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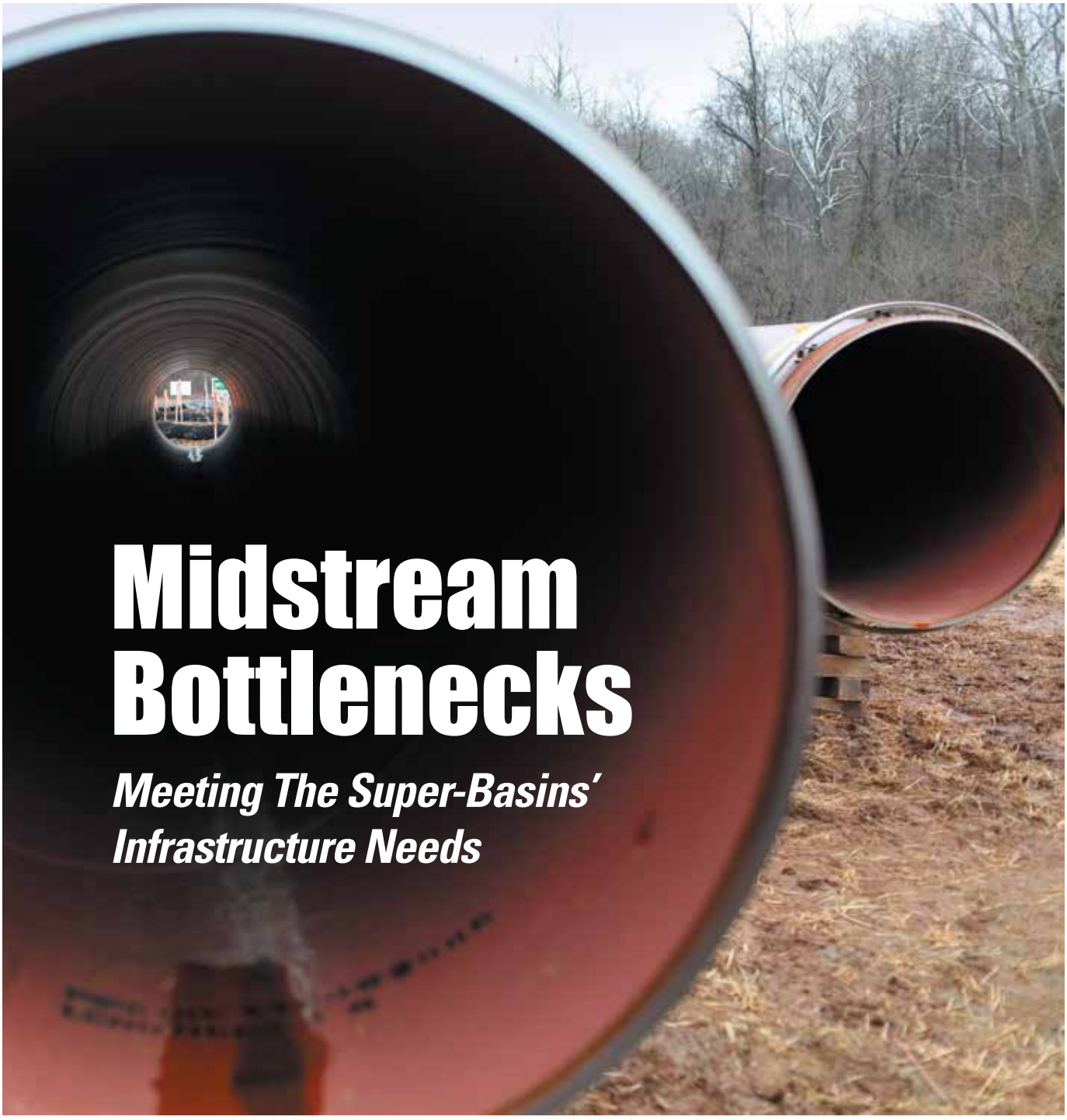

Midstream Bottlenecks

Meeting The Super-Basins' Infrastructure Needs

A supplement to
Oil and Gas Investor

SEPTEMBER 2018

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Midstream Bottlenecks

On the cover: Pipe for the Atlantic Sunrise project waits to be strung along the new Appalachian pipeline's right-of-way. *Source: The Williams Cos. Inc.*

Building a path
toward energy independence.

Atlantic Sunrise Project right-of-way, Pennsylvania

Pipeline progress.

Williams' Transco pipeline moves natural gas from production areas to customers, such as utility companies and power plants, throughout the eastern United States. The nearly complete Atlantic Sunrise Project is designed to supply enough natural gas to meet the daily needs of more than 7 million American homes by connecting producing regions in northeastern Pennsylvania to markets in the Mid-Atlantic and southeast. Just one way Williams makes energy happen.

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Midstream Matters

By Paul Hart, Midstream Editor-At-Large

Where does the midstream fit in the energy sector? It's a valid question. When I took on this role of covering the midstream for Hart Energy, I worked up a PowerPoint presentation that I gave to multiple groups to explain a common question I heard: Just what *is* the midstream?

Sometime after Col. Drake completed that well in Pennsylvania, the oil and gas business bisected itself in two: Upstream exploration and production and downstream refining and marketing. A fellow named Rockefeller over in neighboring Ohio gets credit for creating the downstream as we know it—and with some notable financial success on his part.

But what about the middle of the business: gathering, processing, transportation and storage? That includes all of the things necessary to link producer with consumer and whatever it takes to get that production ready for the consumer. It was a no man's land. Sometimes it was an upstream function, sometimes it was downstream property.

Often, it was something of a coin flip to decide who built and owned all that in-between stuff. Midstream was viewed almost as something of a necessary evil. Over the years, there were moments where companies made the midstream profitable. One great example was oil pioneer Frank Phillips' decision to lay a pipeline from his new refinery at Borger in the lightly populated Texas Panhandle to big Midwest markets such as Chicago and St. Louis.

That opened up a terrific market for his refinery's gasoline and established a trademark still common out in front of many service stations: Phillips 66.

Things began to evolve in the last two decades with the emergence of the MLP structure and other changes. Independent entrepreneurs saw opportunities to make money in the middle of the business without drilling wells or refining products.

For its part, Hart Energy pioneered the sector's first publication dedicated to its news and issues: *Midstream Business*. I've had the pleasure of watching its reputation grow and mature, and thanks to all of you who have offered insights, compliments and critiques.

We heard a common question: The midstream works so closely with producers, shouldn't your publication be more closely matched with the upstream sector?

Yes, perhaps it should be.

So with this issue of Hart Energy's *Oil and Gas Investor*, we're adding regular, midstream-focused supplements to the upstream-focused OGI. We still will cover midstream issues—you'll see more midstream-related articles in OGI—but in a way that serves our upstream audience, too.

Each *Midstream Business* supplement will cover one broad topic. With this first issue, we're focusing on what's probably the chief subject for America's oil and gas business today: Midstream bottlenecks. The U.S. enjoys the finest midstream infrastructure network in the world, but it's not enough.

Production from the big unconventional plays—in particular the Permian Basin—has overwhelmed that infrastructure. The upstream and midstream sectors will need to work together closely to assure those bottlenecks get broken and production can flow freely to customers.

But we heard a common question: The midstream works so closely with producers, shouldn't your publication be more closely matched with the upstream sector? Yes, perhaps it should be.

The nation's role in the worldwide energy business has changed 180 degrees in little more than a decade from top importer to important exporter. Our publications will join the midstream and the rest of the energy business in changing to meet that new role.

Meanwhile, you'll continue to see Hart Energy's popular conference series emphasize midstream topics. Look for a special midstream-focused exports workshop at the DUG Eagle Ford Conference & Exhibition, set for Sept. 19-21 in San Antonio. In October, we will hold our first Midstream Finance Conference in Dallas and there will be special midstream-focused presentations at our annual DUG Midcontinent Conference & Exhibition, scheduled for Nov. 13-15 in Oklahoma City. Plans are underway for special events in 2019.

I hope you find this special supplement valuable. Feel free to forward your comments and suggestions after you have had time to read it. ■

***Paul Hart** can be reached at **pdhart@hartenergy.com** or **713-260-6427**.*

For more coverage, visit **MidstreamBusiness.com**.

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The Permian Production Problem

Stratas Advisors forecasts Permian production will outstrip pipeline and refining capacity in this quarter.

By Joseph Markman

Hart Energy's Stratas Advisors saw the Permian Basin as a land of opportunity for midstream operators in its second-quarter 2018 report. The big play's growth in crude and associated natural gas production has pushed the limits of existing infrastructure to such an extent that the basin's prices are lower than in other plays.

In August, the Permian's central Waha Hub saw gas prices at $1 per million British thermal units below the benchmark Henry Hub in South Louisiana. Prices for Permian crudes have sagged, as well.

"The magnitude of pending production increases, the width of the differentials between in-basin pricing and elsewhere, and the play's proximity to key markets like the Gulf Coast and Cushing [Okla.] should continue to attract midstream energy companies in providing transportation and logistics to meet demand," the analysts wrote.

Stratas cited double-digit discounts of Midland West Texas Intermediate (WTI) crude oil to Cushing WTI prices as well as Cushing's own double-digit discounts to Brent-dated light crude as motivation for a buildout.

Stratas forecast the basin's average third-quarter crude production to be 3.688 million barrels per day (MMbbl/d). Pipeline and refining capacity, however, is only 3.684 MMbbl/d.

"If our current forecast holds, then we expect production to slightly be over the available capacity in the region," Stratas said, adding that the forecast stretches from third-quarter 2018 to the end of third-quarter 2019. Fourth-quarter 2019 will see an 81% jump in pipeline and refining capacity.

This makes for bottlenecks, and it's easy to see why the midstream has multiple infrastructure projects underway or being planned to alleviate the takeaway problems. Construction work to link West Texas and southeastern New Mexico to markets should remain brisk for some time to come. ■

Selected Recent Midstream Construction Projects

Operator/Developer	Project	Location	Added Capacity	Play	Status/Completion
Exxon Mobil Corp., Plains All American Pipeline LP	Crude oil, condensate pipeline	Permian Basin to Texas Gulf Coast	More than 1 million bbl/d	Permian Basin	Joint venture project would originate in Wink and Midland, with delivery points in Webster, Baytown and Beaumont.
Exxon Mobil Corp.	Gulf Coast ethane cracker	Baytown, Texas	1.5 million tons per year	N/A	Full operations began for cracker.
Enterprise Products Partners LP	Offshore crude oil export terminal	Texas Gulf Coast	2 million barrels	N/A	FEED started.
Kinder Morgan Inc., EagleClaw Midstream Ventures LLC, Apache Corp.	Permian Highway Project	Waha, Texas, to U.S. Gulf Coast	2 Bcf/d	Permian Basin	Proposal announced for 430-mile, 42-inch pipeline to be built and operated by Kinder Morgan. Company is evaluating feasibility of 48-inch pipe.
Williams Partners LP	Atlantic Sunrise	Mid-Atlantic and Southeastern U.S.	1.7 Bcf/d	Marcellus Shale	Completion and full service scheduled by late August.

Complete listings online

Source: Hart Energy

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Following the Money in Midstream

With 60% of new LNG capacity worldwide being built in the U.S. and America catapulting into its role as a major energy exporter, plenty of attention is being focused on where, how and when to invest in midstream infrastructure.

Hart Energy's inaugural **MIDSTREAM Finance conference** seeks to answer the most pressing questions. Midstream investors, operating executives and industry analysts will converge **October 22-23** at the Fairmont Hotel in Dallas to address near-term expectations and forward-looking business strategies.

- Will MLPs remain the preferred business structure for midstream entities?
- How will the Trump administration's tax reforms affect MLP and "C-corp" firms?
- Who is providing private equity funding —and where is it going?
- How do you build an operating team that makes investors take notice?
- Is downstream moving into midstream—as upstream moves out?
- How do exports change the game for North American midstream operators?

Burgeoning exports of U.S. natural gas, crude oil and refined products are driving widespread additions to U.S. pipeline, treatment and storage facilities.

The data tell a story

The opening keynote address will come from **Kenny Feng**, President and CEO of **Alerian**, a leader in MLP data and analytics. Conference attendees will hear his unique outlook on what lies ahead for this critical market segment. His company is the source for the famous Alerian Index – whose constituent partnerships represent approximately 85% of the total float-adjusted market capitalization.

From CEO keynotes to expert panels and spotlight presentations on individual companies or focused topics, the entire **MIDSTREAM Finance** program is designed to engage and challenge professionals on all sides of midstream activity. The perspectives will be diverse: Midstream business leaders, Wall St. financiers, private equity players and others will be represented.

Putting skin in the game

A mid-morning spotlight presentation from **Ben Davis**, a partner in **Energy Spectrum Capital**, promises insights from a player with plenty riding on midstream success. Founded in 1995, the Dallas -based private equity firm pursues compelling opportunities in North America's midstream sector. The seven Energy Spectrum Partners (ESP) funds represent **over $3.5 billion of equity capital commitments**, with a diverse limited partner universe spanning corporate and public pension funds, insurance companies, endowments, banks and other institutional investors.

Energy Spectrum focuses on companies seeking growth through buy-and-build strategies or via greenfield development. The firm invests in "throughput" assets such as

crude oil and natural gas gathering and transportation networks, processing and treating plants, and storage facilities. To date, the ESP Funds have invested in more than 55 portfolio companies.

The **MIDSTREAM Finance** program will blend keynote and spotlight presentations with engaging roundtables and panel discussions. At lunch and during morning and afternoon breaks, attendees will have ample opportunities to catch-up with colleagues, network with peers and make new business connections.

Build-out activity continues

Although the midstream sector has been riding a seesaw the last few years, key producing regions like the Permian Basin still need more infrastructure. At the same time, emerging export flows for crude oil, NGLs, LNG and refined products are altering the downstream landscape. **Greg Haas**, director of integrated energy analysis for global research and strategic consulting firm **Stratas Advisors**, will parse the line-up of construction projects and offer his expert opinions about where "the money" needs to go.

Adding new infrastructure capabilities to link the Permian, Marcellus and other big plays to end-use markets is a huge job. An expert panel will share views on what options midstream managements have – and what resources they need -- to get the job done

What's working for partnerships?

Master limited partnerships have been a midstream mainstay but like the rest of the sector they face major challenges. **Lori Ziebart**, executive director of the **Master Limited Partnership Association** (MLPA) joins the conversation to discuss how partnerships are responding to the financial markets and new regulations in Washington. She'll explore how MLPs may change to maintain their key roles in midstream's future.

Entering booming export markets

Thanks to unprecedented production growth, the U.S. has evolved from an energy *importer* to a big-time hydrocarbon *exporter* in just a few years. That creates great opportunities for midstream players — yet also requires new thinking and new business models. The closing panel will wrap-up a content-filled day with a spirited discussion of export opportunities.

From macroeconomics, regulation and taxation to asset financing and markets, if it affects midstream businesses today (or tomorrow), you will hear it discussed on-stage or in the networking at Hart Energy's inaugural **MIDSTREAM Finance** conference. Visit MidstreamFinance.com to learn more. ■

*For more information about the 2018 **MIDTREAM Finance** conference (or any of Hart Energy's other award-winning conferences), please visit HartEnergyConferences.com.*

From the Appalachian Basin to the Gulf Coast, the wave of buildout activity is prompting a parade of new midstream capabilities coming on-stream.

Bottlenecks in takeaway, treatment and transportation networks threaten to throttle upstream development activity in the booming Permian Basin region.

‘Fullstream’

Not all bottlenecks involve pipelines. Stratas Advisors charts a long-term course for the Eagle Ford’s midstream as an example of a complete, or ‘fullstream,’ global energy industry.

By Greg Haas

It's not every day that a research analyst is asked to write a cover story for an influential industry publication. But herein, I hope to add coverage that looks further forward to give a longer-term perspective on the opportunities and risks for the midstream segment of the ever-changing North American energy industry whose nexus is in Texas.

Toward this end, I have excerpted information that could have long-term impact on the midstream industry in general and the Eagle Ford in particular from Stratas Advisors' current and former oil-side research. Other features in this supplement analyze bottlenecks in some of the other big unconventional plays.

We start by noting that the pace of U.S. shale development has been breathtaking. A bewildering price crash has yielded to an anxious period of ongoing-but-uncertain recovery. Global energy trade patterns are disrupted. New demand centers are rising. The U.S. is assuming a new role as a supply and export leader. Society is demanding lower impacts and cleaner energy. Hot money is chasing all manner of energy investments.

That has created numerous midstream bottlenecks as the industry adjusts.

The shale revolution is still ongoing. And because its effects are still spreading throughout the global energy industry, Stratas Advisors offers forward-looking research services to separate the future risks from the rewards, to assess the next opportunities and the potential pitfalls and to evaluate the investments and the returns. We hope our work in this publication shares unique and useful insights and lays out the processes by which Stratas Advisors, a Hart Energy company, conducts energy research and formulates these opinions and forecasts across the global energy value chain.

Four drivers

Changes in upstream supply and downstream demand are driving midstream change across the global energy industry. That reality directs our research analysts, who are located around the world, to provide clients with timely analysis and evaluation of the "fullstream" opportunities and risks impacting the global energy industry.

Stratas Advisors has identified four main themes relevant to the hydrocarbon supply side of the world's energy value chain, but which also have proven utility for analyzing and communicating the dynamics in energy-consuming markets.

Midstream infrastructure, trade flows and pricing dynamics link the two ends of the value chain.

The themes are summarized below:

1. Changing mix—A changing energy mix dawning with greater shale production, a growing importance on natural gas and a heightened preference for clean energy and alternative fuel is driving fullstream investment across multiple energy commodity value chains;

2. Changing flows—Energy flows are coming from new supply areas, including the U.S., and are flowing to new demand regions with differing economic growth rates and energy intensities. Geopolitics and money flows are shifting with the energy economic poles as they rotate from the Atlantic to the Pacific Basin;

3. Changing mobility requirements—A common shared affinity for mobility and electrification, digitization, autonomy, efficiency and green energy is evolving in all modes of transportation; and

4. Changing regulations—An intensifying regulatory environment encompasses standards, regulations specifications, subsidies and mandates.

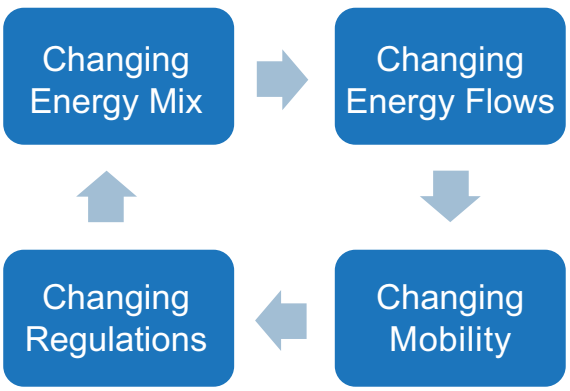
This fullstream framework guides us to produce our best and most valuable research, which must offer unique insight while staying ahead of the market.

Sulfur limits

Stratas Advisors' view on fuel regulations and policies, for instance, allows us to analyze the effects of energy mix, volumetric flows and export opportunities. Not all bottlenecks involve pipeline capacity.

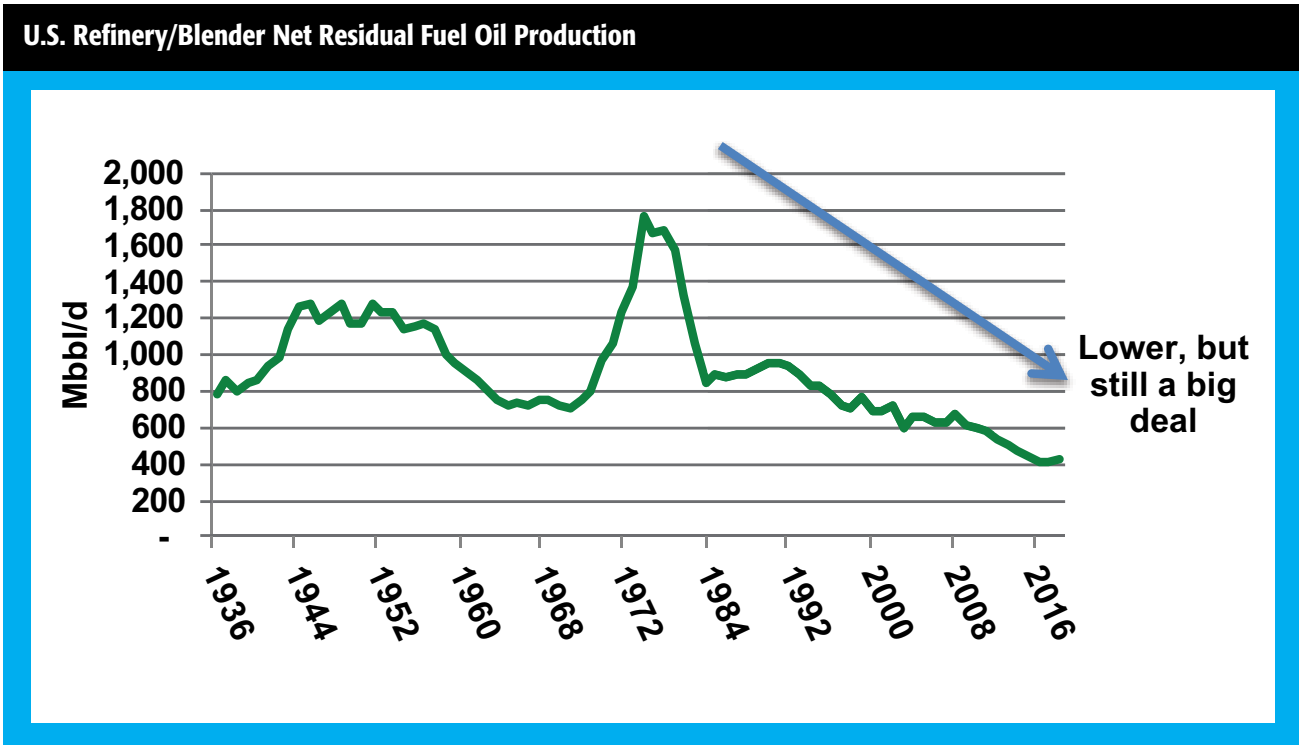
For the Texas oil and gas industry, we see both opportunity and threat as a result of the ongoing reduction of sulfur emissions from the use of marine bunker fuel. The new targets, set by the International Maritime Organization (IMO) in 2016, set a sulfur content limit of 0.5% for marine bunker fuels. On behalf of our fuels and transport clientele around the world, Stratas Advisors researchers have been following the implementation and effects of the overarching MARPOL marine pollution reduction initiatives for years prior to that.

Stratas Advisors *Fullstream* Global Energy Integrated Analysis Framework



Source: Stratas Advisors

U.S. Refinery/Blender Net Residual Fuel Oil Production



Source: Stratas Advisors North American Oil Service, EIA data

This latest sulfur emissions ratchet will take effect in world markets in first-quarter 2020. Our framework analysis shows the effects may soon ripple through the industry, and to Eagle Ford producers, midstream logistics and Texas refiners.

The rules apply globally to between 4 million barrels per day (MMbbl/d) and 6 MMbbl/d of refined product demand. We see few compliance options, yet we believe compliance will be well enforced. Options include fuel switching to marine LNG or low-sulfur diesel, blending fuels, or onboard tailpipe emissions scrubbers. It is also uncertain how high prices may rise or discounts may fall to induce refiners to produce enough diesel or desulfurize bunkers.

All this will create a bottleneck. This change will spread through the global industry. And the Gulf Coast midstream industry may need to accommodate both refinery crude and product slate changes to sustain operations in Houston and Corpus Christi, Texas, and across the region.

For instance, some may be able to switch from heavy high-sulfur crudes, or increase output of low-sulfur diesel, or blend and intensify processing of bunkers into more compliant fuels. These downstream changes would necessitate new or incremental midstream capacity for transportation, storage, segregation, blending and export options.

On the producing side, upstream producers could be persuaded by pricing to raise output of light sweet crude from the Eagle Ford, Permian and other competing resources. For Eagle Ford midstream operators in particular, upstream supply-side dynamics can also spur new gathering and takeaway infrastructure requirements.

Texas refining

In our 2012 multiclient "Refining Unconventional Oil" research report, we analyzed the 4 MMbbl/d of light-oil refinery expansions being talked up in the press. A bit of that has ensued with capacity up 860,000 barrels per day (Mbbl/d) since the 2011 baseline. Closures have also been seen in Hawaii, Alaska and elsewhere, a loss of 920 Mbbl/d of capacity. The strong refinery utilization we forecast also showed up as refinery utilization and is now averaging 91% vs. 86% then.

That represents a stealth 890 Mbbl/d capacity gain. Added together, the gains equate to about 2.1 MMbbl/d of equivalent new light-oil refining capacity. Yet U.S. field crude production rose 4.4 MMbbl/d from 6 MMbbl/d in 2011 to 10.4 MMbbl/d in May 2018.

The gap exists because of exports, which have undergone regulatory changes.

Oil could not be exported beyond Canada due to outdated federal export prohibitions implemented during the 1970s energy crisis. Regulatory changes in 2015 allowed U.S. crude exports to begin in 2016. U.S. crude exports have risen from almost zero to an average of 2 MMbbl/d in May, per the latest full month of U.S. Energy Information Administration (EIA) data. Refined product exports have also incrementally grown by 2.4 MMbbl/d over the same period.

Taken together and seen from a full-stream analytical perspective, the combined crude oil and petroleum product export flow equates to the gain in shale output. Roughly half of the incremental light shale oil output is flowing to offshore refiners while the other half

is flowing to expanded U.S. refineries whose incremental products are also being exported offshore at upgraded higher values.

Looking ahead, we expect more of the same. Incremental crude production flowing to the U.S. Gulf Coast over the next decade will drive refinery expansion locally and expand refined product and crude exports in roughly equal measure.

Therefore, the midstream industry can compete for new business in refinery crude supply and product takeaway logistics, while U.S. field crude output increases through the next decade. Midstream companies including NuStar Energy LP, Buckeye Energy Partners LP and Howard Energy Partners are investing to export U.S. fuel products across Latin America.

Doubled crude exports

Based on our analyses of crude supply, petroleum demand and midstream logistics capacity, we believe U.S. light crude exports will double by the 2020s and be up to 5 MMbbl/d by 2030.

We believe the resources and available acreage within the productive oil-rich shale plays—the Eagle Ford, as well as the Permian, Rockies, Midcontinent and potentially the Bakken—are most likely to attract capital and incrementally yield 1 MMbbl/d to 2 MMbbl/d of light crude production above the current 11 MMbbl/d-range levels.

We take a more cautious view of U.S. refined fuel demand gains. Amid changes in the fleet, driving appetites, regulatory initiatives and alternatively powered mobility, we do not see material movements up or down in transportation demand for petroleum over the next decade.

In that 2012 "Refining Unconventional Oil" report, we forecast that shale oil production gains could back out U.S. Gulf Coast light crude imports. We didn't expect the speed at which that happened. Total U.S. imports of light crude were fully offset by light crude exports in late 2016.

Today, light shale oil exports have peaked in certain weeks of 2018 at more than 3 MMbbl/d and indicate robust net exports of light crude oil. This striking trade development is thanks to the changing energy mix and regulatory environment we see today.

We see offshore transfers or exports from Texas to the world's other refining and consuming regions as key to helping production expand to 12 MMbbl/d to 13 MMbbl/d in the 2020s without domestic supply overhangs, price discounts and existentially threatening shale economics. U.S. crude exports next decade may double and peak between 4.5 MMbbl/d and 5 MMbbl/d.

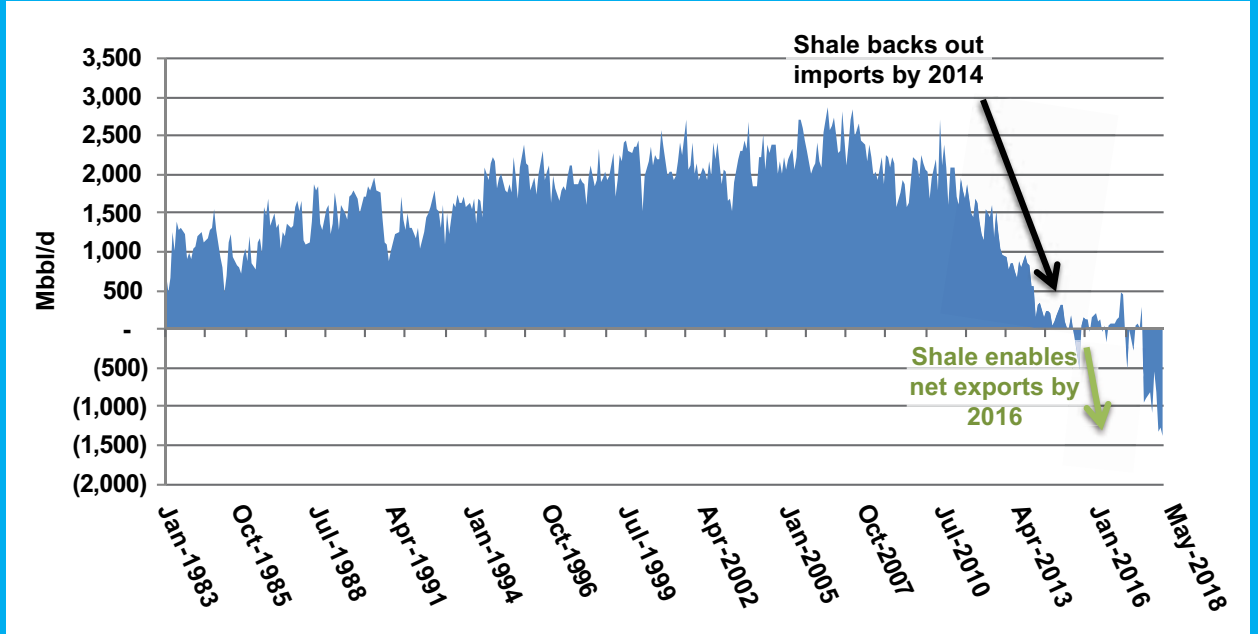
Texas' midstream industry will help the state's industry become both the source and the gateway for higher light-oil supply for global refiners.

Caribbean crude

The offshore crude exports we forecast could include reboots at multiple simple Caribbean refineries. In Curaçao, parties are evaluating a potential restart of the 330 Mbbl/d Isla Refinery. At the former HOVENSA Refinery in the U.S. Virgin Islands, the current owner, Limetree Bay, plans to resume 150 Mbbl/d to 350 Mbbl/d of refining by 2020.

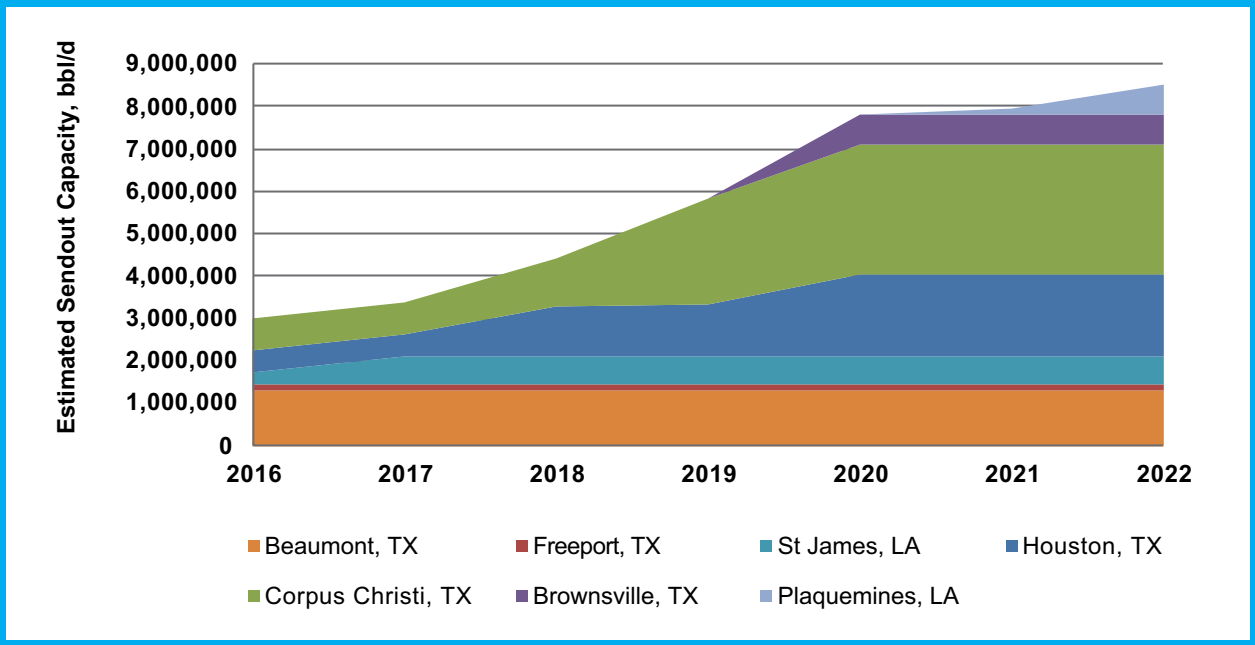
Mexico also plans to invest billions of dollars in up to three new refineries along the Gulf Coast that could refine as

Shale Revolutionizes U.S. Net Light Crude Tradeflows



Source: Stratas Advisors North American Oil Service, EIA data

U.S. Gulf Coast Crude Export Terminal Capacity



Source: Stratas Advisors North American Oil Service

much as 750 Mbbl/d of light oil. Given various threats to ban hydraulic fracturing there, we believe a good fraction of the needed light oil will be imported from the U.S.

We see U.S. light crude nevertheless remaining at a discount to global light crude grades produced and priced elsewhere. That's as long as U.S. refiners continue to run heavy-sour crudes after the IMO 2020 rules go in force. Price discounts in Alberta or from Mexico's Pemex and Venezuela's PDVSA could assure U.S. refiners kitted out for heavy crude will continue running it.

That should leave adequate supplies of light U.S. crude. We believe enduring discounts of Texas crude below global prices should help spur global offshore export growth.

By nation, Canada was the greatest U.S. crude importer in 2017. Canadian imports of U.S. light could grow if IMO-related crude shifting drives Canadian refiners toward sweeter, lighter crudes. Yet China was 2017's second-largest destination for U.S. crude exports, and Asia as a whole was the greatest export region.

VLCC tankers

High-capacity very large crude carrier (VLCC) tankers are already enabling more U.S. barrels to travel greater distances at lower per-barrel costs. VLCC transits will likely be crucial in the global fullstream energy industry.

We see the main U.S. crude export gateway remaining along the U.S. Gulf Coast. The deepwater Louisiana Offshore Oil Platform (LOOP) near St. James, La., was built for offloading imports from VLCCs. The LOOP was recently revamped for bidirectional flow to enable VLCC export loading. The Capline Pipeline reversal is being developed to supply the LOOP with more North American crude for export or local refining markets.

A reversed Capline to the LOOP would be able to deliver Bakken and Canadian crude. Additionally, through the Diamond and interconnecting pipelines, Capline should also be able to provide LOOP exporters with available Permian, Eagle Ford, Rocky Mountain and Midcontinent Oklahoma crude, provided ample supply remains after any IMO-driven crude slate changes ripple through U.S. refineries.

The LOOP presently augments and competes against other existing crude marine export terminals. An additional Louisiana VLCC facility was proposed for deepwater near the Plaquemines, La., port on open season in the third quarter. Tallgrass Energy Partners LP announced the Plaquemines project in a press release detailing its plan to build a high-volume, segregated crude pipeline directly from the Cushing, Okla., pipeline hub to St. James.

Furthermore, multiple proposals and investments are already underway to build out high-capacity VLCC takeaway from Texas. These projects will build on Texas facilities already loading smaller vessels or partially loading VLCCs with reverse-lightering operations. Dockside VLCC partial loading and reverse lightering are underway in Corpus Christi by Occidental Petroleum Corp. and the Houston Ship Channel by Enterprise Products Partners LP. Other VLCC operations in Beaumont and Freeport, Texas, are also either pending or operating.

All in, we estimate that the Gulf Coast, including LOOP, offers facilities to presently load 4 MMbbl/d of oil onto tankers ranging in size from intracoastal

barges, to Suezmax, Panamax and VLCCs with capacities on the order of 750 Mbbl, 1 MMbbl and greater than 2MMbbl, respectively.

So while Louisiana has its LOOP and potentially another export facility at Plaquemines, we believe the home state of the Eagle Ford shale play, in particular, will strive to keep its boast that everything is bigger in Texas.

Several potential offshore projects are pending in Texas and will be based on deepwater moorings to fully load VLCCs in deep water without reverse lightering. We expect to see one or more of the VLCC loading projects finished. Projects are pending at the entry to the Houston Ship Channel (Enterprise Products Partners), in waters off Freeport (a reversal of the 2008-era import facility known as TOPS by Oiltanking and other partners), in waters off Brownsville (by Jupiter MLP) and at the 75-foot-deep waters at Texas' Harbor Island or Ingleside at the Port of Corpus Christi (Buckeye Partners LP, Phillips 66 and Andeavor). San Antonio-based Andeavor is currently being acquired by Marathon Petroleum Corp.

Including all announced facilities, we estimate as much as 7.5 MMbbld to 8 MMbbl/d of crude export loading capacity could be online by the mid-2020s.

Earlier in the summer of 2018, we reported our expectations anticipating that oil majors and large integrated midstream firms will compete in this high-growth offshore export niche. To mitigate risks, we said we expected the formation of joint ventures (JV) to play a significant role in the space.

Several of the VLCC ventures bear this logic out. We see as most emblematic the 2018 announcements by ExxonMobil Corp. about reintegrating to fullstream operations amid the growing shale revolution. The supermajor is investing to grow Permian production, executing JVs for pipeline takeaway, and guiding analysts to model new refining or petrochemical investments to profit all the way to the export dock.

While the locations for VLCC crude export terminals may be relatively few, there are a number of ways for midstream operators of all sizes and capabilities to play this long-term trend. Oil exports will be dependent on operators and firms involved in the logistics of exporting light oil from one supply region to another import-consuming region. Key investments will likely be made in storage terminals, crude carriers, blending facilities, pipelines, marine loading terminals and docks, loading facilities, offshore mooring facilities and offloading facilities.

The volumes and infrastructure support needs will be significant.

The view back then

Since 2012, Stratas Advisors has tracked U.S. progress toward becoming a net energy exporter. That year, we saw a presentation on energy security at Rice University's Baker Institute given by a former CIA official, John Deutch. He delivered a paper that quantified U.S. reliance on net petroleum imports at 52% of consumption in 2009. The paper proposed to lower that ratio to 29% by 2025 to reduce energy security risks via various switching efforts to lower oil imports and increase domestic gas and alternative fuel consumption. It even suggested imposing new refined product export prohibitions.

At the event, we inquired about the possibility that horizontal drilling and hydraulic fracturing could more rapidly revolutionize the supply side and even flood the market. Blank stares were the answers. A fullstream conceptualization was not in the picture. Since then, the Cushing hub has filled, U.S. crude discounts to global crude prices widened to the $30/bbl range, midstream operators invested billions of dollars, inland refiners filled up their coffers and OPEC saw its U.S. market share crater.

Since 2012, we have tracked that ratio and have seen U.S. import reliance fall into the 10% range. Within a shockingly few years, U.S. net petroleum exports enabled by the fullstream energy industry's investment and operations have allowed the nation to nearly become a net energy exporter while internally providing almost fully for its entire energy consumption.

We see more progress along these lines in coming decades as the midstream adjusts to relieve the resulting bottlenecks.

Net imports

The available EIA data for the three months ended May 2018 showed U.S. petroleum imports averaged 10.1 MMbbl/d while exports averaged 7.45 MMbbl/d. That means the U.S. is a net oil importer by just 2.7 MMbbl/d. As U.S. crude output ramps to 12 MMbbl/d to 13 MMbbl/d in the next decade, the U.S. could directly become a net energy exporter. This could happen if about 1 MMbbl/d of net crude imports fall, either as a result of higher light crude exports or lower heavy sour imports; or if about 700 Mbbl/d of incremental production is exported as refined products and NGL; and if another 1 million barrels of oil equivalent per day, as LNG or piped gas to Mexico, is exported.

We are that close. But new infrastructure and midstream investment will be required, especially in the Texas marketplace.

In this piece for the inaugural *Oil and Gas Investor* midstream supplement, I have intended to give readers a high-level, focused view of where the energy industry is heading as it relates to midstream opportunities in Texas in general and the Eagle Ford in particular. I stepped back from granular coverage of the latest bottleneck—the intrigue around infrastructure permits and the debuts of dueling open seasons. I have tried to provide fullstream visibility that draws from our global team of energy experts at Stratas Advisors.

Along the way, we hope to have shed ample clarity on the oil-related opportunities for the Texas midstream industry, both today and in the decade to come. I invite readers to contact Stratas Advisors for questions on the oil sector themes in this work or for additional views on natural gas, NGL and other branches of the integrated global energy industry. ■

Greg Haas *is director of integrated energy for Stratas Advisors.*

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A Complete Project Partner for Midstream Operators

The way you manage details can determine your project outcomes. In the Permian Basin, industry conditions can create a domino effect if something slips through the cracks. Securing power, supervising contractors and forecasting long-lead deliveries takes experience. These are just a few of the interrelated tasks that can delay startups, especially when they need to be accomplished for multiple projects. Your project managers can produce better outcomes with a comprehensive partner that can manage all project details holistically.

"Our engineers are dynamic, well-rounded and not limited by their degrees, which is why they serve as our project managers."

– **Jeff Stake,** *Chief Operating Officer, Oil-GasTech*

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"A single point of contact allows midstream operators to really function at a higher level, managing budgets more than day-to-day details," Stake said. ■

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Permian Possibilities

The big basin keeps getting bigger, creating big challenges—and big opportunities—for a capacity-constrained midstream.

By Paul Hart

The Permian: It's one of those rare place names that merits a definite article. From the legendary Santa Rita No. 1 gusher in 1923 until now, the basin has grown exponentially.

And it continues to grow. The Permian Basin is expected to still be growing when it marks its centennial in just five years.

A U.S. Energy Information Administration (EIA) midyear report projected Permian crude oil production would hit 3.4 million barrels per day (MMbbl/d) in August. Bear in mind: A decade ago Permian producers could not sustain oil production at 1 MMbbl/d.

Numbers are equally impressive for Permian natural gas. August output was to reach 10.9 billion cubic feet per day (Bcf/d), according to the EIA. In 2009, the basin flowed around 5 Bcf/d.

The Permian marked an epic oil output expansion of up to 1.1 MMbbl/d in the first half of 2018—a 53% increase since first-quarter 2017—and that magnitude of increase could occur again in 2019 and again by 2025, some analysts predict.

"It's the basin that keeps on giving," said Cory Richards, CEO of PT Petroleum LLC, at Hart Energy's recent DUG Permian Conference & Exhibition in Fort Worth, Texas.

Midstream machinations

That's the good news. The bad news is the midstream is straining with all its might to move that production to market—never mind that during nine decades of production the Permian has been laced with thousands of miles of pipeline, hundreds of tank batteries, scores of gas plants, dozens of railroad sidings—plus truck lots and who knows what else.

You don't get much better midstream infrastructure than the Permian enjoys, but it's not enough.

That means lower commodity prices, and that's not good for anyone in the industry. "Effective Permian natural gas takeaway capacity is completely utilized, keeping Waha [gas hub] basis under pressure," Robert W. Baird & Co. analysts cautioned in a recent research report.

RBN Energy LLC noted the Waha cash basis averaged more than 50 cents per million British thermal units (MMBtu) as July turned into August. "But a combination of factors—including increased flows to Mexico and a couple of small, under-the-radar expansions of existing takeaway pipes—has prevented the Waha basis from tumbling to $1/MMBtu or even $2/MMBtu," it said in a report.

"Though we estimate nameplate West Texas gas takeaway utilization currently stands at 88%, we believe effective takeaway utilization is closer to 120%," Baird added. "The three operational Mexican export pipelines, [ONEOK's] Roadrunner and [Energy Transfer's] Comanche Trail and Trans-Pecos Pipelines, brought online an aggregate 3.1 Bcf/d in design capacity. Actual flows, however, are constrained to just ~0.3 Bcf/d at present, the limit of Mexico's current import infrastructure," it said. "Beyond exports to Mexico, we believe the gas production trajectory will require two of the six proposed greenfield takeaway projects at a minimum."

Optimism and opportunity

"On the optimistic side, higher prices support broader development. On the negative side, we are a victim of our own success. We are developing bottlenecks in getting crude and natural gas out of the Permian Basin and thus our differentials, in other words what we get paid relative to the benchmarks, have widened," Steve Pruett, president and CEO of Elevation Resources, said at DUG Permian.

Platts recently ranked the Bakken—not the Permian—as the most profitable U.S. play based on internal rates of return. The long-suffering Williston Basin, which endured significant crude differentials due to a shortage of pipeline capacity, has gone to the top as the Dakota Access Pipeline and other pipeline capacity opened up, providing needed infrastructure. So the industry's big capacity bottleneck has moved south to Texas and New Mexico.

Some companies may take a look at their Permian operations and evaluate what it takes to move product, then make decisions based on what they think will be most beneficial. And as always, high demand means high values for assets.

Reuters recently reported that Occidental Petroleum Corp. (NYSE: OXY) is exploring the sale of its pipeline assets, which could fetch a healthy $5 billion that Oxy could plow into more wells. "Occidental's decision to shed the assets is the latest example of an oil company balking at the capex required to maintain U.S. pipelines, which have been plagued by bottlenecks and require construction of new networks," Reuters said.

"Inability to transport enough oil out of the Permian Basin of West Texas and New Mexico … combined with increasing appetite for U.S. oil exports, could help Occidental sell its pipelines for top dollar, according to the sources. Occidental is working with investment bankers on an auction for the pipeline assets, added the sources, who asked not to be identified because the matter is confidential," Reuters added.

Oxy did not respond to comment requests.

Good numbers

All this means that publicly held midstream operators put out some impressive second-quarter financial results. That might pique the interest of investors who have shunned the midstream since the 2014 commodity price collapse.

"The majority of midstream companies are showing upside potential on cash flows for 2018 and we are finally seeing the realization of the ramped-up Permian production from earlier this year," said Justin Carlson, vice president and managing director of research at East Daley Capital, in a recent research report. "Our analysis shows that only a handful of midstream companies will underperform vs. consensus. It's a great time to be investing in the midstream sector, but looking closely at long-term asset health is an absolute must to truly understand a company."

Midstream operators are spending significant time planning ways to do more with what they have until new capacity comes on in the next two or three years.

So it's understandable that the Permian's future dominated presentations and discussions at both DUG Permian and Hart Energy's Midstream Texas Conference & Exhibition in Midland, Texas.

The Permian Basin has excellent infrastructure in place—but it's not enough.

Vaquero Midstream's 400-million-cubic-feet-per-day Caymus cryogenic processing plant near Coyanosa, Texas, is a prime example of a new asset that helps address the Permian Basin's midstream infrastructure needs. *Source: Vaquero Midstream*

Mark Whitley, president and CEO of Chisholm Energy Holdings, told DUG Permian attendees that, "It all fits together—the infrastructure of gathering oil and gas, the infrastructure of moving things like water and sand, they go together. We have decided not to go into the sand-sourcing business. That's just another level of complexity. We really aren't staffed to do that. We could be, somewhere down the road. One thing that you learn being in the business for 42 years is to never say 'never.' What we thought was impossible many years ago is now just taken for granted."

In his Midstream Texas keynote, Bill Ordemann, executive vice president of Enterprise Products Partners LP, gave a call to action for new pipeline capacity as a lack of Permian midstream infrastructure remains a major dilemma. Enterprise ranks No. 5 on the *Midstream Business* Midstream 50 list of the sector's largest publicly held firms and is a major Permian player.

Short-term shortfall

In the short term, Ordemann cautioned there will be "a significant capacity shortfall through 2019" as Permian crude production continues to rise. But as the new Cactus 2, Epic and Grey Oak pipelines come on in 2020, the situation could reverse and a pipeline capacity glut could emerge that might last until 2025.

The situation is equally critical for gas—and a gas-focused infrastructure shortfall could last far longer, he added.

"The ball has got to get rolling on these gas pipelines because my biggest worry is that gas can strain some of the other production if we are not careful. Additional pipeline capacity is critical," Ordemann said in his speech.

"We are drilling better wells," Ordemann said of the industry, adding that he does not subscribe to scaling back production as a means to offset any pipeline capacity shortage. "We are just getting more productive in the wells. And this shows through in key areas for crude oil: Permian, Eagle Ford and Bakken."

Capacity will roughly match gas production out of the basin until perhaps early 2020 as the Sand Hills expansion and Grand Prix projects come on late this year, he said. But after that, there are no firm gas line projects in the offing, yet production is expected to continue to climb, thanks to abundant associated gas produced with unconventional crudes.

Likewise, Ordemann cautioned, the Permian has "a lot of natural gas processing plants, but not nearly enough."

The NGL hit

Ordemann doesn't share the disastrous outlook that some have predicted for crude, but he does see NGL taking a hit if there aren't infrastructure improvements by 2020-2021.

"Today, we do have a little bit of congestion on the NGL side with pipes and allocation," Ordemann said. "But all and all, it seems to be doing OK. I think some people are starting to get squeezed a little, and I think that will continue to happen until the next round of pipelines comes on, hopefully, sometime next year.

"We are planning to bring ours on sometime in the spring of next year," he added. "Hopefully, that will alleviate some of the allocation issues we are seeing today with some of the products."

The petrochemical industry is investing billions of dollars in new plants that will require gas and NGL feedstocks and it's vital the midstream can supply them, Ordemann added. Capacity shortages could cause cost inflation that will jeopardize the economics of those plants.

In a Midstream Texas conference panel discussion titled "Where Is It All Going?" Ken Snyder, chief commercial officer for Frontier Energy, told the conference to expect Permian production to flatline as limited capacity widens

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crude differentials. As output continues to outpace pipelines and trucks, bottlenecks will be inevitable, he said.

"All of a sudden we had more production then we thought we were going to get … Producers were way outstripping their expectations," Snyder added. "Things were clicking in our direction [then] all of a sudden we got tight."

'Siren song'

He predicted growing demand for both trucking and rail capacity. But noting the Permian's alluring "siren song," Snyder agreed with Ordemann that the midstream will ramp up crude capacity by 2020. The challenge is in getting through the next 18 months without self-destructing and then ultimately readjusting, he added.

Crude by rail saved the bottlenecked Bakken. Could it do the same again in the Permian? It may not be wise to lean on rail capacity, however. In a great example of "fool me once-shame on you" thinking, Union Pacific Railroad (NYSE: UNP) announced in its second-quarter earnings call that it "will not invest to support [further crude-by-rail growth]," due to the short-term nature of current Permian opportunities. However, where the nation's biggest railroad does have capacity, "we are working closely with producers to see what we can bring to rail," executives said.

Union Pacific, BNSF and Canadian Pacific (NYSE: CP) were burned badly when they invested millions in infrastructure to support the Bakken, only to watch that traffic evaporate in the downturn and as new Williston Basin pipelines siphoned off the business.

One big Permian producer, Apache Corp. (NYSE: APA), is feeling significant stress from insufficient infrastructure as it develops its sprawling Alpine High Field—one of the biggest U.S. fields discovered in many years. Robert Bourne, vice president of business development for the company's midstream and marketing group, said Alpine has invested $850 million in midstream infrastructure to date for Alpine High.

The result is that the big play will have excellent connectivity, but more will be needed, he added in a Midstream Texas presentation.

Upstream-focused Apache had to create an Alpine High-focused midstream operation in what had been a lightly explored area. It currently has five central processing facilities, 780 MMcf/d of processing, 45 miles of 30-inch trunk line, 121 miles of gathering lines and 34 central tank batteries spread across its 1.5 million leased acres.

But all of that gives Apache access to some 4 Bcf/d of outbound capacity and comparatively easy connections to the Waha Hub.

This will need to be a common Permian scene in coming months as midstream players race to add capacity. This pipe went into one spread of ONEOK's Roadrunner Gas Transmission system that moves Permian gas south to Mexico. *Source: ONEOK Inc.*

Apache had the good fortune of discovering Alpine High in September 2016. The find includes a dry gas play with more than 1,000 highly prospective locations and an even larger wet gas play with more than 3,500 highly economic locations.

Echoing Ordemann's caution, Bourne warned of a takeaway "train wreck" coming for Permian production without significant midstream investment in new infrastructure.

Rumbo al sur

During his presentation, Bourne echoed the RBN report's observation that exports to Mexico will help, but it will take a while for the sector to do what needs to be done.

The potential within Mexico's energy market was the topic of an in-depth Midstream Texas panel discussion, "Mexico Plays Catch-Up." A significant portion of Texas' gas and petroleum production, once refined into petroleum products, already heads south—*rumbo al sur* in Spanish—and the volumes will grow.

Allan Roach, senior vice president of global strategy for shortline railroad operator Watco Cos. LLC; Brandon Seale, president of Howard Energy México; and Michael Moss, vice president of business development for Rangeland Energy III LLC; discussed the potential demand awaiting the industry from the nation's southern neighbor. Already, most of Mexico's domestic gas comes from the U.S. Many Mexican homes rely on LPG for cooking and heating—another big market for Permian gas liquids.

Rail has played a significant role, building on Mexico's comparatively good rail network, Roach said in his presentation.

Meanwhile, RBN Energy Analyst Sheetal Nasta noted in a third-quarter research report that Texas gas going under the Rio Grande rose to 5 Bcf/d in July, upward from a 4.6 Bcf/d average in the first months of this year as infrastructure improvements on both sides

of the border expanded capacity as seasonal power demand increased.

"This new export volume signifies incremental demand for the U.S. gas market at a time when the domestic storage inventory is already approaching the five-year low," Nasta said. "At the same time, it would also signify some much-needed relief for Permian producers hoping to avert disastrous takeaway constraints—that is, if the export growth is happening where it's needed the most, from West Texas. However, that's not exactly the case."

Credit increasing flows out of the Eagle Ford and other South Texas plays for some of the increase, she added.

Think big

The basin's swelling flows can justify some big-inch pipe. "Basically we need a 42-inch line coming out of the Permian every other year [based on crude oil projections]," said Joey Mahmoud, president of Driftwood Pipeline LLC and senior vice president at Tellurian Inc., at DUG Permian in Fort Worth. "And, out of the Permian, we are going to see associated gas is 16, 18, maybe even 20 Bcf/d. That will compete head-to-head with the Marcellus and is something we all need to prepare for."

Tellurian proposed a 42-inch gas line taking 2 Bcf/d from the Waha in Pecos County, Texas, to Lake Charles, La., to fill its proposed Driftwood LNG terminal. A mid-August announcement by Targa and partners proposed the Whistler Pipeline to move gas to South Texas and the Gulf Coast.

Mahmoud cited data from RBN Energy that estimated Permian crude output of 3.2 MMbbl/d today will rise to 4.8 MMbbl/d by 2023. The research firm also said gas output of 7.5 Bcf/d now will rise to more than 12 Bcf/d by 2023.

Pipelines providing new export capacity will be the Permian's best hope in the face of production that is rising faster than expected, speakers on a markets roundtable said.

"The amount of crude growth we've seen is exceeding all projections," said Greg Haas, senior director of integrated energy for Hart Energy's Stratas Advisors. "I think we are on a takeaway treadmill until the mid- '20s."

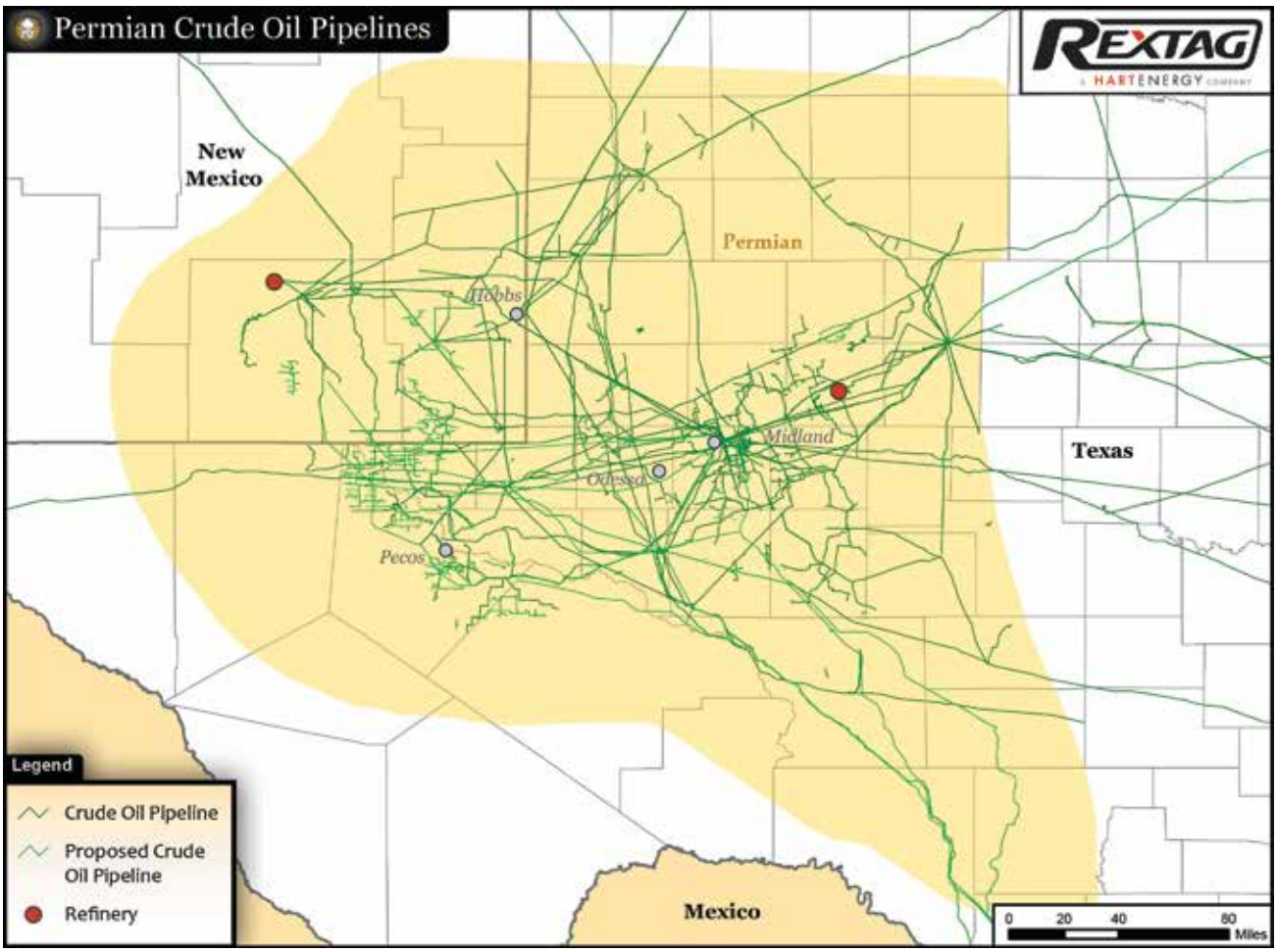
Haas said Permian NGL production will hit 3 MMbbl/d by 2020 and natural gas production will double to 20 Bcf/d by the mid-'20s.

Rail and trucking are expensive alternatives, and in the end, pipelines are the only significant solution to get production out of the basin, he added.

"For natural gas, however, the world is your oyster for LNG exports."

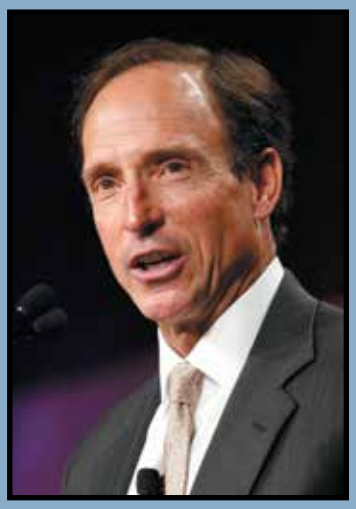
Water woes

Water is a growing new business for midstream operators. Drillers need water for frack jobs, as well as ways to



"On the optimistic side, higher prices support broader development. On the negative side, we are a victim of our own success; We are developing bottlenecks in getting crude and natural gas out of the Permian Basin and thus our differentials, in other words what we get paid relative to the benchmarks, have widened."

– **Steve Pruett**, *president and CEO, Elevation Resources*



dispose of the abundant water produced by the basin's unconventional shales.

That's creating another midstream bottleneck.

Melissa Robinson of Roywell LLC knows that from living and working in Midland. "That's kind of key right now: How do we move water? How do we move oil? We are pumping it out from Midland. We've got to move it. So that's definitely one of the big things all of these companies are highlighting."

Acquiring capital

There appears to be capital available for the Permian buildout. Energy-focused private-equity firm Tailwater Capital announced in July that it had raised $1 billion for its latest fund in a bet on the demand for oil pipelines in North America in general and the Permian in particular.

That fundraising underscores how private equity seeks to invest in pipelines and other midstream assets amid the under-capacity problem. The likes of Blackstone Group LP and BlackRock Inc. have also invested in oil pipelines in recent years.

"It's just a general rule of thumb, but for every $1 of capital that has the opportunity of drilling an oil and gas well, there's probably 30 cents of midstream capital that's required," Tailwater co-founder Edward Herring said in a recent interview.

The new fund, Tailwater Energy Fund III LP, closed at its maximum limit of $900 million and raised a further $100 million co-investment for Silver Creek Midstream, a platform company in the fund. The fund was oversubscribed, Tailwater said.

Fund III will have the same investment strategy as its $650 million predecessor, which targeted mid-market companies with a deal size between $25 million and $350 million.

The preference for smaller companies appealed to investors in private equity funds, referred to as limited partners (LPs), according to Jason Downie, Tailwater's other co-founder.

"Our opportunity is pretty rich relative to, I think, what LPs are seeing from some of the bigger funds that are chasing bigger deals and obviously paying what would be materially higher valuations," Downie said.

In the public sector, those attractive financial numbers for the second quarter and first half of 2018 will help refloat lagging share and unit values on Wall Street.

Think small

Enterprise and Apache aren't the only players investing significant capex in new assets, of course. Several smaller firms—and multiple small-scale projects—are helping to break the bottlenecks.

In late July, Crestwood Equity Partners LP (NYSE: CEQP) said its Crestwood Permian Basin Holdings LLC unit started up the new Orla cryogenic gas plant in Reeves County, Texas. Capacity is 200 million cubic feet per day (MMcf/d). Concurrently, Crestwood brought on its Orla Express Pipeline, a 33-mile, 20-inch high-pressure line connecting the existing Willow Lake system with the Orla plant. Also, Crestwood expects the Nautilus-to-Orla Pipeline, a 28-mile, 20-inch high-pressure line connecting the Nautilus system to Orla, to be fully in service late in the third quarter.

Crestwood Permian Basin Holdings is a 50:50 joint venture between Crestwood and private-equity provider First Reserve. Crestwood's Delaware Basin gathering and processing assets are supported by long-term contracts with several large producers and include 255 MMcf/d of processing capacity, 650 MMcf/d of gas gathering capacity and 390 miles of integrated pipelines.

Crestwood said it reached agreement with EPIC Y-Grade Pipeline LP to acquire undivided joint ownership in the Orla-to-Benedum segment of EPIC's 16-inch NGL pipeline, which was placed into service in June. The ownership interest provides Crestwood control of 80,000 bbl/d of capacity out of the

Delaware Basin to multiple downstream connections in the Benedum, Texas, area with ultimate access to such Texas Gulf Coast markets as Sweeny, Mont Belvieu and Corpus Christi.

Also, it signed a long-term purchase and sale agreement with Chevron Phillips Chemical Co. LP in which Crestwood will sell, and Chevron Phillips will purchase, Y-grade originating from the Orla plant.

Better and better

The current excitement about the Permian's booming output replaces the doldrums the basin's energy industry felt not long ago. Conventional production steadily declined and even a sprawling prospect like the Permian might have seen its best days, many observers said.

That changed rapidly. Experimentation with new technology and techniques is the name of the game in the Permian's Midland Basin, where some operators are using nanoparticles in the hydraulic fracturing process, improving type curves and discovering more oil and gas.

Approach Resources Inc. (NASDAQ: AREX) is among those seeing the benefits of technology in the play with its so-called "science wells" as it tweaks stage and cluster spacing along with concentrations of fluid, chemicals and particles in fluid. Changes implemented have led to improved production in the Wolfcamp, according to Approach Resources CEO J. Ross Craft, who gave several examples in his DUG Permian presentation.

"We picked three wells—one each in the A bench, B bench and C bench—and we adjusted stage spacing down to an average of 174 ft. We pumped roughly 2,000 pounds per foot," Craft said. The technique also included use of nanoparticles. "The oil production on these three wells averaged 22% higher than the type curve. We're pretty excited about what we're seeing."

Like its Delaware sub-basin, the Midland Basin boasts stacked-pay potential with drilling focused mainly on the Wolfcamp Formation. E&Ps have added horizontal drilling techniques to the Midland's history of vertical wells in the Spraberry, giving rise to more production by large public oil and gas companies and smaller private E&Ps alike.

Technology and improved techniques, reservoir knowledge and a willingness to take risks remain key for producers.

Knowing geology

As abundant as the unconventional plays have been, there appear to be plenty more possible reserves out there that will keep the industry busy for many years to come.

For example, a sound knowledge of geology is playing a role in Elevation Resources LLC's success in the Barnett Shale of the Central Basin Platform in Andrews County, Texas. A combination of risk-taking by financial backers, creative ideas from the staff and a partnership with mineral owner University Lands has enabled the company to take risks that private-equity-backed firms normally can't take, Elevation CEO Steve Pruett told DUG Permian Basin attendees.

"Our concept was to drill north-south to propagate fracks in an east-west manner, zipper style, and use sand fracks and hybrid gels. It worked," Pruett said, noting the company leaned on marginal results from other horizontal drillers in the area to help devise its plan of action.

Pruett highlighted the University 1-27 South Unit #3H well, pointing out pay.

The mineralogy of the resource play is mostly clay minerals with silica and carbonate, he said, noting it's similar to the Meramec. The play is classified as "mixed siliciclastic mudstone/marlstone, with near equal proportions of coarse-grained, brittle components."

Elevation believes the play extends north-south about 60 miles, though maturity may be an issue.

Considering the play is emerging, Pruett said work is needed on testing spacing, landing zones, frack formula and water recycling, among other areas. The company also plans to move to pad drilling in 2019.

"We need to transition from a science-based data collection effort to a manufacturing effort," Pruett said. This takes pad drilling and scale, which he said the company started transitioning into as it expands its ownership position.

With 2.1 million acres across the Permian, Elevation's operations are focused in Andrews County on the Central Basin Platform and in the southern Midland Basin.

A final takeaway from the DUG Permian conference was the importance of paying attention and working with others: Upstream and midstream must cooperate to break the bottlenecks.

Cory Richards, CEO of PT Petroleum, told the Fort Worth conference, "We are a private company and quite small in comparison to others. We pride ourselves on being top-notch technical students. We analyze existing data as much as we can. You have to extract as much understanding as you can from the existing data. We are a big proponent of trading data with other operators and believe firmly that helps accelerate the pace of progress with technology."

The worldview

The Permian is no Las Vegas; What happens there must go elsewhere. Its influence on the world's energy business can only grow.

The Permian Basin remains the premier basin on Earth, according to Bill Marko, managing director of Jefferies LLC.

"The Permian is where the action is—everybody in this room knows that," Marko told DUG Permian attendees. Marko, who spoke at the conference during an A&D-focused panel, expressed concern about possible global supply shortfalls if the number of new final investment decisions didn't pick up. However, he pointed out that growth in the Permian—where production and activity have been rising—translates to growth worldwide.

"The Permian is going to be important for worldwide oil supply," he said, adding that the vast majority of drilling locations in the U.S. are located in the prolific basin. The challenge is getting that supply to market. ■

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Go Long!

The Marcellus and Utica are growing up as needed takeaway capacity comes online.

By Frank Nieto

Source: Aspen Photo/ Shutterstock

It's football season again, and similar to a quarterback gaining enough trust in a receiver that he gives him a hot read to "go long," the Appalachian Basin has become even better with experience as the Utica Shale's prolific output over the last seven years has given new life to the Midwest's energy sector.

The Utica has become so strong that it's hard to tell if it or its older brother, the Marcellus Shale, is the strongest play in the Appalachian Basin.

The Utica's strength is best represented by the growth of production out of Ohio, which is home to the majority of the play. According to the Ohio Department of Natural Resources, gas production was up 5% to 4.3 billion cubic feet per day (Bcf/d) at the year's midpoint. Crude production was down 17% from the previous year, but was still an impressive figure at more than 4 million barrels total.

Growing numbers

These numbers continue to grow, with RBN Energy LLC reporting that combined overall gas production from the Marcellus and Utica reached a record 25.3 Bcf/d in the fall of 2017.

According to RBN, the bulk of these gains are attributed not to a dramatic increase in production, but to increased pipeline takeaway capacity. This capacity has increased more than 2.4 Bcf/d since 2016 with more than 4 Bcf/d now in service. The days of record-breaking IP rates from new wells may be over, but the midstream is just getting started in the region.

"The Marcellus and Utica shales have lasted through some high and low times in the market and continue to be steady producers," according to Jason Stechschulte, commercial development manager for Marathon Pipe Line LLC (MPL). "Now that more natural gas pipelines are coming online in the play, you can expect to see further upstream and midstream investment."

Stechschulte said Marathon officials consider condensate production from the Marcellus and Utica as one because of how much their operations in the area—which are extensive—overlap each other and because of similarities with their product qualities. Marathon is a significant player in the region's midstream, but also in downstream refining and marketing.

Unlike the remote Permian or Bakken plays, the Utica and Marcellus lie adjacent to big markets in the U.S. and Canada so new pipelines are comparatively short. Marathon Petroleum's 93,000-barrels-per-day Canton, Ohio, refinery lies within the Utica's footprint and has a splitter for local gas liquids production. *Source: Marathon Petroleum Corp.*

"Initially, we planned on segregating Marcellus and Utica production in the pipe, but over time we realized we didn't have to separate them. That's a positive, since it requires less investment while still offering the same services," he added.

Ahead of schedule

Marathon has invested heavily in the Appalachian Basin, most notably with the $1.28 billion acquisition of MarkWest Energy Partners by Marathon's MLP, MPLX, in late 2015. MPLX ranks No. 8 on Hart Energy's current list of the sector's largest players, the Midstream 50 list.

"MPL [also part of MPLX] was already operating important assets in the area and MarkWest is the largest natural gas processor and fractionator in the region. Each company's assets meet the demands of the other. In order to realize these synergies sooner, we accelerated portions of our pipeline projects following the acquisition," Stechschulte said.

Since the acquisition, MPLX has sped up its Utica Build-Out and Cornerstone Pipeline projects. The 50-mile Cornerstone Pipeline was constructed to augment MPL's condensate truck unloading facility in Canton, Ohio, which was its first midstream investment in the Utica. This pipeline terminates at Marathon's Canton Refinery, where it supplies a 25,000 barrels-per-day (Mbbl/d) condensate splitter that was built in 2014, with deliveries now optimized between pipe and truck.

"We didn't know everything about the Utica when we made that investment, but we thought there was an opportunity," Stechschulte said. He added that while a truck can deliver about 190 bbl of condensate, the pipeline can deliver that in about two minutes. However, all forms of transportation are still needed in the region and MPLX is investing in truck, barge, rail and pipeline projects.

Completed in July 2017, the Utica Build-Out was designed to connect the Midwest markets by extending a pipeline and upgrading multiple pump stations along existing pipe-

Blue Racer's Natrium gas plant on the Ohio River in Marshall County, W.Va., is a major processor of Utica and Marcellus NGL. The firm has plans to expand its Appalachian processing capacity to 1.2 billion cubic feet per day. *Source: Blue Racer Midstream*

lines. This added connectivity to the Husky refinery in Lima, Ohio; as well as two refineries in Toledo, Ohio; and the Marathon refinery in Detroit. The company also reversed the 250-mile RIO Pipeline, which ran from Robinson, Ill., to Lima. This reversal provided connectivity to the refinery in Robinson and access to Chicago and Mount Vernon, Ind., via some additional MPL pipelines from Robinson.

Canadian markets

Of course, the Midwest isn't the only market for Utica production, as MPL has also built connectivity to Canadian diluent pipelines, including the Cochin and Southern Lights systems. MPL's strategy has centered on providing solutions for producers, refiners and diluent blenders in Western Canada.

"We're trying to offer a wide array of options. We're connected to 10 refineries throughout the Midwest, and now, the diluent market. Our goal is to offer flexibility and optionality rather than just focus on one specific market," Stechschulte said.

"We've been fortunate in that we've been able to complete our projects on schedule and under budget. One of the challenges that we've faced has been that we're trying to build the right assets for today's needs while also considering future customer needs," he added. In order to meet future demand, MPL's Utica pipelines can be expanded for additional capacity.

From unknown to superstar

A lot can happen in five years. Although that may seem like a short time, consider that the Utica went from a virtual unknown in 2011 to one of the world's largest shale plays by 2016. One of the early midstream players in the Utica and Marcellus was Blue Racer Midstream LLC, which entered in late 2012 and now has one of the most extensive rich gas-gathering systems in Appalachia.

Blue Racer has 800 million cubic feet per day (MMcf/d) of gas processing nameplate capacity and about 1.5 Bcf/d of fractionation capacity. The company also has a significant lean gas-gathering business in the region, with about 350 MMcf/d in capacity.

Blue Racer began as a joint venture between private-equity firm Caiman Energy II LLC and Dominion Natrium Holdings Inc., an affiliate of Dominion Energy Inc. (formerly Dominion Resources Inc.). These assets helped the company weather the downturn when producers pulled rigs out of the play at significant levels throughout 2015 and 2016.

"In the early days, we were growing from scratch and had a huge backlog of wells that were drilled by our producers. As drilling slowed down, there was still that enormous backlog that was brought online. As that backlog was depleted, our producers started actively drilling again," said Blue Racer CEO Stephen L. Arata.

Arata said the company is confident the play's worst is behind it. "We've come through the trough period and going forward, our producers' economics at today's strip are outstanding in both lean and rich gas, in part due to drilling enhancements such as longer laterals and better completion techniques," he said.

Nimble moves

Since it is a privately backed company, Blue Racer has a longer time horizon for investments relative to when it expects the assets to produce cash flow. "Unlike an MLP, we're not spending the money and expecting to immediately pay distributions on the assets," Arata said.

Blue Racer's customer base includes 20 companies across the play, which is among the most diverse in the Utica. Arata said the company makes sure to work with customers on an individual basis rather than focus on a single large customer.

While its customer and asset bases are large, it's still a small company with under 250 total employees. "There are not a lot of layers of management here, which allows us to address issues and come up with solutions on a pretty quick basis," Arata added.

Being able to move quickly has allowed Blue Racer to build up one of the largest gathering systems that covers most of the Utica, as well as portions of the Marcellus. Its footprint covers most of Ohio with significant gathering assets into West Virginia. About 40% of the gas the company processes is Marcellus rich gas out of West Virginia.

"It helps to be nimble in a developing play since companies haven't committed all of their acreage to a single midstream operator," Arata said. Blue Racer's extensive rich gas-gathering system is also a strategic advantage since producers can quickly tie into the system, he added.

"We don't have to lay a gas line more than a couple of miles to collect any molecules of gas in the play. The most challenging asset to build, particularly in a developing play, is a long 20- to 30-plus-mile, large-diameter pipeline that requires multiple customers to commit in order for the economics to work for the midstream operator. We have all of those lines already in place, so it's very easy and efficient for us to get a customer's gas online shortly after signing a contract," he said.

Higher capex

Blue Racer's 2018 capex is significantly higher than 2017's, but the company doesn't want to get too far ahead of its customers in adding capacity.

"That's one of the reasons we are running at 90% capacity. We want to stay ahead, but we don't want to have empty plants sitting around," Arata added.

The company currently operates four cryogenic processing plants in the Utica, each with 200 MMcf/d of nameplate capacity. It also plans to build more similarly sized plants as demand increases.

Blue Racer would be able to bring its fifth plant online with six months' notice and the sixth plant could be brought online with a year's notice. With these two additional plants in operation, it would have a combined 1.2 Bcf/d of nameplate processing capacity.

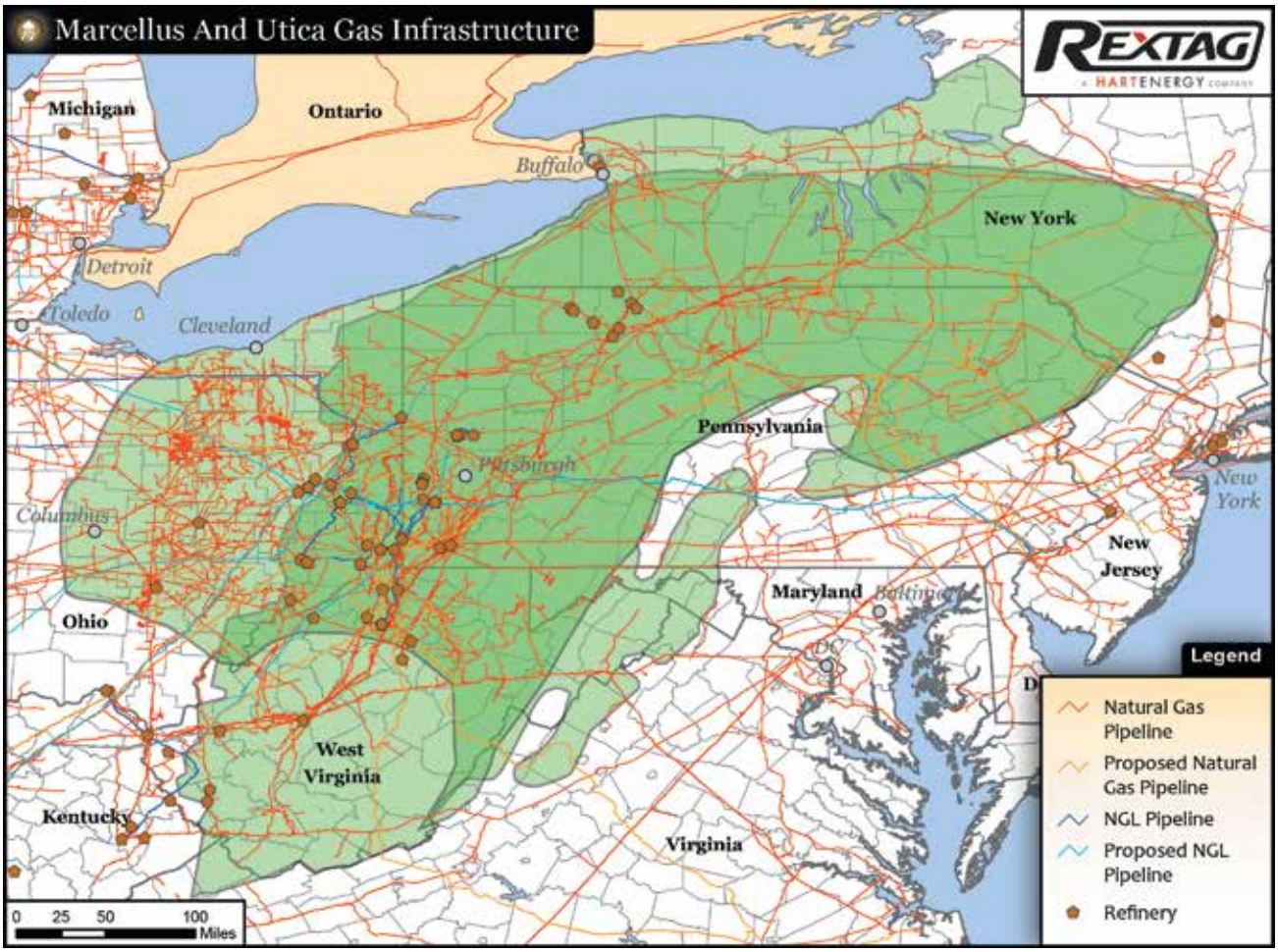
Marcellus moves

With the Utica continuing to grow, it's easy at times to forget about its older brother, but the Marcellus Shale is still the site of some of the most extraordinary production output in the world. The play accounts for nearly 40% of the country's total natural gas output, though production is expected to remain relatively flat this year as demand catches up with production.

The midstream is doing its part to help on this end by adding new pipeline not just in the Utica, but in the Marcellus as well. This new pipe will increase takeaway capacity to nearly 8.5 Bcf/d in 2018. This capacity is helping move Marcellus production to new end-use markets.

One of the largest pipeline projects in the Marcellus is Williams Partners LP's Atlantic Sunrise project, which will expand the existing Transco natural gas pipeline system by looping the Leidy Line in Pennsylvania and adding about 183 miles of new pipeline called

MPLX added its Cornerstone Pipeline to provide an additional 180,000 barrels per day of takeaway capacity for Utica condensate. *Source: MPLX LP*



the Central Penn North and Central Penn South. This project, which was scheduled to be complete in August, will transport up to 1.7 Bcf/d of Marcellus gas to markets in the Mid-Atlantic and Southeast. (See the adjoining story for more on Atlantic Sunrise.)

The opposition

While the Appalachian Basin is filled with good energy news, midstream developers are facing challenges from environmental groups seeking to delay or block several important projects in the region. The most notable of these challenges has been EQT Midstream Partners' Mountain Valley Pipeline, which has had two key sections of its proposed 303-mile system successfully blocked by the Sierra Club and other environmentalist groups. This project is designed to transport up to 2 Bcf/d of natural gas from Wetzel County, W.Va., to Pittsylvania, Va.

The 4th U.S. Circuit Court of Appeals accepted the Sierra Club's argument that a 3.6-mile segment of the Mountain Valley Pipeline would disrupt and erode woodlands in Virginia and West Virginia. The court has asked the U.S. Forest Service and the U.S. Bureau of Land Management to further review their previously approved licenses for this project. It's unclear how long this delay could last, but it almost surely will increase the project's price from the currently estimated figure of $3.5 billion.

While EQT faces challenges for this project, the company's midstream segment continues to grow with the creation of a new company, which has yet to be named.

This company will incorporate the midstream assets of EQT Corp., which were dropped down to EQT Midstream Partners, along with assets in Rice Midstream Partners. EQT Midstream Partners will remain a separate publicly traded entity when the new midstream venture goes public in the third quarter. This new venture will be the third-largest gas gathering company in the country and have a huge focus on the Marcellus and Utica. EQT Midstream ranks No. 21 on the Midstream 50.

Prior to this merger, EQT sold its southern Appalachian producing gas and oil and midstream assets to Diversified Gas & Oil for $575 million. This sale included 6,400 miles of gathering pipeline and 59 compressor stations in Kentucky, Virginia and West Virginia.

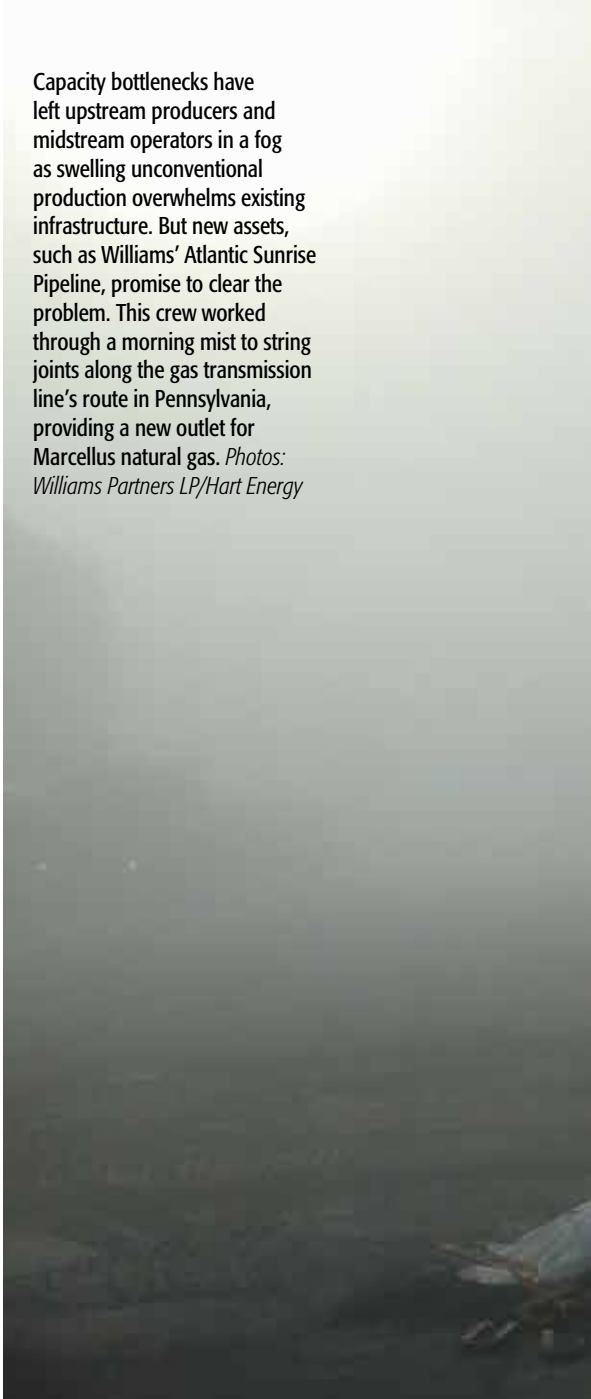
As more operators like MPLX, Blue Racer, Williams and EQT continue building in the Utica and Marcellus shales, the region will keep moving from rookie standout to the industry's MVP. ■

***Frank Nieto** is a freelance writer based in Washington, D.C.*

The Dawn of Atlantic Sunrise

It wasn't always easy for Williams Partners, but with Atlantic Sunrise now in service, Marcellus bottlenecks give way and new markets get a connection to a treasure trove of natural gas.

By Len Vermillion



Capacity bottlenecks have left upstream producers and midstream operators in a fog as swelling unconventional production overwhelms existing infrastructure. But new assets, such as Williams' Atlantic Sunrise Pipeline, promise to clear the problem. This crew worked through a morning mist to string joints along the gas transmission line's route in Pennsylvania, providing a new outlet for Marcellus natural gas. *Photos: Williams Partners LP/Hart Energy*

The drive through Lancaster County in southeastern Pennsylvania is a pretty one. Rows of corn stalks line backroads under picturesque blue skies. This is farmland.

It's also home to the second-largest Amish community in the U.S. But to the appreciative executives, contractors and workers finishing up the Atlantic Sunrise pipeline extension, it's also known as Spread 7, an important link in the much-anticipated project that has been four years in the making.

On a bright and sunny Friday morning, a Williams Partners LP SUV pulls up to a hidden clearing between thick trees, far removed from the barns and fields it passed to get there. At that moment, Atlantic Sunrise was about a month away from full service and finishing touches were coming along splendidly on the 1.7 billion-cubic-feet-per-day (Bcf/d) pipeline that connects to Williams' existing Transco Pipeline not far away. Once fully operational, Atlantic Sunrise is expected to go a long way to easing the bottlenecks that plague the Marcellus and to help producers get substantial reserves of natural gas out of the basin and to vital markets up and down the Eastern Seaboard.

It was a massive project.

Multiple obstacles

The first thing that comes to mind while looking out over a hilly corridor where Caterpillar operators carefully tap dirt into place above the 42-inch pipe is that it was not any easy one. The 189-mile greenfield path from near Bradford, Pa., to southern Lancaster County was riddled with obstacles.

"These are arguably quite treacherous mountains. They are difficult terrain to lay [pipe] in," said Evan Kirchen, vice president of engineering and construction for Williams Partners, in an interview back at the company's offices in Houston. "The issues are safety and keeping the pipe stabilized."

The project encountered several stream crossings as well, which required directional drilling in some cases. One quick look at an area near the Conestoga River in Lancaster County shows evidence of the journey. The pipe crosses under the river, burrows through a hillside past a lone, undisturbed house and emerges unscathed across a road. It's a testament to the drilling skill involved.

And much of the work in the vital Spread 7 was done while working around a particularly nasty winter in the northeastern U.S. this year.

Challenges, challenges

Despite challenges that were thrown its way from the terrain, Mother Nature, the occasional landowner (the project saw less than 5% condemnations, according to Williams), regulators and, yes, protesters—some of whom at one point barged into the project's field office and even went as far as to stage a fake cemetery in the pipeline's path—Atlantic Sunrise construction marched on.

And it's an important infrastructure build for the gas industry.

"It's a combination of two things, really. It opens up the Marcellus, which is in much need of takeaway capacity," said Frank Ferazzi, senior vice president for Atlantic-Gulf at Williams in

Houston. "It gives access to the market of Transco, and not just a little bit of the market. The path that we cover essentially gives access to virtually all the markets on the East Coast that Transco serves.

"It will interconnect with Transco mainline in Southeast Pennsylvania, and then it has access to all of the customers including those who serve the New York market," Ferazzi continued in discussing the project. "But we're actually providing additional reverse-flow capability to deliver much of that supply all the way down to our Station 85 [in Alabama]."

Atlantic Sunrise will serve nine different shippers. The largest is Cabot Oil & Gas, which Ferazzi said is about half of the line's 1.7 Bcf/d capacity.

"They're already a large customer of Williams, but this will be the first contract they have with Transco," he said. "It makes them a Top 5 customer by virtue of their participation in this single project."

For producers like Cabot, the new takeaway capacity couldn't come soon enough.

Breaking the logjam

"We have suffered a differential in that northeastern part of Pennsylvania unlike any part of the country has for the last three or four years, simply because we have about 8 Bcf/d of gas in a six-county area moving per day," Dan Dinges, CEO of Cabot Oil & Gas, said during a recent Leaders In Industry Luncheon at the Houston Petroleum Club. "The pipeline just will not hold any more capacity than that. We are trying to break the logjam."

Dinges told the gathering the gas that will come through Atlantic Sunrise has already been sold. He expects the project to generate significant cash flow in the next three years and beyond.

But producers won't be the only ones benefitting. Ferazzi explained that the project connects many markets on the East Coast to Marcellus gas for the first time. That will allow Transco's markets to continue to grow as well.

Call this photo "before." Miles of pipe joints lie stacked at an Alcoa plant yard in Lebanon County, Pa., before work began on the new transmission system.

Grass sprouts on the pipeline's completed right-of-way. Williams worked extensively with farmers and landowners to ensure minimal impact on the land and environment, altering the path for Atlantic Sunrise accordingly.

"It's consistent with Williams's strategy of matching supply with growing markets," he said.

Road less traveled

Make no mistake, Williams has always been interested in taking advantage of as much existing pipe as possible. Atlantic Sunrise is, after all, about making Transco even more productive.

"Once you get to Transco, we're taking advantage of pipe we already have in the ground that is historically good in supplying north-south," Ferazzi said. "We did have to build some new facilities to allow for reverse flow, but we didn't have to build a new pipeline. We were able to, at reasonable cost, give customers access to virtually every market on the East Coast."

But traversing the busy Northeast corridor, particularly in eastern Pennsylvania and northern New Jersey, was part of the reason Williams decided to carve a largely greenfield path to meet Transco.

"That corridor through New Jersey and New York is highly utilized and

Winter may be gone, but weather can still prove nasty. With no sun in sight, work continues as best it can along the Atlantic Sunrise route.

Above: Williams built Atlantic Sunrise through many existing utility corridors along its 181-mile greenfield path. Here, mats to control erosion and water runoff cover a hillside.

Right: A stretch of Atlantic Sunrise pipe goes in the trench outside Lancaster, Pa.

difficult to build out because it's very urban," Kirchen said. "This project is a much larger project than we could get around that corridor, so you can go directly down into southern Pennsylvania and tie in."

"It made a lot of sense for us to build brand-new infrastructure, bypassing a lot of the congested area and expanding further south," Ferazzi added.

Greenfield challenges

Of course, any greenfield path will keep developers on their toes and ready to adjust. And that it did. Ferazzi pointed out while looking at a map that—although the path looks straight—it is wrought with twists and turns throughout the length of the pipeline. Some were the result of the wishes of regulators, some to appease landowners and some simply because the terrain proved too formidable, so it was better to just bypass it.

"A greenfield path always has its challenges," Kirchen said. "We spent a lot of effort with our outreach in communities and with landowners, and also working with regulating authorities, primarily around water bodies."

The entire project took place inside Pennsylvania's borders and the Williams executives said working with one government body helped, especially in a state with a vested economic interest in the success of the gas industry.

"You're dealing with a government, and just because of the development of

CAT skinners finish one of the last work sites along the Atlantic Sunrise route through Lancaster County, Pa., assuring four feet of cover.

Don't miss an exclusive video documentary from Lancaster County, Pa., on the final touches to the Atlantic Sunrise Pipeline. The video can be found at *MidstreamBusiness.com* and *OilandGasInvestor.com*

the Marcellus, they are used to infrastructure projects," Ferazzi said. "We've proven to Pennsylvania that we can build pipelines the way they are supposed to be built."

Land acquisition

Atlantic Sunrise runs through a part of Pennsylvania that thrives on fertile farmland and features plenty of streams, creeks and rivers. Kirchen said the mountainous area to the north and farmland to the south forced a fair share of rerouting. Often, he said, the company voluntarily rerouted the pipeline at the request of landowners. It also aimed to minimally impact the environment.

"More than half of the pipeline was modified at points to accommodate the feedback from landowners," he said.

In one instance, the company rerouted the pipeline around a horse farm that also served the only veterinarian in the area. He also pointed to "a few anthropological findings" that they had to reroute around.

But Williams's executives weren't at all concerned about the rerouting, saying it goes with the territory—no pun intended. During a visit to the site, one local executive said he had attended a fair share of livestock auctions and bid on more than a few pigs.

And as for protesters, any high-profile pipeline project has them. Many, however, were from other regions of the country and the protests seem to focus more on the campaigns against fossil fuels in general rather than the Atlantic Sunrise project itself. And about those protesters who barged into the field office one day, they eventually left peacefully—but left some of the office staff a little shaken from the experience.

What's next?

Now that Atlantic Sunrise is in-service, the first question that comes to mind is, Will its capacity be expanded?

Ferazzi answered with a chuckle and declined to comment. But he did offer, "Once you build an existing line and you develop relationships with landowners and you have pipe in the ground, the future expansions to get additional supplies on Transco will be much easier than what we had to go through initially to build that greenfield pipeline."

Point taken.

"No doubt, once you put in a large pipeline like that, you position yourself well to be able to expand it over time," he added. ■

The housing for an Atlantic Sunrise compressor station goes up on the right-of-way in Wyoming County, Pa.

Crews ready pipe to go under the Conestoga River following a directional drilling job under the stream.

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Oklahoma!

Everything's up to date in the Sooner State's midstream—but bottlenecks loom if Midcontinent producers continue to drill terrific wells.

By Gregory DL Morris

For a state with a history of jumping the gun and staking claims, well, sooner, Oklahoma producers and the midstream operators supporting them are doing fine—having waited for the shale bonanza to make its way to the state.

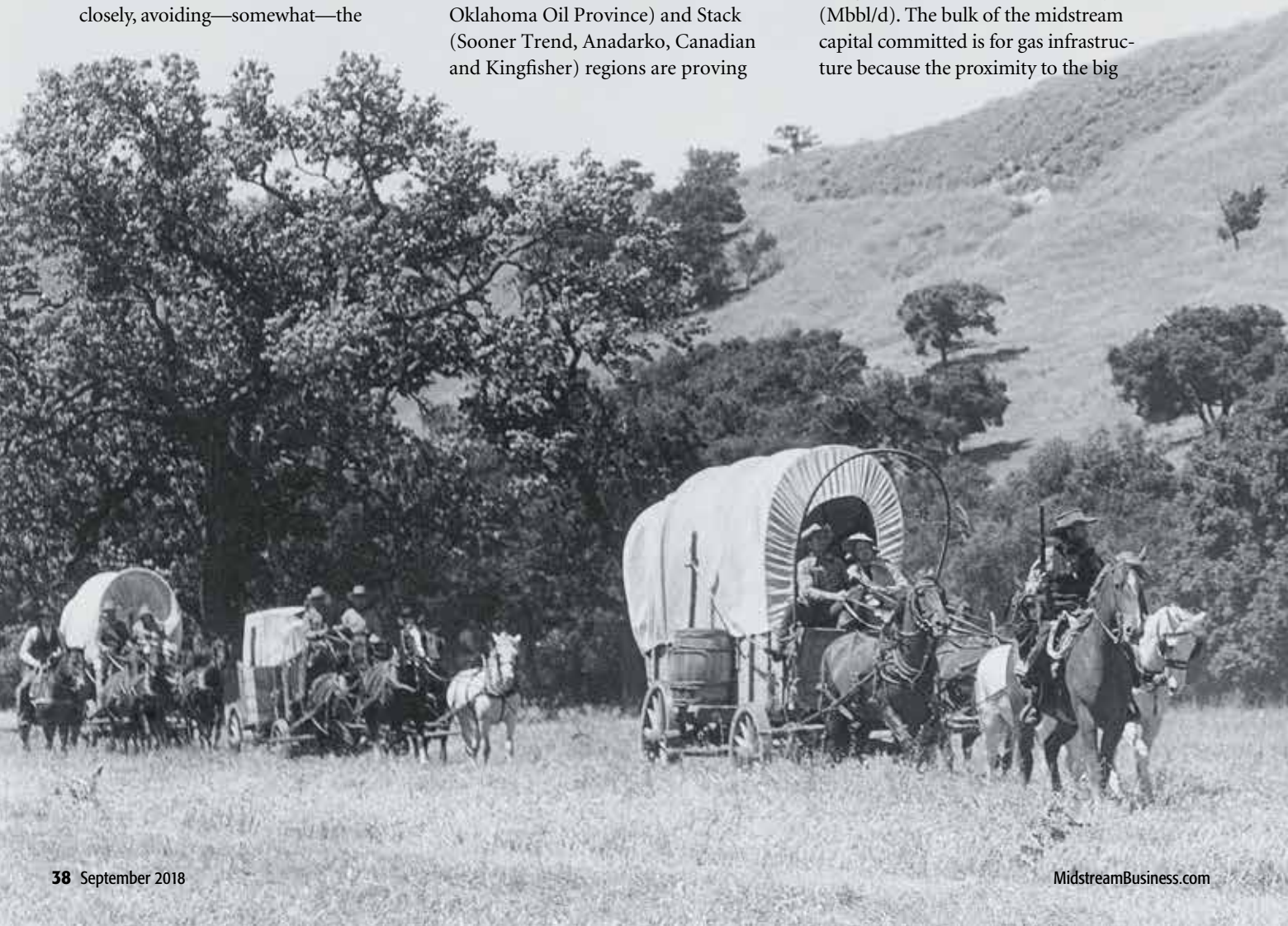
Refinements in completions, as well as a better understanding of production dynamics, are enabling midstream and upstream companies to collaborate closely, avoiding—somewhat—the capacity mismatches that have marked the Bakken, Permian and other big unconventional plays.

This reconfirms that while the early bird gets the worm, the second mouse gets the cheese.

'Can't say no'

In Oklahoma, the cheese is wells coming on larger and richer than anticipated. The Scoop (South Central Oklahoma Oil Province) and Stack (Sooner Trend, Anadarko, Canadian and Kingfisher) regions are proving to be, paraphrasing Rodgers and Hammerstein, plays that can't say no, so midstream's in a terrible fix. Just when the wells say come on, let's go, pipelines will often say nix.

According to East Daley Capital Research, the gross amount of gas coming out of the Anadarko Basin will increase by 1.4 billion cubic feet per day (Bcf/d) by 2020 while oil production will grow by 172,000 barrels per day (Mbbl/d). The bulk of the midstream capital committed is for gas infrastructure because the proximity to the big



Cushing, Okla., storage and trading hub means there are existing transportation options for a fair amount of crude oil.

Ryan Smith, East Daley's director of research, noted in particular the creative solutions on which producers and midstream operators collaborate.

"The Wildcat project from Enable Midstream [Partners] is interesting," he said. "Getting excess production capacity into East Texas, it gets out of the basis constraint in Oklahoma—about $1.50 per [thousand cubic feet] at [the Permian hub at] Waha—and into the Barnett where there are better prices. It also diversifies NGL away from just Conway [Kan.] to getting Mont Belvieu [Texas] prices."

He expects that Enable Midstream will need additional processing capacity, possibly the Wildhorse Plant, by about 2020.

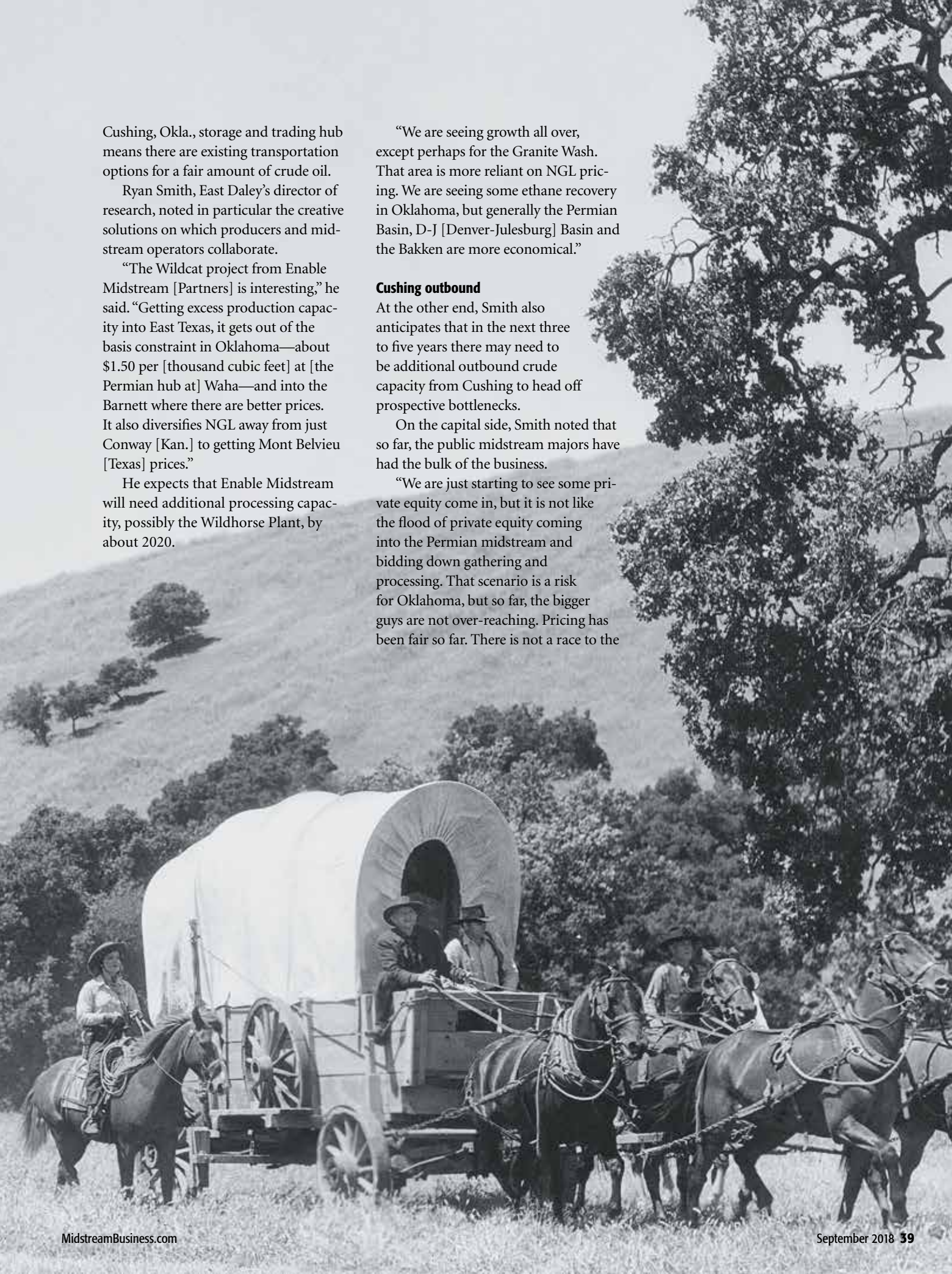
"We are seeing growth all over, except perhaps for the Granite Wash. That area is more reliant on NGL pricing. We are seeing some ethane recovery in Oklahoma, but generally the Permian Basin, D-J [Denver-Julesburg] Basin and the Bakken are more economical."

Cushing outbound

At the other end, Smith also anticipates that in the next three to five years there may need to be additional outbound crude capacity from Cushing to head off prospective bottlenecks.

On the capital side, Smith noted that so far, the public midstream majors have had the bulk of the business.

"We are just starting to see some private equity come in, but it is not like the flood of private equity coming into the Permian midstream and bidding down gathering and processing. That scenario is a risk for Oklahoma, but so far, the bigger guys are not over-reaching. Pricing has been fair so far. There is not a race to the



A crescent moon and the planet Venus top off EnLink's Chisholm II gas plant as another day comes to an end. The Dallas-based operator has invested heavily in its Central Oklahoma platform to assure production from the big Stack play in the Midcontinent moves to market. *Source: EnLink Midstream LLC*

bottom as we are seeing in parts of the Permian," he added.

Enable expected to have the 400 million cubic feet per day (MMcf/d) Wildcat rich gas line from the Anadarko Basin to North Texas in service by mid-year. Continental Resources Inc. recently confirmed, as widely believed, that it is the anchor shipper on Wildcat.

By the end of the year, two other big projects are to be in operation: the Cana and Stack Extension (CaSE), a 205,000 dekatherm per day (Dth/d) line from the Anadarko to hubs in Texas, Louisiana and Arkansas; and the Muskogee project, a 20-year, 228,000 Dth/d agreement with power utility Oklahoma Gas and Electric Co. (OG&E) on Enable's Oklahoma intrastate system.

Oh what a beautiful mornin'

"The basis in Oklahoma has gotten wider," according to Craig Harris, executive vice president and chief commercial officer for Enable. "Without new infrastructure, producers would be constrained. And not just them. It's the whole market, including us. This is not just about getting 400 million a day out, but providing 400 million a day of growth for all of us."

Through the cycles, the pendulum swings between producers building out to processing and transmission, and the midstream building gathering in to the wellhead. The new close collaboration across Oklahoma between midstream and upstream is a direct result of producers trying to live within their balance sheets, Harris asserted.

"Producers have always wanted to get molecules to a central delivery point," he added. "If we have their confidence, if we are ready with pipe when they are ready, they can make more money the day we open the valve. But if we don't have their confidence, they will go back to building out."

CaSE, for which Newfield Exploration Co. is the main producer, and Muskogee, for which OG&E is the key consumer, are expansions within Enable's existing operations.

"There is a lot of discussion about getting gas out of the market," Harris said. "But what could be better than creating a new market on our system?"

Friends

If the farmer and the cowman should be friends, so should the Midcontinent's upstream producers and midstream operators. While it seems like the kind of local arrangement that could have arisen over golf or steaks, OG&E is a public utility, so the whole plan had to go through a formal request-for-proposal process.

"We came out on top, and we want to give them attractive terms," Harris added. "Our intrastate system is designed for just this sort of thing. There are other power plants within the footprint, and we continue to have discussions with other generators."

That said, there is only so much gas one largely rural state can consume by itself. The industrial, urban and export markets outside of Tulsa and Oklahoma City are the big prizes.

But the molecules keep coming.

"Once a pipe is in the ground, that is what you have got," Harris said. "That is why we have designed our system with a rich gas super-header. When one area comes on higher than anticipated, we can wheel between different processing plants."

That is also good, he added, "because wells also decline. No one wants to build just for the peak. We have to be efficient with capital, just as the producers are trying to be." That focus on efficiency has meant something of a lag in residual gas.

"This is an area of focus for us," Harris said. "Our projects for Continental and Newfield are helping, for now. We continue to look for ways to get gas to market, including moving gas to the west instead of the more trafficked path to the southeast. And we are looking at incremental capacity as producers get more and more efficient with longer laterals."

The land is grand

Oklahomans belong to the land, and the geology below it is grand.

"We have to acknowledge that we—the industry, upstream and midstream—are constantly surprised at how strong the wells are that are coming online in Oklahoma," said Ben Lamb, executive vice president of Oklahoma, North Texas and Permian for EnLink Midstream. "And I will take that surprise every day of the week. Wells are easily two and three times what the type curves were indicat-

ing just two or three years ago, at the inception of these shale plays."

Just a few years ago, the common expectation was six wells in a section.

"Now producers are targeting 10 to 12 wells just in the Meramec," Lamb said. "All that puts pressure on the midstream, especially when producers shift from delineation to production. At that point they need a system that was designed for that increased scale of development rather than for two or three wells at a time—and definitely not something that was designed for the old Sooner Trend 30 or 40 years ago."

In this case, fit-for-purpose means multiple interconnected processing plants, notably with multiple transportation and residue gas outlets. Not surprisingly, he offered the EnLink system as an example.

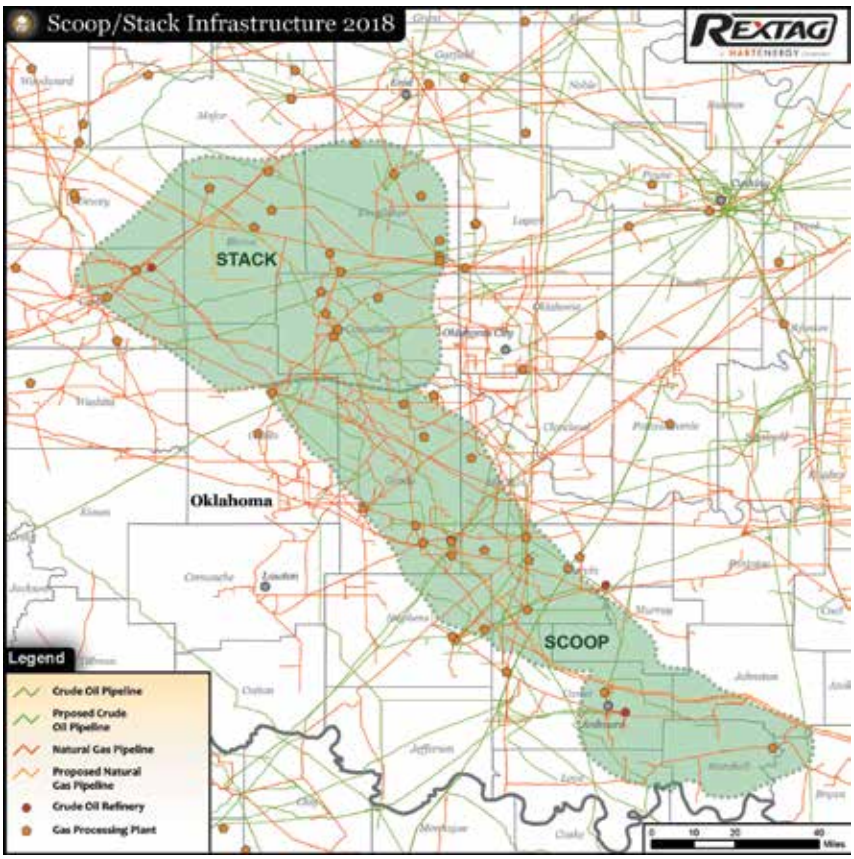
"Our Thunderbird plant is in the early stages of construction and will increase our capacity in Central Oklahoma by 200 MMcf/d to 1.2 Bcf/d when it comes into service in the first quarter of 2019," Lamb added.

All or nothin'

"That makes us the largest player in the Stack," he said. "Having a system with scale and interconnection among the plants means that operations are seamless from the producers' perspective."

Having built and grown a mature and complex gas gathering and processing system, EnLink has undertaken to replicate that, over time, in crude. That initiative started with the Black Coyote and Redbud projects. Altogether, EnLink is spending nearly half a billion dollars in Oklahoma in 2018.

"Black Coyote and Redbud are separate crude gathering systems and are underpinned by two different large producers," Lamb said. "We are also close to many other producers with a great deal of acreage, which represents a lot of opportunity for wellhead gathering. At the other end of the system, there are multiple outlets via our crude terminals. We can market the oil ourselves, or the producers can arrange to market it themselves. The key is both physical system flexibility, as well as market access flexibility, and we have that."



EnLink placed the first phase of its crude gathering system, Black Coyote, into service in April. Black Coyote will initially gather volumes primarily from Devon's Showboat development and is expected to connect to all of Devon's near-term, large-scale development projects. Devon is concentrating resources in the over-pressured oil window, which has the best returns in the play, and Devon expects to have eight large-scale developments underway by year-end. Redbud will expand upon Black Coyote.

Flexibility extends among plays and markets. Lamb explained that EnLink moves NGL out of Oklahoma through the Mont Belvieu, Texas, hub and into Louisiana via its Cajun-Sibon Pipeline for refining and petrochemical customers.

"There used to be around 8 Bcf/d coming into Louisiana from offshore, which supplied the liquids that the state's petrochemical industry needed. Now there is less than 3 Bcf/d coming onshore, as most are coming from the U.S. shale plays. We are now a critical link to the liquids they need."

That need translates into a profit. "Louisiana is a premium market for liquids, as compared to Texas," Lamb said. "That physical connection—using EnLink's pipes from Oklahoma to move raw NGL into fractionators in Louisiana—creates incremental value for those liquids coming out of Oklahoma."

Territory folks should stick together

The new kid on the block, Valiant Midstream, is fast off the mark. It was only formed in July 2017 and aspires to have its first 200 MMcf/d processing plant in service by the fourth quarter, if not—well—sooner. The train will serve Corterra Energy and Canyon Creek Energy, along with other producers and third-party gathering systems in the Arkoma Basin.

Earlier this year, Brandon Webster, Valiant Midstream's president and CEO, told Hart Energy, "With a little luck and Mother Nature cooperating, there's a chance we'll beat that schedule. In the interim, we will be taking the gas to

"The basis in Oklahoma has gotten wider. Without new infrastructure, producers would be constrained. And not just them. It's the whole market, including us."

– **Craig Harris**, *executive vice president and chief commercial officer, Enable Midstream Partners*

legacy processing plants in the area." Valiant has signed a contract for Targa to take the NGL to Mont Belvieu.

"Given the aggressive growth of producers in the region, we immediately began looking at NGL and residue gas outlets," Cody Blosch, senior vice president of business development for Valiant, said. "Their Grand Prix project to Mont Belvieu, Texas, is a good fit for our NGL."

That camaraderie extends across the plays.

"We feel like we have a lot in common with all the Midcontinent players," Blosch said. "What is good for our producers is good for the Arkoma Stack and good for the state."

The feeling seems to be mutual. He added that Targa mentioned Valiant Midstream "several times" in its earnings statements regarding the parties' NGL relationship.

"The pie is large enough for all of us," Blosch said, "but we are still being proactive. We are Oklahoma people, mostly midstream guys, but some of us have upstream management experience too. That helps us better understand the producer perspective."

The Arkoma is a "much underestimated basin," Blosch stressed. "It did not have longer laterals and enhanced completions until very recently. There is a great deal of upside to the rock with multiple benches. We saw what was happening in the Scoop and the Stack and knew that technology would soon be hitting the Arkoma Stack."

The core of Valiant Midstream's system is in southeastern Oklahoma's Hughes, Coal and Atoka counties, where there tends to be a lack of modern processing infrastructure along with some aging and undersized pipelines.

"Oklahoma is blessed with a lot of infrastructure," Blosch said. "That helps producers at the start, but it is just not enough for the volumes that are coming online. So yes, we have been drilling in Oklahoma for 100 years, but today producers need the latest cryogenic technology, capacity and reliability."

Specifically to residue gas, Blosch noted that "Cheniere's Midship and Enable's Wildcat projects will help, but there will be a need for a new line" before too long. "It's not only that wells are coming on larger and richer than anticipated. It is also that there are dry gas areas with big volumes as well. They are prolific and are filling the existing residue capacity," he explained.

Further, the exact delineations of the Scoop and the Stack, and more so the Arkoma, have yet to be made final.

"There clearly are fairways," Blosch said, "but people are still trying to sort exactly where those start and end."

You can't beat midstream infrastructure like this–Oklahoma's sprawling Cushing pipeline, storage and trading hub. This is Blueknight Energy's share of the complex with nearly 6.6 million barrels of storage. In all, Blueknight operates 7.8 million barrels of storage for Midcontinent producers. *Source: Blueknight Energy Partners LP*

With fringe on top

To that end, Valiant Midstream has already started discussions with producers about the next 200 MMcf/d plant. "We are committed to the success of our producers, and that will mean another train. We are just trying to determine when. We are also looking at potential projects for other like-minded producers elsewhere in the Midcontinent."

While most of the midstream attention in Oklahoma has been on natural

Surging Midcontinent production could spark major additions to Oklahoma's midstream infrastructure. This welder lays a bead on a pipe inside an EnLink plant in the Sooner State. *Source: EnLink Energy Partners LLC*

gas and gas liquids, burgeoning crude production is also in need of gathering and transportation.

In the second quarter, Kingfisher Midstream, part of Alta Mesa Holdings, formed a 50:50 joint venture called Cimarron Express with Ergon Inc., which owns crude- and asphalt-terminal operator Blueknight Energy Partners. Cimarron will build and operate a 65-mile, 16-inch crude line from northeastern Kingfisher County, Okla., in the Stack, to Blueknight's terminal at Cushing. Blueknight is the fourth-largest terminal operator at Cushing. The line will provide direct access for Alta Mesa and other producers, and will have an initial capacity of 140 Mbbl/d, expandable to about 200 Mbbl/d. Cimarron is expected to be completed in mid-2019.

Alta Mesa executed a long-term acreage dedication and transportation agreement with Cimarron Express, which incorporates about 130,000 net acres in Kingfisher and Garfield counties. The receiving terminal for Cimarron will be at Kingfisher's crude storage facility in northeastern Kingfisher County. The pipeline will connect to Kingfisher's crude-gathering system and truck-unloading facilities.

Blueknight owns and operates 10.4 MMbbl of liquid asphalt storage at 56 terminals in 26 states; 6.9 MMbbl of above-ground crude storage, the bulk of which are at the Cushing Interchange. Blueknight already has 655 miles of crude pipeline, primarily in Oklahoma. Ergon is a group of privately held companies in refining and marketing, asphalt and emulsions and other related businesses.

"We already have pipelines in southern Oklahoma and from the Scoop to Cushing," Mark Hurley, CEO of Blueknight, said. "We did not have a presence yet in the Stack, which has the best crude economics today of the Scoop and the Merge. Alta Mesa is a major producer in the Stack, with eight rigs running and more to come. They wanted economical and reliable transportation to Cushing. A former colleague of mine now works at ARM Energy, also part of the Alta Mesa organization. We started talking about opportunities we could work on together and it developed into the venture."

Brian Melton, chief commercial officer of Blueknight, noted that Alta Mesa will be the anchor shipper with its acreage commitment, but that Cimarron will serve other producers.

"Kingfisher Midstream is actively pursuing crude- and gas-gathering, and all the barrels that they get will flow into our pipe," Hurley added.

Plenty of heart, plenty of hope

Amid all the excitement over the hot resource plays, Melton noted that "there is also activity in the southern part of the state. If prices hold at current levels or even a bit lower, that is good for southern Oklahoma as well." The best times may lie ahead.

Broadly speaking, Hurley agreed that there is close collaboration between upstream and midstream.

"Lead time on Cimarron is about a year, which is a shorter time than some projects. Even a year out requires close cooperation with producers. Many of those have their own midstream affiliates so joint ventures make sense. The trend is definitely to spread risk and capital. That is just prudent when there are significant demands on capital and many opportunities to develop." ■

> "We have to acknowledge that we—the industry, upstream and midstream—are constantly surprised at how strong the wells are that are coming online in Oklahoma. And I will take that surprise every day of the week."
>
> — **Ben Lamb**, *executive vice president of Oklahoma, North Texas and the Permian, EnLink Midstream*

***Gregory DL Morris** is a freelance writer based in Chapel Hill, N.C., specializing in energy and petrochemical topics.*

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Perennial NGL power player DCP Midstream operates the O'Connor cryogenic plant in Weld County, Colo. It can process 160 million cubic feet per day of Denver-Julesburg Basin gas, producing around 22,000 barrels per day of NGL. *Source: DCP Midstream*

Transfer Is At The Top

Energy Transfer secures the top NGL producer ranking in Hart Energy's annual survey while MarkWest Energy retains the top gas processor ranking.

By Frank Nieto

It took nearly a decade, but the old guard comprising the pinnacle of the *Midstream Business* annual rankings of top NGL producers has shifted. Energy Transfer Partners assumed the No. 1 spot in the producer rankings, based on 2017 numbers, one year after DCP Midstream Partners surrendered it.

Last year, Energy Transfer wasn't officially ranked since we were unable to obtain confirmed figures—but it was previously second in our rankings for the previous year. The biggest move saw DCP Midstream tumble all the way down to No. 4 for NGL producers.

Energy Transfer produced 467,500 barrels per day (bbl/d) in 2017, which was a good-sized lead over Enterprise Products Partners, which retained the No. 2 spot in the rankings with 404,433 bbl/d. Perhaps the most impressive movement in the NGL rankings was by MarkWest Energy Partners, a subsidiary of MPLX LP, which reported an 18% gain from 2016 with 394,000 barrels per day (Mbbl/d) in 2017.

Nearly as impressive was MarkWest's 12% gain in its gas processing figures for 2017, which increased to 6.46 billion cubic feet per day (Bcf/d) and allowed the company to retain its spot atop our gas processing rankings. Enterprise Products Partners moved back into the second spot in our processing rankings after a 1% gain to 5.16 Bcf/d. DCP Midstream Partners fell to the No. 3 position in the rankings, with 4.77 Bcf/d of gas processed.

Hart Energy has made every reasonable effort to ensure the veracity of this information. Neither Hart Energy nor parties involved in gathering and presenting this material

TOP NGL PRODUCERS

Rank	Company	2017 NGL Produced (bbl/d)	2016 NGL Produced (bbl/d)	Percentage Change	2016 Ranking
1	Energy Transfer Partners	467,500	N/A*	N/A*	10
2	Enterprise Product Partners	404,433	378,885	7%	2
3	MarkWest Energy Partners	394,000	335,000	18%	3
4	DCP Midstream Partners	375,000	392,987	-5%	1
5	Targa Resources	333,200	305,500	9%	4
6	ONEOK Partners	187,000	156,000	20%	6
7	EnLink Midstream Partners	176,300	162,000	9%	5
8	The Williams Cos. Inc.	148,000	151,000	-2%	7
9	Kinder Morgan Inc.	141,438	146,445	-3%	8
10	Enable Midstream Partners	90,110	78,700	14%	Unranked

**Company did not supply 2016 numbers. Source: Hart Energy*

will be held liable for any errors or omissions.

Anticipated rankings

The movement up the charts by both Energy Transfer and MarkWest Energy Partners was not unexpected. In fact, in recent years while speaking at multiple Hart Energy conferences, both companies said they would top these rankings by the 2016-2017 time frame. They proved themselves correct.

The rise of Energy Transfer Partners and MarkWest Energy Partners to the top of our rankings is in many ways another sign of the dominance of the big Permian and Appalachian basins. Energy Transfer's strength in South Texas has pushed the company to become the largest NGL producer in the country, while MarkWest's large asset base in the Marcellus and Utica shales has seen it become the top gas processor in the country.

Planned resurgence

DCP Midstream Partners held the top spots for nine years before dropping to second in the top gas processor rankings for 2016, but has fallen in both rankings in recent years. However, the company says its growth program, dubbed DCP 2.0, is progressing well.

"DCP 2.0 is all about transforming people, processes and technology, and differentiating DCP competitively in our industry," Wouter van Kampen, chairman, president and CEO of both DCP Midstream and DCP Midstream Partners, said during the company's conference call to discuss 2017 earnings.

This new strategy by DCP is heavily focused on technology to help raise margins, lower costs and improve reliability.

"Make no mistake of viewing this as merely implementing sleek apps and putting plan screens up in a control room. This is all about disrupting the industry to change how we deliver midstream services more competitively and reliably. To do that, we started by looking outside the midstream space," van Kampen added.

DCP plans to hire new workers from outside the industry to work with industry veterans to drive innovation; this is much like other companies have done, reinventing themselves.

The first of DCP's new innovations from this strategy is the integrated collaboration center (ICC), which takes the place of a traditional control room. The ICC uses information from data sources such as SCADA, engineering, contracts, financial systems and real-time prices to inform plant operators how they can optimize returns and reliability from DCP's integrated plant system. These improvements should result in increased NGL production and gas processed in the coming years.

Reaching new markets

Not that other companies aren't planning to further improve efficiency and production levels.

Energy Transfer is expanding its asset base in Mont Belvieu, Texas, by adding a fifth NGL fractionator in the hub through its Lone Star NGL subsidiary. This 120 Mbbl/d fractionator will increase the company's total fractionation capacity to 640 Mbbl/d when it comes online in the fall. This system has access to most of the global markets through the Houston Ship Channel and is connected to nearly every play in the country, which will help the company further increase its volumes.

Enterprise Products Partners has long been one of the largest midstream operators at the big Mont Belvieu gas liquids hub. The company recently completed construction on its ninth fractionator there. This 85 Mbbl/d facility will increase the company's total fractionation capacity in Mont Belvieu to 740 Mbbl/d.

The location of these assets along the Houston Ship Channel has also helped Enterprise enter into the petrochemical midstream space as that sector has grown in the past decade. North American petrochemical crackers have been operating at a more than 90% run rate for much of this year with a focus on converting ethane to polyethylene. Demand from the U.S. petrochemical industry for ethane is about 1.5 million barrels per day (MMbbl/d) and may exceed 1.8 MMbbl/d by the end of the year.

"U.S. petrochemicals had extremely positive long-term fundamentals [in the


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first quarter of 2018] because of rich shale gas, which has given them a significant global advantage," Jim Teague, CEO of Enterprise Products Partners, said during a conference call to discuss the company's first-quarter earnings.

"Enterprise has the premier supply position in the industry to meet this growing feedstock demand and we're moving into providing midstream-type services for both domestic and global petrochemical [companies]," he continued.

Increasingly these services will include exports for crude, natural gas, ethane, LPG, petrochemicals and refined products. "We don't think anyone is better situated to serve growing global demand than Enterprise," Teague said.

TOP GAS PROCESSORS

Rank	Company	2017 Gas Processed (Bcf/d)	2016 Gas Processed (Bcf/d)	Percentage Change	2016 Ranking
1	MarkWest Energy Partners	6.46	5.76	12%	1
2	Enterprise Product Partners	5.16	5.10	1%	3
3	DCP Midstream Partners	4.77	5.45	-12%	2
4	Targa Resources	3.47	3.41	2%	6
5	The Williams Cos. Inc.	3.05	3.50	-13%	5
6	EnLink Midstream Partners	2.45	2.24	9%	7
7	ONEOK Partners	1.98	1.88	5%	8
8	Kinder Morgan Inc.	1.35	1.43	-6%	Unranked
9	Western Gas Partners*	N/A*	4.02	N/A*	4
10	Enbridge Inc. (formerly Midcoast Energy Partners)*	N/A*	1.72	N/A*	9

**Company did not supply 2017 numbers. Source: Hart Energy*

Building a new hub

While Enterprise's existing hub in Mont Belvieu is helping it enter new markets, MarkWest Midstream Partners has taken a different approach by building a hub to handle volumes out of the rapidly developing Appalachian Basin.

In just under a decade, MarkWest has gone from a company that was unranked in this annual listing of the top gas processors to the largest gas processor in North America. This ascension was the result of long-term planning to focus resources on emerging plays. Today, MarkWest has the largest gathering and processing complex in the Appalachian Basin and serves both Marcellus and Utica producers.

MarkWest continues to grow in the Northeast along with producers. It recently completed construction on its ninth natural gas processing plant at its Sherwood Complex in Doddridge County, W.Va. This complex has a total processing capacity of 1.8 Bcf/d and is planning to add 200 MMcf/d of processing capacity via two new processing plants.

An additional 200 MMcf/d of processing capacity is also scheduled to be added at its Houston, Pa., complex. In total, MarkWest's parent, MPLX, plans on adding 800 MMcf/d of incremental processing capacity and 100 Mbbl/d of additional fractionation capacity in the second half of 2018.

While it garners a great deal of attention, the Northeast isn't the only important play for MarkWest. The company also has important assets in the Permian Basin and the Midcontinent Stack play. MarkWest doubled its processing capacity in the Permian through its 200 MMcf/d Argo natural gas processing plant and is building the 75 MMcf/d Omega processing plant in Oklahoma.

New blood

There was one new entrant into the rankings this year as Oklahoma City-based Enable Midstream Partners placed 10th in the top NGL producer rankings with 90,110 bbl/d. Formed in 2013, Enable has a significant asset base of 14 processing plants with a total capacity of 2.5 Bcf/d, more than 13,000 miles of gathering lines, just under 8,000 miles of interstate pipeline, and just over 2,000 miles of intrastate pipeline.

Enable has seen an increase in activity out of Oklahoma's Anadarko Basin with a 29% increase in processed volumes out of the play since the first quarter of 2016. The company plans on capitalizing on this growth with its Project Wildcat, which is designed to provide producers with access to natural gas markets in Texas via Energy Transfer's Tolar Hub.

"Enable is uniquely positioned to serve the significant production growth [out of the Anadarko Basin] and our Project Wildcat remains on track to begin service in the second quarter of 2018, adding 400 MMcf/d of processing capacity and providing new markets for Anadarko Basin production," President and CEO Rod Sailor said during a conference call to discuss first-quarter earnings.

Given the scale of this project, Enable Midstream may come out as the top gas processor in the rankings in future years.

The exact ranking positions for the top processors and NGL producers in the next decade won't be known anytime soon, but if it's anything like the 2017 listing, the rankings will be determined by decisions processors and producers make today. ■

***Frank Nieto** is a freelance writer based in Washington, D.C.*

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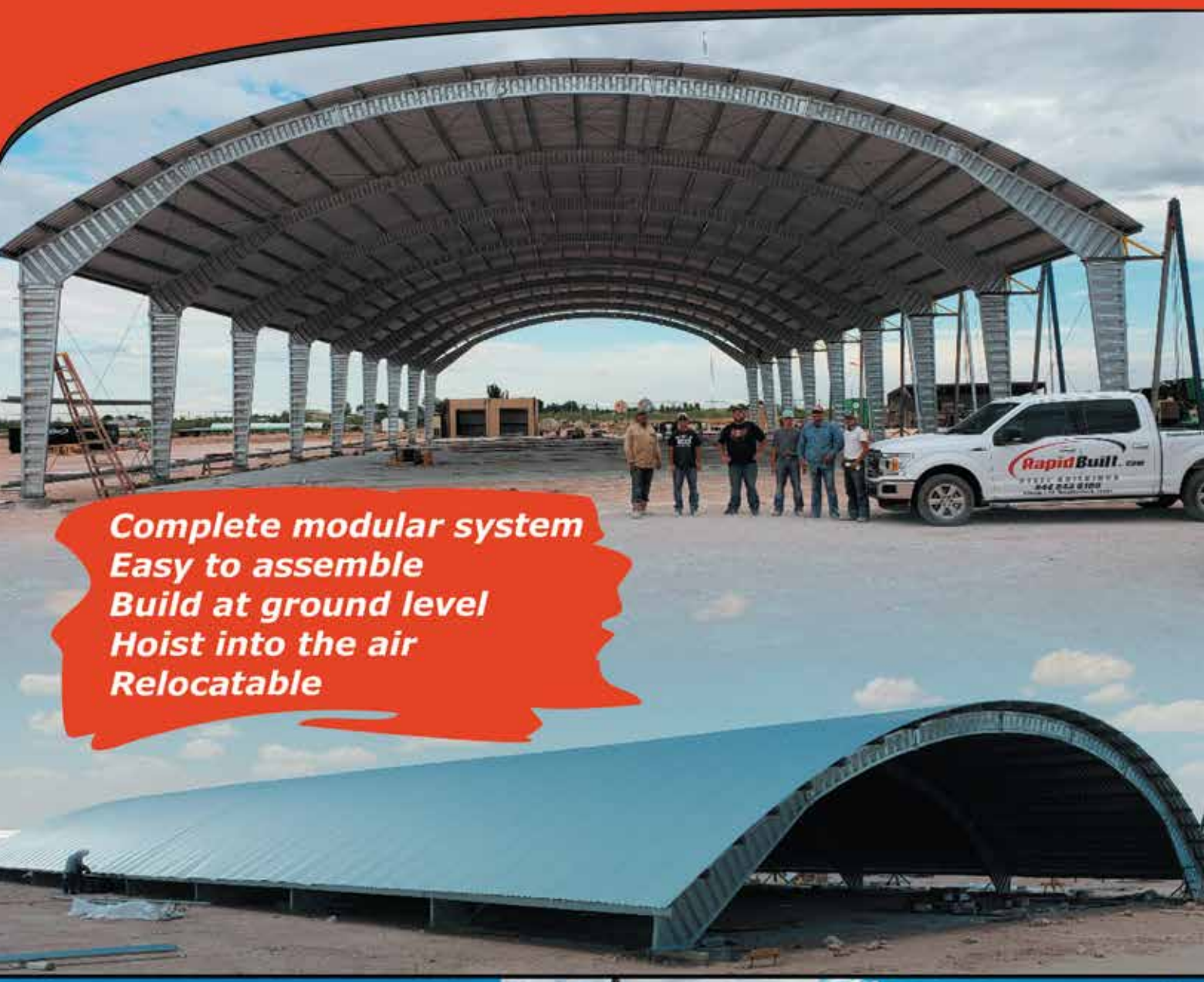

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Key Players In The Midstream

The Top 10 publicly traded companies from this year's Midstream 50 rankings plan to play key roles in overcoming the sector's current bottlenecks.

By Erin Pedigo

Midstream Business is revisiting the companies that made the Top 10 cut of its 2018 Midstream 50 rankings. These companies are profiled here with updates on their earnings, key assets and capex plans.

All seem to be doing well, with revenues and market caps in the billions, and more to go as big capex projects loom ahead.

Along with the 40 other members of the list and their fellow midstream operators, these midstream giants will play leading roles in completing the needed buildout to overcome current bottlenecks hampering production from the nation's major unconventional plays. Top-ranked Enbridge Inc. had projected a cool CA$7 billion alone in new 2018 projects.

Bringing this year's Midstream 50 Top 10s back for an encore can provide further insight into trends, predictions and news to watch with these companies.

1: Enbridge Inc.

- NYSE: ENB
- Share price as of Aug. 10: $36.04

The biggest news for this year's top-ranked Midstream 50 firm was its merger with Spectra Energy in 2017 that enabled it to leapfrog from the No. 4 slot on the prior year's list to the

Enbridge Inc., which sits atop the Midstream 50 list, ranks its Line 3 replacement project as the largest undertaking in the company's history. Target date for completion of the 1,031-mile project is 2019. *Source: Enbridge Inc.*

top of the heap. The company rose to No.1 on its performance, which was "transformational," according to CEO Al Monaco, who added that the Spectra acquisition helped Enbridge "rebalance our business mix with best-in-class natural gas transmission assets" and extend growth potential.

To that point, Enbridge's major growth projects include Access Northeast Pipeline and Atlantic Bridge, supplying natural gas and NGL to New England and the Canadian Maritimes. It also is proceeding with replacement of its Line 3 from Hardisty, Alberta, to Superior, Wis., which the Calgary-based firm said ranks as "the largest project in Enbridge history," worth CA$5.3 billion.

Second-quarter EBITDA was CA$3.17 billion, up from CA$2.58 billion in the prior-year quarter. The firm noted that in 2018, CA$7 billion of new projects are expected, with CA$800 million already brought online since year-end 2017. These included the "Stampede offshore oil lateral in the Gulf of Mexico and the Wyndwood and High Pine natural gas transmission expansions on the [British Columbia] Pipeline system," it said.

"We're very pleased with our strong financial results this quarter and the year is shaping up well," Monaco said. "The results reflect strong operational performance across all of our core businesses, including the Liquids Mainline System where we moved record average volumes. We're also seeing increasing cash flow from the more than $12 billion of new projects brought into service over the past year. The solid financial performance and diversity of growth from our recently acquired natural gas transmission and utility businesses, together with the continued realization of cost synergies, is clearly proving out the value of the Spectra Energy acquisition completed last year."

2: Energy Transfer Equity LP

- **NYSE: ETE**
- **Unit price as of Aug. 10: $18.36**

Energy Transfer kept its No. 2 spot on this year's Midstream 50 list. In perhaps its biggest change, it looks to complete a major reorganization to streamline its complex organization.

In August, Energy Transfer Equity LP (ETE) and Energy Transfer Partners LP (ETP) announced a definitive agreement providing for the merger of ETP with a wholly-owned subsidiary of ETE in a unit-for-unit exchange.

In connection with the transaction, ETE's incentive distribution rights (IDRs) in ETP will be canceled. The transaction, which was approved by both boards and conflicts committees, is expected to close in the fourth quarter, subject to approval by a majority of the unaffiliated unitholders of ETP and other customary closing conditions.

ETE currently owns the general partner of ETP.

Under the terms of the transaction, ETP unitholders—other than ETE and its subsidiaries—will receive 1.28 common units of ETE for each common unit of ETP they own.

When announcing the transaction, ETE said the deal is expected to provide significant benefits for the partnerships, including:

- Providing a premium to the current ETP common unit trading price while being immediately accretive to ETE's distributable cash flow per unit;
- Improving the combined partnership's equity cost of capital through the elimination of ETE's IDRs in ETP, which in turn is expected to enhance the combined partnership's cash accretion from investments in organic growth projects and strategic M&A following the closing of the transaction;
- Further aligning the economic interests within the Energy Transfer organization;
- Simplifying the overall structure, which will reduce complexity and improve transparency for investors; and
- Increasing cash distribution coverage and retained cash flow, which will allow the combined partnership to reduce its leverage ratio as well as reduce the need for equity issuances to fund organic growth.

"The transaction is expected to strengthen the balance sheet of the combined organization by utilizing cash distribution savings to reduce debt and to fund a portion of ETP's robust growth capex program. The completion of major capital projects currently in progress is expected to continue to generate strong distributable cash flow growth for the combined partnership following the transaction. The partnerships expect to maintain investment grade credit ratings for the combined partnership," it added.

Energy Transfer has an active 2018 capex program. Its Rover Pipeline, providing critical new capacity in the Marcellus and Utica plays, entered service earlier in the year's first half.

3: Kinder Morgan Inc.

- **NYSE: KMI**
- **Share price as of Aug. 10: $17.91**

The infrastructure giant has been particularly busy, forming a joint venture (JV) with upstream producer Apache Corp. to develop the Permian Highway Pipeline project, which it said will cost $2 billion and will transport 2 billion cubic feet per day (Bcf/d) of natural gas through 430 miles of pipeline from the Permian Basin's Waha Hub to U.S. Gulf of Mexico and Mexican markets.

The project "is structured to provide unrivaled market optionality for Permian producers," said Sital Mody, chief commercial officer of the Kinder Morgan Natural Gas Midstream unit. "By contracting for space on KMI's extensive intrastate systems, the project will offer seamless nominations to the Katy and Agua Dulce market hubs; pipeline headers into LNG export facilities on the Texas Gulf Coast; multiple pipelines delivering gas into Mexico, including Valley Crossing, NET Mexico and KMI's Border and Monterrey pipelines; and numerous other intrastate and interstate pipelines. Additionally, shippers on the project will be able to

Kinder Morgan Inc. operates one of the few CO_2 pipeline systems in the country, moving naturally occurring CO_2 from fields in Colorado and New Mexico to the Permian Basin, where the gas is used for EOR operations. *Source: Kinder Morgan Inc.*

contract for additional transportation, storage and gas sales options with KMI, whose existing intrastate systems are directly connected to most end users along the Texas Gulf Coast."

KMI has not been without its share of industry drama. Its Kinder Morgan Canada unit's Trans Mountain Expansion project was sold to Canada's federal government for CA$4.5 billion in the second quarter. This came after controversy erupted over the efficacy of the project.

Midstream Business contributor Markham Hislop reported in May: "While industry players universally applauded the deal, they also made it clear they are not happy about how the project became so precarious that the national government had to ride to its rescue. The Canadian Energy Pipeline Association said it is 'deeply concerned' that the Liberal government 'needed to purchase the project for it to be built and to assert federal jurisdiction,' according to CEO Chris Bloomer."

Trans Mountain Expansion has been bitterly opposed by a coalition of First Nations, municipalities and environmental groups. But it was British Columbia's government, led by Premier John Horgan, that has said it will use "every tool in the toolbox" to expand provincial jurisdiction for environmental protection in order to "protect the coast" from the planned increase in oil tanker transit that forced the federal government into the project.

In the U.S., KMI is still developing its Utica Marcellus Texas Pipeline (UMTP) project to move NGL out of Appalachia to the Gulf Coast.

For second-quarter financials, due to $749 million in non-cash impairments taken during the period, KMI reported a net loss to common stockholders of $180 million, despite generating second-quarter distributable cash flow (DCF) of $1.1 billion, an increase of 9% over second-quarter 2017. The company continued to fund all growth capital through operating cash flows with no need to access capital markets for that purpose, it said.

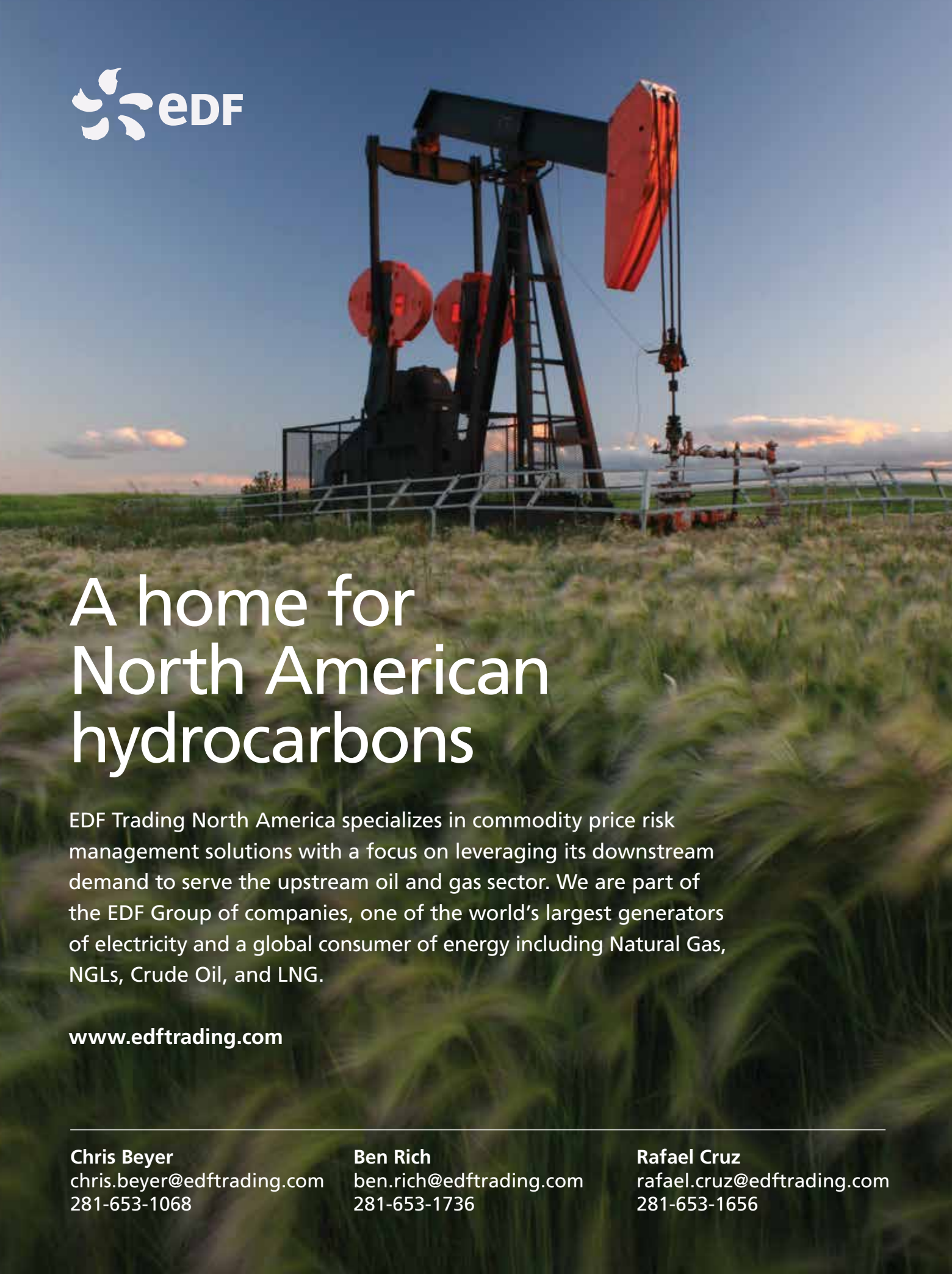
4: TransCanada Corp.

- **NYSE: TRP**
- **Share price as of Aug. 10: $44.47**

The Calgary-based midstream giant announced in June that it would expand export capacity on its NGTL System, which takes natural gas from the Western Canadian Sedimentary Basin to downstream markets. The expansion cost $140 million, and shippers carried out agreements for 280 million cubic feet per day of service that will begin in 2021, a press release added.

TransCanada Corp. announced second-quarter net income attributable to common shares of CA$785 million, or 88 cents per share, compared with net income of CA$881 million, or CA$1.01 per share for the same period in 2017. Comparable earnings for second-quarter 2018 were CA$768 million, 86 cents per share, compared with CA$659 million, 76 cents per share for the 2017 period.

"With our existing asset portfolio benefiting from strong underlying market fundamentals and $28 billion of near-term growth projects including maintenance capex advancing as planned, earnings and cash flow are forecast to continue to rise. This is expected to support annual dividend growth at the upper end of an 8% to 10% range through 2020 and an additional 8% to 10% in 2021," said Russ Girling, president and CEO. "We have invested approximately CA$10 billion in these projects to date and are well positioned to fund the remainder through our strong and growing internally



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generated cash flow along with a broad spectrum of financing levers including access to capital markets and further portfolio management activities.

"In addition, we continue to methodically advance more than CA$20 billion of medium- to longer-term projects—including Keystone XL, Coastal GasLink and the Bruce Power life extension agreement. Success in advancing these and/or other growth initiatives associated with our vast North American footprint could extend our growth outlook beyond 2021," Girling added.

5: Enterprise Products Partners LP

- **NYSE: EPD**
- **Unit price as of Aug. 10: $29.36**

One of the largest publicly traded partnerships providing midstream gathering, treating, transportation, processing and storage, Enterprise Products, at No. 5 on 2018's Midstream 50 list, is set to develop an offshore Texas crude export terminal, according to a recent press release. The ability to load very large crude carriers (VLCC) with 2-million-barrel (MMbbl) capacity would be "the most efficient and cost-effective solution to export crude oil to the largest international markets in Asia and Europe," the announcement said.

The company's Seaway marine terminal in Texas City, Texas, will be able to load about 1.1 million barrels of crude on one VLCC. Seaway, a 50:50 JV between EPD and Enbridge Inc., includes 500 miles of 30-inch pipeline from Oklahoma to Texas, allowing supply to reach the Texas Gulf Coast, according to EPD.

A final investment decision (FID) is still expected on development of the export terminal, according to the company.

EPD reported strong financial results for the second quarter. Net income was reduced by $322 million, or 15 cents per unit on a fully diluted basis, of non-cash mark-to-market losses. "Substantially all of these mark-to-market losses were incurred in connection with our hedging activities related to the Midland-to-ECHO Pipeline," it said. Adjusted EBITDA increased 32% to a record $1.8 billion for the quarter, compared with $1.3 billion for second-quarter 2017.

Capital investments were $983 million in the second quarter and $2.1 billion for the first six months of 2018. "Included in these investments were sustaining capex of $73 million in the second quarter of 2018 and $139 million in the first six months of 2018," the firm said in its earnings announcement.

"We are very pleased with the performance of our businesses during the second quarter of 2018," said CEO A.J. (Jim) Teague. "We set 14 financial and operational performance records during the quarter. We benefited from $5.3 billion of assets being placed in service since the second quarter of 2017, strong volume growth across our integrated system of assets and the impact of higher NGL prices on our natural gas processing business."

6: The Williams Cos. Inc.

- **NYSE: WMB**
- **Share price as of Aug. 10: $31.73**

Williams has interstate gas pipeline and gathering/processing operations across the U.S., including strategic assets in the deepwater Gulf of Mexico, the Rockies, the Pacific Northwest and the Eastern Seaboard. In a major restructuring of assets, the Tulsa, Okla.-based firm announced in the third quarter an asset sale in the Four Corners region and entry into the booming Denver-Julesburg Basin in northeastern Colorado.

Williams and KKR & Co. said they purchased Discovery DJ Services from TPG Growth, the middle-market and growth equity platform of alternative asset firm TPG, for $1.173 billion, subject to customary closing conditions and purchase price adjustments. Discovery is a Dallas-based provider of

The Opal, Wyo., gas processing plant of The Williams Cos. Inc. has emerged as a natural gas pipeline and storage hub for much of the Intermountain West. *Source: The Williams Cos. Inc.*

gas and oil gathering and processing services in the southern portion of the DJ Basin.

Williams will be Discovery's operator and will hold a majority of governance voting rights. Williams has committed to fund additional capital as required to bring its economic ownership to 50:50.

Meanwhile, Williams announced the combined sale of assets and equity in New Mexico and Colorado to Harvest Midstream Co. for $1.125 billion in cash, subject to customary closing conditions. The proceeds from the transaction will contribute to funding Williams' extensive portfolio of attractive growth capital and investment expenditures, including those opportunities associated with the Discovery acquisition, the firm said.

Williams gained the sprawling San Juan Basin assets in 1983 through its acquisition of Salt Lake City-based Northwest Energy Corp.

Williams has an active, long-term capex program and was scheduled to place its new Atlantic Sunrise Pipeline—helping to de-bottleneck Marcellus gas production—in service in August.

For the second quarter, Williams reported net income of $135 million, a $54 million increase over second-quarter 2017 results. Adjusted income per share was 17 cents, up 31% from the prior-year period.

In a move similar to Energy Transfer's effort toward corporate simplification, Williams and its Williams Partners LP partnership announced merger plans in the second quarter, which was approved by share and unit holders at a mid-August special meeting in Tulsa.

7: Plains All American Pipeline LP

- NYSE: PAA
- Unit price as of Aug. 10: $26.97

Plain's key assets run from Canada to Corpus Christi, Texas, with major crude, NGL and gas pipelines with rail and marine refined products capabilities. The firm is a major midstream player in the booming Permian Basin.

Willie Chiang, executive vice president and COO, recently discussed Plains' growth plans with analysts. Plains has emphasized it wants to expand its gathering footprint, primarily in the Delaware Basin, with expansion supported by a combination of acreage dedications and volume commitments. PAA is seeking to debottleneck the intra-basin system and provide access to take-away pipes while expanding capacity into and out of the Wink, Texas, hub.

Regarding projects, Chiang said its Cactus II Pipeline system is on-track to "connect the Delaware Basin with the Corpus Christi/Ingleside area," and also noted that "the extension of 24-inch loop of our Sunrise system adds [about] 500,000 barrels per day of capacity from Midland [Texas] to Colorado City [Colo.] and Wichita Falls [Texas.] This enables us to utilize [about] 120,000 barrels per day of existing available capacity on our Basin Pipeline system from Wichita Falls to Cushing [Okla.]"

The firm was scheduled to announce second-quarter financial results in mid-August. According to first-quarter earnings, adjusted EBITDA for that quarter was $593 million, "slightly ahead of expectations" according to Chiang. Going into 2019, he said, fee-based adjusted EBITDA growth should be between 14% and 15%.

8: MPLX

- NYSE: MPLX
- Unit price as of Aug. 10: $38.61

The Findlay, Ohio-based MLP, formed in 2012 by downstream giant Marathon Petroleum Corp., gathers, processes, transports and stores gas and NGL and is a major service provider in Appalachia's Utica and Marcellus plays. It has 62 light-product terminals with about 24 MMbbl of storage capacity, and about 2.8 MMbbl of capacity in storage caverns, among other assets.

It described second-quarter earnings as record setting. It had $453 million of net income and $867 million of adjusted EBITDA. For gathering/processing alone, MPLX had $174 million in net income and $341 million in adjusted EBITDA, "driven by record gathered, processed and fractionated volumes," the firm said in its earnings announcement.

In the Marcellus/Utica, a "solid growth trajectory" continued, with gathered volumes averaging 2.8 billion cubic feet per day (Bcf/d), up 46%, driven primarily by higher Utica dry gas volumes, the company said. Processed volumes went up 10% to 5.2 Bcf/d on average, and fractionated volumes went up 16%, averaging 407,000 barrels per day, the company added.

Growth in the Northeast is a priority, MPLX executives emphasize. Operations began at its 200-million-cubic-feet-per-day (MMcf/d) Majorsville 7 gas processing plant in Pennsylvania in July. MPLX also expects to add 600 MMcf/d of incremental processing capacity and 100,000 barrels per day of additional fractionation capacity in the Marcellus by the end of 2018, the firm added.

9: ONEOK Inc.

- NYSE: OKE
- Share price as of Aug. 10: $68.66

This Fortune 500 company is a leading provider of NGL transmission and storage that has expanded its West Texas LPG system into the Delaware Basin and zeroed in on growing production in the Midcontinent Stack region in the last year. It's also a major player in the Bakken and Oklahoma.

The Canadian Valley II project in western Oklahoma's Stack play was designed to bring the company's total gas processing capacity there to about 1.1 billion cubic feet per day by 2019, the company announced. The play is one of the key Midcontinent production and transport points, and it is undergoing "rapidly increasing customer production," a press release said.

Also in 2017, ONEOK invested $200 million to expand its NGL system into the Delaware Basin, located in the prolific Permian Basin. This move "positions the West Texas LPG system for significant future NGL volume growth," President and CEO Terry K. Spencer, adding key intrastate pipeline and storage assets include the Roadrunner Gas Transmission system serving the Permian.

For the second quarter, ONEOK announced improved financials compared to second-quarter 2017.

"Results primarily benefited from natural gas volume growth in the Stack and Scoop areas and the Williston Basin … NGL-volume growth in the Stack and Scoop areas and Permian Basin, and higher optimization and marketing activities in the natural gas liquids segment," the company said in its earnings announcement.

OKE's second-quarter operating income and EBITDA increased 40% and 30%, respectively, compared with second-quarter 2017. Quarterly net income totaled $281 million, 68 cents per diluted share while DCF increased 37% percent compared with second-quarter 2017.

10: Cheniere Energy Inc.

- **NYSE American: LNG**
- **Share price as of Aug. 10: $62.81**

The LNG giant jumped dozens of places on the current Midstream 50 list after holding the No. 40 spot in 2017's rankings. This was solely due to its entry into the growing LNG export market.

According to Jack Fusco, president and CEO, "2017 was a breakthrough year for Cheniere … In 2017, we brought the third and fourth trains at Sabine Pass [La.] online ahead of schedule and on-budget, fulfilling our obligations to our foundation customers and successfully marketing and delivering portfolio LNG volumes."

Since that time, work has moved forward on its Corpus Christi Liquefaction project in Texas, with a FID made in May for Bechtel to continue construction, according to a press release.

Serving Cheniere's plants is requiring significant expansion of the gas pipeline grid around the Gulf of Mexico, including its Creole Trail Pipeline.

Second-quarter earnings were scheduled for release in mid-August. For the first quarter, EBITDA was $907 million, an 88% increase from $483 million in 2017's first period. The firm raised its 2018 guidance in its first-quarter earnings announcement.

It projects full-year EBITDA to be between $2.3 billion and $2.5 billion, an increase from an earlier projection of $2 billion to $2.2 billion, with its DCF projection rising to $350 million to $550 million, above the earlier range of $200 million to $400 million. ■

Cheniere Energy's Sabine Pass plant in Louisiana put the U.S. on the map as a major LNG supplier. The rapidly expanding gas export business has helped the firm emerge as one of the midstream sector's biggest players. *Source: Cheniere Energy Inc.*

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Midterm Madness

All energy players have a lot on the line in November—including the midstream.

By Matthew Hite

If election history proves true, then midterm election madness could be coming to us this November. Right now the Republican Party controls the White House and both chambers of Congress and has a majority on the Supreme Court.

Historically speaking, when a Democrat or Republican administration has been in the same position of controlling all three branches, it usually loses control of Congress during the midterm elections. These elections are held two years into a four-year presidential term. So the big question this November is, Will history once again repeat and the Democrats take over one or both chambers of Congress, or will the Trump administration buck history and preserve its majority over both chambers of Congress?

I'll share my thoughts on what could happen this November and also share some changes that are already occurring at some of the federal agencies that are important to the midstream sector.

Uphill battle

Starting with the Senate, Republicans hold 51 seats, Democrats hold 49 seats, and 35 seats are up during the November midterms. Twenty-six of these are Democrat-held, while only nine are Republican-held. So, right out of the gate, the Democrats are in an uphill battle with the numbers against them.

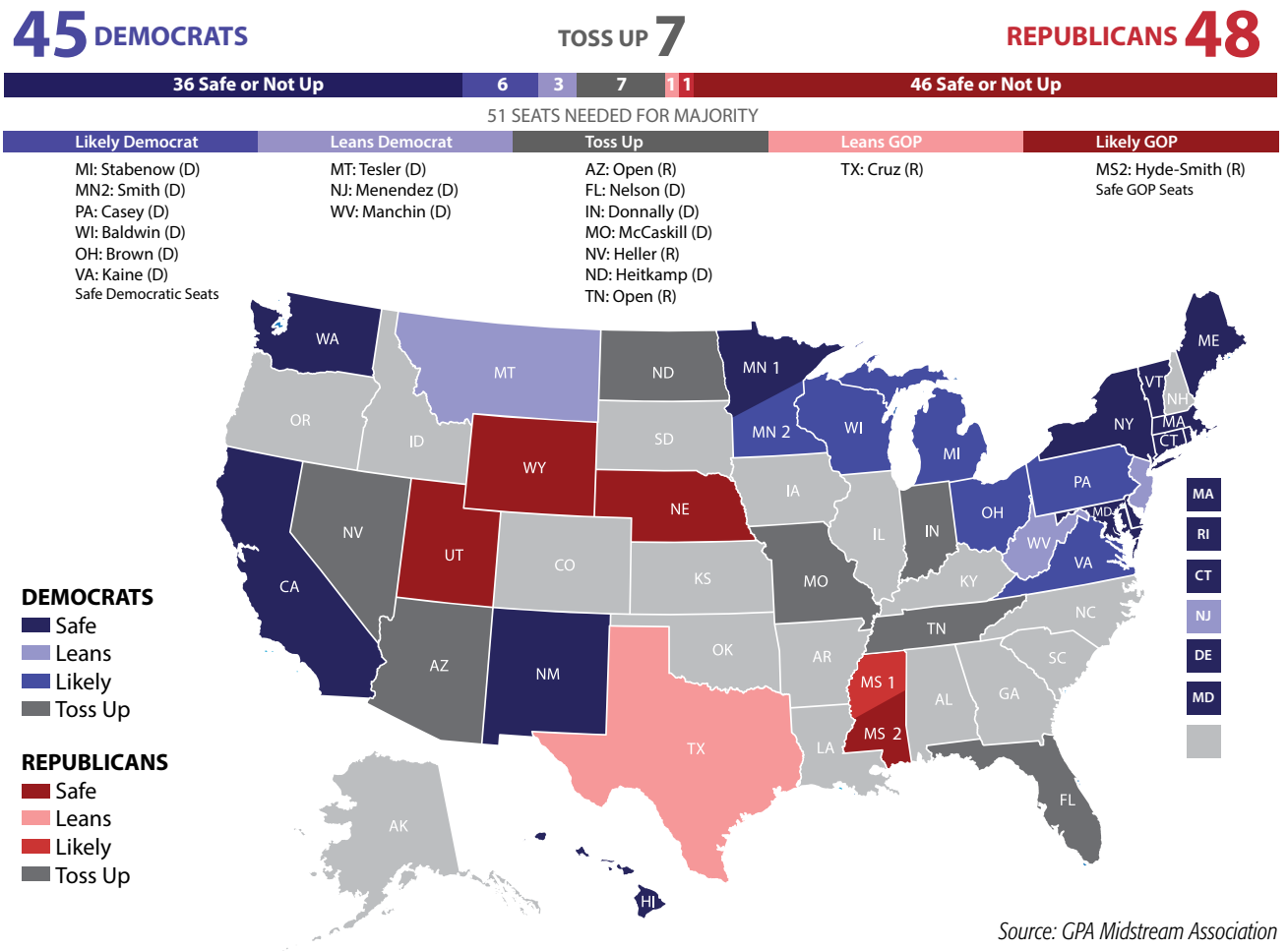
However, on the money front, Democrats have been much better at raising cash than the Republicans. With 10 of the 26 Democrat seats up for re-election in states that were won by President Trump in 2016, a Democratic takeover of the Senate is highly unlikely. Republicans will likely hold on to their Senate majority and could increase it by a few seats. I think the President still has long coattails, and that will help Republicans hold the Senate.

If one of the chambers flips in November, it's more likely to be the House, which has all 435 seats. The current split in the House has Republicans holding 236, Democrats holding 193, and six vacancies. A 218-seat majority is necessary to control the House, and Democrats are likely to cut into the Republican majority.

By how much is the golden question.

At the beginning of August, political news and polling monitor Real Clear Politics predicted about 35 House seats as toss-ups. Democrats held two of

U.S. Senate Midterm Election Preview



Source: GPA Midstream Association

those while Republicans held 33. The Democrats have a pickup-friendly playing field.

Republican retirees

It's important to note that Republicans have a large number of retirements, leaving many of these seats undefended. At this point the Democrats have seen a significant boost in their cash raising efforts, which could give them the advantage they need to close the gap.

This will be a close one. I think the Democrats will make significant gains but fall short of taking the House.

As for the latest on the Trump administration, in July, then-Environmental Protection Agency (EPA) Administrator Scott Pruitt resigned. That same day, President Trump appointed Deputy Administrator Andrew Wheeler to serve as acting EPA administrator. Full disclosure: I previously worked for Wheeler and consider him a close friend. That bias aside, and judging him on his merits and achievements, I do think Wheeler will be a fantastic fit at the agency and an ally to the midstream industry.

A mid-July interview he did with the *Washington Examiner* provided key insight into Wheeler's vision for the agency.

"'I think we can protect the air, we can protect the water and still deregulate at the same time,'" Wheeler said in the interview. "'We have to transform to the 21st century and a lot of the apparatus we are using is still in the 20th century. I don't expect to change everything in the brief tenure that I will have here, but I hope to put the agency on the path to looking at things differently …'"

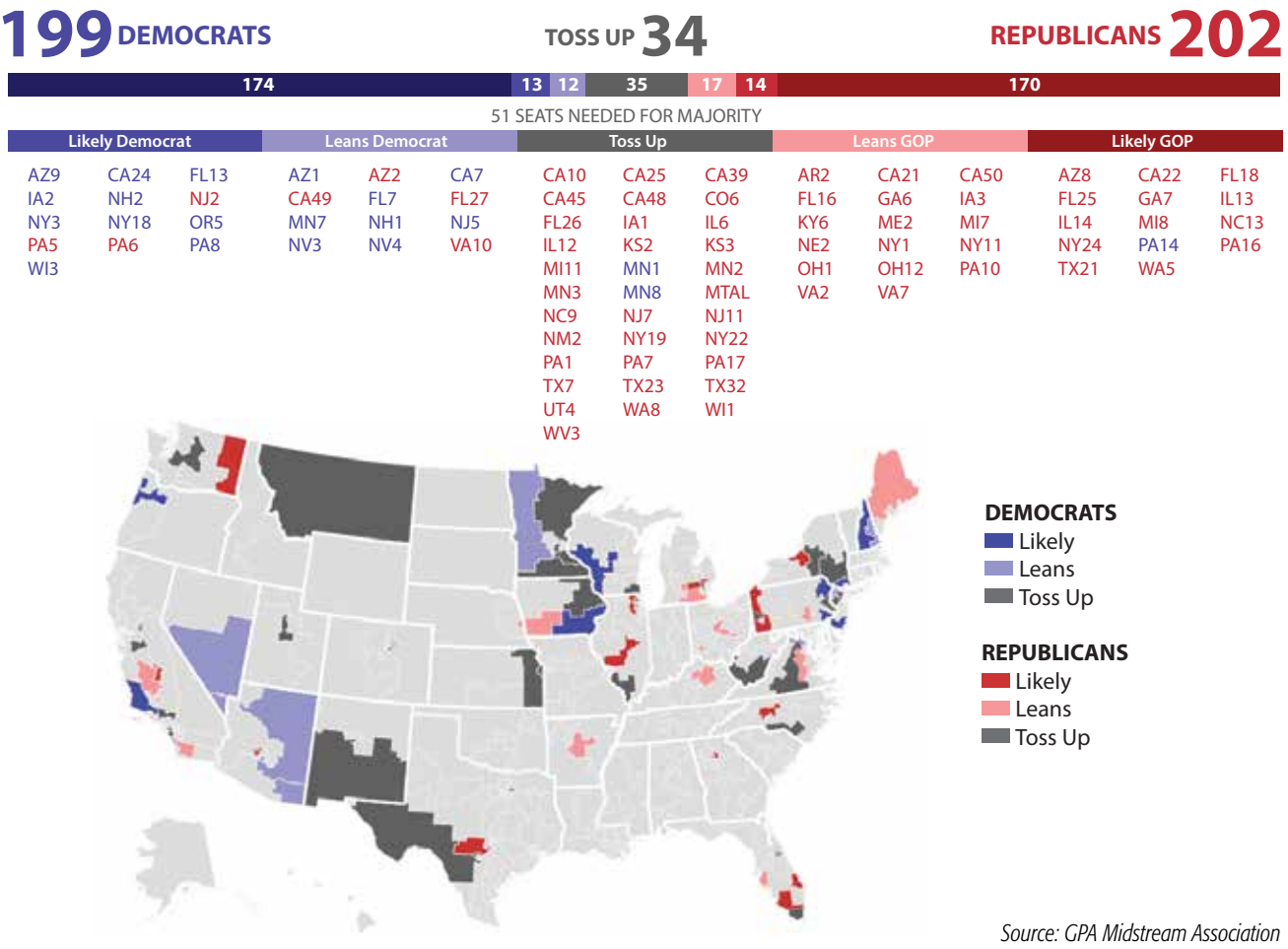
Gas Mega Rule

The midstream industry will see a lot of change this year at the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA). PHMSA is trying to make progress on the Gas Mega Rule, which it recently separated into three distinct sections. In addition to that, PHMSA experienced significant congressional pressure to accelerate completion of congressional mandates from the last two pipeline safety reauthorization bills.

The next pipeline safety reauthorization will get underway next year, but PHMSA needs to make significant progress to avoid the wrath of Congress due to its slow implementation of these mandates.

At the U.S. Department of Commerce (DOC), we hope to see an increase in its ability to process more

U.S. House Midterm Election Preview



Source: GPA Midstream Association

exemptions from trade tariffs. DOC has been overwhelmed by the sheer number of requests from companies seeking exemptions from President Trump's tariffs on the import of foreign-made steel and aluminum.

Business Insider explained in an article published in June, "Under Section 232 of the Trade Expansion Act, the law the Trump administration is using to impose the tariffs, companies can request exemptions if there is no way for them to get the goods they need from a domestic metals producer. But the Commerce Department, which is tasked with handling these requests, is struggling to keep up."

Tariff turmoil

The article went on to say that at a June hearing, Wilbur Ross, secretary of commerce, said more than 20,000 requests for product exemptions had been filed.

"Ross blamed the snail's pace on the lack of funding for the department. A report from *The Washington Post*'s David Lynch paints the issues as much deeper. Officials in the department say there are not enough employees to handle the sudden influx of requests. And employees in the department do not have the expertise to handle such requests, the *Post* reported," the article continued.

Another change we are already seeing in D.C. is the amount of environmental activist scrutiny that has been placed on U.S. Department of the Interior (DOI) Secretary Ryan Zinke. These groups, originally so fixated on former EPA Administrator Scott Pruitt, seem to have refocused their attention on Zinke. As a result of this new focus, Zinke has faced numerous inquiries from independent investigators within his department.

GPA Midstream Association has lobbied—and will continue to lobby—DOI on a variety of issues and regulations. Keeping Zinke in place at DOI is of utmost importance to the midstream industry, and the energy industry as a whole.

November will bring a fascinating midterm election. A lot is on the line for both Democrats and Republicans. The midstream industry also has a lot going on at EPA, DOC, PHMSA and DOI with the various changes and issues mentioned here.

It will not be a quiet fall in D.C. for the midstream industry. ■

Matthew Hite *is vice president of government affairs for the GPA Midstream Association, based in Washington, D.C.*

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OPPORTUNE

Changing SOX

A pipeline company—Enron—triggered the Sarbanes-Oxley revolution. Sixteen years out, federal measurement requirements are changing even as the midstream contends with swelling volumes.

By Mike Squyres

It doesn't seem like that long ago. The massive financial collapse of Enron Corp. took place back in 2001, finally culminating with the company's declaration of bankruptcy on Dec. 2 of that year. Enron shareholders lost a total of $74 billion. Enron employees lost billions' worth of 401(k) plan benefits.

At the time, it was the largest corporate bankruptcy ever.

Enron's virtual disintegration exposed unprecedented accounting and corporate fraud. When the U.S. Securities and Exchange Commission (SEC) launched a probe into Enron's finances in October 2001, many pipeline executives were afraid that the industry would face a complete loss of credibility in the financial community.

No pipe problem

But Enron's pipeline business wasn't the problem. During the dot-com era in the 1990s, Enron reinvented itself. It was no longer just a pipeline company; it launched initiatives in energy supply and the Internet. It built power plants and started an online trading business. Enron also entered the broadband communications market and even launched a water company.

Enron was flying high. The company had undergone a spectacular transformation that made it a darling of Wall Street and winner of numerous innovation awards. However, Enron severely overvalued its new assets and implemented a series of

financial schemes to cover up big losses in those new businesses.

When the dot-com bubble burst in 2000, Enron found itself overexposed in the market, and the collapse began.

Ultimately, it was the dot-com industry, not the pipeline industry, which rocked the investing world. By the end of 2000, the dot-coms had lost well over $1.7 trillion in market value.

The federal government had to step in. Not only were the dot-coms crashing, the country was in a recession, and Enron-like accounting scandals were coming to light in other industries at companies such as Adelphia, Peregrine Systems, Tyco International and WorldCom. WorldCom's bankruptcy in June 2002 eclipsed Enron's. The scandals shook public confidence in U.S. securities markets. With midterm elections coming up in November of that year, action on the part of the government proceeded quickly.

'Remarkable consensus'

The House and Senate undertook hearings that focused on the scandals. According to then-Sen. Paul Sarbanes, D-Md., "[The Senate] hearings produced remarkable consensus on the nature of the problems: inadequate oversight of accountants, lack of auditor independence, weak corporate governance procedures, stock analysts' conflict of interests, inadequate disclosure provisions, and grossly inadequate funding of the Securities and Exchange Commission."

Congressman Mike Oxley, R-Ohio, introduced the "Corporate and Auditing Accountability, Responsibility, and Transparency Act of 2002," which passed the House in April that year. Meanwhile, Sen. Sarbanes was working on his own legislation and introduced the "Public Company Accounting Reform and Investor Protection Act of 2002," which passed in the Senate that July. A reconciled version of the two acts, formally named the "Sarbanes-Oxley Act of 2002," took only a day to pass overwhelmingly in the House and Senate. President George W. Bush signed the act into law on July 30, 2002.

Soon, people were using the abbreviation "SOX" for the new law.

SOX was intended to ensure the reliability of publicly reported financial information and restore investor confidence in U.S. capital markets. It revised numerous laws dating back to the Franklin D. Roosevelt administration during the Great Depression, including the Securities Act of 1933 and the Securities Exchange Act of 1934. SOX significantly expanded responsibilities for corporate boards, directors, executives, auditors, attorneys and securities analysts. It also subjected this group of people to serious penalties for non-compliance.

Today, SOX continues to loom large across all industries. Its reach extends from the C-suite and board of directors, deep into company routines such as day-to-day operations in oil and gas measurement departments. Because SOX required companies to implement processes that ensure the accuracy of reported results, the integrity of the measurement process was brought into finer focus.

SOX is organized into 11 titles or sections, most of which address the measurement process in one way or another. The two most important are Sections 404 and 409.

Section 404 has been the most controversial provision in SOX. It states that it is management's responsibility to maintain a sound internal-control structure for financial reporting and to assess its own effectiveness. It is the responsibility of the auditors to attest to the soundness of management's assessment and report on the state of the overall financial control system.

Section 409 covers real-time disclosures. In terms that are easy to understand, companies are required to disclose to the public, on an urgent basis, information about material changes in their financial condition or operations.

Compliance is now more than maintaining measurement integrity and keeping close tabs on monthly closeouts and reporting how lost and unaccounted-for quantities are handled.

Dynamic nature

For those who are not involved with compliance on a day-to-day basis, the dynamic nature of SOX could seem surprising. Since 2002, there have been few legal challenges or revisions to the law. Given that it was produced so hastily, that is surprising.

The Jumpstart Our Business Startups (JOBS) Act of 2012, signed by President Barack Obama, did exempt emerging growth companies from certain SOX requirements, such as those in Section 404.

The Financial CHOICE Act that passed the House of Representatives last year relieves some of the SOX auditing requirements for internal controls at smaller institutions; however, CHOICE has run into a roadblock in the Senate. Meanwhile, the Senate has passed the Economic Growth, Regulatory Relief and Consumer Protection Act, other legislation that has similar intentions to CHOICE but includes nothing related to SOX.

In either case, SOX is a relatively minor issue. The main intentions of the CHOICE Act and the Economic

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Growth, Regulatory Relief and Consumer Protection Act are to overturn significant portions of the Dodd-Frank Act, which was signed into law in 2010. We will have to see if a reconciled version of the two includes any SOX-related provisions.

Many industry groups do have their sights set on SOX Section 404, and we shouldn't be surprised to see more legislation to that effect. For instance, the Community Bank Access to Capital Act of 2017 would relax Section 404 compliance for banks with less than $1 billion in assets.

Still, the bottom line is that SOX has endured the past 16 years largely intact and unscathed. Why, then, is there so much new compliance activity?

Changing compliance

It turns out that even if the law doesn't change, compliance rules do.

SOX required the SEC to implement the initial rulings that put the law into practice. One of the SEC's actions, dictated by SOX Title I, was the creation of the Public Company Accounting Oversight Board (PCAOB) to provide independent oversight of public accounting firms providing audit services.

Since then, the PCAOB has been actively issuing new auditing standards, for example, to govern audits of internal controls. In 2016, the PCAOB issued a proposal to further refine the potential reporting requirements around critical audit matters (CAMs). As a result, external auditors have faced increasing inspection report requirements from the PCAOB and are more focused on evaluating deficiencies. While the past two years have been very busy for external auditors, the CAMs effects, including the measurement function, extend throughout companies.

SOX also required management at public companies to select an internal control framework and annually assess and report on the design and operating effectiveness of their internal controls. Once SOX was passed into law, most companies adopted the Committee of Sponsoring Organizations of the Treadway Commission's (COSO) 1992 framework. COSO's release of an updated version in 2013 caused an uptick in activity that has only recently returned to normal.

The Financial Accounting Standards Board (FASB) has also issued standards that affect SOX compliance. Companies are now updating controls documentation to comply with the FASB's new revenue recognition standards. The FASB update on Revenue from Contracts with Customers is effective for fiscal years beginning after Dec. 15, 2017.

A more recent FASB update overhauls lease accounting and is effective for fiscal years beginning after Dec. 15, 2018.

Many of the dynamics come from companies themselves. Since 2002, mergers and acquisitions have continued to be rampant, but business processes have also drastically changed; companies are undergoing digital transformations and finding that regulations or enforcement actions by other federal agencies such as the Federal Energy Regulatory Commission, Department of Transportation/Pipeline and Hazardous Materials Safety Administration and Bureau of Land Management all have SOX implications.

Meanwhile, energy industry companies seek to optimize SOX compliance, streamline their audits and minimize costs.

The measurement function

While SOX immediately impacted measurement operations following passage in 2002, more recent actions on the part of COSO, FASB, PCAOB and government regulatory agencies have continued to make SOX compliance a moving target.

Compliance is now more than maintaining measurement integrity and keeping close tabs on monthly closeouts and reporting how lost and unaccounted-for quantities are handled. Controls have to be in place, processes must be thoroughly documented, compliance with those processes must be proven, failures that result in material errors must be reported and cybersecurity incidents must be disclosed.

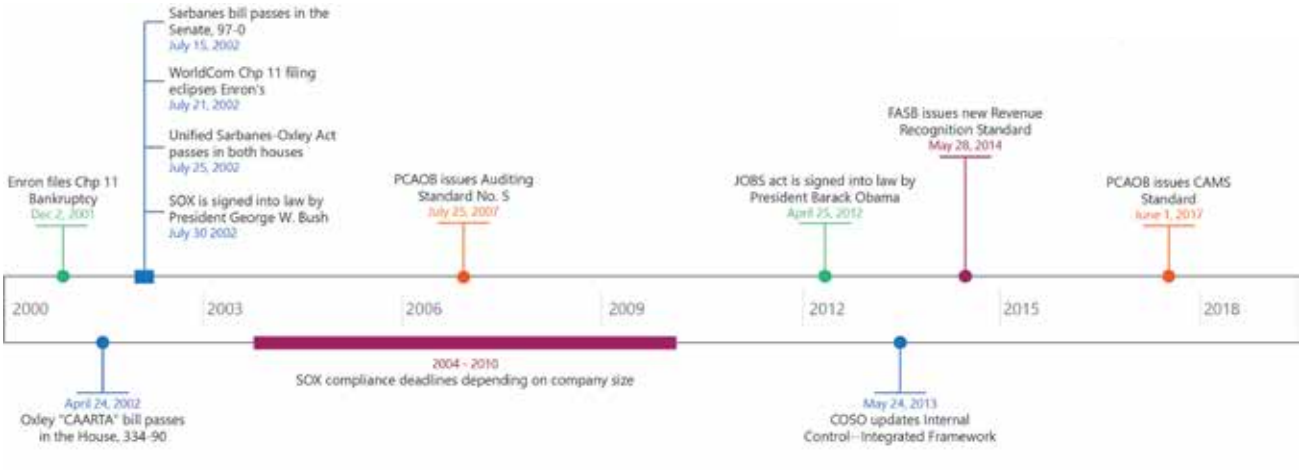
Typically, the measurement audit thoroughly evaluates the measurement process, how well it is documented, how the company complies with it and how the company documents that compliance.

It is now more important than ever to document everything that a SOX audit might require—including the entire measurement process. The entire team must understand the information contained in all measurement records and documentation. The PCAOB further requires clear proof that the manager who approved the process actually reviewed it in detail.

Documenting the entire measurement process can be daunting, but we know many cases in which this work has been completed. A measurement automation application really helps organize it. All office and field processes must be included. In addition to routine processes such as monthly closeout, processes for prior period adjustments, system balancing, data validations, anomaly management and handling of lost and unaccounted-for quantities must be documented.

Processes inevitably change, too, making revision tracking extremely important. A revision report must doc-

A Sarbanes-Oxley Timeline



Source: Flow-Cal Inc.

ument not only what changed but also how and why. The result of the change must be tracked as well, and all personnel involved must be identified and their contributions specified.

Many of the PCAOB's updated audit requirements affect measurement audits, which are now more critical than ever. A measurement audit will evaluate how effective a company's measurement process is, identify potential financial exposures and specify areas for improvement.

Measurement audits

Typically, the measurement audit thoroughly evaluates the measurement process, how well it is documented, how the company complies with it and how the company documents that compliance. It also assesses corrective actions and how they are recorded. The audit could assess selected process equipment such as meters and tanks. Inspections and maintenance of all process equipment must be included in the company's measurement process.

The process must also include all policies, procedures, controls and training. New PCAOB requirements mean that not only does the measurement process require a description of a particular provision, such as training, it also requires the company to document how it complies with that description and to record the occurrence of all training sessions.

Many of the new requirements related to SOX are information technology (IT)-focused, particularly regarding security.

With IT and operating technology merging, some measurement departments have found themselves responsible for the measurement computing infrastructure. That brings an entirely new list of implementation measures and reporting requirements into play.

Companies are required to disclose cybersecurity incidents. This brings scrutiny to a reporting company's cybersecurity implementation. Management must document and enforce access controls, user identification and authentication, review and monitoring of user accounts, and security of online information.

All cybersecurity measures taken, including hardware and software in use, must be reported. Security product reports must include version management and update history.

Disclosures must include malicious-software detection, correction and prevention; unauthorized software; and violation of security protocols, including activity reports.

Risk assessments must be included, and management must report on plans to address any potential problems it uncovers.

Compliance dynamics

Although SOX has endured the past 16 years largely unchanged, new rules and requirements on the part of various entities such as COSO, FASB and PCAOB have injected dynamics into SOX compliance. Due to the vast reach of SOX reporting requirements, even seemingly unrelated actions on the part of regulatory agencies and corporations can affect SOX compliance.

Most of these activities have direct consequences for oil and gas company measurement departments. It's now a lot more than maintaining measurement integrity. Processes must be thoroughly documented and compliance with those processes proven. Management review must also be proven. In addition, failures that result in material errors must be reported, and cybersecurity incidents must be disclosed.

With talk of new potential challenges to SOX, and with anticipation that activity on the parts of COSO, FASB, PCAOB and others will go on, SOX compliance will continue to be a dynamic process. ■

***Mike Squyres** is president of Flow-Cal Inc.*

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Minimum Volume Commitments

The new ASC 606 standard creates challenges for midstream operators—but solutions are available.

By Marc Gorewitz, Jennifer Tu and Sandy Dhariwal

Minimum volume commitment contracts (MVCs), often referred to as throughput agreements, are agreements under which a shipper or producer—a counterparty—undertakes to transport an agreed minimum volume of a commodity such as natural gas, NGL or crude oil through a third-party operator's assets, such as pipelines or processing plants, over a specified period.

In the midstream industry, these contracts are typically utilized to enable the operator to recoup the costs of constructing infrastructure, such as a processing plant or pipeline lateral, for the benefit of the counterparty. Under these agreements a counterparty pays a shortfall or deficiency fee if the MVC is not met for a specified period—monthly, quarterly or annually.

Tracking challenges

Several challenges exist in tracking these volume commitments. Tracking of throughput agreements tends to be a manual and time-consuming process; invoice statements to producers are often challenged and it is difficult for the organization to track and have reporting insight with respect to the number of these agreements and the progress of each counterparty in fulfilling their obligations.

Companies face difficulties tracking these throughput agreements to determine if commitments are being met within the contractual time periods. At most companies, throughput agree-

Given the fact that these throughput contracts represent a counterparty's fixed minimum obligation over multiple years, the future minimum revenues to be earned for these agreements and the expected timing of such recognition must be disclosed under ASC 606.

ments are tracked in spreadsheets, outside of commercial systems.

While commercial systems have the functionality to calculate the settlement for actual volumes transported, these systems are rarely capable of calculating whether a commitment has been met for a specified period.

These throughput agreements often have diverse structures that contribute to the complexity in tracking them. Some common features include:

- **Rollover/Excess volume carry-forward provisions**—This is the ability of the counterparty to roll over volumes flowed in excess of the MVC in the current period and apply against the commitment level for subsequent periods (offset shortfalls in future periods). Excess volumes may either be carried forward until utilized or may expire if unused by a specified date. Rollover provisions may allow 100% of the excess volume or a specified percentage to apply to future MVCs.
- **Deficiency cap**—Another common provision is a deficiency cap that essentially places a limit on the amount of the shortfall or deficiency that can be charged to the counterparty within the contractual period.
- **Makeup rights**—This is the ability for the counterparty to make up shortfalls by flowing excess volumes in future periods. Often no deficiency fee is due until the makeup period has expired. This may also be structured as the potential for the refund of deficiency fees in future periods.
- **Third-party volumes**—In certain agreements, in addition to counterparty volumes, third-party volumes on those same assets may be applied toward satisfying the volume commitment.

In addition to the above provisions, there are other factors that may impact deficiency calculations. An example would be adjustments for operational issues such as unplanned maintenance, weather or other force majeure events that prevent a counterparty from flowing the commodity and thus impact their ability to meet the commitment. Another example would be a prior period adjustment where it is subsequently determined that actual volume was higher or lower than the initially reported volume, which may result in the determination that a counterparty has actually satisfied a commitment for which it was previously thought a deficiency was due.

The adoption of the Financial Accounting Standards Board's Accounting Standards Codification (ASC) 606, "Revenue from Contracts with Customers," has added another layer of complexity to these calculations. ASC 606 is effective for public calendar year filers from Jan. 1, 2018, and for private calendar year filers from Jan. 1, 2019.

As part of their adoption of ASC 606, companies are required to disclose the future minimum fixed (unearned) revenues to which they are entitled over the remaining life of their contracts with customers.

Given the fact that these throughput contracts represent a counterparty's fixed minimum obligation over multiple years, the future minimum revenues to be earned for these agreements and the expected timing of such recognition must be disclosed under ASC 606. The unearned future minimum revenues must be disclosed in the financial statements at each reporting date (quarterly for public companies and typically annually for private companies). Therefore, there is an ongoing requirement to adjust MVC calculations for actual volumes and other adjustments, such as fee escalations, in order to generate these disclosures.

A case study

At Opportune, we recently completed an enterprise-wide revenue recognition project for a large midstream client. As part of this project, Opportune designed a solution for consolidating the unearned revenue at a contract level across all business segments.

Several of the client's business segments had MVCs that required disclosure under ASC 606. Opportune Process & Technology consultants worked in tandem with Opportune Complex Financial Reporting (CFR) consultants to deliver the solution.

The CFR resources analyzed the contracts to determine the fees that were subject to the ASC 606 disclosure requirements and assisted the client in drafting the technical accounting memos summarizing how revenue was to be recognized upon adoption of ASC 606.

The midstream client had a high number of throughput agreements spanning multiple assets, which contained several of the contract provisions referenced earlier.

Historically, all the MVCs had been manually tracked outside of the commercial application within separate Excel spreadsheets. While the Excel spreadsheets each utilized similar calculations to track the commitments, there were no common templates with the same formulas. Therefore, aggregation and review was difficult. Opportune's CFR team worked with the client to develop a standardized set of Excel templates with a common set of inputs, calculations and consistent output formats.

A new set of calculations was added to the commitment templates to facilitate the calculation of the unearned revenue for the purposes of the new ASC 606 disclosures. There were a number of benefits coming out of the development of the standardized templates. They included:

- Greater spreadsheet integrity and reduced risk of errors;
- Ease of review for both accounting and external auditors with a robust audit trail back to contracts;
- Dual purpose—not only could the client calculate deficiency fees and progress against volume commitments, the client could also generate the metrics required for ASC 606 disclosure;
- Simplified setup of tracking for new contracts; and
- Ease of training and ability to transfer responsibility for tracking different contracts because everyone is familiar with a common set of templates.

The future

The Excel MVC templates are still subject to limitations of a manual process. The next evolution of this solution would be to automate the tracking and calculation of these volume commitments within an integrated application across the enterprise and facilitate the sharing of information with counterparties within a web-enabled mobile platform.

One such platform that would be a logical fit for this solution is the Salesforce development platform. Out of the box, Salesforce provides a cloud-based architecture that allows for sharing of data, both inside and outside an organization.

The solution envisioned would either import or interface actual volume data from within the source system(s) and support the calculations required to track actuals against a commitment level while factoring in contract provisions (rollovers, deficiency caps, etc.) and calculate any deficiencies.

Storing the data in a common repository would facilitate reporting of multiple volume commitments within one segment and across the enterprise. Built-in Salesforce analytics would provide a means to capture key metrics on these agreements.

Lastly, the operator of the asset would have the option of sharing the status of the MVCs with counterparties in near-real time using a secured portal, thus enabling the counterparty to increase or decrease volume flows to meet volume commitments before the commitment period ends. ■

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