UPSTREAM TEXAS

SUMMER **2019**

A PUBLICATION OF THE TEXAS INDEPENDENT PRODUCERS AND ROYALTY OWNERS ASSOCIATION

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TIPRO

M&A – TEXAS, WALL STREET AND LAND VALUE

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Permian Water Management: A Viable Emerging Market or a Tragedy of the Commons in the Making?

Legislative Profile:
Speaker of the Texas House Dennis Bonnen

Member Profile:
Matador Resources President Matthew Hairford

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Welcome to this edition of *Upstream Texas!*

TIPRO is the voice of Texas' upstream sector and represents members by lobbying at the state and federal levels to ensure they can continue to explore for and produce oil and natural gas. As the official bi-annual magazine of the association, *Upstream Texas* features insights into the opportunities and challenges currently facing the Texas oil and gas industry, as well as profiles key industry players and regulators.

While U.S. oil and gas production is steadily rising and the industry is growing, major acquisitions of energy companies announced in 2019 indicate that the sector continues to rapidly change. In this issue of *Upstream Texas*, starting on page 8, TIPRO reviews factors in today's market that are driving consolidation of businesses in the oil and natural gas industry. Experts from DrillingInfo provide TIPRO with a look at the upstream M&A market and offer a forecast on expectations for deal activity in Texas in the short and long term.

In addition, water issues remain a key area of focus for Texas operators. With the summer heat upon us, strategies to conserve water resources are at the forefront of industry conversations, particularly for producers based in West Texas' Permian Basin who need to embrace new innovative approaches to manage water usage. Turn to page 11 to gain understanding on some of the latest intelligence available relating to water issues affecting the Permian.

Inside this publication, also find profiles of top industry and state leaders, including: Speaker of the Texas House of Representatives Dennis Bonnen (page 14); Railroad Commission Executive Director Wei Wang (page 15); and Matador Resources President Matthew Hairford (page 16).

TIPRO members, this is your magazine, and we welcome your feedback. Please contact TIPRO's Director of Communications Kelli Snyder [ksnyder@tipro.org] or Content Strategist John McCurdy [jmccurdy@naylor.com] with your ideas, recommendations or comments.

UPSTREAM TEXAS IS PUBLISHED FOR THE **TEXAS INDEPENDENT PRODUCERS & ROYALTY OWNERS ASSOCIATION** 919 CONGRESS AVE. SUITE 1000, AUSTIN, TX 78701 **PHONE** 512.477.4452 **WWW.TIPRO.ORG OFFICERS | CHAIRMAN** EUGENE GARCIA **PRESIDENT** ED LONGANECKER **PUBLISHED BY NAYLOR ASSOCIATION SOLUTIONS** 5950 NW 1ST PLACE GAINESVILLE, FL 32607 **PHONE** 800.369.6220 **WWW.NAYLOR.COM**
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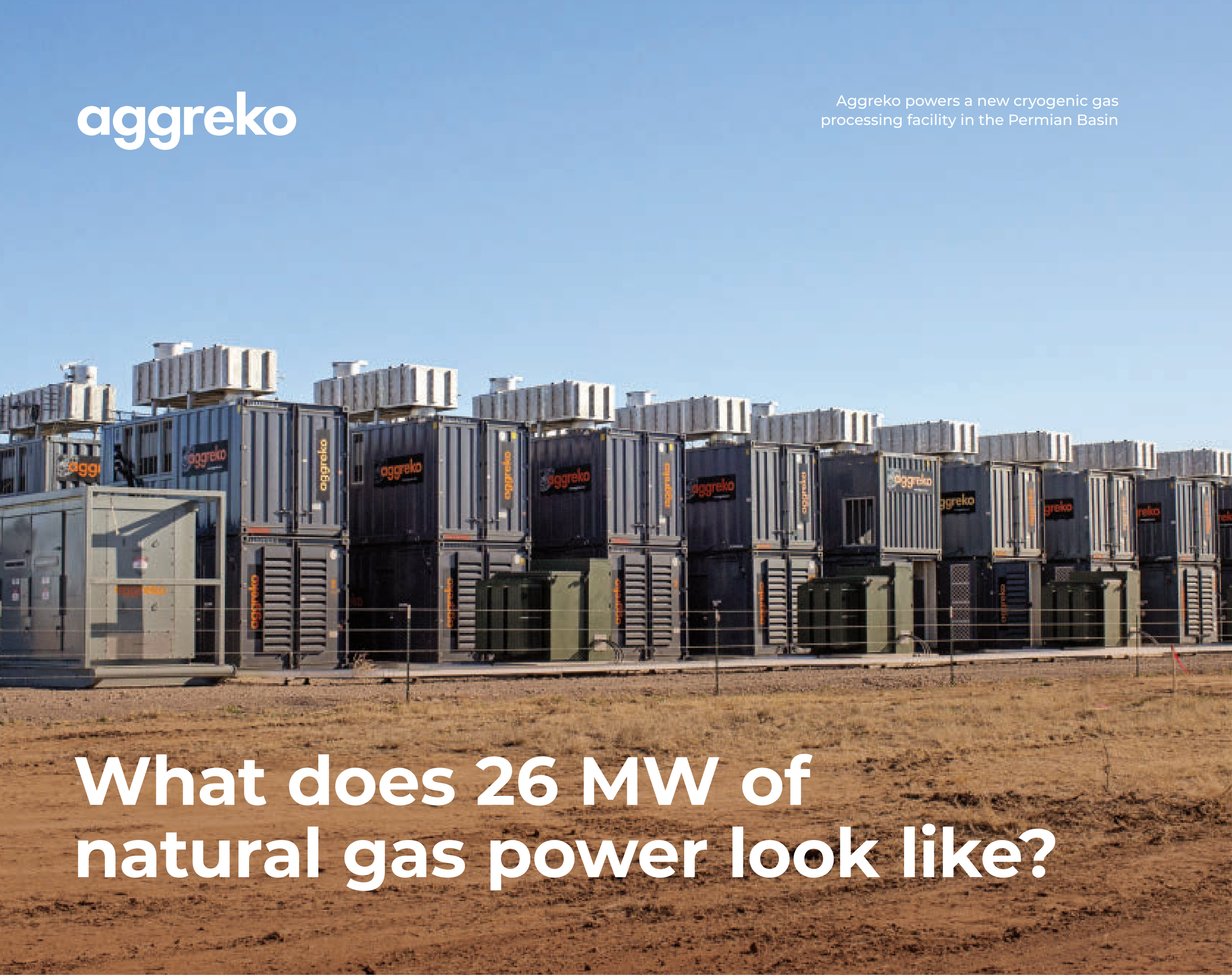


Aggreko powers a new cryogenic gas processing facility in the Permian Basin

What does 26 MW of natural gas power look like?

- Advanced SCADA system
- Custom SCR emissions control
- Reliable remote monitoring
- Certified technicians and expertise

Your engineering partner for projects of any size - anytime, anywhere

Making a massive difference in the Permian Basin

When an extremely large-scale cryogenics plant asked for help processing gas streams and getting them onto the power grid, we realized this would be our biggest power project yet in North America. The challenge was threefold. First, we needed to decompress gas that was nearly ten times more compressed than usual. Second, we had to bring emissions in line with West Texas and Federal requirements, and last but not least, we had to incorporate a custom real-time monitoring system.

Our experts developed a complete skid system to handle the high decompression requirements. When it came to reducing emissions by 75% percent, we designed and installed custom SCR and oxidation-catalyst setups to retrofit on each natural gas generator. To achieve real time monitoring capabilities, our local team brought in our overseas SCADA colleagues for additional support and we designed and implemented a world-class monitoring system for maximum uptime. Together, we have provided over 25 natural gas generators during phase one with a plan to have over 40 generators during phase two.

For more solutions like this, call Aggreko today.

CUSTOMER

Cryogenics Plant

LOCATION

Permian, Texas, USA

SECTOR

Oil & Gas

KEY FACTS

26 MW

Phase 1

42 MW

Phase 2

5

Cryo streams

1250psi

Incoming gas pressure

75%

Emissions reduction required

OUR DIFFERENCE

Our in-house Engineering team made this massive project a successful reality.

INDEPENDENTS EMBRACE OPPORTUNITIES FROM TEXAS' SHALE FRONTIER

Eugene Garcia
CHAIRMAN – TEXAS INDEPENDENT PRODUCERS & ROYALTY OWNERS ASSOCIATION

THE EXPLORATION AND PRODUCTION of oil and natural gas has always seen the business go through cycles of investment, expansion, consolidation and contraction. The exceptional way Texas independents have managed these cycles over the past decade with the application of technological and operational innovation has set us apart from history. Even with over a century of drilling activity in Texas, oil and gas basins found right here in the Lone Star State remain the most sought-after in the world. Continuous operational improvement and new drilling advancements have driven record-breaking oil and gas production in our state. The result has been to incentivize independent producers to raise their stakes and increase their investment in new and currently producing assets in the great state of Texas.

Perform a quick search online for the "world's top oilfield," and you'll quickly see that the Permian Basin, which spans across West Texas and portions of New Mexico, dominates the results you receive. This is for a good reason. The Permian Basin today is producing greater volumes of oil than even Saudi Arabia's famous Ghawar Field. The fact that the Permian is now considered the most productive oilfield in the world is a truly remarkable accomplishment born of the investment made over the past decade by Texas independents. We have been pumping oil from the Permian for nearly 100 years, and still today there are opportunities for our current generation of explorers and producers to take advantage of. Continually advancing technologies are allowing for further improvement of the drilling and recovery processes resulting in efficiencies in production and leading to the expansion of what is considered to be an economic reservoir.

The advancements and innovations come with a cost. The expense and insight required to drive these advancements have made it increasingly more difficult for smaller independent producers to keep pace. Where there is a challenge, however, there is an opportunity. Some producers have welcomed the potential the Permian brings by looking for opportunities for consolidation and other deal-making transactions.

Upstream M&A deals in the U.S. totaled $84 billion in 2018, the highest total since the onset of the oil and gas downturn in 2014. The second half of 2018 fueled the surge with a record-setting $32 billion worth of deals in Q3 2018 and $21 billion in Q4 2018. Following the record levels of 2018, U.S. oil and gas M&A hit a 10-year low during the first quarter of 2019 as the commodity price retreated and financial focus shifted to free cash flow.

Shortly after the end of Q1, Chevron Corp. announced it would acquire Anadarko Petroleum Corp., with Occidental Petroleum ultimately winning favor with shareholders. More recently, Dallas Cowboys owner Jerry Jones strengthened his company Comstock Resources Inc.'s position in the Haynesville Basin, one of the largest natural gas basins in the United States, with a cash and stock deal valued at $2.2 billion to buy privately held Covey Park Energy, LLC.

In nearly all of the billion-dollar-plus acquisitions over the past two years, TIPRO members were involved on both sides of the transaction. While our organization prefers not to lose any members, these deals help strengthen the assets of fellow TIPRO members, improving the longevity of their drilling programs while creating wealth for shareholders, some of which use those proceeds to start new independent oil and gas companies.

As the most prolific shale formation in the world, the Permian Basin continues to dominate production growth and forecasts for the state and country. This region has also seen a clear trend of established operators hoping to strengthen their continuous acreage to allow for more recovery. This has driven increased levels of M&A activity for operators in the region seeking to expand their footprint to drive greater efficiency and lower production cost. Additionally, as seen with the Covey Park Energy acquisition, the M&A trend may expand beyond the Permian to other fields across Texas.

Doing its part, TIPRO continues to diligently work to provide a suitable environment for industry growth by advocating for sound policy measures supportive of domestic energy development. Through our regular communication outreach and industry forums, we also strive to provide members with updated market analysis to help you and your company stay informed of current conditions and future expectations for the state's E&P sector. ■

"Doing its part, TIPRO continues to diligently work to provide a suitable environment for industry growth by advocating for sound policy measures supportive of domestic energy development."

TO ENJOY THE PERMIAN'S FULL POTENTIAL, TEXAS PRODUCERS MUST STRATEGIZE ON WATER MANAGEMENT PRACTICES

Ed Longanecker
PRESIDENT – TEXAS INDEPENDENT PRODUCERS & ROYALTY OWNERS ASSOCIATION

THE TOPIC OF WATER use in oil and natural gas operations has been a focal point from a policy, environmental and operational standpoint for many years on issues related to recycling, disposal, innovation and reuse, to name a few. Water is an essential component in the oil and gas drilling process, but the industry continues to innovate and adopt methods of exploration and production that improve efficiencies and lessen its environmental footprint, including water use in the hydraulic fracturing process. These issues will continue to be key areas of focus for reducing operating costs, improving extraction methods for oil and natural gas and minimizing the use of this precious natural resource.

During the 86th Texas Legislative Session, several bills sought to address water issues of relevance to the Texas oil and natural gas industry. One example is House Bill 3246 by state Representative Drew Darby, which clarified that fluid oil and gas waste is the property of the entity producing and utilizing fluid oil and gas waste until transferred. The Texas Legislature has always required the mineral estate and oil and gas operators to bear the burden and the obligation of properly handling, transporting and disposing of oil and gas waste in compliance with highly technical and costly environmental regulations. Given the increase in produced water associated with rising levels of oil and gas production in Texas, further clarity on ownership was provided through HB 3246.

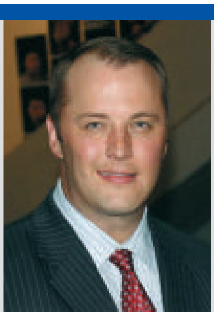
The definition of oil and gas waste is codified in Water Code Section 27.002(6): "Oil and gas waste" means waste arising out of or incidental to drilling for or producing of oil, gas or geothermal resources; waste arising out of or incidental to the underground storage of hydrocarbons other than storage in artificial tanks or containers; or waste arising out of or incidental to the operation of gasoline plants, natural gas processing plants or pressure maintenance or repressurizing plants. The term includes but is not limited to salt water, brine, sludge, drilling mud and other liquid or semi-liquid waste material.

Groundwater has a separate definition that does not include oil and gas waste nor fluid oil and gas waste. "Groundwater" means water percolating below the surface of the earth, according to Tex. Water Code § 36.001(5). The definitions of groundwater and oil and gas waste are separate and distinct. House Bill 3246 passed the Texas House and Senate and was signed into law by Governor Greg Abbott.

Another water-related bill that TIPRO supported during the 86th Legislative Session was House Bill 2771 by Representative J.M. Lozano, which transfers certain responsibilities of the Railroad Commission of Texas relating to regulation of discharges of produced water, hydrostatic test water and gas plant effluent into water resulting from the development of oil, natural gas or geothermal resources to the Texas Commission on Environmental Quality (TCEQ). This legislation also transfers any obligations, contracts, property, records and funds appropriated by the legislature relating to such regulation. The Railroad Commission will continue to carry out duties related to such regulation until the regulatory authority of the National Pollutant Discharge Elimination System (NPDES) was delegated to TCEQ.

TCEQ is permitted to act to ensure an orderly transfer of powers relating to this legislation, including hiring employees and amending its memorandum of understanding with the Railroad Commission. TCEQ would be required to submit to the U.S. Environmental Protection Agency (EPA) by September 1, 2020, a request to supplement or amend the Texas Pollutant Discharge Elimination System to include delegation of NPDES permit authority for the discharge of oil and gas wastes to TCEQ. This bill also garnered support from the Texas House and Senate and was signed into effect by the governor.

These legislative items and others supported by TIPRO represent examples of the evolving Texas oil and natural gas industry and the important role of the Texas legislature and key regulatory agencies. Inside this edition of *Upstream*, read more about another set of issues related to water management in the oil and natural gas industry. Considering that TIPRO members produce approximately 90 percent of the oil and natural gas in Texas, our organization will remain focused on addressing all challenges and opportunities related to water use and all priority issues that impact our industry. ■



"Water is an essential component in the oil and gas drilling process, but the industry continues to innovate and adopt methods of exploration and production that improve efficiencies and lessen its environmental footprint, including water use in the hydraulic fracturing process."

M&A – TEXAS, WALL STREET AND LAND VALUE

Texas has scored 45 percent of all deals in last decade

By Brian Lidsky,
SENIOR DIRECTOR, DRILLINGINFO MARKET INTELLIGENCE

SINCE 2009, a date roughly in line with the beginning of the U.S. oil shale revolution, there have been over 3,500 individual upstream oil and gas transactions totaling $775 billion in the United States. Globally, there have been more than 7,700 deals exceeding $2 trillion. Recently, in early May 2019, Occidental Petroleum agreed to acquire Anadarko Petroleum for $57 billion, marking the largest U.S. deal in this timeframe. In a highly public battle, Occidental pulled out all the stops to beat Chevron and become the Permian Basin's largest producer of oil and gas, surpassing Chevron, the previous leader.

Of the $775 billion for U.S. deals, 45 percent has been in Texas. Within Texas, pure Permian deals account for 35 percent of that number, followed by pure Eagle Ford deals with 17 percent. Several large deals span across multiple resource plays, including Exxon's $41 billion buy of XTO Energy in December 2009, BHP's $15 billion buy of Petrohawk in December 2012 and BHP's subsequent $10 billion sale of its U.S. onshore assets to BP in July 2018.

Royalty Markets Robust

Date	Buyers	Seller	U.S. Play	Value ($MM)	$/Daily BOE	$/Acre
11/06/17	Franco-Nevada	Undisclosed	Delaware	$110		**$156,857**
02/06/18	Viper	Undisclosed	Multiple	$26		**$118,721**
06/30/18	Viper	Undisclosed	Midland	$103		**$111,472**
07/31/18	Viper	Undisclosed	Midland	$61		**$109,336**
07/31/18	Viper	Diamondback	Delaware	$175		**$103,184**
12/31/17	Viper	Undisclosed	Multiple	$39		**$98,237**
08/01/17	Viper	Undisclosed	Delaware	$282	$32,400	**$95,421**
10/15/18	OTPP	Range Resources	Marcellus	$300	$17,287	**$83,693**
09/30/17	Viper	Undisclosed	Delaware	$23		**$72,100**
06/04/18	Osprey Energy	Royal Resources	Eagle Ford	$894	$40,550	**$34,861**
02/09/17	Energen Corp	Undisclosed	Delaware	$18		**$28,125**
03/02/17	Clayton Williams	Undisclosed	Delaware	$44		**$23,316**
08/08/17	EK Energy	Undisclosed	SCOOP/STACK	$17		**$19,091**
03/22/17	Franco-Nevada	Undisclosed	Midland	$110		**$15,143**
11/27/17	Black Stone Minerals	Noble Energy Inc	Multiple	$340	$49,680	**$13,600**
06/07/17	Oxy et al.	Enduro Resource	Delaware	$50	$39,540	**$12,125**
09/07/18	Undisclosed	Viking Minerals	Eagle Ford	$28		**$11,965**
12/17/18	Alliance Resource	Dale Operating	Multiple	$500		**$9,086**
06/30/17	Rice Energy	Undisclosed	Marcellus	$49		**$8,167**
02/07/19	Kimbell	EnCap (Phillips)	Multiple	$151	$39,570	**$7,212**
05/29/18	Kimbell	Haymaker	Multiple	$404	$38,450	**$4,548**
11/21/18	Kimbell	Rivercrest; Kimbell Art	Multiple	$108	$42,908	**$3,398**
04/24/17	Kimbell	Maxus Energy	Conventional	$16	$29,580	**$1,172**
05/08/17	Black Stone Minerals	Undisclosed	Haynesville	$35		**$712**

Royalty deals with acreage value since Jan. 1, 2017, with >$10MM deal value.
SOURCE: DRILLINGINFO

In November 2014, oil prices crashed after multiple years near or over $100/bbl. Since that price crash, the U.S. upstream oil and gas deal markets have totaled $318 billion in over 1,300 deals, and Texas' share has been 39 percent, with pure Permian deals skyrocketing to a 63 percent share of that Texas total.

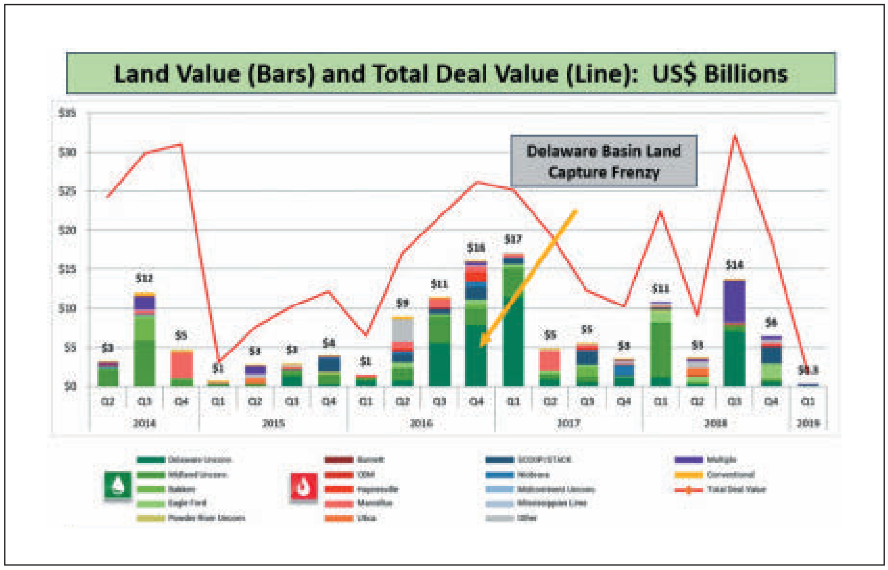
The U.S. Shale Revolution and Soaring Land Values

In the U.S., crude oil production peaked in November 1970 at 10.0 million barrels per day (MMbbl/d) and declined to as low as 4.2 MMbbl/d in August 2005. With the onset of horizontal drilling, only recently in November 2017 did the U.S. surpass its prior crude oil production peak, and the recent high was 12.2 MMbbl/d in December 2018. Texas' share of this is an impressive 40 percent. This surge in U.S. oil production is having profound positive effects on the U.S. energy equation and national policies.

In the U.S. deal markets, a similar revolution has occurred impacting the value of land and leasehold. For perspective, since 2009 unconventional deals account for 72 percent, or over $550 billion, in deal value. Of that, 43 percent has been allocated to land and leasehold. Prior to the shale revolution, rules-of-thumb values for acreage and lease bonus tended to range from $100 to $1,000 per acre. Today, with the industry blessed with the ability to extract large quantities of oil and gas from tight reservoirs via horizontal drilling and fracking, land value has soared to levels reaching $75,000 or more per acre. For royalty acreage, the number goes higher, approaching record levels over $150,000 per acre. These record numbers for land, though, are just that and reserved for the most de-risked and valuable land in the country. But they do demonstrate the value of land and leasehold in some of the hottest and most economic rocks in the country.

The Delaware Basin, Poster Child for the Evolution of a Shale Play

Most recently, the Delaware Basin portion of the Permian has been the poster child for the evolution of a shale play from exploration to land capture to full development. Deal activity in the Delaware began in earnest back in 2014 as many private equity-backed companies bought large acreage positions. Examples include Jagged Peak Energy paying $76 million in March 2014 at $1,500/acre for 41,000 net acres in Reeves, Ward and Pecos counties, Texas, then following up in September 2014 with a $41 million buy in Ward and Winkler counties at $4,000 per acre. RKI Exploration entered in April 2014 with a $125 million buy from Chaparral Energy in a deal that paid value for existing production and brought along 29,000 net acres.



SOURCE: DRILLINGINFO

Land buying in the Delaware Basin reached a feverish pace beginning in the third quarter of 2016 as drilling results came in and de-risked large swaths of continuous pay. This land capture frenzy continued through the first quarter of 2017. In just nine months, there were $30 billion of Delaware Basin deals, of which $25 billion of that deal value was for land buys. Notable deals in this land capture phase include Exxon's $5.6 billion buy of Bass Companies, Noble Energy's $3.2 billion buy of Clayton Williams, EOG's $2.5 billion buy of Yates and Diamondback's $2.4 billion buy of Brigham Resources.

Following this land capture phase, these companies and others went about the serious business of de-risking their new acreage. Deal activity went relatively silent for 18 months until Diamondback made a major additional commitment with its $9.2 billion purchase of Energen Resources. Most recently, in their battle to acquire Anadarko Petroleum, both Chevron and Occidental revealed the key asset driving the deal was in fact Anadarko's core holdings in the heart of the Delaware Basin play.

Today's Strategic Drivers in E&P

It is well-publicized that the sentiment of public investors in E&P has taken a significant shift in the last 18 months. Historically, investors graded E&P managers on growth of oil and gas reserves and low finding costs to add these reserves. After years of outspending internally generated cash flow combined with subpar stock performance compared to the overall stock market, independent E&P managers now are grilled on their path to free cash flow.

Capital market activity is backing up Wall Street's change in sentiment. As this relates to deal-making, during the 2016 and early 2017 Delaware Basin land buying spree, buyers announced deals and literally raised equity capital overnight. Wall Street has changed. For example, in dramatic fashion late last year in a single week beginning October 28, 2018, three corporate mergers were announced. In each one, the buyer's stock price tumbled on the announcements.

It kicked off October 28, 2018, with Denbury striking a $1.7 billion merger with Eagle Ford player Penn Virginia that eventually got terminated. Chesapeake followed suit on October 30th with a $4.0 billion merger with Eagle Ford-focused Wildhorse Resource Development and immediately traded down 12 percent on the news. Encana closed the week with a $7.7 billion deal to buy SCOOP/STACK player Newfield Exploration by offering a 35 percent premium, and the market similarly knocked down Encana's stock price by 12 percent on the day of the announcement.

Some companies acknowledge that the current investor sentiment is a positive for the industry. Harold Hamm, CEO of Continental Resources stated, "There is more realization that companies are under-valued." Underscoring the comments of Hamm are activist investors. In early January, activist Elliott Management made a surprise move. Elliott, a money management firm, made a bona fide offer to buy QEP Resources at $8.75/share, which represented a 44 percent premium to its prior-day price at the time of the announcement. Currently, QEP is undertaking a full strategic review of its alternatives to maximize shareholder value, which could result in a sale of the company.

What's Next in M&A

The recent battle between Occidental and Chevron for the prized assets of Anadarko Petroleum has many wondering what's next for U.S. oil and gas M&A. The question can be attacked from several angles. In 2017 and 2018, oil and gas M&A deal value averaged nearly $20 billion per quarter. But averages don't predict much. The market volume of smaller deals (less than $100 million) has been relatively strong and consistent over time, and we expect this to continue.

There has been an uptick since late last year in corporate mergers and mega-deals (more than $1 billion), driven in large part by strategic pivots of buyers, as well as the shutdown of easy access to capital on Wall Street. The clearest example of a strategic pivot is BHP, which retreated to its strength in offshore assets while BP took the opportunity to make a strong entry into the U.S. shales. In response to Wall Street's reluctance to issue fresh capital,

Royalty Deals More Than Double in 2018: US$ Billions

	1Q17	2Q17	3Q17	4Q17	2017 Total	% 2017	1Q18	2Q18	3Q18	4Q18	2018 Total	% 2018	1Q19	% 1Q19
Property	$11.7	$9.7	$6.9	$6.1	$34.5	51%	$11.5	$6.0	$17.8	$2.7	$38.1	46%	$1.1	70%
Royalty	**$0.4**	**$0.2**	**$0.3**	**$0.5**	**$1.4**	**2%**	**$0.2**	**$1.4**	**$0.6**	**$1.0**	**$3.3**	**4%**	**$0.2**	**15%**
Acreage	$0.6	$0.4	$0.7	$0.4	$2.1	3%	$0.8	$0.3	$1.0	$0.5	$2.7	3%	$0.2	11%
Corporate	$12.2	$8.2	$3.8	$3.2	$27.4	41%	$9.6	$1.1	$12.1	$13.5	$36.3	44%	$0.1	3%
Farm-In	$0.3	$1.0	$0.6	$0.0	$1.9	3%	$0.2	$0.2	$0.5	$0.9	$1.9	2%	$0.0	0%
Total	$25.1	$19.5	$12.3	$10.2	$67.2	100%	$22.3	$9.1	$32.1	$18.7	$82.3	100%	$1.6	100%

SOURCE: DRILLINGINFO

there has been an uptick in corporate mergers involving significant use of the buyer's equity capital as currency.

Also driving future activity will be a scorecard on management. Managers with a track record of strong adherence to low costs, best-in-class operations and existing assets in the best rocks should be rewarded with larger portfolios. This translates into an expectation for further consolidation within de-risked shale plays, as operational excellence and low cost matters. Targets likely include those companies that continue to carry high debt levels, as well as those with premium Tier 1 acreage positions that don't have the balance sheet to move to full development mode. With Wall Street seriously hammering underperforming companies, there is room for accretive and value plays for top management teams.

For TIPRO members, the good news is that the M&A market for minerals and royalties is a shining spot. Historically this has been a relatively hidden sector of the marketplace, but with the advent of greater data transparency, many more buyers are moving into this space, including Wall Street. The most recent example is Brigham Minerals, a royalty company that went public on April 18, 2019, at $18/share in an offering that went out both upsized and at the upper end of its range. The offering has performed well and has since trended around $20/share.

In 2018, royalty deals set a record for M&A, clocking in at $3.3 billion. Brigham is now the sixth publicly traded royalty and minerals company. The combination of strong support from Wall Street and greater data and transaction transparency bodes well for those owning royalties and minerals, as this sector has become much more competitive on the buying side. ■

About the Author

Brian Lidsky is senior director of Drillinginfo's Market Intelligence. Prior to joining Drillinginfo, he had roles including EVP and member of the board of directors with John S. Herold, Inc., co-founder of private Canadian operator Vigilant Exploration and managing director of PLS Inc. He has extensive industry experience with expertise in M&A, valuations, market intelligence and capital markets. Lidsky holds a B.S. in geology from Emory University and an MBA from the Jones Graduate School of Business at Rice University. For more information, please contact Drillinginfo at support@drillinginfo.com or the author at brian.lidsky@drillinginfo.com or visit Drillinginfo.com.

PERMIAN WATER MANAGEMENT:

A VIABLE EMERGING MARKET OR A TRAGEDY OF THE COMMONS IN THE MAKING?

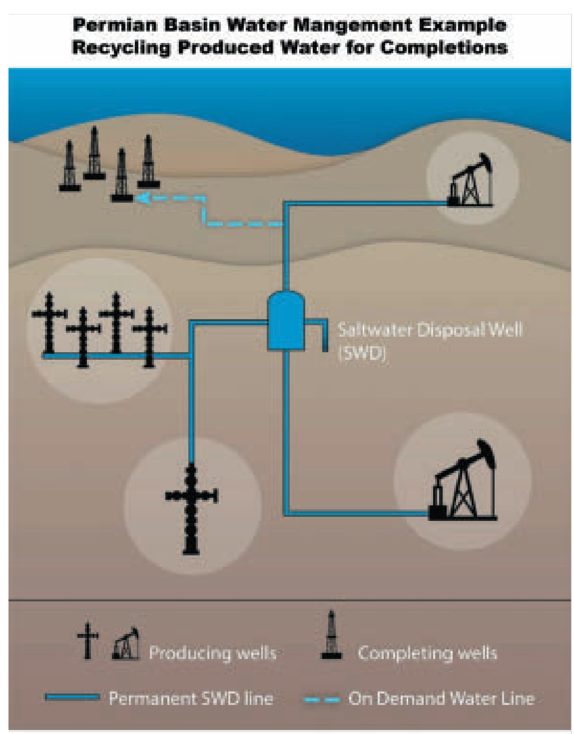
By Kelly Bennett,
PRESIDENT, B3

THE PERMIAN BASIN, located in western Texas and eastern New Mexico, reached a significant milestone in 2018: the Basin produced approximately 5.2 million barrels of oil equivalent per day (MMboed). Considering just oil production, the Permian Basin's 3.3 MMbbl/d was greater than all but five other countries – Saudi Arabia, Russia, Iraq, Canada and Iran. As the industry has learned how to apply horizontal drilling, hydraulic fracture stimulation (fracking) and a host of other innovative technologies to the Permian Basin, oil and natural gas production has soared. Since 2007, Permian oil and gas production are up by almost 270 percent and 70 percent, respectively. Billions of dollars have been invested by E&P and midstream companies to build out the infrastructure needed to move the resulting production to the Gulf Coast and other markets. The Permian has become a critical asset for the economic future for Texas and New Mexico, as well as the entire U.S.

Over the past 10 years, as the industry pursued the Permian prize, an unexpected source of uncertainty developed: water. Water is an integral input and output of the development processes, yet it is itself becoming a major challenge for the industry. Water factors into production economics in two ways: first, water is the fluid used to hydraulically fracture the rock, which allows oil and gas to flow to the wellbore. Second, water exists with oil and gas within the petroleum-bearing formations and is produced along with these commodities.

In many areas of the Permian Basin, water is a relatively minor concern; water for hydraulic fracturing supply is abundant and produced water volumes are minimal, thus requiring minimal management effort and cost. In other areas, such as parts of the Delaware Basin and Midland Basin sub-areas of the Permian Basin (which together account for over 70 percent of total Permian Basin oil production), up to 12 barrels of brine are produced along with each barrel of oil.

In these areas, disposal costs for this saline water can be significant. Disposal certainty is critical to meeting producer guidance, requiring tremendous financial investment by producers, midstream and service ventures in reliable disposal infrastructure. In addition to cost concerns, development is occurring in specific areas that show signs of increased subsurface pressure or are in seismically active locations. Disposal operations at some locations may contribute to increased pressure, posing



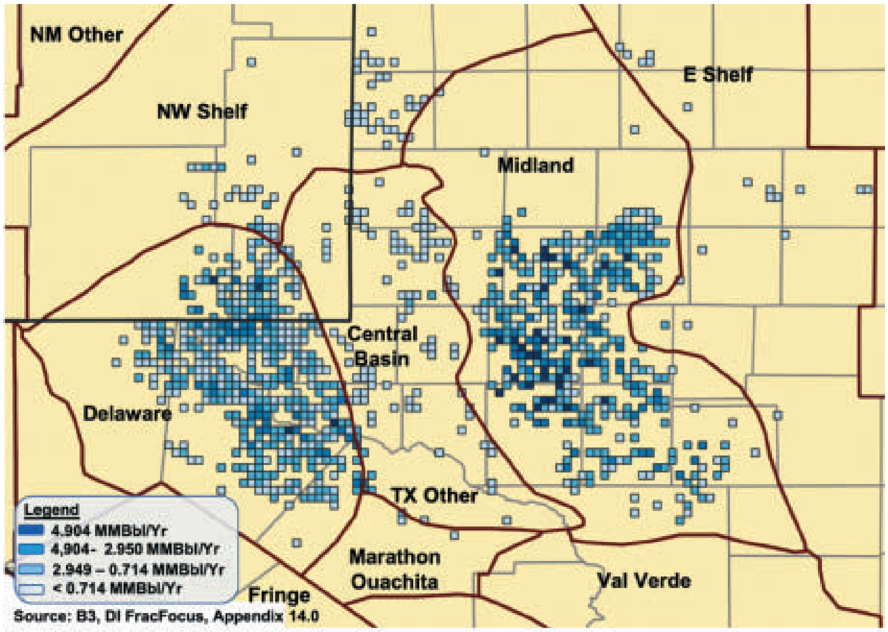
potential challenges for oil drillers and disposal operators. Research into the complex seismicity dynamic is currently ongoing through industry partnerships with some of the country's premier academic institutions.

The relative nascence of the Permian water management industry compounds the producers' water concerns. Across the entire Permian Basin, approximately 35 percent of the water disposal wells active on January 1, 2019 were drilled since January 1, 2016. In the Delaware Basin and Midland Basin sub-areas, 57 percent and 45 percent of active wells were drilled between those dates, respectively. Traditionally, disposal wells were drilled by producers to handle their own disposal needs. However, over the past five years, midstream entities have emerged to stitch together producers' existing proprietary and commercial systems to enhance economies of scale. Still, the process is slow and entails risk for all parties; the scale and scope of the ultimate water handling business has yet to be defined.

How oilfield water management evolves is critical to the broader oil industry and, by extension, Texas, New Mexico and the country. Today, disposing of produced water costs from $0.50/bbl to over $4.00/bbl, depending on transportation and where and how the water is produced and disposed. Similarly, water for hydraulic fracturing can generally be obtained for less, usually from $0.50/bbl to $3.00/bbl, including transportation. If supplies of water for hydraulic fracturing tighten, it is likely that producers' water acquisition costs will rise.

Similarly, if concerns over seismicity and over-pressurization intensify and injection pressures are limited and/or disposal wells are moved to more remote areas, it is likely that disposal costs will rise appreciably as well. Taken together, it is relatively easy to conceive of water management costs increasing $1.0 million or more per well[1]. Price increases along these lines alter the competitive position of individual producers within the Permian Basin and diminish the competitive position of the Basin relative to other producing regions in the country, all while creating interesting opportunities in the water management space.

Reducing the uncertainty associated with water is essential for the industry. To begin, the industry needs to understand the size and scope of the problem. How much water is needed for hydraulic fracture stimulation, and how much produced water will be generated? How will the disposal industry be reshaped? Will pressure and seismic concerns and capacity thresholds (natural or imposed) alter the location, permitting, development and use of disposal wells?



Does recycling (either for industry or other beneficial use) have a significant role to play? If so, under what circumstances will it make an impact on the disposal industry? What should the ultimate scope and scale of the water management service industry be: sub-area, state-wide, interstate? Is producer ownership of disposal assets the best means to protect their interests, or can properly constructed and managed midstream companies provide lower cost and more certain service?

To provide insight into these questions, B3 Insight and TIPRO member Drillinginfo (DI) initiated a four-part analysis of the outlook for water in the Permian Basin. The title for this four-part study is *Permian Water Management: A Viable Emerging Market or A Tragedy of the Commons in the Making?* The title is intended to portray two possible endpoints for the evolution of Permian Basin water management associated with oil and gas development. On the one hand, as more information emerges and the market for water services evolves, consolidation could create larger-scaled enterprises to assist producers in solving their broad water management needs while mitigating associated environmental burden.

Conversely, individual operators across the industry could continue to focus on independently satisfying near-term needs and obligations, following potentially unsustainable business-as-usual water management practices. This later "tragedy of the commons" situation could disrupt development economics across the Permian Basin, undermining the basis for much of today's investment.

Key Conclusions

Oil and gas production will grow significantly over the next 10 years. If oil and gas prices average $52/bbl and $3.00/Mcf, respectively, oil production is forecast to grow from 3.3 MMbbl/d in 2018 to slightly less than 5.5 MMbbl/d in 2028. Over the same period, natural gas production is projected to increase from 7.9 Bcfd to 11.7 Bcfd. If oil and gas prices rise to an average of $74/bbl and $3.60/Mcf during the 10-year period, production will increase to slightly less than 7.0 MMbbl/d and 14.1 Bcfd for oil and gas, respectively.

Water demand for hydraulic fracturing in the Permian Basin will grow substantially between 2019 and 2028. By 2028, the Permian is forecast to produce between 25 MMbbl/d and 34 MMbbl/d of produced water. In other words, total produced water in the Permian Basin is projected to increase by up to nearly 50 percent from current levels over the next 10 years, depending on production and water-cut dynamics. The vast majority of this growth will come from the Delaware Basin and Midland Basin sub-areas, with the Central Basin Platform and Northeast Shelf sub-areas accounting for most of the remaining balance.

There is an opportunity to mitigate some reliance on subsurface disposal through increased recycling (this will be explored in subsequent study volumes), but given the significant expected growth of produced water volumes relative to hydraulic fracturing water needs, increased disposal capacity (subsurface or elsewhere) will be needed, regardless of recycling.

Subsequent Installments

The second installment of the Permian water study has three basic objectives. The first is to create a foundational description of the Permian Basin saltwater disposal industry, including structure, utilization patterns, market dynamics and how each change as the industry evolves. The second objective is to discuss the process of permitting disposal wells in Texas. This section will address current regulatory approaches to dealing with issues related to disposal, including seismicity concerns and the resulting impact on permit applicants. The third objective is to present B3's estimates of remaining injection capacity for shallow (e.g., San Andres, Delaware Mountain Group) and deep (i.e., pre-Woodford) formations. While the pressure and rate injection limits for individual injection wells is obtainable from regulatory permits, the natural geologic capacity of the formations receiving the injected material is not well understood and has not been publicly articulated. B3 is developing resource models to estimate this disposal capacity in the most prominent injection zones.

The third installment discusses the competitive structure of the nascent water midstream industry and its consolidation. B3 estimates that over 600 companies in the Permian Basin provide water services to the oil and gas industry. B3 is evaluating the competitive position and scope of service offerings for the largest companies and will use this information to describe the current structure of the industry and its ability to manage the volumes presented in Part One.

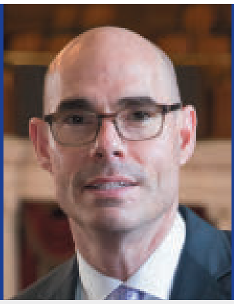
The fourth installment draws conclusions on the outlook for the oilfield water industry in the Permian Basin and implications for producers, midstream operators and investors.

Over the next decade, managing the growth of produced water volumes in the Permian will prove to be critical to oil production in the basin. While the magnitude of these water volumes poses challenges for the industry as a whole, it also presents many opportunities that will require organization and collaboration from many stakeholders. Among those opportunities, the development of a mature water midstream industry and the first large-scale, full-lifecycle water management systems are poised to provide essential services to producers. Growth and evolution of the industry is well underway; the sustained growth of production hinges upon it. ■

For additional information, please contact B3 Insight at info@b3insight.com.

Reference

1. (e.g. for a well with an EUR of 0.5 million BOE, a WOR of 3:1, and a 0.5 million BBL frac volume, a $0.50/bbl increase in disposal and frack water costs = $1 million).



DENNIS BONNEN

Speaker of the Texas House of Representatives

IT WAS 1996, DENNIS Bonnen was 24, and though it might have appeared audacious, running for the newly open Texas House of Representatives seat in his home district felt like the next logical move.

The youngest of four children in a family from Angleton, Texas, Bonnen absorbed the example of parents, who were deeply involved in their community. His mother was a founder of the Friends of the Angleton Library, for which she also was a longtime board member. His father had served in countless civic organizations while working as Angleton's city attorney and then as its judge.

"Civic-mindedness was instilled in us from an early age and undoubtedly played a role in my interest in politics as I got older," Bonnen says. "My parents didn't tell me to run, but I saw this as my opportunity to serve the community I've lived in my entire life – just like our parents had taught us to."

He had graduated from St. Edwards University in Austin with a degree in political science, and during his time there had been able to serve as a House sergeant-at-arms. Later, he relocated to Washington, D.C., to intern with his congressman.

Already more than familiar with politics, policy and legislative life, Bonnen moved back home to pursue the opportunity and left it to voters in his Gulf Coast district to decide whether he was too young. He won that race, and more than two decades later, the Republican has risen to the House's highest-ranking post, a position that keeps him inside the Texas statehouse around the clock.

As the new speaker of the Texas House of Representatives, Bonnen has made a point to encourage camaraderie and promote cooperation amongst members of Texas' legislative body. Achieving some unity and mutual respect in the often divisive world of politics constitutes an underlying theme of his speakership, he affirms, although it doesn't mean papering over substantive differences.

"The best solution for my community may not work for someone else's, which is why it's so important for every member to have a seat at the table, the freedom to vote their district and the ability to freely work with one another to drive the House's agenda," Bonnen says. "At the end of the day, the legislation we pass and send to the governor will tell a story of what the House's priorities were. What's been equally important is fostering a spirit of collaboration among the membership, because a willingness to work together and compromise is the only way to reach legitimate solutions."

By reforming the state's property tax and public school finance structures, state leaders tackled the thorny issues that arguably topped most Texans' priorities and helped ensure that the success of today's students will translate into the success of tomorrow's workforce, he reflects. But good intentions are not enough, he acknowledges, which is where unity comes in.

"We knew the only way to do it – successfully – was by setting aside personal politics and working together," Bonnen says. "I asked members on the first day of the session to make an earnest effort to get to know one another and spend time with members they wouldn't normally spend time with. That's worked to our benefit, and I believe it played a huge role in being able to pass such monumental legislation as school finance and property tax reform. The House is a family, and families work together. That's our key to success."

Bonnen emphasizes that House members set the chamber's agenda, which is why he deflects much of the credit for the passage of Senate Bill 533, which aims to revive inactive wells by creating a five-year severance tax exemption for those that qualify, to its House sponsor, Energy Resources Committee Chairman Chris Paddie, R-Marshall. Bonnen praises the new law – set to become law in September – as smart policy.

"It's no secret that the Texas oil and gas industry has been a cornerstone of our state's robust economy – I see evidence of that every day at home on the Gulf Coast," he says. "It's legislation like this that has helped keep Texas the top state for production year after year and has led the country in its quest for energy independence." ■

WEI WANG

Executive Director of the Railroad Commission of Texas

WHEN CONSIDERING THE MISSION of the Railroad Commission of Texas (RRC), something very profound stands out to the agency's Executive Director Wei Wang. The 36-word description that dictates the commission's reason for being states: "Our mission is to serve Texas by our stewardship of natural resources and the environment, our concern for personal and community safety and our support of enhanced development and economic vitality for the benefit of Texans."

"The word 'serve' is the cornerstone of the RRC's mission statement," says Wang. "It's what we do as an agency, and it's the key unifying characteristic of everyone at the commission. We owe it to our fellow Texans to provide them with the highest possible level of service."

Since Wang took the helm as the RRC's head staff member – first on an interim basis in October 2017, and then permanently in April 2018 – the commission has based its service to Texans on three main pillars, he describes.

"The RRC has nearly 800 employees across Texas," he says. "As spread out as we are, it's critical we share a clear, unifying vision about how we serve Texas. So one of the first things I did was to put in place three core principles by which we operate: results-driven, service-oriented and collaboration."

According to Wang, those notions address the RRC's "what, why and how." Some important indicators suggest the agency is executing that game plan. As an example, he cites some efficiency records the commission set in 2018, no small feat for an agency that he suggests already is widely seen as the global leader in energy regulation.

"We reduced the drilling permit review time to two days, and we beat the legislative 979 well-plugging goal by more than 400 wells," he reports.

However, Wang emphasizes, the RRC's results are only as good as its staff. Therefore, the commission is striving to fully tap its potential. "The commission launched its leadership development program and technical training curriculum to invest in our employees," he says. "This builds consistent, high-standard technical expertise and is a game-changing strategy to attract and retain the best employees."

The RRC's employee development initiatives have the agency working with several universities and industry experts on technical training opportunities, Wang reports. He notes the commission recently graduated the first two inaugural classes of its new "Boots on the Ground" oil and gas inspection training school.

"It is very important to me that staff apply rules consistently in every part of the state and all our inspectors are technically proficient to the same standards," he says. "Having the best team starts with building the best team. It is about developing career paths to ensure knowledge transfers and to further technical competency. Knowing the latest industry trends and technology ultimately help us better serve all Texans."

Of course, he acknowledges, even the best staff still needs corresponding tools and techniques to oversee an innovative, high-tech industry. That is why the agency's commissioners have assigned Wang with modernizing the commission's technology and business processes. He points to the example of the RRC's Online Inspection Lookup tool, or "RRC OIL," an online searchable database that improves regulatory transparency and encourages industry compliance by allowing anyone with Internet access to examine oil and gas inspection and violation data.

But despite the great strides, Wang allows, RRC modernization remains a work in progress. "We've got a lot to do," he recognizes. "We're transitioning out of decades-old mainframe technology completely in the next few years. What this means for the operators, mineral owners and the general public alike is straightforward – reduced permit processing time and better data. At the end of the day, doing this saves time and money, both for the taxpayers we serve and the industry we regulate."

As for his place in the big picture, Wang describes himself as a facilitator for his colleagues.

"I often tell my team that my job as the executive director is to make sure they have the resources and tools to do theirs," he explains. "The energy industry is a vital component of our state's economy. What we do at the commission has profound impacts on our state. It is imperative that we effectively implement our commissioners' policy decisions and maintain a stable, predictable regulatory framework in Texas." ■

MATTHEW HAIRFORD

President of Matador Resources Company

RECALLING THE PREPARATION FOR and run-up to the company's 2012 initial public offering, Matador Resources Company President and Chair of the Operating Committee Matthew Hairford remembers a particularly demanding but rewarding period.

"The Matador IPO was quite memorable, with a lot of travel and many interesting investor meetings," he says. "It gave us a chance to signal to the market how we were going to organically grow Matador's value as a team and then come back later to discuss that we had done what we said we were going to do. We have continued that tradition and culture to this day, and plan to keep it as an important part of who we are."

Whether people deem such consistency to be reliability, follow-through or simple integrity, the company prioritizes such a reputation, Hairford emphasizes.

"We strive to be accurate in our projections and guidance to the market," he says. "It is very important to us to be known as a company that does good technical work, explores in the better basins and does what it says it is going to do."

That, he reflects, leads into and flows from the company's core strategy of creating shareholder value with an approach that concentrates on yielding profitable growth at a measured pace. Matador owns and operates both upstream and midstream oil and gas assets in North Louisiana, East Texas, the Eagle Ford Shale and the Delaware Basin, with most of the midstream assets located in the Delaware Basin, Hairford details. The company's primary operating focus is drilling economic horizontal wells and building midstream infrastructure on its Delaware Basin acreage.

"We can add shareholder value through both business lines," he says. "We continue to focus on developing all of our assets in a capital-efficient and profitable manner."

According to Hairford, part of that efficiency stems from a fairly flat company structure that emphasizes a team approach and strives to recognize quality input, regardless of its source within the organization.

"Our company is very collaborative in nature, and we are very thankful for the strength of the entire Matador team," he observes. "We have an open-door policy and see great advantage in fully vetting issues that arise and decisions that need to be made and keeping everyone engaged."

Complementary perceptions add nuance and texture to a company's outlook, Hairford suggests. Therefore, Matador benefits from many of its team members' multifaceted backgrounds and experiences.

"Working in the field is one of the best ways to get an understanding of what is important in the industry, and we find great value in people spending time next to the wellhead," he says. "Thinking broadly and holistically is also very important in understanding the business and how to achieve success in this business."

Hairford's own experience extends back to his youth growing up in Hooker, Oklahoma. In addition to farming and ranching operations, his father owned and operated an oil field service company that focused on designing and operating gas lift systems. He has lived in many oil- and gas-related locales, including Hobbs, New Mexico; Houston; Oklahoma City; Midland, Texas; Tyler, Texas; Tulsa, Oklahoma; and currently Dallas.

"I particularly liked the pace, the ability to see results and the overall opportunity set that the oil and gas industry provides. There are not many industries that have a comparable set of opportunities, and this is a fun business," he says.

Turning to today, innovation has helped the industry meet the world's energy needs, he notes, and oil and gas companies' creativity and drive are as great a resource as the hydrocarbons they produce.

"The advancement of unconventional reservoir development will continue for many years," he says. "New technology, resulting in faster drilling times and higher recovery rates, will be important in years to come. I also believe that this industry will continue to be innovative and remain receptive to market conditions, political influences and economic movements in the energy sector."

As regulatory and environmental issues loom ever larger, Hairford urges balance among regulators, royalty owners and producers and predicts there can be outcomes acceptable to everybody.

"A solution for temporarily abandoned and inactive wells is a great example of an issue that needs to be addressed," he says. "At Matador, we fully support the Texas Railroad Commission and other governing agencies and strive to be a good, receptive and cooperative partner."

Part of that commitment includes membership in and involvement with the Texas Independent Producers & Royalty Owners Association (TIPRO), he maintains.

"TIPRO provides a very important service to our company, to the independent producers and royalty owners and to the overall oil and gas industry," he says. "It gives the group a platform from which to be heard and not only addresses issues for the industry and royalty owners but also contemplates the effect on the environment and overall economic benefit for all involved. The meetings give producers and royalty owners a chance to network and to discuss economic, technical and political issues." ■

TIPRO WELCOMES NEW MEMBERS

Jay Allison
Cimarex Energy Co.

Nathan Batts
Texas A&M University

Marsha Breazeale
Oil Patch Press

Kurt Brown
Texas Tech University

Kari Bryan
Mekusukey Oil Company, LLC

Federico Chavez-Torres
University of Texas at Austin

Ruben Colchado
Triple Five Energy Resources, LLC

Fernando Creus
Mirkus, Inc.

Steve Daniels
Legacy Reserves Inc.

David DeLeon
Delta Property Tax Advisors

Shauna DeMattee
BPX Energy

Marc Dingler
Diamondback Energy, Inc.

Phil Duda
Schlumberger

David Dudics
University of Texas at San Antonio

Bryan Erman
Matador Resources Company

Sean Gao
Flying Tigers Hot-Tapping, LLC

Austin Gladden
Texas A&M University

Debra Gordon
Riviera Resources

Brian Gross
Eagleridge Energy

Joey Hainsfurther
Hillstone Environmental Partners

Matthew Hairford
Matador Resources Company

Kyle Hammond
Legacy Reserves Inc.

Daniel Higdon
Sabinal Energy

Bird. Holmquist
Exxon Mobil Corp.

Rachel Huang
Flying Tigers Hot-Tapping, LLC

Cliff Humphreys
Matador Resources Company

Sochi Iwuoha
University of Calgary

Sameer Kalaliya
Curtin University

Munaza Kanwal
Missouri University of Science and Technology

Sam Knazier
BP America Production Co./ BPX Energy, Inc.

Andrew Leyendecker
University of Texas at Austin

Stephen Lindsey
GHA Barnett, LLC

Eric Liu
Flying Tigers Hot-Tapping, LLC

Thomas Mazurek
Mazurek, Belden & Burke, P.C.

John Melko
Foley Gardere

April Mestas
QEP Resources, Inc.

Fred Miller
Hydrozonix

Trey Murphy
University of North Carolina

Samantha Omey
Exxon Mobile Corp.

Kyle Perkins
Matador Resources Company

Preston Phillips
Aethon Energy

Jaime Rangel
Lone Star College System

Ben Richardson
MC Parish Trust

Chris Rosas
Rosas PLLC

Christopher Sandoz
BPX Energy

Kenneth Shore
Shoco Productions, LP

Chad Smith
EDFS

Jordan Spearman
Brigham Minerals

Kayla Sullivan
Texas Scottish Rite Hospital

Jason Tackett
Sage Natural Resources LLC

Merritt Talbot
Occidental Petroleum Corp.

Keith Thibodeaux
ENUIT, LLC

Alan Title
T3L, LP

Taylor Vaughn
Delta Property Tax Advisors

Olivia Walker
University of Alberta

Eric Waller
MD America Energy, LLC

Kevin Ware
KJE Environmental & Vivil Engineering

Reilee Williams
Texas A&M University

Wilson Woods
Texland Petroleum, LP

Calendar of Events

July 10, 2019
IPAA/TIPRO "Leaders in Industry" Luncheon
Houston Petroleum Club
Houston, Texas
For more information, call (202) 857-4733.

August 7-8, 2019
TIPRO's Summer Conference
Hyatt Hill Country Resort
San Antonio, Texas
For more information, call (512) 477-4452.

August 14, 2019
IPAA/TIPRO "Leaders in Industry" Luncheon
Houston Petroleum Club
Houston, Texas
For more information, call (202) 857-4733.

August 21-22, 2019
Summer NAPE Expo
George R. Brown Convention Center
Houston, Texas
For more information, call (817) 847-7700.

September 11, 2019
IPAA/TIPRO "Leaders in Industry" Luncheon
Houston Petroleum Club
Houston, Texas
For more information, call (202) 857-4733.

October 9, 2019
IPAA/TIPRO "Leaders in Industry" Luncheon
Houston Petroleum Club
Houston, Texas
For more information, call (202) 857-4733.

November 13, 2019
IPAA/TIPRO "Leaders in Industry" Luncheon
Houston Petroleum Club
Houston, Texas
For more information, call (202) 857-4733.

December 11, 2019
IPAA/TIPRO "Leaders in Industry" Luncheon
Houston Petroleum Club
Houston, Texas
For more information, call (202) 857-4733.

Please see TIPRO's online Calendar of Events for additional details on association meetings and conferences.

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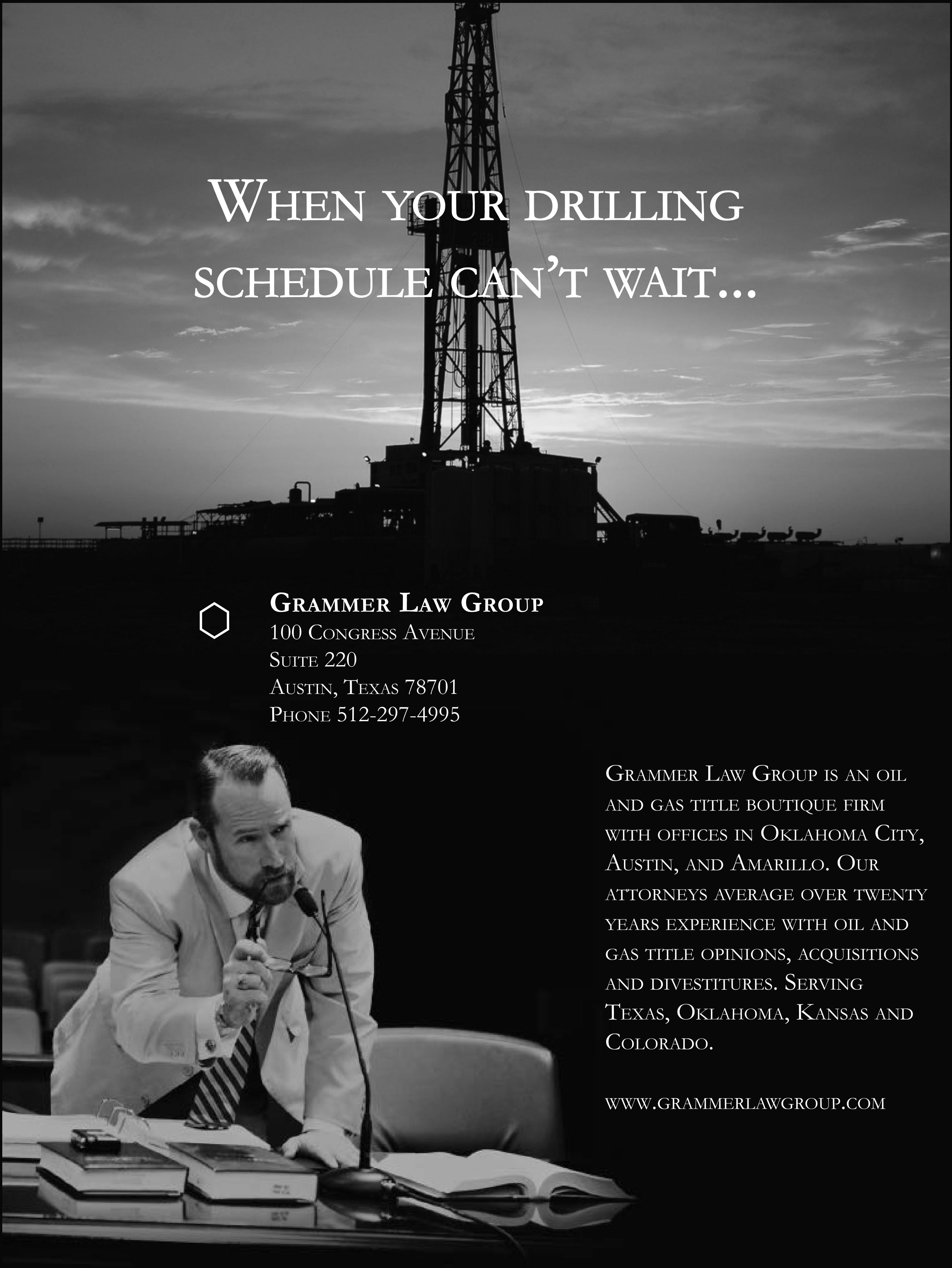
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