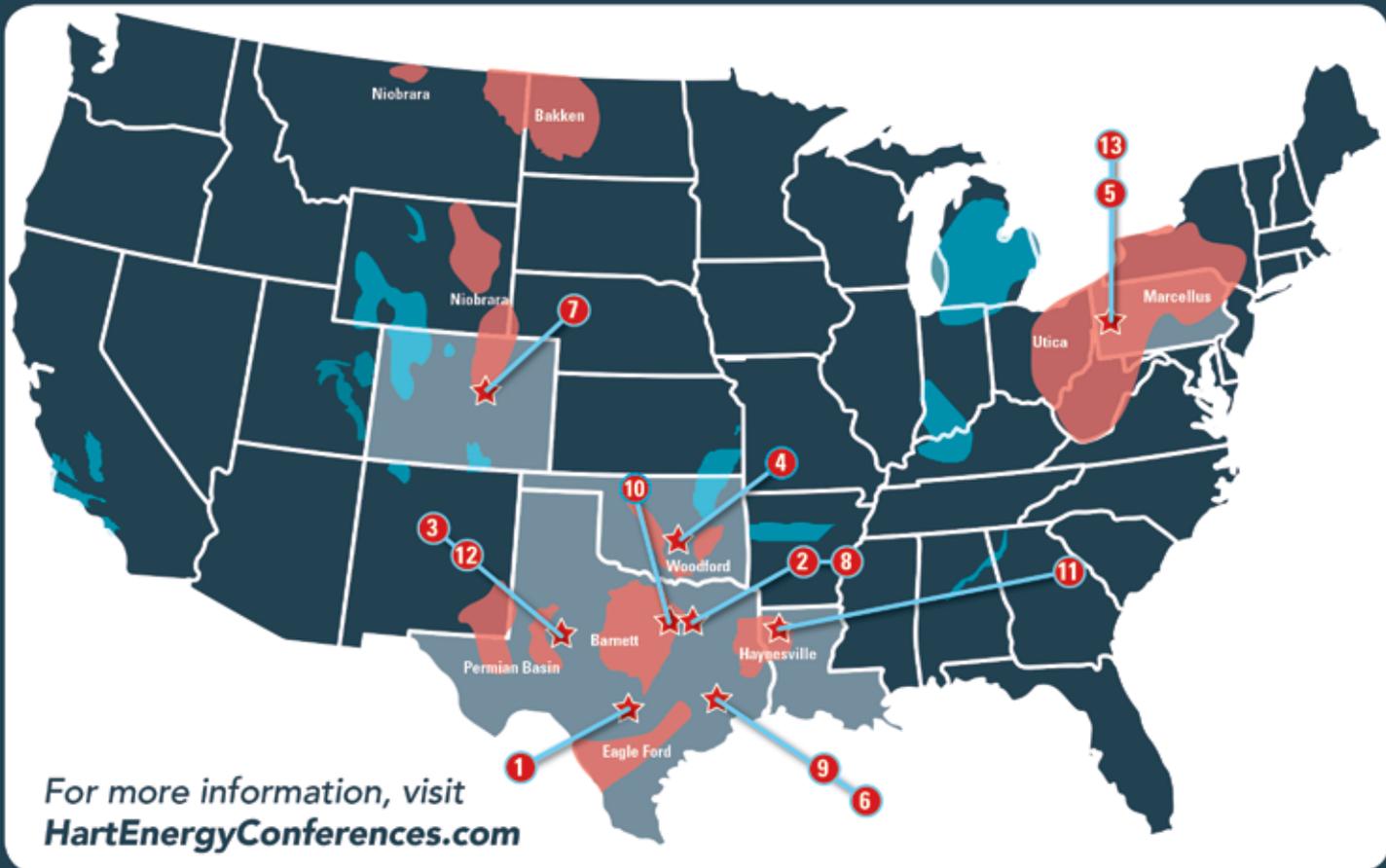
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Wattenberg Consolidation: PDC, SRC Energy To Combine In \$1.7 Billion All-Stock Merger

PDC ENERGY INC. is answering activist investor calls made earlier this year to return more cash to shareholders with an all-stock merger worth roughly \$1.7 billion, including the assumption of debt.

The Denver-based oil and gas producer announced the merger agreement with **SRC Energy Inc.** on Aug. 26. It is expected to materially increase PDC's scale and free-cash profile, enhancing its ability to return additional capital to shareholders.

In the agreement, PDC will acquire SRC Energy, gaining SRC's core area of operations in Greater Wattenberg Field of the Denver-Julesburg (D-J) Basin. Combined, the company is set to become the second-largest producer in the basin.

"SRC's complementary, high-quality assets in the core Wattenberg, coupled with our existing inventory and track record of operational excellence will create a best-in-class operator with the size, scale and financial positioning to thrive in today's market," Bart Brookman, president and CEO of PDC, said in a statement on Aug. 26.

The news of the deal, which analysts called a merger of equals, initially sent shares of both companies soaring.

"Finally, an E&P deal that gets the stamp of approval from Wall Street," Mike Kelly, senior analyst with **Seaport Global Securities**, wrote in an Aug. 26 research note. "We're encouraged to see investors look past the fact that the deal is not accretive on an EV/EBITDA basis and instead focus on the accretiveness on [free cash flow, return on capital employed and net asset value]."

Pro forma, PDC will have about 182,000 core Wattenberg net acres, with nearly 100% located in Weld County, Colo. The company also holds roughly 36,000 net acres in the Delaware Basin, which it entered in 2016. Combined production is 200,000 boe/d.

"We remain committed to our core Delaware Basin acreage position and are confident the combined company with its multibasin focus will be well-positioned to deliver superior shareholder returns," Brookman said.

Kimmeridge Energy Management Co., a private-equity firm which owns about 5.1% of PDC's shares, has campaigned for the producer to cut costs and return more cash to shareholders. Specifically, the firm called for the return of proceeds from asset sales to shareholders.



At \$55 per barrel of Nymex oil, the pro forma company expects to generate about \$800 million of free cash flow between the second half of 2019 and year-end 2021, half of which is planned to be returned to shareholders through a share repurchase program.

PDC is also expecting the combination to generate significant corporate synergies including annual general and administrative (G&A) cost savings of about \$50 million. The company will maintain a strong, through-cycle balance sheet with pro forma leverage of 1.3 times as of June 30.

Kelly said the expected 11% free-cash-flow yield for fiscal-year 2020, plus a plan to devote roughly half of its \$800

million free cash flow through 2021 to share buybacks, "should sound good to even the most cynical E&P haters."

SRC shareholders will receive a fixed exchange ratio of 0.158 PDC shares for each share of SRC common stock, representing an implied value of \$3.99 per share based on the PDC closing price as of Aug. 23. The \$1.7 billion transaction also includes the assumption of SRC's net debt of about \$685 million as of June 30.

Lynn A. Peterson, CEO and chairman of the board of SRC Energy, said the combined company should be a leader in the Colorado energy industry.

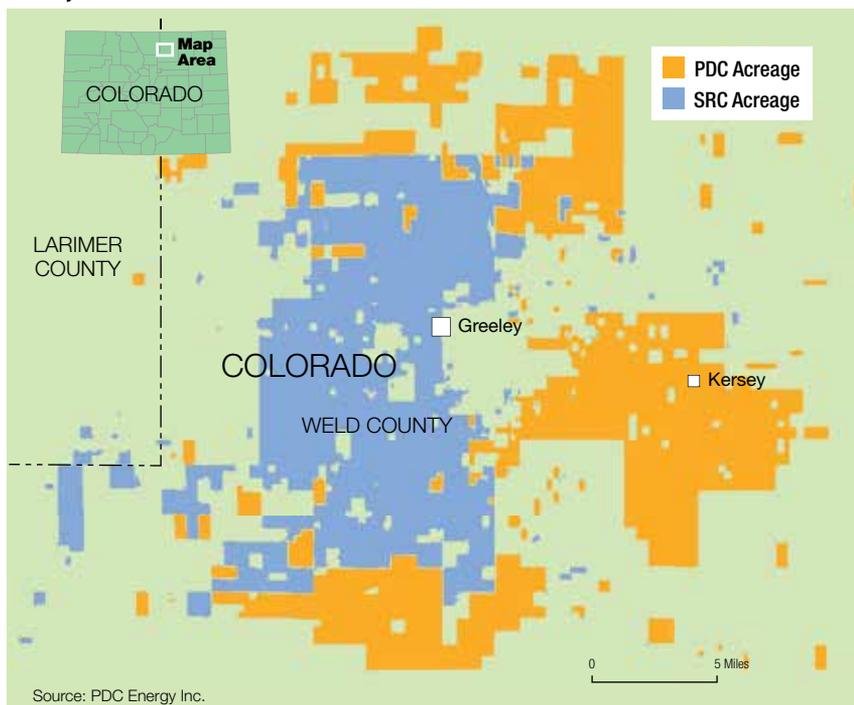
"The transaction also provides SRC shareholders with the opportunity to participate in the significant upside potential created by a larger-scale D-J Basin producer with complementary assets in the prolific Delaware Basin," Peterson said in a news release.

The transaction, which has been unanimously approved by each company's board of directors, is expected to close in fourth-quarter 2019.

J.P. Morgan is exclusive financial adviser to PDC for the transaction, and **Wachtell, Lipton, Rosen & Katz** is its legal counsel. **Citi** and **Goldman Sachs & Co.** are serving as financial advisers to SRC, and **Akin Gump Strauss Hauer & Feld LLP** is the company's legal counsel.

—Emily Patsy

PDC, SRC Combined Assets



Riviera Sells Remaining Hugoton Basin Assets

RIVIERA RESOURCES INC. agreed in August to sell the remainder of its Hugoton Basin assets in southwestern Kansas for \$295 million to an undisclosed buyer.

The independent oil and gas company has been working to simplify the multibasin portfolio it inherited from its spin-off from **Linn Energy** last year. Divestitures so far have included the sale of its Arkoma Basin and Michigan assets plus a portion of its Hugoton assets in a transaction that closed in May.

The Hugoton Basin, geographically centered in southwestern Kansas, is Riviera's largest producing asset, according to the company website.

Riviera said the Hugoton transaction contract price represented roughly 45% of its market capitalization, according to the closing price of the company's stock on Aug. 23. The company also expects to realize about \$10 million in G&A cost savings from the sale starting in first-quarter 2019.

The company's interest in Hugoton properties to be sold consists of the following:



- Upstream properties of about 4,000 wells with second-quarter net production of roughly 104 million cubic feet equivalent per day (MMcf/d); and
- Natural gas processing plants located in Grant County, Kan., which include the Jayhawk natural gas processing plant with inlet capacity of 450 MMcf/d, current delivered volumes of about 260 MMcf/d, and the Satanta natural gas processing plant that is currently inactive.

After closing the transaction, Riviera will continue to own upstream assets in East Texas, North Louisiana, the Anadarko Basin and the Uinta Basin. Additionally, the company said it continues to grow its midstream business, **Blue Mountain Midstream LLC**.

David Rottino, president and CEO of Riviera, said the company will continue to focus on monetizing assets to "unlock the sum of the parts value."

"Accomplishing a complete regional exit through these transactions not only highlights the value of our assets, but our capability to resourcefully maximize value given the current market environment, generating significant proceeds that we can use to return capital to shareholders," Rottino said in a news release.

Proceeds from the Hugoton sale will be added to cash on Riviera's balance sheet, use of which will be determined by the board and management at a later time, the company release said.

The transaction will have an effective date of July 1. Riviera expects it to close in fourth-quarter 2019, subject to completion of customary title and environmental due diligence, as well as other closing conditions.

CIBC Griffis & Small was financial adviser to Riviera during the transaction and **Kirkland & Ellis LLP** provided legal counsel.

—Emily Patsy

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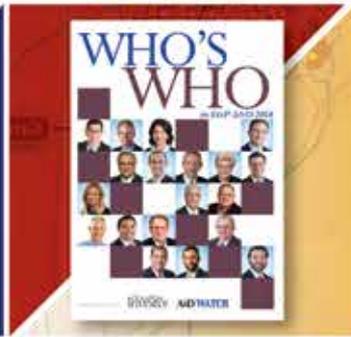
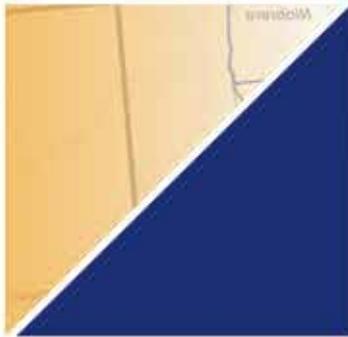
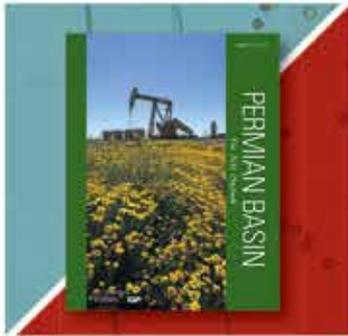
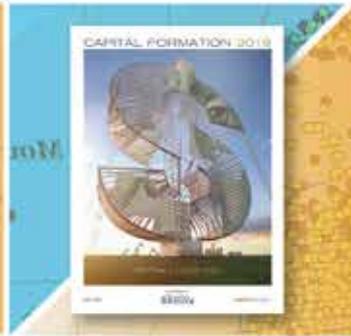
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Chevron, ExxonMobil Take Opportunistic M&A Approach

AS INDUSTRY WATCHERS await the next blockbuster shale company merger in the Permian Basin, two of its biggest players are sticking with an “opportunistic approach” to deals.

“We’re not under any pressure to transact, and I think we demonstrated that earlier this year—not to name any specific situations—but I think we proved that out,” Jeff Gustavson, vice president of **Chevron Corp.**’s Mid-continent business unit, told attendees of Barclays 2019 CEO Energy-Power Conference on Sept. 4. “That said, we’re always looking. We’ll take an opportunistic approach, like we always have, to M&A, and that includes what’s going on in the Permian Basin. I’m not saying we will transact, but we’re always looking.”

Darren Woods, CEO and chairman of **ExxonMobil Corp.**, said that consolidation in the Permian is likely, but that the company is in no hurry.

“I think time is on our side to let that play out,” he said at the conference on Sept. 4.

“We’re keeping a watchful eye, and I think we’re there for the long term, and as opportunities present themselves we’ll take advantage of them.”

For Chevron, any potential deal would have to clear three main hurdles to be considered: the asset must be a strong strategic fit, competitive with the existing portfolio and deliver value.

Though Chevron was outbid by **Occidental Petroleum Corp.** in the battle for assets owned by **Anadarko Petroleum Corp.**, it gained a \$1 billion breakup fee. The company has also cored up acreage with swaps and farm-outs through the years.

In 2018, it transacted on 95,000 acres, and on 60,000 acres in 2017.

“We have had great success in consolidating our land position through swaps, the creation of joint ventures, farm-outs and sales,” Gustavson said. “This is a critical focus area for our organization given the huge value uplift associated with these transactions.”

Woods said that the historical arc of developing industries typically includes a period with many independent companies, followed by eventual consolidation.

“I expect consolidation to happen over some period of time,” he said.

For now, ExxonMobil’s focus is on knowing what “value opportunities are out there” in the Permian and being in a position to participate.

“If there is the opportunity to acquire something that brings unique value to



ExxonMobil we’ll be in position to transact on that,” he said.

Chevron is stepping up its activity as smaller independent E&Ps spend less on new drilling and completions, shifting focus more to growing earnings amid continued oil price volatility, geopolitical uncertainty and investor angst.

A conference attendee asked Gustavson what was driving Chevron’s pace in the Permian given the current environment, pointing out that some believe the majors are “stepping on the accelerator precisely at the wrong time; whereas, everyone else is pulling back.”

“I expect consolidation to happen over some period of time. I think time is on our side to let that play out.”

—Darren Woods,
chairman and CEO of
ExxonMobil Corp.

Gustavson said Chevron takes a longer-term view.

“It’s important to have a rateable development plan when you’re ramping up and you’re ramping down, going back to that factory optimization and efficiency.” The company is running 20 rigs, which it believes is an optimal number, as development areas were ranked by return.

“We don’t fund everything that we can fund out there. We have to draw a line somewhere,” Gustavson added. “We don’t have unlimited capital from our corporation. We’re part of a much bigger portfolio, but we’re very comfortable with that 20-rig pace for now. ... What we’re really focused on right now is making those 20 rigs that support that bigger factory operate as if they’re 24 rigs or 28 rigs.”

Chevron has grown its net unrisks resources in the Permian to about 16.2 billion barrels of oil equivalent (Bboe), an increase of 6.9 Bboe since 2017.

“If you look at what we’ll produce at current activity levels over the next few years, that’s just a portion of that overall inventory,” he added. “The production story and the value story extend well beyond 2023.”

But he cautioned that not all of those barrels are created equal, and the focus is on certain tiers.

Currently, “we see about half of our acreage today as being in some of the best areas in the basin and that’s a very long queue. ... That doesn’t mean that the rest of that inventory is not valuable,” he added. “It’s just less understood than some of the core development areas in the core benches that are being developed in those areas.”

That could change as the company learns more about the basin, including by applying technology.

Industrywide, “I think we’re really in the early innings of that story [with] digital technology and some of the other subsurface technologies to improve recoveries from the shales we’re producing in the Permian,” he said.

—Velda Addison and Darren Barbee

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TRANSACTION HIGHLIGHTS

UINTA BASIN

■ Canada's **Crescent Point Energy Corp.** reached an agreement to sell all of its Uinta Basin assets for US\$525 million, the company said Sept. 3. Crescent said it is selling to a private operator, which wasn't named.

Crescent Point's Uinta Basin asset includes about 350 net sections of undeveloped land and 29.5 MMboe of proved developed producing.

The company estimates that its forecast production of 20,000 boe/d, 75% of which is crude oil, results in a sale 4.8 times cash flow at current strip prices. The sale is equivalent to \$35,000 per producing boe.

The company also divested southeast Saskatchewan conventional assets.

WEST VIRGINIA

■ **Viper Capital Partners LLC** said Sept. 3 that it acquired drilling rights to more than 12,000 acres of the Rock Creek and Tanner oil fields in Roane and Gilmer counties, W.V.

Details about the deal, which includes 371 oil wells, weren't disclosed. The Houston-based firm said it anticipates focusing on conventional drilling strata using shallow horizontal drilling technology for the already proven.

Viper Capital said it will work with its affiliated operating firm, **Cunningham Energy LLC**, to drill and develop the plays.

President Ryan Cunningham said the company's strategic model will follow acquiring and drilling of historically prolific oil fields using new shallow horizontal technology.

"The Rock Creek and Tanner fields have proven time and time again that conventional oil is an ongoing viable asset," he said in a news release. "We intend to apply our newly adopted model of producing conventional reservoirs through the unconventional method of shallow horizontal drilling and completion."

PERMIAN, EAGLE FORD

■ Billionaire hedge fund manager John Paulson's firm on Sept. 9 launched a salvo at **Callon Petroleum Co.**'s proposed \$3.2 billion acquisition of **Carrizo Oil & Gas Inc.**

Instead, the company should consider selling itself, the firm said in a letter to Callon's board of directors.

Paulson & Co. Inc. holds about a 9.5% stake in Callon. In the letter, the firm says the deal will weaken the company's Permian pure-play status

by adding Carrizo's "inferior Eagle Ford assets."

"Callon stock's astounding 36% decline since the transaction was announced demonstrates shareholder dissatisfaction with the deal and its terms," the firm said in the letter, referring to Callon's July 15 announcement that it would purchase Carrizo.

Callon offered Carrizo shareholders 2.05 shares for each Carrizo share held, or about \$13.12 per Carrizo share based on Callon's closing share price on July 12, representing a 25% premium. Shares of both companies have fallen since then, and the deal now values each Carrizo share at \$9.07.

Paulson noted that paying a 25% premium for the acquisition is "unjustifiable."

The original \$3.2 billion valuation, which would have Callon pay about \$16,500 per acre in the Delaware Basin, is among the lower prices for such deals in the past few years, Andrew Dittmar, an M&A analyst at data provider **Enverus**, told Reuters. Carrizo's holdings in the Eagle Ford are mature and could add to the combined company's cash flow without a lot of investment, he added.

MIDSTREAM

■ Midstream energy firm **Tallgrass Energy LP** said on Aug. 27 it had received an offer from **Blackstone Infrastructure Partners**, its partners and affiliates to acquire the shares in Tallgrass that they do not already own.

The shareholders, who now own about a 44.2% stake in Tallgrass, have made a nonbinding preliminary proposal to acquire the remaining stake at \$19.50 per Class A share, Tallgrass said.

Tallgrass also said its board intends to form a committee consisting of independent directors to consider the proposal. The bid represents a 36% premium to Tallgrass' stock on Aug. 27, according to **Baird Equity Research**.

ARKOMA BASIN

■ **Encana Corp.** said its subsidiary, **Newfield Exploration Mid-Continent Inc.**, has wrapped up its sale of natural gas assets in Oklahoma's Arkoma Basin in a deal initially valued at \$165 million.

The buyer of the assets has not been disclosed, though **BMO Capital Markets** listed the buyer as **NextEra Energy Inc.**

The Arkoma assets include about 140,000 net acres of leasehold and an

average daily production of 77 million cubic feet equivalent of natural gas. Encana said its full-year production guidance of 560,000 to 600,000 barrels of oil equivalent per day remains unchanged.

Encana, which purchased **Newfield Exploration Co.** in February for \$5.5 billion, said it plans to use sale proceeds to reduce debt.

OHIO

■ **Diversified Gas & Oil Plc**, a U.S.-based conventional producer, said Aug. 29 that a judge had approved its purchase of bankrupted **EdgeMarc Energy Holdings LLC**'s assets for \$50 million.

Diversified will acquire the company's natural gas development, production and exploration assets as well as 12 gross producing unconventional Utica gas wells in Monroe and Washington counties, Ohio. The deal includes certain undeveloped lands containing deep Utica rights. The company expects to monetize, either fully or partially, three drilled, uncompleted wells that EdgeMarc sold.

The deal, which is still subject to closing conditions, includes assets with average production of about 46 million cubic feet per day, 99% of which is gas.

EBITDA attributable to the assets for the 12 months through December 2018 was \$30.5 million. The purchase price "represents a multiple of less than three times projected cash flow," the company said, adding that no incremental administrative expenses will be associated with the acquisition.

GOM

■ **W&T Offshore Inc.** closed its purchase of **ExxonMobil Corp.**'s Gulf of Mexico (GoM) assets offshore Alabama for \$167.6 million, about \$32 million less than the announced purchase price, W&T said Sept. 3.

The acquisition was funded by cash on hand and borrowings on its previously undrawn revolving bank credit facility. The Houston-based independent acquired ExxonMobil's assets in the Mobile Bay area, which produced roughly 19,800 net barrels of oil equivalent per day (25% liquids) in first-quarter 2019. The price of the acquisition, announced in late June for \$200 million, dropped after taking into account customary closing adjustments and an effective date of Jan. 1, 2019, the company said.

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CONSOLIDATING THE YESO



RICHARD MASON,
CHIEF TECHNICAL
DIRECTOR

In the *what-have-you-done-for-me-lately* world of Permian Basin oil and gas, New Mexico's Northwest Shelf has, until now, escaped public notice. It is not the Delaware or Midland basins. Nor is it part of the Spraberry-Bone Spring-Wolfcamp triumvirate of 21st century, headline-producing geology.

But, welcome anyway to the Northwest Shelf's Yeso, the slope margin dolomitic and time-coterminous equivalent of the Delaware Basin's Bone Spring to the south. The Yeso occupies that netherworld between conventional and unconventional geologic characteristics that have garnered economic notice with the application of modern horizontal drilling and multistage fracturing.

At less than 5,000 feet, Yeso reservoirs are shallow, which means current breakevens below \$30 oil on \$4 million horizontal wells. Production finds a ready outlet to the Artesia, N. M., refining complex.

Oil and gas interest in Yeso-related reservoirs (primarily Blinebry) and Paddock formations of Leonardian age) dates to the 1960s. Privately held regional companies such as Yates Petroleum Corp. and Chase Energy Corp. were among the most active Yeso participants early on. Interest was rekindled after 2011 when ConocoPhillips Co. drilled 70 vertical Yeso wells near Maljamar, N.M., for evaluation. Historically, vertical Yeso wells were located along the narrow east/west Abo Reef trend between Carlsbad and Artesia, N.M., targeting the slope down from the Northwest Shelf into the Delaware Basin. Current horizontal drilling has moved activity back north of the reef margin edge.

Before New Mexico's Delaware Basin dominated oil and gas interest, the Yeso abided. E&Ps drilled more than 3,600 Yeso wells. By volume, Concho Resources Inc. accounted for more than half of Yeso wells followed by Apache Corp., with a little more than one-third.

In fact, Concho Resources traces its corporate history to the Yeso. In 2006, the Midland-based E&P combined with Artesia-based Chase Oil Corp. to establish a Yeso position on the Northwest Shelf. This predated Concho's Henry Petroleum LP acquisition in 2008 that set the company on course to become a dominant player in the Texas portion of the Permian Basin. In 2010, Concho expanded its Yeso holdings after acquiring Artesia-based Marbob Energy Corp. for \$1.4 billion.

Other regional Yeso acquisitions include EOG Resources Inc., which picked up its own slice of the Yeso pie as part of the Yates Petroleum \$2.34 billion acquisition in 2016. The Northwest Shelf Yeso neighborhood also includes Apache, Occidental Petroleum Corp. and ConocoPhillips.

The modern Yeso narrative developed traction when Houston-based Percussion Petroleum LLC picked up 6,000 net acres in Eddy County in 2016. Eventually, Percussion became the largest player on the western portion of the Northwest Shelf with 22,000 net acres, while Concho remained the main player on the eastern half. Concho initiated horizontal drilling in 2016 and Percussion followed, applying modern slickwater horizontal techniques to what was formerly a shallow vertical play.

Enter Houston-based Spur Energy Partners LLC. The privately held start-up is led by Jay Graham with financial backing from New York-based KKR & Co. Graham is formerly the CEO of WildHorse Resource Development Corp., which established its technical street cred by developing the geologically complex conventional Red River Play in northern Louisiana. That acreage subsequently sold to Range Resources Corp. for \$4.4 billion in 2016. The next corporate iteration of WildHorse focused on the underdeveloped northeast Eagle Ford and legacy Austin Chalk. WildHorse went public at the end of 2016 and was subsequently merged into Chesapeake Energy Corp. in a \$3.98 billion deal in late 2018.

After acquiring Percussion's Yeso holdings in May 2019, Spur added 70,000 net acres and 2,500 operated Yeso wells from Concho—roughly one-third of Concho's well inventory—for \$925 million in cash in September 2019.

Graham's companies are known for exceptional technical prowess in addressing overlooked, geologically challenging oil and gas plays. That history may make the difference in the Yeso. One intriguing question is whether the upper Yeso and Glorieta formations in New Mexico exhibit similar residual oil zone characteristics to those found in the horizontal San Andres play underway on the Central Basin Platform and the Texas extension of the Northwest Shelf. Such linkage suggests that production will be longer-lived, even in a low commodity price environment.

In that case, long live New Mexico's Yeso.

EASTERN U.S.

1 A deeper pool wildcat has been staked by **Pioneer Oil Co. Inc.** in Franklin, Ill. According to IHS Markit, #1-34 Royalton is scheduled to be drilled to 6,200 ft and is in Section 34-7s-1e. Pioneer's venture is targeting Platteville oil pays. A successful completion would open a new pool and extend Clifford Field about 1.5 miles to the northwest. Offsetting Pioneer Oil's new location to the southeast is a shallow 300-ft test drilled in 1989. Within 2 miles to the southeast is Williamson County's Clifford Field, a three-well reservoir opened in 1957. More recently, **Paragon Oil** re-entered a 2,600-ft well in 2016 that was originally abandoned in 2003. The workover, #1-11 Illinois Minerals, was tested pumping 7 bbl of crude and 2 bbl of water per day from Aux Vases at 2,431-44 ft. Pioneer is based in Vincennes, Ind.

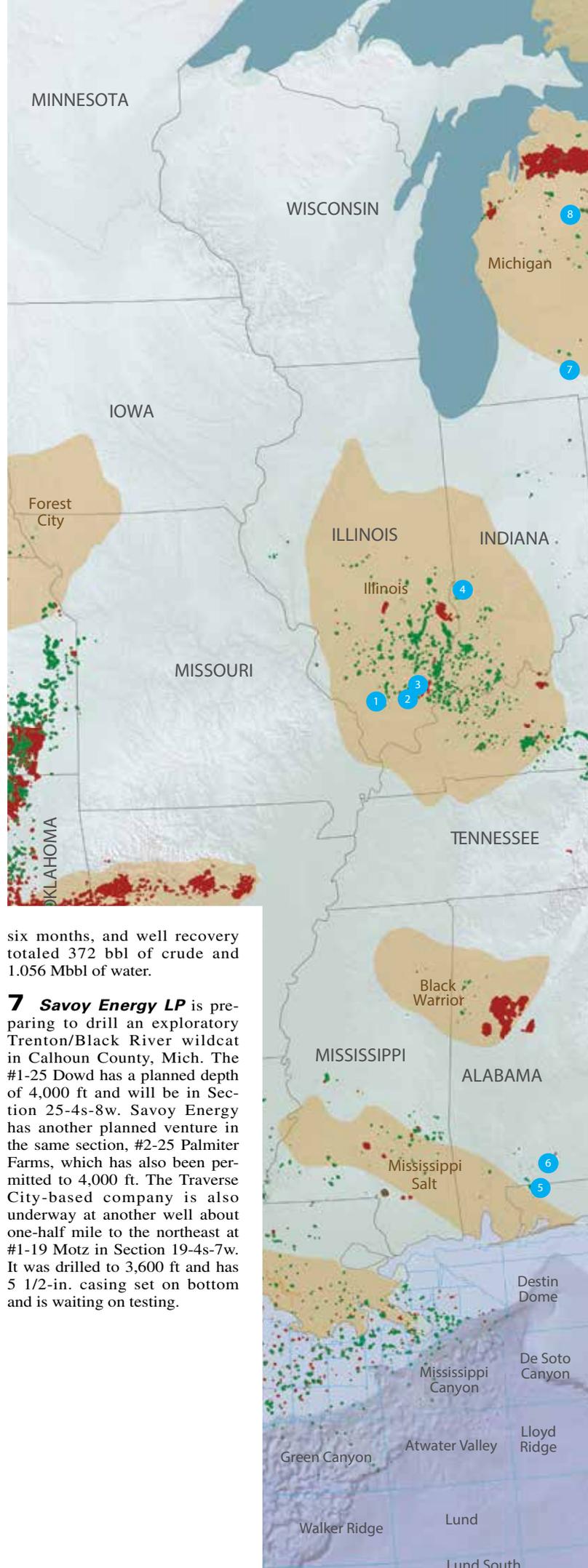
2 Two 5,700-ft exploratory tests have been scheduled by **Campbell Energy** in Saline County, Ill. The #24-1 Tison Heirs will be in Section 24-7s-6e. Immediately to the east in the same section will be #1 Longbranch. Both of the Carmi, Ill.-based company's ventures tests are targeting oil pays in Backbone (Lower Devonian). The wells are about 1.5 miles north of Raleigh Field, which yields crude from pays as deep as Salem.

3 **Pioneer Oil Co. Inc.** is drilling the first of three deeper pool wildcats in southeastern Illinois' Trumbull Consolidated Field. The #1-36 Ackerman Trust is in Section 36-5s-8e of White County and has a planned depth of 4,550 ft. The other well in the program, #1-26 Lynn Simmons, will be in Section 26 and has a planned depth of 4,550 ft, and the #1-35 Judie Simmons well will be in Section 35 and has a planned depth of 4,500 ft. All of the wells are targeting Chouteau Lime (Lower Mississippian). White County's Trumbull Consolidated Field was opened in 1944 and produces from a range of Mississippian pays, including Aux Vases at 3,170 ft, Ohara Lime at 3,230 ft, McClosky Lime at 3,290 ft and Ullin at 4,110 ft. Field production extends about 10 miles northeast of Pioneer Oil's new locations.

4 **Siskiyou Energy** reported two Aux Vases completions in Knox County, Ind. The vertical wells are in Section 30-2n-8w in Monroe City Consolidated Field. The #6 Wade Harrell Unit was drilled to 1,904 ft. It produced 20 bbl of oil after acidizing with production from perforations at 1,244-1,469 ft. Within one-half mile to the southwest, #7 Wade Harrell was tested flowing 50 bbl of oil per day after acidizing. It was drilled to 2,170 ft, and production is from perforations at 1,450-1,465 ft. Siskiyou is based in San Antonio.

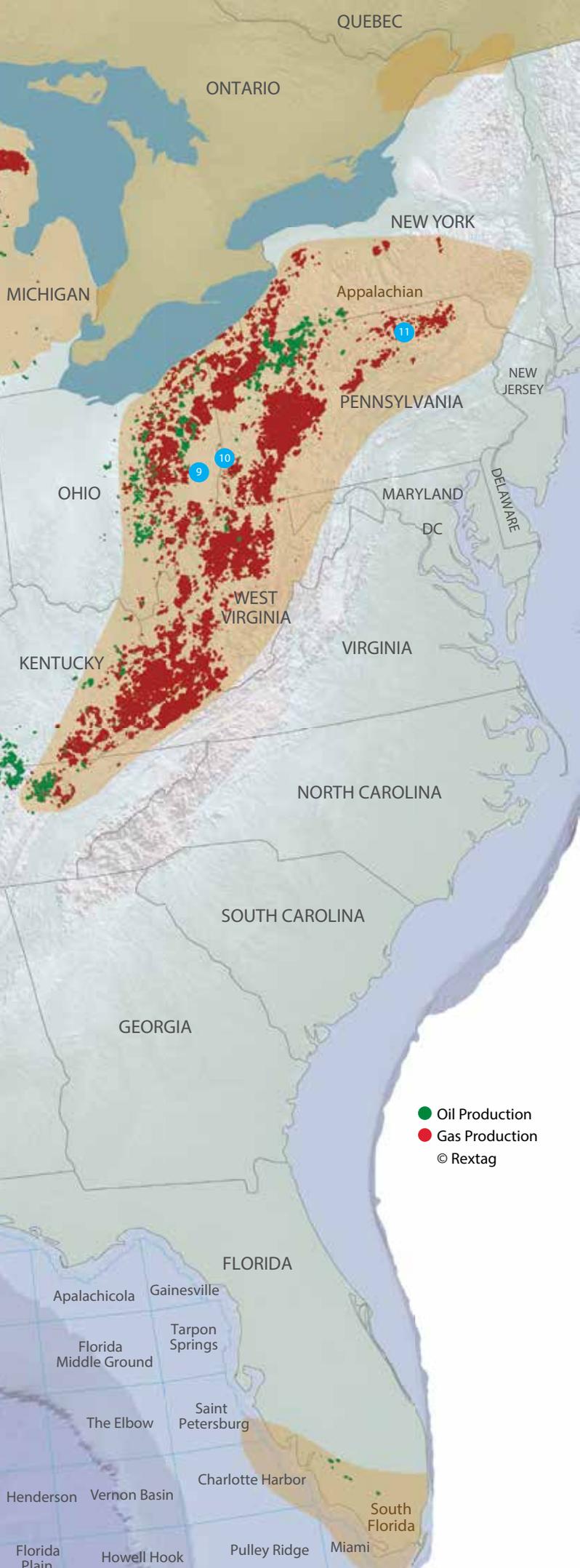
5 Three directional Jay Field sidetrack Smackover tests have been permitted by Los Angeles-based **Breitbart Operating** in Santa Rosa County, Fla. The #30-1A Hunter Unit will be in Section 30-5n-29w and has a planned depth of 16,049 ft (15,982 ft true vertical). The original vertical hole was drilled in 1972 to 16,068 ft, and it produced 858 bbl of crude and 841 Mcf of gas per day from Smackover at 15,684-15,702 ft. Through 2005, the Jay Field well produced 1.3 MMbbl of oil and 1.7 Bcf of gas. Two miles to the northwest in Section 19-5n-29w, #19-6 D.R. Simmons is permitted to 15,954 ft (15,888 ft true vertical). **ExxonMobil Corp.** initially completed the well in 1981, and it flowed 1.146 Mbbl of oil and 1.3 MMcf of gas per day from Smackover at 15,774-15,813 ft. Production through 2012 was 2.4 MMbbl of oil and 2.2 Bcf of gas. About one-half mile to the west, #19-8 Jess A. Moore has a planned depth of 16,051 ft (15,943 ft true vertical). The well was initially drilled to 15,963 ft in 1983 and initially flowed 239 bbl of oil from Smackover at 15,816-15,862 ft. Online until 2011, output totaled 1.1 Mbbl of crude and 2.3 Bcf of gas.

6 **Sklar Exploration** is underway at a directional Smackover wildcat in Escambia County, Ala. The venture, #1 Cedar Creek Land & Timber 21-16, is in Section 28-3n-11e with a planned bottomhole location to the northwest in Section 21. The planned depth is 13,550 ft, 13,498 ft true vertical. Within 3 miles to the northeast is a directional Smackover discovery drilled by the Shreveport, La.-based company in 2014 at #1 Cedar Creek Land & Timber 14-9 in Section 14. Production is from a Smackover zone at 12,600-12,604 ft. According to IHS Markit, it produced sporadically over



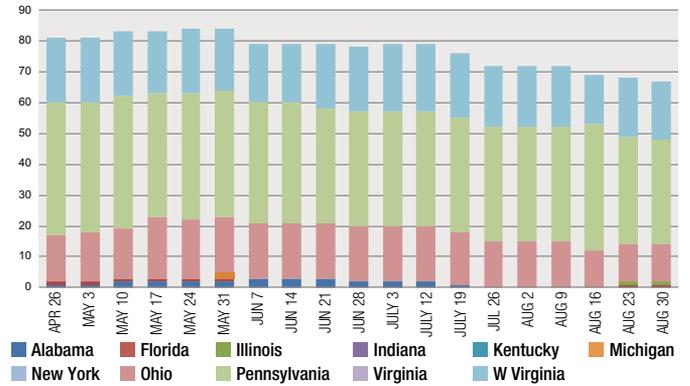
six months, and well recovery totaled 372 bbl of crude and 1.056 Mbbl of water.

7 **Savoy Energy LP** is preparing to drill an exploratory Trenton/Black River wildcat in Calhoun County, Mich. The #1-25 Dowd has a planned depth of 4,000 ft and will be in Section 25-4s-8w. Savoy Energy has another planned venture in the same section, #2-25 Palmyer Farms, which has also been permitted to 4,000 ft. The Traverse City-based company is also underway at another well about one-half mile to the northeast at #1-19 Motz in Section 19-4s-7w. It was drilled to 3,600 ft and has 5 1/2-in. casing set on bottom and is waiting on testing.



Eastern U.S. Rig Count

Apr. 19, 2019-Aug. 30, 2019



Data compiled from Baker Hughes

8 According to IHS Markit, **West Bay Exploration** has filed a permit application to expand Michigan's Skeels Field to the southeast. According to a filing with Michigan regulators, the Traverse City-based company plans to drill #1-5 Cuddie in Gladwin County with a true vertical depth of 4,150 ft. The venture will be directionally drilled in Dundee Lime and will bottom to the north in Section 5-19s-2w. West Bay has had a Dundee Lime development drilling program in Skeels Field since 2016. The most recent drilling by the company is about 1 mile to the west at #1-7 Spinazzola in Section 7. The directional well was drilled to 3,846 ft (3,833 ft true vertical). It was completed in an unreported Dundee Lime zone. Through March 2019, well recovery totaled 26.125 Mbbl of crude.

9 Oklahoma City-based **Ascent Resources Inc.** completed a Utica Shale producer in Jefferson County, Ohio. The #2H Nolan S was drilled from a drillpad about 30 ft southeast of a previous Ascent discovery, #1H Nolan. The #2H Nolan was tested flowing 21,506 MMcf of gas with 212 bbl of water per day. The Gould Consolidated Field completion is in Section 36-5n-2w. It was drilled to 18,532 ft, and production is from perforations at 9,905-10,046 ft. The true vertical depth is 9,567 ft.

10 **Chevron Corp.** has received permits for four Marcellus wildcats in Marshall County, W.Va. The wells will be drilled from a drillpad in Franklin Dist., Glen Easton 7.5 Quad. The #02H Mason has a projected depth of 19,583 ft (6,560 ft true vertical) and will bottom to the northeast. The #03H Mason has a planned depth of 19,760 ft (6,560 ft true vertical) and will be drilled to the north. The #04H Mason has a planned depth of 20,671 ft (6,560 ft true vertical) and will be drilled to the northwest. The #09H Mason has a planned depth of 12,764 ft (6,650 ft true vertical) and will be drilled to the southeast. Chevron's headquarters are in Houston.

11 Permits for three Marcellus Shale-Harkness Field ventures have been issued to **Chesapeake Operating Inc.** The wells will be drilled from a pad in Section 8, 7.5 Quad, Overton Township in Bradford County, Pa. The #3 Oilcan has a planned depth of 15,962 ft and a planned true vertical depth of 8,500 ft. About 20 ft north on the pad, #5 Oilcan has a planned depth of 20,714 and a planned true vertical depth of 8,500 ft. The #6 Oilcan has a planned depth of 14,471 ft and a planned true vertical depth of 8,500 ft.

GULF COAST

1 Lamar Oil & Gas Inc. completed a workover in the western Aransas County (RRC Dist. 4), Texas, portion of Copano Bay. The #1 State Tract 00080 was tested flowing 630 Mcf of gas, 12 bbl of 46.2-degree-gravity oil and 5 bbl of water per day from perforations in Frio at 9,900-14 ft. The Copano Bay South Field well was directionally drilled to 10,214 ft and was plugged back to 10,029 ft before it was tested. The well was originally completed in 2008, when Rockport, Texas-based Lamar tested the well flowing 2.5 MMcf of gas and 67 bbl of condensate per day from Frio at 10,095-10,105 ft. Through mid-2018, cumulative production was 2.9 Bcf of gas and 81.293 Mbbl of condensate.

2 Three Haynesville Shale wells were completed from a pad in DeSoto Parish, La., by Oklahoma City-based **Chesapeake Operating Inc.** The pad is in Section 28-14n-115w in Bethany Longstreet Field. According to IHS Markit, #1-Alt Banks 28&21-14-15HC flowed 29.232 MMcf of gas per day from acid- and fracture-treated perforations at 12,264-22,092 ft. It was drilled about 2 miles to the northeast to 22,163 ft, 11,807 ft true vertical. Gauged on a 29/64-in. choke, the flowing casing pressure was 7,380 psi. The offsetting #2-Alt Banks 28&21-14-15HC flowed 34.608 MMcf of gas per day from treated perforations at 12,274-22,103 ft. It was drilled to the north to 22,131 ft, 11,929 ft true vertical, and tested on a 32/64-in. choke with a flowing casing pressure of 7,237 psi. The #3-Alt Banks 28&21-14-15HC produced 30.744 MMcf of gas per day. It was drilled about 2 miles to the northeast to 22,047 ft, 11,836 ft true vertical. Tested on a 30/64-in. choke, the flowing casing pressure was 7,304 psi. Acid- and fracture-treated perforations are at 12,167-21,989 ft.

3 In Caddo Parish, Louisiana, **Chesapeake Operating Inc.** completed a horizontal Haynesville well in Caddo Parish, La. The #2-ALT JPIL22-15-10-16-15HC was completed flowing 36.5 MMcf of gas per day during testing on a 32/64-in. choke with a flowing casing pressure of 7,552 psi. The Metcalf Field well is in Section 16-15w-22s and had a projected depth of 27,180 ft.

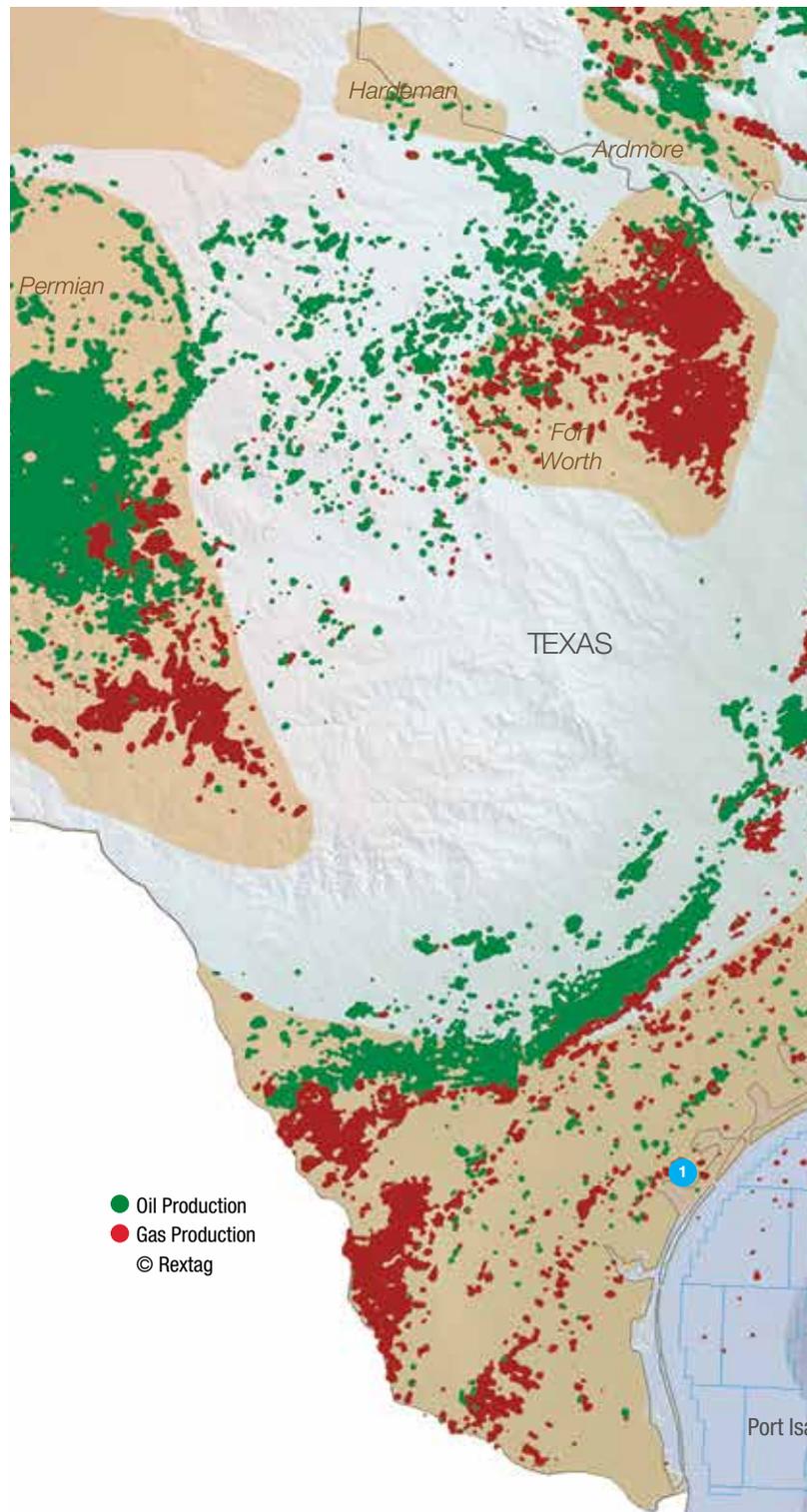
4 Tellurian Operating LLC announced two Haynesville Shale wells in DeSoto Parish, La. The #1-Alt Rambin 12&1-11-11HC initially flowed 16.915 MMcf of gas and 240 bbl of water from an acid- and fracture-treated zone at 13,280-20,645 ft. The 20,800-ft well has a true vertical depth of 12,900 ft and was tested on a 19/64-in. choke with a flowing casing pressure of 9,505 psi. The offsetting #2-Alt Rambin 12&1-11-11HC produced 15.216 MMcf of gas and 264 bbl of water per day. Production is from acid- and fracture-treated perforations at 13,015-20,096 ft. It was drilled to 20,193 ft, and the true vertical depth is 12,548 ft. Gauged on a 20/64-in. choke, the flowing casing pressure was 9,200 psi. The Houston-based company's Chemard Lake Field wells were drilled from offsetting surface locations in Section 13-11n-11w. Both wells bottomed within 1.5 miles to the north in Section 1.

5 The completion of two Haynesville Shale wells was announced by **Indigo Minerals** in Red River Parish, La. The #1 Jordan 36&25-11-10H produced 27.639 MMcf of gas and 590 bbl of water from an acid- and fracture-treated zone at 13,911-20,611 ft. It was tested on a 27/64-in. choke, and the flowing casing pressure was 9,052 psi. Drilled to 20,670 ft, 13,493 ft true vertical, it bottomed about 1.5 miles to the south in Section 25. The #1 Jordan 36&1-11-10H was tested in an acid- and fracture-treated zone flowing 22.345 MMcf of gas and 65 bbl of water per day from perforations at 13,136-18,375 ft. It was drilled to the south 18,404 ft with a true vertical depth of 12,941 ft, and it bottomed in Section 1-10n-10w. The Redoak Lake Field wells were drilled from offsetting surface locations in Section 36-11n-10w.

6 Chevron Corp. plans to bypass the original hole at a Lower Tertiary exploratory test on Garden Banks Block 913. The #1 (BP) OCS G34528 will be kicked off at 15,136 ft. Block 912 (OCS G36012) and Block 913 make up Chevron's Kingsholm prospect. According to the exploration plan for the project, up to eight exploratory tests could be drilled from various surface locations on the tracts. Water depth in the area is 4,800 ft. The Houston-based company was last active in the area in 2016, drilling a Lower Tertiary exploratory test on the company's Dawn Marie prospect to the southwest. The #1 OCS G31688 on Block 998 reached a total depth of 34,427 ft with few other details available.

7 A drilling plan has been filed by **BP Plc** for Green Canyon Block 821, a deepwater tract 12 miles west of the company's Mad Dog development. According to the new exploration plan, the London-based company will drill up to four tests from various surface locations on Block 821 (OCS G34561). Water depth in the area is about 4,000 ft. BP was active on Block 821 in 2005 under a previous lease at #1 OCS G16806 near the far eastern edge of the tract. It was abandoned at 24,000 ft in Miocene and is the only drilling on the block to date.

8 Anadarko Petroleum Corp. has scheduled a development test in the company's producing K2 Field. The #8 OCS



G11075 will be drilled in the central portion of Green Canyon Block 562. Area water depth is 3,925 ft. The most recent drilling in K2 Field took place in mid-2018 at #7SS (BP) OCS G11075. It was drilled to 28,617 ft (26,980 ft true vertical). Through mid-2019, production from Upper Miocene perforations at 25,754-25,840 ft has totaled 778.84 Mbbl of crude and 364 MMcf of gas. Anadarko is based in The Woodlands, Texas.

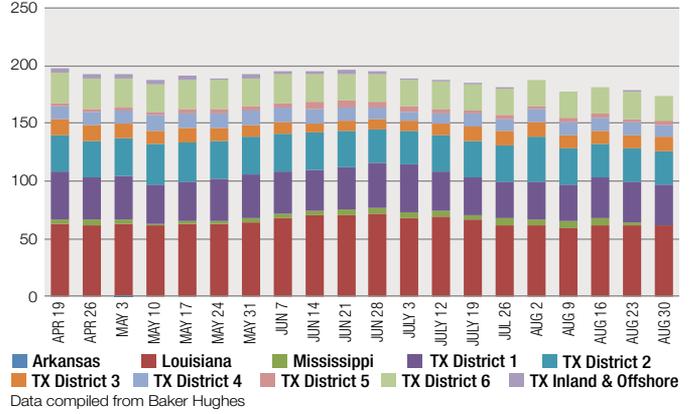
9 Shell Oil Co. announced that it will begin developing its PowerNap deepwater project in the Mississippi Canyon 943. PowerNap is expected to start production in late 2021, and its peak production rate is estimated

as high as 3.5 Mbbl of oil equivalent per day. The recoverable resource is estimated at more than 85 MMboe. The PowerNap discovery, #1 OCS G34467, was announced in 2015. It hit hydrocarbons in multiple subsalt Miocene zones. Water depth is approximately 4,200 ft. The initial hole was drilled to 30,968 ft (30,360 ft true vertical) and was followed by two deeper side-tracks, 34,114 ft (32,787 ft true vertical) and 31,432 ft (31,118 ft true vertical), that were designed to delineate the discovery. Shell is based in Houston.

10 A Mississippi Canyon Block 122 discovery was announced by **Murphy Oil Corp.** at the company's Hoffe

Gulf Coast Rig Count

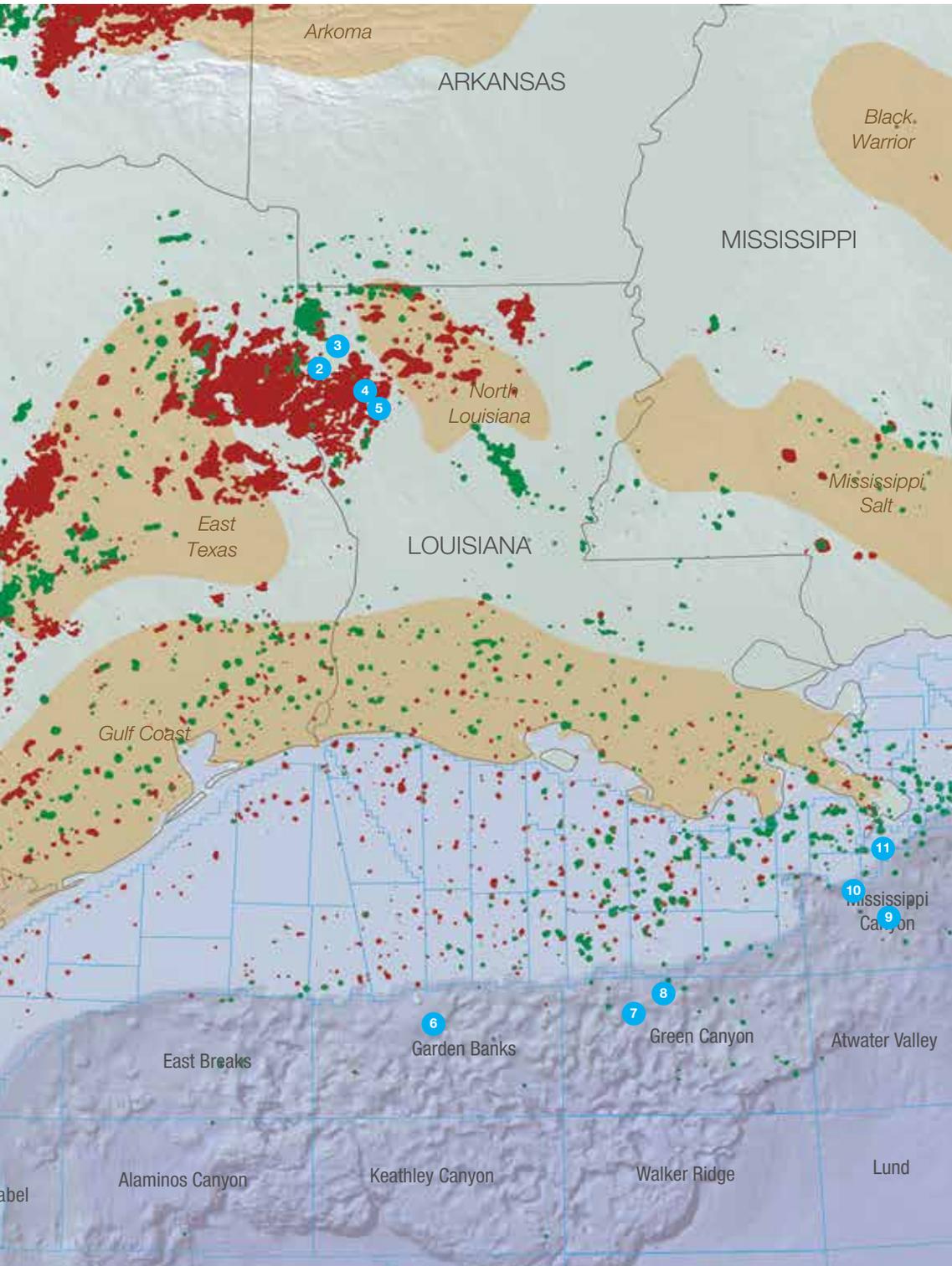
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Park prospect. According to the company, #1 OCS G34424

encountered oil in multiple zones. The drillship is still remaining on location to complete well evaluation. No total depth has been disclosed. Water depth in the area is 4,000 ft. In 2017, **Chevron** was active in the area and drilled one exploratory test on the prospect at #1 OCS G35318, which was abandoned at 18,014 ft and is in the southwestern corner of the same block. It was drilled to the south and bottomed in Block 166. Murphy is based in El Dorado, Ark.

11 Chevron Corp. has scheduled a development test in the company's producing Blind Faith Field. The #6BF OCS G21182 will be drilled in the western portion of Mississippi Canyon Block 696, with a planned bottomhole to the west in Mississippi Canyon Block 695. Water depth in the area is 6,900 ft. It will be the first new drilling in Blind Faith Field since it came online in 2008. The company has, however, completed a handful of sidetracks and workovers in the area in recent years. Production through mid-2019 is 81 MMbbl of crude/condensate and 62 Bcf of gas from Miocene at 20,938-25,096 ft.



MIDCONTINENT & PERMIAN BASIN

1 In Ford West Field, Denver-based **Cimarex Energy Co.** completed an extended-lateral Wolfcamp discovery in the Culberson County (RRC Dist. 8), Texas, portion of the Delaware Basin. According to IHS Markit, #1H Azra State 16 Unit produced 5.326 MMcf of gas, 642 bbl of 50.1-degree-gravity condensate and 3.747 Mbbl of water daily. It was tested on a 1-in. choke with a flowing tubing pressure of 183 psi and a shut-in tubing pressure of 1,020 psi. Acid- and fracture-stimulated perforations are at 8,118-20,633 ft. The horizontal well was drilled to 20,179 ft, 8,126 ft true vertical, and is on a 1,600-acre West Texas lease in Section 16, Block 114, PSL Survey, A-8856. The lateral bottomed about 2.5 miles to the south in Section 4, Block 110, PSL Survey, A-8853.

2 A horizontal Wolfcamp producer has been completed by **Jetta Operating Inc.** in Reeves County (RRC Dist. 8), Texas. According to IHS Markit, #3H Hermosa State 55 30-31 flowed 5.842 MMcf of gas, 560 bbl of 50-degree-gravity oil and 4.456 Mbbl of water daily from fracture-treated perforations at 10,222-19,542 ft. It was tested on an adjustable choke with a flowing casing pressure of 285 psi and a shut-in casing pressure of 1,015 psi. The Ford West Field well was drilled to 19,707 ft, 9,717 ft true vertical, and is in Section 30, Block 55 T5S, T&P RR Co Survey, A-5993. The 2-mile long lateral bottomed to the south in Section 31. Jetta is based in Fort Worth, Texas.

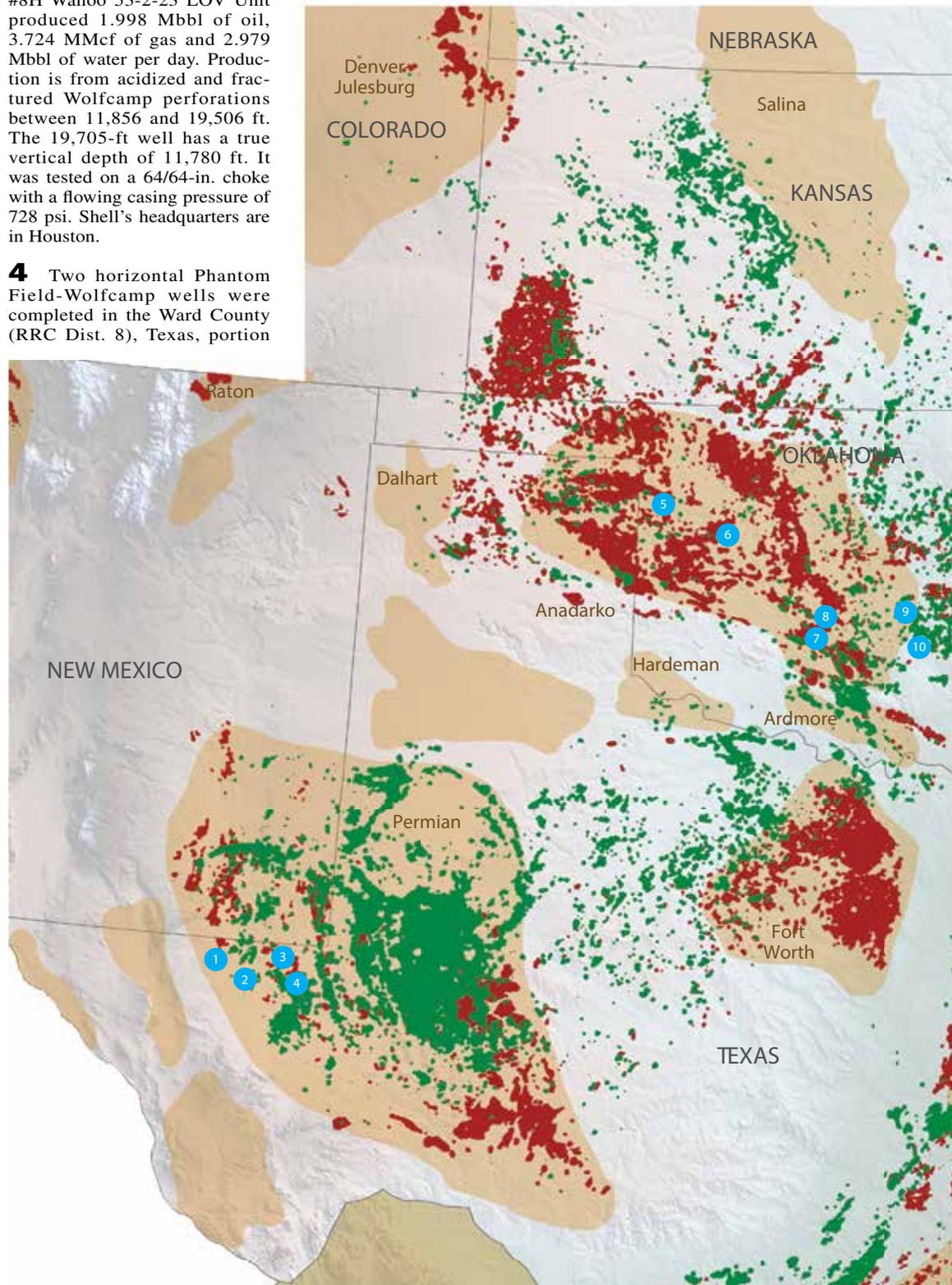
3 **Shell Oil Co.** completed two Phantom Field Wolfcamp wells from a pad in Loving County, Texas. The pad is in Section 26 T&P RR CO, A-1076 Survey. The #3H Wahoo 53-2-23 LOV Unit was tested flowing 2.252 Mbbl of oil, 5.165 MMcf of gas and 4.345 Mbbl of water per day. It was drilled to 19,650 ft, 11,624 ft true vertical. Production is from perforations at 11,744-19,383 ft and was tested on a 1-in. choke with a flowing casing pressure of 944 psi. The #8H Wahoo 53-2-23 LOV Unit produced 1.998 Mbbl of oil, 3.724 MMcf of gas and 2.979 Mbbl of water per day. Production is from acidized and fractured Wolfcamp perforations between 11,856 and 19,506 ft. The 19,705-ft well has a true vertical depth of 11,780 ft. It was tested on a 64/64-in. choke with a flowing casing pressure of 728 psi. Shell's headquarters are in Houston.

4 Two horizontal Phantom Field-Wolfcamp wells were completed in the Ward County (RRC Dist. 8), Texas, portion

of the Delaware Basin by **Felix Energy**. IHS Markit reported that #1H Missouri Gulch 848586-F flowed 1.205 Mbbl of 49.2-degree-gravity oil, 3.545 MMcf of gas and 1.669 Mbbl of water per day. Production is from acid- and fracture-treated perforations at 11,333-22,230 ft. The flowing tubing pressure was 1,166 psi on a 39/64-in. choke. It is in Section 84, Block F, G&MMB&A Survey, A-44, and was drilled to 22,345 ft, 11,188 ft true vertical. It bottomed 2 miles to the northwest in Section 86. Less than 2 miles to the southwest in Section 98, Block F, G&MMB&A Survey, A-52, #1H

Iowa Gulch 9797-F produced 864 bbl of 45.4-degree-gravity crude, 1.031 MMcf of gas and 1.676 Mbbl of water per day. It was tested on a 33/64-in. choke, and the flowing tubing pressure was 784 psi with production from acidized and fracture-stimulated perforations at 11,225-21,254 ft. Drilled to 21,364 ft (11,224 ft true vertical), it bottomed 2 miles to the northwest in Section 96. Felix Energy's headquarters are in Denver.

5 A Cherokee completion by **Valpoint Operating LLC** was tested flowing 470 bbl of 44-degree-gravity oil, 3.075



MMcf of gas and 2.93 Mbbl of water per day. The #36-25 1H Weston is in Section 1-17n-23w, Ellis County, Okla., and is in Peek South Field. It was drilled to 18,450 ft, 9,940 ft true vertical. Production is from acidized and fractured perforations at 10,347-18,361 ft. Valpoint's headquarters are in Amarillo, Texas.

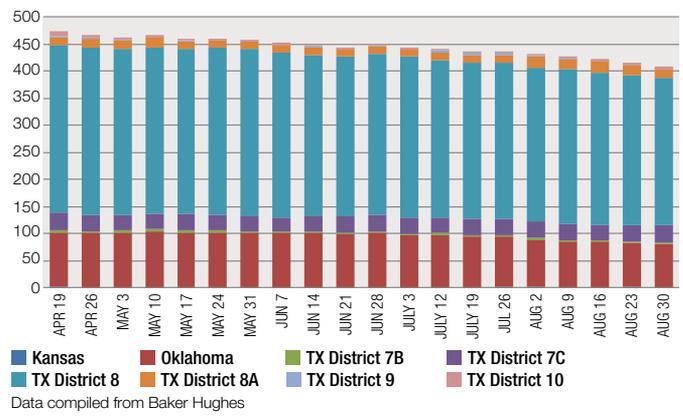
6 In Kingfisher County, Okla., **Marathon Oil Corp.** announced results from an Upper Meramec discovery at #2-28-33MXH Mike Stroud Bia 1509. The Altona Field venture is in Section 33-15n-9w, and it was drilled to 20,222 ft, 10,715 ft true

vertical. It produced 9.211 MMcf of gas, 1.285 Mbbl of oil per day. Additional completion information is currently unavailable. Marathon is based in Houston.

7 A Woodford completion by **Gulfport Energy Corp.** in Grady County, Okla., flowed 19,963 MMcf of gas and 4.5 Mbbl of water per day. The #1-17X20H Kael is in Section 17-4n-6w and was drilled to 27,508 ft with a true vertical depth of 17,655 ft. It was tested after acidizing and fracturing and produces from 17,785-26,585 ft. Gulfport's headquarters are in Oklahoma City.

Midcontinent & Permian Basin Rig Count

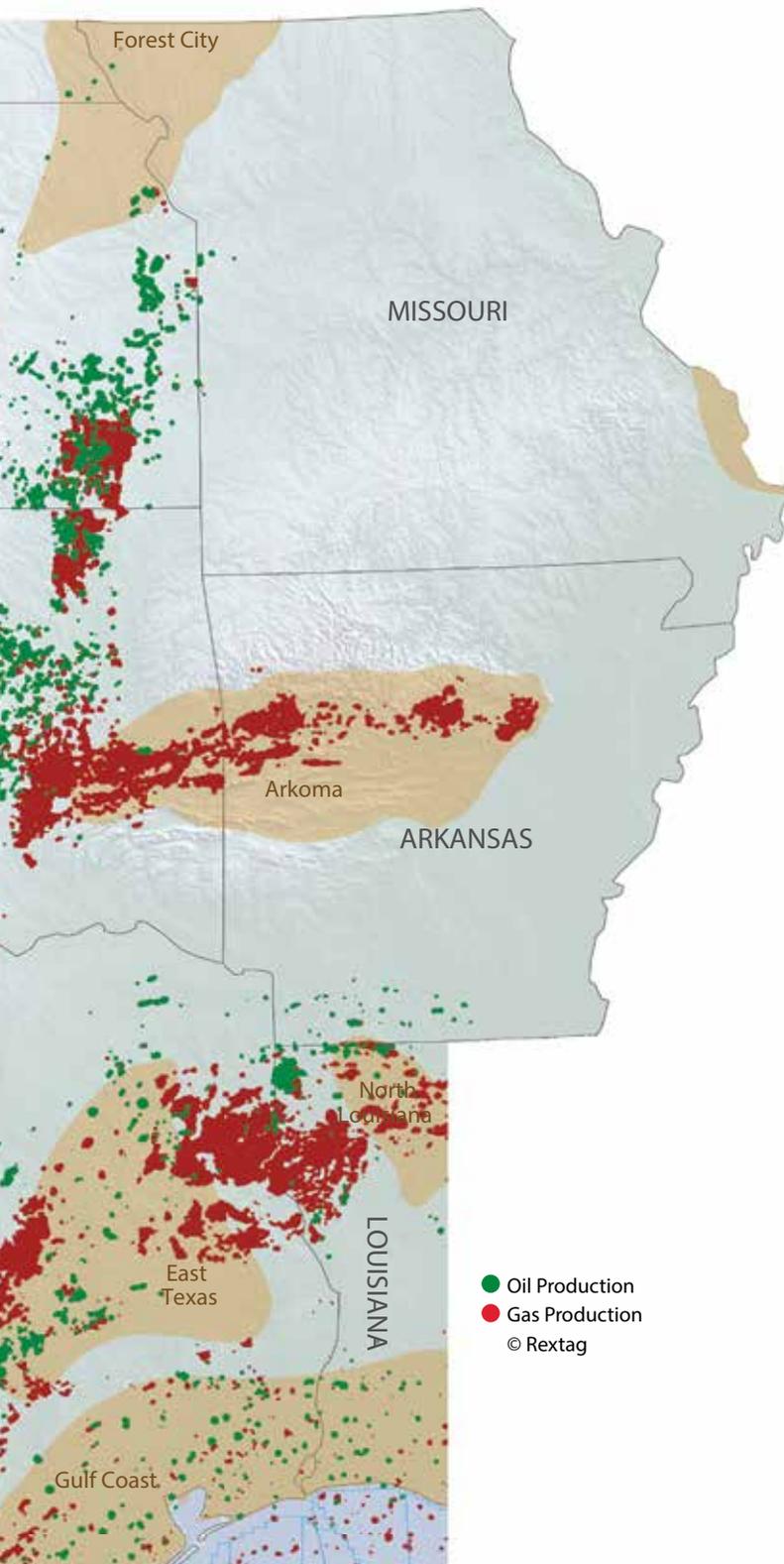
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8 Three high-rate horizontal Woodford producers in Chitwood Field were completed from a drillpad in Section 27-5n-6w of Grady County, Okla., by **Gulfport Energy Corp.** The #6-27X34H Jeannie is producing from perforations at 15,336-21,740 ft and flowed 13.8 MMcf of gas with 631 bbl of 59-degree-gravity condensate and 4.718 Mbbl of water per day. The venture was drilled about 1.5 miles to the south at 21,890 ft (15,222 ft true vertical) and bottomed in Section 34-5n-6w. It was tested on a 32/64-in. choke after acidizing and fracturing. Within one-half mile to the east-southeast, #8-27X34H Jeannie flowed 12.9 MMcf of gas, 561 bbl of condensate and 2.583 Mbbl of water per day. It was drilled in a parallel lateral to 21,327 ft, 15,197 ft true vertical, and bottomed in Section 34-5n-6w. It was tested on a 3/64-in. choke and was acidized and fractured between 15,150-20,980 ft. About 20 ft north on the pad, #7-27X34H Jeannie produced 11.7 MMcf of gas, with 394 bbl of condensate and 1.128 Mbbl of water per day. Drilled to 21,510 ft (15,230 ft true vertical), production is from perforations at 15,394 and 21,225 ft.

9 In Hughes County, Okla., **Corterra Energy Operating LLC** reported results from two Woodford wells that were completed from an Arkoma Basin pad. The #0310-1XHR Beth is in Section 3-6n-9e and was tested on a 64/64-in. choke flowing 2.39 MMcf of gas daily, with no water. Production is from an acidized and fractured interval at 5,202-12,699 ft. Drilled to 14,312 ft, 5,118 ft true vertical, it bottomed in Section 10-6n-9e. The respective shut-in and flowing tubing pressures were 580 psi and 101 psi. About 15 ft north on the pad, #V0409-1HX Josh flowed 2.19 MMcf of gas per day, with an unreported amount of oil and water. It has a parallel lateral extending to 14,280 ft, and it bottomed in Section 9-6n-9e. The wellbores extend across much of Spaulding East Field, a Booch (Pennsylvanian) oil pool that produces from around 2,800 ft. Corterra is based in Tulsa, Okla.

10 An exploratory test in Atoka County, Okla., flowed 8.2 MMcf of gas and 777 bbl of water per day. **Bravo Arkoma LLC's** #4-31/30H Cairo is in Section 31-2n-12e. It was tested on a 26/64-in. choke with production from acidized and fractured perforations in undifferentiated Mississippian between 11,614 and 20,144 ft. Respective shut-in and flowing tubing pressures were 2,387 psi and 1,348 psi. The well was drilled to the north to 20,348 ft and bottomed in Section 30-2n-12e. The true vertical depth is 11,541 ft. Bravo's headquarters are in Tulsa, Okla.



● Oil Production
● Gas Production
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WESTERN U.S.

1 A **True Oil LLC** discovery at a Sweetgrass Arch delineation test initially flowed 3.2 MMcf of gas per day. The Casper-based company's #41-5-1 Simmes Ranch is in Section 5-36n-3w of Toole County, Mont. Production is from perforations in Sunburst (Lower Cretaceous) at 2,206-09 ft. A deeper Sunburst interval at 2,296-2,300 ft was acidized then closed off by a bridge plug set at 2,244 ft. Nearby production is within 1 mile to the east-southeast at a Sunburst gas discovery completed in 1955 at #1 Rhone C.W. Shay. It was drilled to 2,203 ft and completed initially flowing 1.25 MMcf of gas per day. It produced 81.1 MMcf of gas before being abandoned in 2005.

2 **Black Oak Energy LLC**, based in Casper, has scheduled 32 horizontal exploratory tests on a common drillpad in the Red Desert Basin. The drillpad will be in Section 12-25n-96w of Sweetwater County, Wyo. The horizontal projects are on the company's Nightshade Fee leases. Sixteen of the wells will be drilled in Fox Hills, while eight each will be drilled in Lewis and Almond (Mesaverde). Bottomhole locations are to the south in Section 24-25n-96w and to the north in Section 1-25n-96w.

3 In Converse County, Wyo., Denver-based **Northwoods Operating LLC** has completed a two-section horizontal Frontier producer on the southwestern flank of the Powder River Basin. Located in Section 13-39n-75w, #13W24-7FH Aspen initially flowed 57 bbl of 47-degree-gravity oil, 783 Mcf of gas and 610 bbl of water per day. Production is from an approximate 2-mile lateral drilled to the southeast to 23,262 ft, 12,527 ft true vertical, and it bottomed in Section 24-39n-75w. It was tested on a 24/64-in. choke following 42-stage fracturing between 12,853 and 23,164 ft. Northwoods has six other wells planned from this drillpad.

4 **Petro-Hunt LLC**, based in Denver, completed two, two-section horizontal Turner producers in Campbell County, Wyo. The #43-71-4A-9-2TH USA is in Section 4-43n-71w and initially pumped 337 bbl of 38-degree-gravity oil, 372 Mcf of gas and 181 bbl of water per day. Production is from a lateral extending from 9,437 ft south-eastward to 18,965 ft (9,105 ft true vertical) and bottomed in Section 9-43n-71w. It was tested following 38-stage fracturing between 9,545 and 18,777 ft. Within 2 miles to the southwest, #43-71-5C-32-2H Stuart pumped 264 bbl of 38.6-degree-gravity oil with 495 Mcf of gas and 407 bbl of water per day. Production is from a lateral extending from 9,661 ft northward to 19,229 ft and bottomed in Section 32-44n-71w. It was tested after 38-stage fracturing between 9,752 and 19,044 ft.

5 **Burlington Resources LP** completed a horizontal Niobrara producer in the Denver-Julesburg Basin. The #4-64 8-7-4CH Tiberius is in Section 8-4s-64w, Arapahoe County, Colo. It initially flowed 1.228 Mbbbl of 40-degree-gravity oil, 893 Mcf of gas and 858 bbl of water per day. Production is from a lateral drilled to the west to 15,416 ft, 7,656 ft true vertical, with a bottomhole location in Section 7-4s-64w. It was tested on a 38/64-in. choke following 29-stage fracturing between 8,265 and 15,263 ft, and the flowing tubing pressure was 581 psi. Burlington Resources is a subsidiary of **ConocoPhillips**.

6 A permit for a 3,500-ft wildcat in Section 7-8s-1e, Fall River County, S.D., has been issued to **T-C Oil Co. LLC**. The well, #7-1 South Dakota-Federal, is in a nonproducing and lightly drilled township. No objectives were disclosed, but presumably they include Pennsylvanian Leo Sands (Minnelusa). The venture is about 1 mile east of Niobrara County, Wyo., and within 6 miles east and east-northeast of two Niobrara County fields, Mule Creek and Mule Creek West. Combined production from the field is approximately 4.4 MMbbl of oil, 88.5 MMcf of gas and 22.7 MMbbl of water from Dakota, Lakota and Leo. Mule Creek Field was discovered in 1919. T-C Oils headquarters are in Refugio, Texas.

7 **Bruin E&P Operating Inc.** announced results from a Middle Bakken completion in Williams County, N.D. The well has the highest reported rate in the county. The #156-101-1B-12-2H Borrud was tested flowing 4.635 Mbbbl of oil, 3.246 MMcf of gas, and 6.079 Mbbbl of water per day. The Tyrone Field well is in Section 1-156n-101w and was drilled to 21,326 ft, 10,303 ft true vertical, and production is from perforations at 10,595-21,186 ft. It was tested on a 56/64-in. choke, and the flowing casing pressure was 1,565 psi. Bruin's headquarters are in Houston.

8 Oklahoma City-based **Continental Resources Inc.** reported results from a three-section Three Forks producer on the Nesson Anticline in Williams County, N.D. The #8-1H1 initially flowed 1.833 Mbbbl of 41-degree-gravity oil, 2.576 MMcf of gas and 3.103 Mbbbl of water per day. The discovery is in Section 1-156n-95w, and production is from a nearly 3-mile long lateral in Three Forks extending from 10,281 ft southward to 26,291 ft at a bottomhole location in Section 13-156n-95w. The true vertical depth is 10,248 ft. It was tested on a 36/64-in. choke,



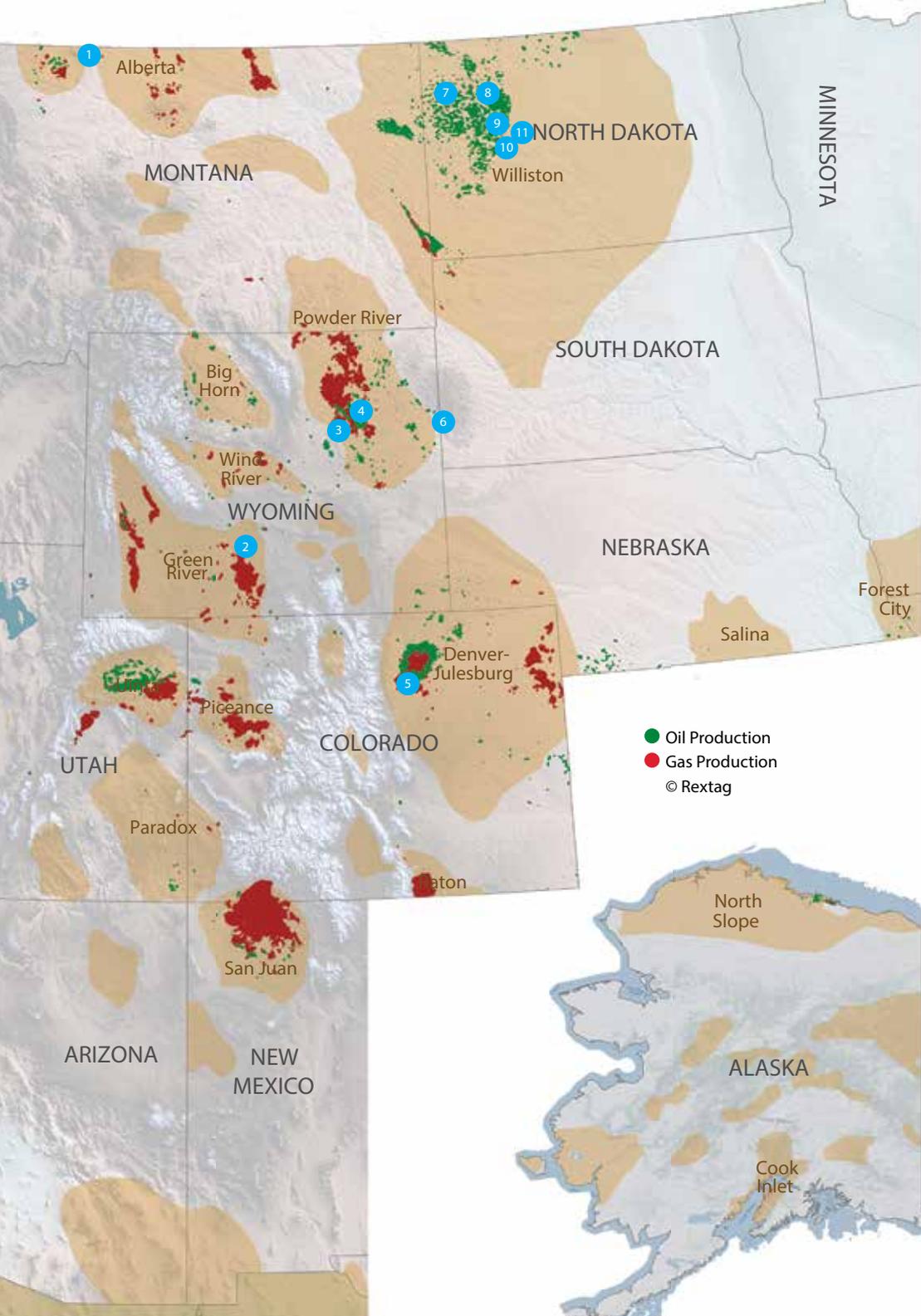
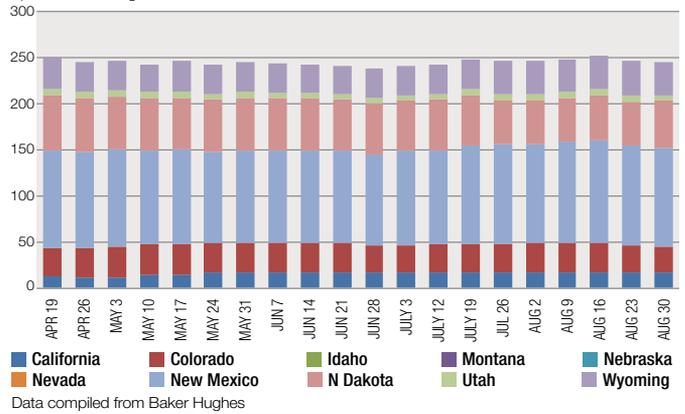
following 50-stage fracture stimulation and acid cleanup between 10,281 and 26,291 ft. According to Continental, the Pleasant Valley Field well is a “strategic stepout” and one of the company’s first tests of its optimized completion technology. It outperformed the company’s legacy well in the vicinity by 145% at 120 days and a 2-mile legacy well by 100% at 60 days.

9 Results from two Bakken discoveries on the Fort Berthold Indian Reservation in McKenzie County, N.D., were announced by **WPX Energy**

Rocky Mountain. According to IHS Markit, #26-35HD Grady Minot produced 4.634 Mbbl of 42-degree-gravity oil, 3.657 MMcf of gas and 2.435 Mbbl of water daily. The #26-35HD Grady Minot is in Section 23-149n-94w, and production is from a lateral in Middle Bakken drilled to 21,148 ft (10,828 ft true vertical) and bottomed in Section 35-149n-94w. It was tested on a 32/64-in. choke after 40-stage fracturing between 11,143 and 21,013 ft, and the flowing casing pressure was 2,150 psi. The #26-35HF Grady Minot flowed 4.304 Mbbl of oil, 3.669 MMcf of gas and 2.2 Mbbl of

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water per day. Production is from a Middle Bakken lateral drilled to the south to 21,152 ft (10,813 ft true vertical) and bottomed in Section 35-149n-94w. WPX is based in Oklahoma City.

10 WPX Energy Rocky Mountain completed two Williston Basin-Squaw Creek Field producers on the Fort Berthold Indian Reservation in McKenzie County, N.D. The completions were drilled from a pad in Section 35-149n-94w. According to IHS Markit, the #26-35HZ Grady Minot initially flowed 3.224 Mbbl of oil, 2.447 MMcf of gas and 2.257 Mbbl of water per day from a fractured horizontal Three Forks interval at 11,253-20,956 ft. The lateral was drilled to the south to 21,118 ft (10,901 ft true vertical). The #26-35HC Grady Minot initially flowed 3.792 Mbbl of oil, 3.194 MMcf of gas and 2.097 Mbbl of water per day from a fractured horizontal Middle Bakken interval at 11,202-21,039 ft. The lateral was drilled to the south to 21,191 ft (10,806 ft true vertical). Two additional wells have been drilled from the pad, #26-35HT and #26-35HY, but no completion details have been released.

11 In Mountrail County, N.D., **Marathon Oil Corp.** completed a Middle Bakken well that was tested flowing 9.347 MMcf of gas, 9.014 Mbbl of oil and 5.963 Mbbl of water per day. The #41-17H Driftwood USA is in Reunion Bay Field and was drilled to 23,159 ft, 10,742 ft true vertical. Production is from acidized and fractured perforations at 12,780-22,563 ft. The Houston-based company’s well is in Section 8-150n-93w.

INTERNATIONAL HIGHLIGHTS

In August 2019, the Trump administration imposed new additional sanctions on Venezuela, ordering a freeze on all Venezuelan government assets in the U.S. and barring transactions with U.S. citizens and companies. The move was intended to put pressure on the country to remove Venezuelan President Nicolas Maduro. However, it was not clear if new sanctions will attempt to prevent Russia and China from receiving Venezuelan oil in repayment of debt (2020 for Russia, 2012 for China).

Later in August, China National Petroleum Corp. invested \$3 billion to finance construction of a new oil blending plant to blend extra-heavy grades from Venezuela's Orinoco Oil Belt into the exportable Merey crude.

Meanwhile, restricted Iranian and Venezuelan oil exports have significantly hiked demand for Russia's Urals blend of crude and have increased Russian oil revenues by a minimum of \$900 million between November 2018 and July 2019.

Demand for Russia's Urals blend of heavier, sourer crude increased when OPEC and its allies instituted a 1.2-million-barrel-per-day reduction. The Trump sanctions spurred demand to a record high, and Russian crude is now traded at a premium to North Sea Brent. These sanctions have created a shortage in heavier, sourer crude.

—Larry Prado

1 Canada *Leucrotta Exploration*

completed an Upper Montney stepout in British Columbia at #8-22-81-14W6 on the company's Mica acreage. After testing on initial flow-back for five days, the well had a final flow rate of 16 MMcf/d (13.9 MMcf of gas and 50 bbl of 42-degree-gravity oil per day). The Calgary-based company expects NGL recovery of 338-676 bbl/d. Flow rates continued to increase toward the end of the test with stable flowing pressure.

2 Guyana

Tullow Oil announced results from exploration well #1-Jethro in the offshore Guyana Orinduik Block. The well was drilled to 4,400 m and encountered 55 m of net oil pay in a high-quality, oil-bearing sandstone reservoirs of Lower Tertiary. Tullow will evaluate the find and will plan an appraisal program. The discovery de-risks other Tertiary age prospects within the Orinduik license area, including the shallower Upper Tertiary Joe Prospect, which will be drilled after operations are complete at #1-Jethro on the adjacent Kanuku Block to test the Cretaceous oil play.

London-based Tullow is the operator of the Orinduik Block and #1-Jethro discovery well with 60% interest. *Total* holds 25% with the remaining 15% being held by *Eco (Atlantic) Oil & Gas*.

3 Morocco

Dana Petroleum announced a gas discovery at the Anchois prospect in the offshore Morocco Tanger-Larache license area. The #1-Anchois discovery well was drilled to 2,435 m. Two intervals of high-quality, gas-bearing sands were encountered with a combined gas column of about 90 m and about 40 m of net pay. Preliminary estimates of reserves are approximately 100 Bcf. The well will be suspended as a potential future producer. More data will be acquired and analyzed before deciding on further exploration drilling in the license. Dana Petroleum is based in Aberdeen.

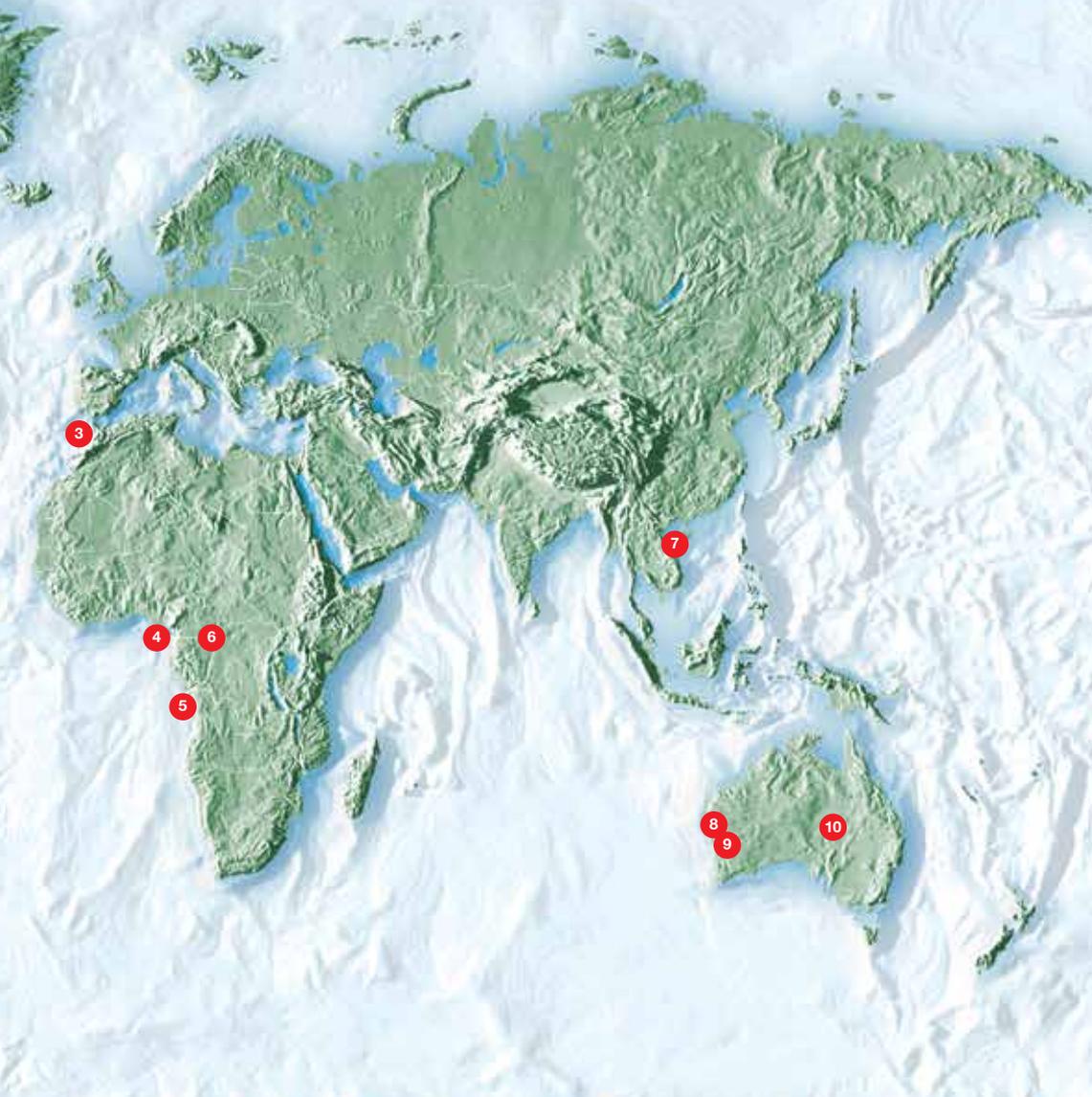


4 Nigeria

Oriental Energy reported an oil discovery in two deep prospects offshore Nigeria's Ebok Field in Block OML67. The #45-Ebok is on the North Fault Block of the field and was testing the hydrocarbon potential of the deeper stratigraphic levels in the field. The venture encountered approximately 170 ft of gross pay in two reservoirs, with additional upside. Wireline logging and sampling indicated excellent reservoir and fluid characteristics. The well was drilled in 145 ft of water, and the total depth was 9,167 ft. The field was originally discovered in 1968. Oriental's headquarters are in Abuja, Nigeria.

5 Angola

Eni completed #2-Agogo, the first appraisal well of the Agogo discovery in Block 15/06, offshore Angola. The venture confirmed the 650 MMbbl of in-place oil at the field and indicates further upside in its northern sector where additional appraisal drilling is planned. The #2-Agogo was drilled to 3,949 m and is in 1,700 m of water. It hit 58 m net of 31-degree-gravity oil in Miocene and Oligocene sandstones with excellent petrophysical characteristics. The results confirm the extension of the Agogo reservoir to the north of the discovery well and below the salt diapirs. The highly deviated well was designed to reach the sequences below the salt diapirs and prove the reservoir and oil charge in this sector of the Agogo structure. Initial estimates indicate a production capacity of more than 15 MMbbl of oil per day. Eni is the operator of Block 15/16 with 36.8421% interest, and partners include *Sonangol* (36.8421%) and *SSI Fifteen Ltd.* (26.3158%).



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9 Australia
Strike Energy confirmed a gas discovery in Wagina Sandstone at the West Erregulla prospect in Western Australia permit area EP 469. The #2-West Erregulla encountered approximately 74 m and is comprised of sections of clean sand with interpreted blocky porosity development between 4,106 and 4,180 m. According to the company, the well section was finished without observing the end of Wagina, and wireline tools have confirmed the presence of a gas and hydrocarbon bearing zone with no reported water. Strike is drilling ahead to 5,200 ft to the targeted Basal Wagina Sandstone and the primary gas sand sequence in Kingia High Cliff, with additional testing planned. Strike Energy is the operator and the holder of a 50% joint-venture interest in EP469, with partner **Warrego Energy**.

10 Australia
A three-well appraisal program by **Cooper Energy** has begun in the Parsons oil field in the South Australia portion of the Cooper Basin. The #6-Parsons has been spud in the PEL 92 Joint Venture. The #6-Parson will test extension to field boundaries to the north. The planned depth is 1,665 m and is approximately 1,100 m north of #3-Parson. The #7-Parsons is about 700 m northeast of #3-Parsons and will test extension to field boundaries to the northeast, and the planned depth is 1,659 m. The #8-Parsons, located approximately 600 m southeast of #4-Parsons, will test extension to field boundaries to the southeast. It has a planned depth of 1,670 m. The primary target of all three wells is Namur Sandstone. Adelaide-based Cooper Energy has a 25% interest in the PEL 92 joint venture with the balance held by operator **Beach Energy**.

6 Republic of Congo

Rome-based **Eni** announced a significant oil discovery in Delta de la Cuvette Field in the Republic of Congo. According to operator Eni, the field has 1 Bcm of hydrocarbons, including 359 MMbbl of oil, with a potential for daily output of 983 Mbbl of oil per day. The field encompasses about 392 sq m, and there have been four exploratory wells drilled in the region in 2019. Based on additional testing and exploration, the find could quadruple the current national oil output. Partners in the project are **Total** and state-owned company **SARPD Oil**.

7 Vietnam

An offshore Vietnam gas and condensate discovery was announced by **Eni** at exploration well #1-X Ken Baul in Block 114 in the Song Hong Basin. Well results indicate a significant potential of hydrocarbon accumulation, according to the company. It hit several intervals of gas and condensate sandstone interbedded with Miocene age shale, with an estimated net reservoir thickness in excess of 100 m. The well had technical issues and was plugged and abandoned; however, a drilling campaign is planned in 2020 to assess the exploration potential in the Song Hong Basin. The discovery was drilled to 3,606 m and is in 95 m of water. Eni is the operator of four blocks in the Song Hong and Phu Khanh Basins including Block 114 and #1X-Ken Bau with 50% interest in partnership with **Essar** holding the remaining 50%.

8 Australia

Norwest Energy has updated information on the Waitsia prospect in exploration permit EP368 of the Perth Basin. Norwest Energy has re-evaluated the oil and gas prospectivity of the Waitsia gas discovery after encountering significant hydrocarbon accumulations within the Lower Permian Kingia and High Cliff Sandstone formations. According to the company, the structure has been mapped with a southern culmination, abutting the Allanooka Fault, and a northern culmination in the vicinity of well #1-East Heaton, which was terminated above Kingia. The prospect offers significant upside potential for sizeable oil accumulations within both Kingia at 2,470 m and High Cliff Sandstone at 2,570 m. According to the company, the gross prospective resources of Kingia and High Cliff range from 8.6 MMbbl to 61.1 MMbbl. The prospect is situated within a structural setting comparable to the Mt. Horner oil field, about 15 km to the west. Joint Venture partners in the EP368 exploration permit are **Energy Resources Ltd.** and Perth-based Norwest Energy (20%).

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BUILDING A WAR CHEST

For those wondering what steps to take in building a war chest to fund a possible acquisition, Occidental Petroleum Corp. provided an example at EnerCom's recent conference in Denver. In addition to an equity component of \$7.4 billion, Occidental raised \$31.8 billion in debt and preferred equity issues ahead of the August closing of its acquisition of Anadarko Petroleum Corp.

What most would certainly find difficult to replicate: a weighted average cash cost of less than 5%.

Detailing Occidental's pursuit of Anadarko, dating as far back as 2017, the presentation by CFO Cedric Burgher highlighted what was "the largest energy bond deal ever done," providing total financing for Occidental of \$13 billion in 10 tranches. This allowed Occidental to fully pay off its bridge financing after what

Burgher described as a number of "sleepless nights."

Less expensive terms loans provided a further \$8.8 billion—beyond the \$6 billion said to be the maximum an issuer could raise—with a yield of 3%. This cheapest form of financing helped offset the earlier \$10 billion preferred equity issue sold to Berkshire Hathaway, which carried a yield of 8% (plus upside from warrants—see the June 2019 issue of *Oil and Gas Investor*).

Bottom line: total raised was \$31.8 billion at a weighted average cash yield of 4.6%.

Also taking advantage of low interest rates was ExxonMobil Corp., which priced \$7 billion in senior note offerings. The largest of the seven tranches was a \$1.25 billion offering, due 2029, yielding 2.44%.

—Chris Sheehan, CFA

EQUITY

Company	Exchange/ Symbol	Headquarters	Amount	Comments
Carnelian Energy Capital	N/A	Houston	US\$775 million	Carnelian Energy Capital Management LP announced the single closing of its oversubscribed third fund, Carnelian Energy Capital III LP, at the fund's hard cap, which, with the inclusion of the general partner's commitment, totaled \$775 million of capital commitments.
Switchback Energy Acquisition Corp.	NYSE: SBE.U	Dallas	US\$300 million	Priced its IPO of 30 million units at a price of \$10 each. Each unit consists of one share of the company's Class A common stock and one-third of one redeemable warrant, with each whole warrant entitling the holder thereof to purchase one share of the company's Class A common stock at an exercise price of \$11.50 per share.

DEBT

Occidental Petroleum Corp.	NYSE: OXY	Houston	US\$13 billion	Announced senior note offerings comprising 10 tranches priced at: \$500 million due 2021 at LIBOR plus 95 basis points; \$500 million due 2021 at LIBOR plus 125 basis points; \$1.5 billion due 2022 at LIBOR plus 145 basis points; \$1.5 billion of 2.6% notes due 2021 priced at 99.912 to yield 2.65%; \$2 billion of 2.7% notes due 2022 priced at 99.893 to yield 2.737%; \$3 billion of 2.9% notes due 2024 priced at 99.87 to yield 2.928%; \$1 billion of 3.2% notes due 2026 priced at 99.931 to yield 3.211%; \$1.5 billion of 3.5% notes due 2026 priced at 99.506 to yield 3.559%; \$750 million of 4.30% notes due 2039 priced at 99.481 to yield 4.339%; and \$750 million of 4.4% notes due 2049 priced at 98.539 to yield 4.4%.
ExxonMobil Corp.	NYSE: XOM	Irving, Texas	US\$7 billion	Announced a senior note offering comprising seven tranches priced at: \$750 million due 2022 at LIBOR plus 33 basis points; \$750 million of 1.902% notes due 2022 priced at par; \$1 billion of 2.019% notes due 2024 priced at par; \$1 billion of 2.275% notes due 2026 priced at par; \$1.25 billion of 2.440% notes due 2029 priced at par; \$750 million of 2.995% notes due 2039 priced at par; and \$1.5 billion of 3.095% notes due 2049 priced at par.
ONEOK Inc.	NYSE: OKE	Tulsa, Okla.	US\$2 billion	Priced \$2 billion senior notes in three tranches: \$500 million of 2.75% notes due 2024 priced at 99.807 to yield 2.791%; \$750 million of 3.40% notes due 2029 priced at 99.644 to yield 3.442%; and \$750 million of 4.45% notes due 2049 priced at 99.505 to yield 4.480%.
Magellan Midstream Partners	NYSE: MMP	Tulsa, Okla.	US\$500 million	Magellan Midstream Partners LP priced \$500 million of 3.95% senior notes due 2050. The notes were priced at 99.910% of par to yield 3.955% to maturity. The partnership intends to use the net proceeds from this offering of approximately \$494.4 million, after deducting underwriting discounts and estimated offering expenses, for general partnership purposes, including expansion of capital projects.
Enbridge Inc.	NYSE: ENB:CA	Calgary	C\$700 million	Priced C\$700 million in two tranches: C\$400 million of 2.37% notes due 2029 priced at 99.965 to yield 2.374%; and C\$300 million of 3.01% notes due 2049 priced at par.

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FIRST-PAGE MEN



LESLIE HAINES,
EXECUTIVE EDITOR-
AT-LARGE

When most people pass away, that sad event does not make the first page of any newspaper. But for some oil and gas industry icons, their passing does. I call these people the first-page men. The late T. Boone Pickens was one. George Mitchell, the father of fracking in shales, was another. Michel Halbouty, credited with discovering 50 fields and twice declaring bankruptcy only to stage comebacks, was another.

These men were wildcatters who seemed larger than life because they made such a significant impact on the industry they loved and on their communities, and they enjoyed long, energetic careers full of ups and downs and controversies—and often, expensive forays outside the oil and gas industry into ranching, banking, politics and pursuits such as winemaking and horse racing.

We are prone to say we'll never see their likes again, but I think that isn't true. Just as the oil and gas industry constantly renews itself by applying new technologies and adopting new thinking, enabling companies to revive plays, so does the inner circle of industry icons expand. No doubt you can name some of the leaders working today who will be remembered and become known as the iconic CEOs of this era.

It saddened me to learn of Boone Pickens' passing last month for many reasons, especially when remembering his quick, folksy wit and what he called Booneisms. I heard him speak many times, most recently at an investor forum in Dallas held at the Perot Museum of Nature and Science, as well as at several of the Hart Energy series of shale and A&D conferences. One year at A&D, he opened his keynote remarks by saying he would speak fairly quickly because it was the opening day for quail season and he had some serious hunting to do in South Texas.

He was a risk-taking oilman and commodities trader, true, but he had a passion for conservation as well, for example, testifying before Congress to stop the practice of foreign-owned companies slaughtering horses in Texas for feed that they sent to Asia. He and his wife chartered a 737 to New Orleans to rescue hundreds of abandoned dogs and cats after Hurricane Katrina.

For decades Pickens tirelessly promoted the use of natural gas, before it became fashionable in the last decade. He urged American truckers to get off diesel, and the U.S. government to stop sending billions of dol-

lars to foreign oil suppliers. "It's the greatest transfer of wealth in human history," he complained. Twice he was chairman of the Natural Gas Vehicle Coalition. Today, that "export" of dollars to foreign oil suppliers has changed thanks to the surge in U.S. oil production, something he could not have foreseen at the time.

Like many oilmen, he made a lot of money during his career, billions really—donated a lot—and lost a lot. He constantly reinvented his companies, his strategies and his efforts.

A Booneism from the late 1990s when he was losing money: "I told a friend, 'This is the kind of market that builds character.' He looked at me and said, 'If it gets any worse, you'll have more character than Abe Lincoln.'"

In August 2001, he launched BP Capital Energy Equity Fund. By mid-2002, it was down nearly 40%. But in 2005, his funds under BP Capital Management earned \$1 billion. "It's interesting that the thing that sank us at [his former E&P empire] Mesa Petroleum—natural gas—was what made BP Capital. Timing is everything," he wrote in his 2008 autobiography, "The First Billion is the Hardest."

The book reveals that a few years earlier, he reached a low point when, in his late 60s, he became clinically depressed because nothing was going right: his company was losing a ton of money at the time, commodity prices were going the wrong way, and he was going through a divorce. He lost 90% of his investing capital at one point. But he always recovered. He loved sports and never gave up until the final second.

"After a half century in the oil and gas business, I've learned a lot of lessons. Few have been cheap," he wrote. "Consider my three rules of energy: No. 1: The cost of finding oil and gas is always higher than you think. No. 2: Oil and gas always take longer than expected to get on production. No. 3: Discoveries are never as large as producers originally think."

Although he wrote those rules in 2008, as the unexpected shale boom was just getting underway, these seem to be wise rules of thumb even today.

Please join us in Dallas on Oct. 22 and 23 for our annual A&D Strategies & Opportunities conference, where we can bemoan the slow pace of dealmaking and hear from the experts on what opportunities come next.



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