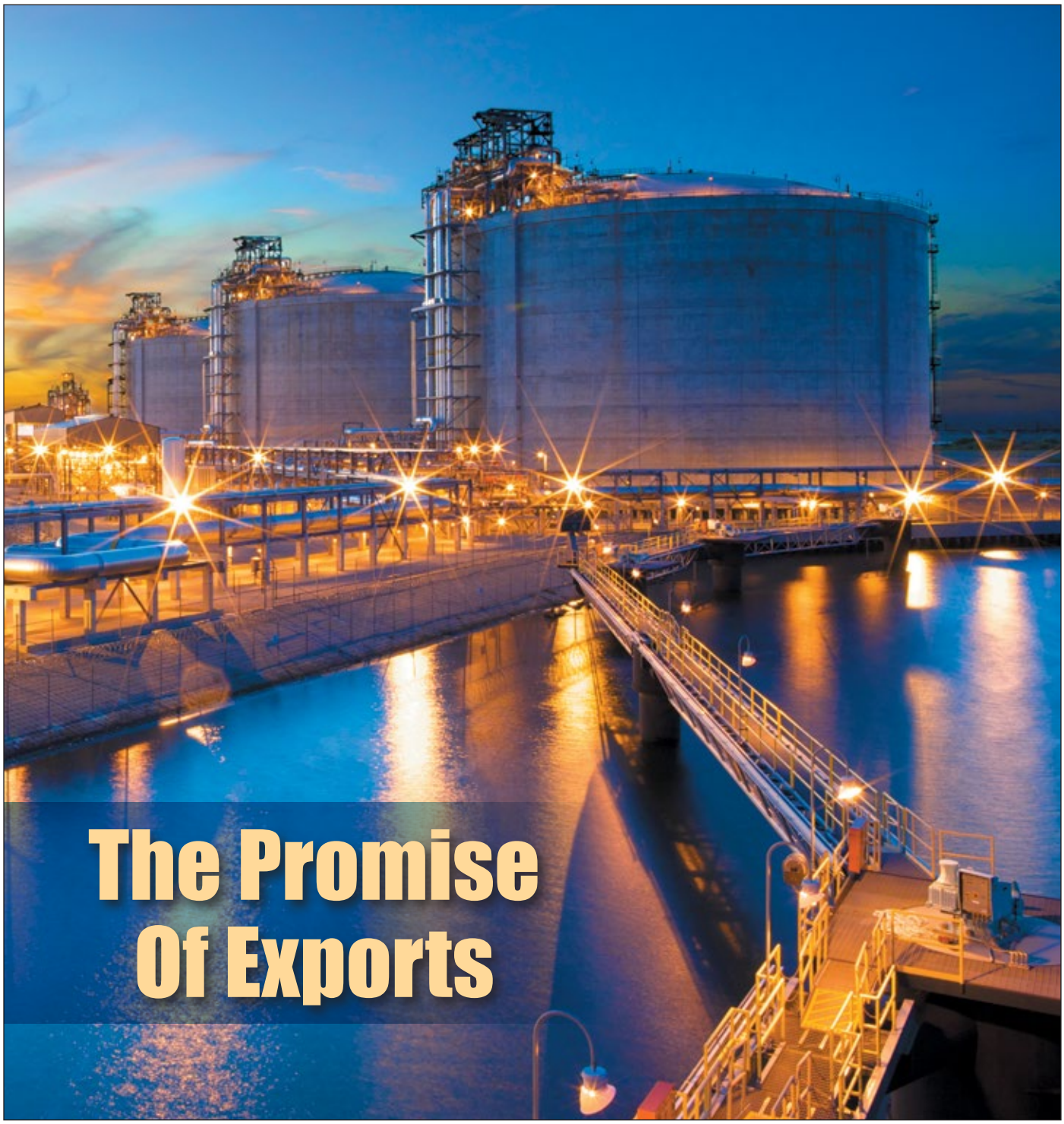
MIDSTREAM Business



The Promise Of Exports

A supplement to Oil and Gas Investor

MARCH 2020

HARTENERGY

More **Experience** Is Better.

Founded in 1995,

Energy Spectrum is the first midstream private equity fund in the United States.

More experience leads to

better judgment, wiser decisions and higher returns

for our portfolio company partners.

If you are a determined midstream entrepreneur seeking a capital partner,

let our experience work for you.

ENERGY SPECTRUM CAPITAL

EnergySpectrum.com | 214.987.6100

Jim Benson • Jim Spann • Tom Whitener • Peter Augustini • Ben Davis
Mark Honeybone • Mike Mayon • Chandler Phillips • Michael Mitchell • Austin Lutz

AZURE MIDSTREAM COMPANY LLC · BLUEJACK ENERGY SOLUTIONS · Bluewing midstream · CALICHE · THE CERITAS GROUP · Frontier Midstream, LLC

KANATA ENERGY GROUP · LAKEWOOD MIDSTREAM LLC · LASER MIDSTREAM COMPANY, LLC. · MVP · PINNACLE MIDSTREAM · PRISM MIDSTREAM LLC

RIMROCK ENERGY PARTNERS · Santa Fe MIDSTREAM · STONEHENGE Energy Resources LP · TAPROOT ENERGY PARTNERS · TRISTATE MIDSTREAM · VESTA MIDSTREAM PARTNERS, LLC

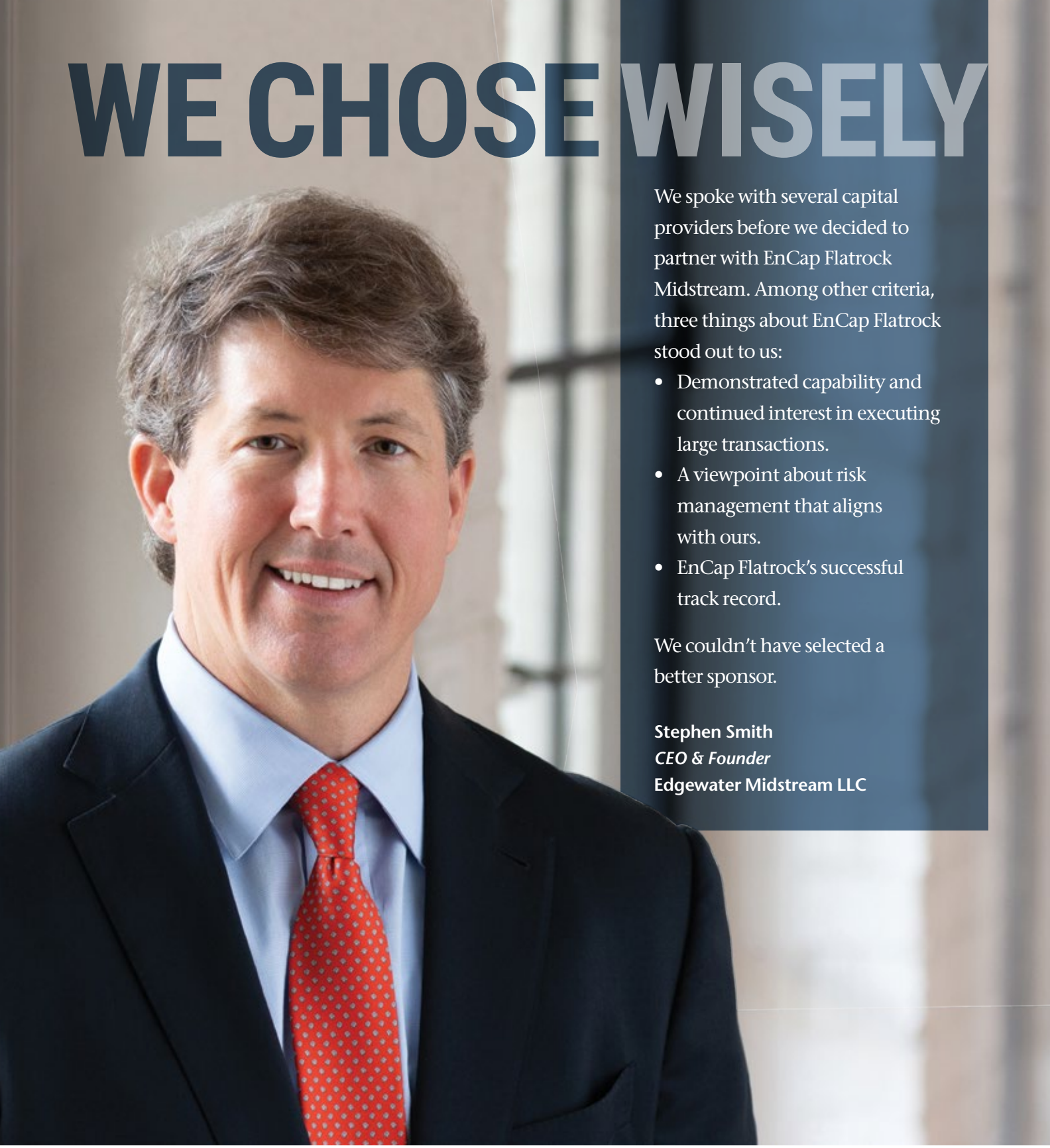
A supplement to
Oil and Gas Investor
1616 S. Voss Rd., Suite 1000
Houston, Texas 77057
713.260.6400 Fax: 713.840.8585
HartEnergy.com

MIDSTREAM Business

MARCH 2020

On the cover: The Cameron LNG Terminal at Hackberry, La., shimmers in twilight. The plant shipped its first liquefied gas in 2019 as its first two trains came online. *Source: Sempra LNG*

WE CHOSE WISELY



We spoke with several capital providers before we decided to partner with EnCap Flatrock Midstream. Among other criteria, three things about EnCap Flatrock stood out to us:

- Demonstrated capability and continued interest in executing large transactions.
- A viewpoint about risk management that aligns with ours.
- EnCap Flatrock's successful track record.

We couldn't have selected a better sponsor.

Stephen Smith
CEO & Founder
Edgewater Midstream LLC

EnCap Flatrock Midstream

www.efmidstream.com

Our core belief is that midstream success begins at the wellhead. We come to work every day to help our management teams bring oil and gas products from the wellhead to the best markets in the most efficient and effective way possible.

We are actively looking for new management teams. Call to arrange an introductory meeting.

Texas: 1826 N. Loop 1604 West, Suite 200 | San Antonio, TX 78248 | 210-494-6777
1100 Louisiana Street, Suite 5025 | Houston, TX 77002 | 281-829-4901

Oklahoma: 3856 South Boulevard, Suite 210 | Edmond, OK 73013 | 405-341-9993

Look Twice

By Paul Hart, Midstream Editor-At-Large

The midstream entered 2020 after a tough stretch. It's a challenge to any business when your customers—the E&P sector in this case—struggle. But here's hoping that investors begin to see midstream as a different type of investment worthy of consideration.

Midstream stocks got sucked down with their upstream brethren, although the businesses are fundamentally different. I've made this point in several conversations with non-energy friends recently. I've used the toll road analogy—something U.S. motorists seem to increasingly encounter—to make the point that midstream operators have a smoother revenue stream. Regardless of a commodity's price, the midstream receives revenue at its toll booth whenever that commodity moves from A to B.

Stock trends have switched the overall energy industry's investment rationale from growth to value. Beat-down shares offer strong growth potential. Many midstream analysts have hopes that Wall Street will start to mull the midstream once again, this time as a value opportunity. Christopher Sighinolfi, midstream equity analyst at Jefferies LLC, headlined a research report "Value So Nice, Worth Looking Twice" as the year began.

Beat-down shares offer strong growth potential. Many midstream analysts have hopes that Wall Street will start to mull the midstream once again, this time as a value opportunity.

"While E&P developments may continue to shape sentiment, we see compelling midstream value amid declining leverage, moderating capex, escalating free cash flow, insider buying, and 3rd-party M&A …" he said. Sighinolfi goes on to point out midstream capex demands this year will decline—and that will help results.

"We also find it constructive that, with reduced E&P activity and the pending completion of large, longer lead-time projects, total capital expenditure across our midstream coverage is poised to decline ~21% year-over-year in 2020 and a further >30% in 2021, aiding returns (return on invested capital and return on equity), free-cash-flow generation, and continued leverage moderation," he added. "We believe ongoing leverage reductions will give investors greater confidence in the sustainability of equity payouts, perhaps returning income-oriented investor interest in the group."

Speaking of income, MarketWatch columnist Philip Van Doorn published a list of 28 stocks that he rated tops in dividend potential this year. Four firms on the list, The Williams Cos. Inc., Archrock Inc., Valero Energy Corp. and Marathon Petroleum Corp., have significant midstream exposure. Other energy-related names included Schlumberger NV, Baker Hughes Co., Halliburton Co. and ConocoPhillips. Full disclosure: I own Williams and ConocoPhillips shares.

Given slumping business conditions, maintaining high dividends can challenge management. EnLink Midstream LLC recently cut its dividend to an annualized 75 cents per unit, but Sunil Sibal, senior analyst at Seaport Global Securities LLC, noted the move "allows EnLink to be free-cash-flow positive in 2020. The dividend cut was largely expected, and the update was viewed in a positive light by the equity investors and is also incremental positive for credit, especially with 2020 EBITDA guidance mid-point also coming in ~2.5% ahead of consensus."

We focus this issue on one of the most promising areas for the sector: exports. The changing flow of the products midstream handles is an exciting challenge—and a very dramatic one. The U.S. Energy Information Administration (EIA) pointed out in its January *Short-Term Energy Outlook* that the nation has been a net exporter only since last September. But it expects the trend to continue well into the new decade.

"EIA forecasts that the United States will be a net exporter of total crude oil and petroleum products by 0.8 million barrels per day (MMbbl/d) in 2020 and by 1.4 MMbbl/d in 2021," the EIA report said.

The sector faces multiple other issues, and we will continue to do our best to provide insights and commentary. One major development worth noting occurred in late in 2019 and might clarify the land covenant issue that emerged in the 2016 Sabine bankruptcy. A Colorado court handling the Badlands Energy bankruptcy seems to have upheld the precedent that land dedications are real property, not executory contracts to be shed in a restructuring. That could be a plus for midstream operators. It will be interesting to see what happens next on this important issue.

Separately, I want to welcome back to these pages our Regulatory Review feature written by Matt Hite, vice president of government affairs for the GPA Midstream Association. It's an election year, and I welcome his insights on what's happening in Washington. ■

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

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

RESOURCE ENERGY
EQUIPMENT

RESOURCE ENERGY EQUIPMENT
601 BENTON KELLY ST. SUITE A
SHREVEPORT, LA 71106
PHONE: (318)415-6499
FAX: (318)415-6503

Resource Energy Equipment is your service source for all natural gas drivers, compressors, generators and more. We specialize in remanufactured compressor equipments.

We offer support for onshore and offshore gas compression packages ranging from 50 HP to over 8,000 HP, for domestic and international markets.

We have aligned ourselves with the most respected suppliers and manufacturers of compressors and engines thereby ensuring quality, reliability and the latest technological advancements.

- **24/7 Call out Service**
- **Installations and Startup Services**
- **Maintenance: Preventive and Long-Term**
- **PMs on Engines and Compressors**
- **Overhauls and Exchanges**
- **Right Size your compression**
- **Parts and Recommended Spares Commissioning**
- **Critical Spare Parts**
- **Preservation**
- **Troubleshooting**
- **Restaging Compressors**
- **Engine Swings**
- **Equipment Upgrades**
- **Machine Shop Services**
- **Equipment Repackaging and Refurbishing**
- **Foundation Repairs**

WWW.RESOURCEEE.COM

Coast With The Most

Work on storage and export facilities on the water ramped up as 2019 came to a close.

By Joseph Markman

Worries that crude oil bottlenecks in the Permian Basin would shift south to the Gulf Coast have not materialized, analysts concluded as the year began, because infrastructure projects completed in 2019 in the Corpus Christi, Texas, area are enabling record levels of waterborne exports.

Market intelligence provider Genscape said the addition of almost 2 million barrels per day (MMbbl/d) of inbound pipeline capacity and 5 MMbbl of storage capacity has allowed the region to absorb the increased output from the prolific Permian. That contributed to the record average of 3.72 MMbbl/d of U.S. crude exports during the last week of 2019, the U.S. Energy Information Administration reported in a release of data.

The trend remained strong going into the new year.

In a twist, the Gulf Coast—not the Permian Basin—led the way in the adjoining table of selected midstream infrastructure projects, including plans to build another major storage facility and another fractionator in the Corpus Christi area.

Things remain active in the basin, of course. Enterprise Products Partners LP started-up its new Mentone natural gas processing plant in Loving County, Texas, early in 2020. The cryogenic facility can process 300 million cubic feet per day, extracting more than 40,000 barrels per day (bbl/d) of NGL. Supported by a long-term acreage dedication agreement, the new plant facilitates continued growth of the Delaware Basin, the company noted in an announcement.

Mentone is the seventh gas plant operated by Enterprise in the Delaware.

Gulf Coast

Joint venture partners Mercuria Energy Group and Dauphine Midstream LLC envision their Pin Oak Terminal storage facility, scheduled to open midyear in the Corpus Christi area, as a trading hub for the volumes of shale oil shipped to the coast.

Mercuria, a Swiss commodities trader, wants the 2 million barrel (MMbbl) facility to become the main crude oil price assessment location for oil flowing through Corpus Christi. Pin Oak will have the ability to export 320,000 bbl/d when it opens, though that capacity could double in 2021 when the planned Phillips 66 Red Oak pipeline is expected to go into service and bring crude to the Corpus Christi port from West Texas, North Dakota, Colorado and the big Cushing, Okla., pipeline trading hub and storage facility.

Also in the Corpus Christi area, EPIC Y-Grade LP announced its final investment decision (FID) for a second greenfield fractionator at its complex in the Corpus suburb of Robstown, Texas. The decision signals the continued ability of EPIC to lock in gathering and processing companies in the Permian Basin to fixed-fee multiyear supply contracts for their NGL.

In conjunction with making the FID, the company upsized its existing Term Loan B by $150 million to finance the project. This upsize brings the total borrowing base of the company to $950 million.

The project involved upsizing the company's existing Term Loan B by $150 million. That brought the total borrowing base of the company to $950 million.

"Our customers value EPIC as a strategic alternative to Mont Belvieu, and we are committed to providing them the highest level of service," said Phillip Mezey, CEO of EPIC.

Deepwater project

Up the coast, Enterprise Products Partners and Canadian pipeline giant Enbridge Inc. announced a letter of intent in December to jointly develop a deepwater crude oil terminal capable of fully loading very large crude carriers (VLCCs).

VLCCs, which carry most crude shipments in the world, can handle from 1.9- to 2.2 MMbbl of West Texas Intermediate (WTI) oil. Enterprise's Sea Port Oil Terminal (SPOT), an onshore/offshore facility in Brazoria County, Texas, will be capable of loading 85,000 bbl/hour or 2 MMbbl/d.

Assuming the project succeeds in obtaining a deepwater port license from the U.S. Maritime Administration, Enbridge could purchase an interest in SPOT Terminal Services LLC, which owns SPOT.

Even farther up the coast in Louisiana, Tellurian Inc.'s Driftwood LNG export project gained approval from the U.S. Federal Energy Regulatory Commission (FERC) as 2019 ended to start site preparation work, including vegetation clearing and grading, demolition and removal of existing buildings, and dredging of marine berths.

Tellurian plans to begin construction of the $27.5 billion plant sometime in 2020, with first production of LNG expected in 2023. The company said it had completed 27% of the required engineering work and ordered equipment in advance of construction.

Driftwood is designed to produce about 3.6 billion cubic feet per day (Bcf/d) of natural gas. Project partners include units of Total SA, Vitol, Petronet LNG Ltd., General Electric Co. and Bechtel Corp., which has a contract to build the liquefaction facility.

Northeast

As a raucous crowd welcomed the New Year in Times Square, The Williams Cos. Inc. welcomed the Gateway Expansion Project into full service, boosting the level of natural gas coming into the region and beating the target date by 11 months.

Gateway, an expansion of the existing Transco pipeline system, provides 65,000 dekatherms per day of incremental firm transportation capacity for the New Jersey tri-state area. Construction began in early 2019, with an original in-service projection of November 2020. However, the company attributed the early in-service to close coordination with customers, which allowed expedited project execution and construction.

Midcontinent

Holly Energy Partners LP and Plains All American Pipeline LP announced in early October they will invest a total of $130 million in a 50:50 joint venture, Cushing Connect Pipeline & Terminal LLC. Cushing Connect will build a 160,000 bbl/d common carrier crude oil pipeline that will connect the Cushing crude oil hub to the Tulsa, Okla.,

Selected Recent Midstream Construction Projects

Operator/Developer	Project	Location	Added Capacity	Play	Status/Completion
GULF COAST					
Pin Oak Terminals LLC	Crude oil storage facility	Corpus Christi, Texas	2 million bbl	JV of Mercuria Energy Group and Dauphine Midstream LLC said their project is expected to open in mid-2020.	Expected to begin second half of 2020
Tellurian Inc.	Driftwood LNG export project	Near Lake Charles, La.	27.6 mtpa	In December 2019, FERC approved request to start site preparation work.	N/A
Enterprise Products Partners LP, Enbridge Inc.	Sea Port Oil Terminal	Brazoria County, Texas	2 million bbl/d	Companies sign letter of intent to develop the deepwater terminal capable of loading VLCCs.	Beginning service mid-2021
Epic Y-Grade LP	Fractionator	Robstown, Texas	110,000 bbl/d	FID made on second greenfield fractionator in the Corpus Christi, Texas, area.	First half of 2023
NORTHEAST					
The Williams Cos. Inc.	Gateway Expansion Project	New York State, New Jersey, Pennsylvania	65,000 dekatherms/day	Expansion of the Transco pipeline went into service at the close of 2019.	Fourth-quarter 2019
MIDCONTINENT					
Holly Energy Partners LP, Plains All American Pipeline LP	Cushing Connect Pipeline and Terminal	Cushing, Okla., connected to Tulsa, Okla., refining complex.	160,000 bbl/d pipeline; 1.5 million bbl storage	Joint venture terminal expected to be in service in second-quarter 2020; pipeline in service in first-quarter 2021.	Fourth-quarter 2019

Source: Hart Energy

refining complex some 60 miles away, owned by a subsidiary of HollyFrontier Corp. Also included is ownership and operation of 1.5 MMbbl crude oil storage in Cushing.

The terminal is expected to be in service in the second quarter, and the target in-service date for the pipeline is first-quarter 2021. The project is backed by long-term commercial agreements.

Eagle Ford

Goodnight Midstream LLC announced an expansion of its Eagle Ford Shale operations in late November, including the start of construction of a saltwater injection facility in DeWitt County, Texas. The company also rebranded Wyatt Water Solutions LLC, which is now under the Goodnight corporate umbrella.

In October, Goodnight received a commitment of more than $500 million in growth capital from Tailwater Capital LLC to support the expansion.

The saltwater disposal facility, named Rooster, will be located south of Yorktown, Texas, and will serve both piped and trucked volumes. Rooster is expected to expand Goodnight's Eagle Ford operations to include three saltwater disposal facilities and 40 miles of pipeline in DeWitt and Atascosa counties.

Bakken

Dakota Access LLC will nearly double the flow of its oil pipeline through North Dakota if the North Dakota Public Service Commission approves the project. The Standing Rock Sioux Tribe opposes the plan, contending that spills could foul their drinking water and a sacred lake.

Dakota Access, controlled by Energy Transfer LP, wants to build a pump station as part of an upgrade to boost capacity of the 1,172-mile underground pipeline from 570,000 bbl/d to 1.1 MMbbl/d. The extra capacity is seen as critical to handling expanding crude output from the Bakken Shale.

Construction would take eight to 10 months, starting this spring, Energy Transfer's vice president of engineering, Chuck Frey, told the state commission.

Canada

Rangeland Midstream Canada Ltd., a wholly owned subsidiary of Rangeland Energy III LLC, said it commenced the construction of its Marten Hills Pipeline System in October 2019. The system consists of new crude oil and condensate pipelines located in the Marten Hills region of north-central Alberta.

The Marten Hills Pipeline System will extend about 53 miles to an interconnect with Plains Midstream Canada's Rainbow Pipeline System, which serves the Edmonton, Alberta, hub and refining market. The Marten Hills system is expected to come into service in second-quarter 2020. ■

Joseph Markman *can be reached at* ***jmarkman@hartenergy.com*** *or* ***713-260-5208.***

Bright Spots In A New Decade

Familiar challenges remain, but growing export markets buoy the midstream.

By Paul Hart

A new year, a new decade, but the sector faces lingering issues. The oil and gas business continues to confront low prices, abundant supplies/flat demand and ESG (environmental, social and governance) concerns.

But some industry observers turned optimistic as 2020 got underway.

"Pending further hostilities between the U.S. and Iran, or other geopolitical events around the world, it's not outside the realm of possibility that WTI [West Texas Intermediate] crude prices could hit $70 per barrel (bbl) based on three factors," Ryan Dusek, director in the commodity risk advisory group at Opportune LLP, said in a recent research report. The factors he named were:

- **Political risk**—"The ever-increasing U.S. sanctions may continue to escalate tensions and draw a more severe Iranian retaliation, forcing prices up to this expected level;"
- **Hedge prices**—"The futures market is quietly indicating this risk is only temporary. While WTI prices have increased nearly 30% since August, expected hedge prices have barely increased by 5% … my analysis indicates that we need a minimum WTI price of $70/bbl to qualify as this extreme condition;" and
- **Technicals**—"With minimal changes to my long-term fundamental outlook, slowing demand and strong growth in U.S. supply will continue to dominate for the foreseeable future."

The Aframax tanker *Eser K* rides high in the water as loading begins at EPIC Midstream Holdings LP's new Corpus Christi, Texas, dock. The vessel, under charter to Russia's Lukoil, handled the first shipment from the facility, formerly used for grain loading. EPIC plans to open a second dock on Corpus Christi's ship channel in the third quarter as worldwide demand for U.S.-produced light sweet crude grows. *Source: DataWing Global*

Feeling better

"We're feeling much better going into 2020 than we have the past five years—and they have been a long five years," Becca Followill, senior managing director and head of equity research at U.S. Capital Advisors LLC, told clients as the year began.

"Beyond the obvious themes of slowing production and the follow-on impact to midstream, our key themes for 2020 are:

- A forced look at corporate governance;
- The need to check additional boxes;
- Eliminating traditional 'MLP math'; and
- The resulting bifurcated multiples from those who don't adapt to a new reality.

"So what do we think works in 2020? 2019 was an easier call, as it was a blue-chip rally kind of year. But those stocks have had a tremendous run, and we think investors are willing to move a little further up the risk spectrum in 2020," she said.

A Wall Street willing to take a second look at the midstream—and oil and gas overall—would be great news as the buildout continues. Oil and gas production continues to climb, but growth has slowed. That might help the midstream catch up.

Followill isn't alone in assessing promise in this year.

"2019 was another volatile year—though many parts of the value chain are moving in the right direction as we move further into 2020," Raymond James said in the introduction to its annual midstream outlook. "After appreciating moderately through the first ~8 months of 2019, the benchmark Alerian MLP Index struggled from August to early December—and finished the year just slightly in the red (although the index generated a high-single-digit total return).

"Despite a lukewarm market reaction, 2019 largely featured solid earnings and operating results; however, capital allocation, governance/alignment concerns, and upstream sensitivity (e.g., contract/counter-party risk and expected production/takeaway mismatches) dominated the narrative," the outlook said.

The export game

It added a succinct forecast for midstream later in the report: "The game is all about exports."

In recent years, it's a game the U.S. has played well. DNV GL published an oil and gas industry research report early this year that refers to a "meteoric rise up the oil and gas exporter charts" by the U.S.

"A decade ago, the country had an oil-trade deficit of 12 million barrels a day (MMbbl/d) but, in September 2019, for the first time in over 70 years, the U.S. recorded a full month of oil exports exceeding imports. In 2020, U.S. oil exports are expected to grow once again, from 2.8 MMbbl/d currently, to 3.3 MMbbl/d, as new pipelines in Texas increase capacity."

The midstream sector must deal with that challenge in this decade—something absolutely unthinkable as 2010 began. The whole wellhead-to-customer flow has changed as who the "customer" is has changed.

The U.S. has emerged as a major exporter of crude oil and natural gas. Meanwhile, its role as a significant petroleum product supplier has grown.

Exports? It's a nice problem to have, but how to handle the business?

Flaring's Finale?

Multiple NASA photos taken from the International Space Station feature strange bright spots popping out of inky black nights in the otherwise empty Sahara, Arabian Peninsula and remote corners of North America.

They are flares, the energy industry's painful, no-other-choice answer to the lingering question: "What to do with the natural gas?"

The industry and royalty owners want the problem solved because flared gas equals lost revenue. Regulatory agencies don't like it. Now, financial markets' increasing emphasis on ESG–environmental, social and governance–issues has given an additional push to end flaring.

It's hardly a new problem. Participants in Oklahoma's early 20th century oil boom told how a pedestrian could easily walk the 10 miles of rough dirt road between Drumright and Cushing at night without a lantern. The constant string of flares, adjoining nearby wells or power houses, lit the countryside nicely. Think Times Square, the area had no gas-gathering network at the time. Tellingly, Cushing already had emerged as a crude oil storage and pipeline hub.

Crude oil and the heavier gas liquids are preferred products, and without the gathering systems, processing plants and pipelines needed to move the gas to market, there's nothing to do but burn it. Even if there were sufficient midstream infrastructure, who wants the gas? In vacant parts of the planet, the answer is no one.

Advancing LNG technology and growing midstream infrastructure may be slowly solving the problem.

A recent Raymond James research report estimated the 4% of the world's annual gas production burns away on flare stacks–wasted.

"At 14 Bcf/d [billion cubic feet per day], the amount of gas flared globally is almost on par with the gas production of China, and more than Saudi Arabia's," the report said. Or, roughly the entire daily gas production of the Permian Basin as 2019 ended, according to the U.S. Energy Information Administration.

"There is no overarching global regulation of flaring, but the World Bank is leading an initiative called Zero Routine Flaring (ZRF) by 2030," the Raymond James study said. "This is in the broader context of United Nations climate talks … As of year-end 2019, 32 national and subnational governments have signed up, including 10 of the top 15 flaring countries …

"In aggregate, these 32 jurisdictions account for approximately 60% of global flaring. Each participating country has committed to eliminate flaring, with the exception of what may be required for safety reasons or under special circumstances, over the next decade. Participation in ZRF does not necessarily imply national legislation to ban flaring–for example, the U.S. has no such law at the federal level–but at least there is a publicly declared commitment."

The trend could boost share prices for producers, midstream operators and the burgeoning LNG export business.

"However, investing on this specific premise would be rather tenuous; both the timetable and the magnitude of ESG score improvement are very difficult to quantify. In thinking about how to play this theme, therefore, we would steer investors towards the relevant technology providers," Raymond James said.

But there's a long ways to go to put all the pieces together, the report noted. "If it were automatically a 'slam dunk,' there would be no need for flaring" now.

–Paul Hart

A recent Stifel report referred to a worldwide "tectonic shift toward lighter hydrocarbons"—toward exactly what the U.S. has to offer to foreign customers, thanks to the light sweet crudes typical of the shale plays. Many industry observers believe the Jan. 1 mandate by the International Maritime Organization sharply restricing high-sulfur bunkers will further speed the trend.

Crude oil

The world's political hotspots seem to oddly correspond with major oil fields with one significant exception—the U.S. Repeal of the crude export ban five years ago opened a new market to domestic producers, and that created the present challenge from midstream operators: How to get the oil to docks? New infrastructure had to go in harborside to move the product.

And so investment in new, outward-facing assets continues.

EPIC Midstream Holdings LP loaded its first cargo of crude as 2019 ended from a repurposed wharf on the Corpus Christi Ship Channel, refitted to handle oil rather than grain. It can handle Aframax tankers (750,000 bbl) at 20,000 bbl/hour.

The dock complements the company's new 600,000 bbl/d crude pipeline that links the Permian and Eagle Ford plays to Corpus Christi. The San Antonio-based operator plans to open a second, larger dock on the Corpus channel in the third quarter. It will be able to handle Suezmax tankers (1 million bbl) and load at 40,000 bbl/hour

"A low-sulfur barrel is going to be a very attractive barrel, so demand is strong right now" for crude produced in the Permian Basin of West Texas and New Mexico, EPIC President Brian Freed told Reuters as 2019 ended. "There's room for a lot of projects to get done."

And EPIC plans to go lighter, further proof of that "tectonic shift."

The firm plans to open a 900,000 bbl/d crude line in the first quarter and will begin offering a second, ultralight crude grade—West Texas Light—as it batches Permian Basin shipments. It rates above 44 API gravity, still lighter than the light 39.6 API gravity for WTI.

> "If you're a small- to medium-sized company, I would say one of the best things you can do is to do a joint venture, either with a large U.S. company that's going into that particular market or with an international company."
>
> – **Kenneth Haynes**, *senior international trade specialist, U.S. Department of Commerce*

NGL

EPIC will complement its existing crude system during the first quarter with a 400,000 bbl/d pipeline dedicated to Y-grade (mixed NGL) service. The firm's building a related separator at Robstown, Texas, outside Corpus Christi.

The largest gas liquids shipping points have been at Houston, Targa Resources Corp.'s Galena Park operation and Enterprise Products Partners LP's operation—the largest of them all. It handled an average of 509,000 bbl/d in second-half 2019 following a major expansion.

Abundant gas liquids supplies create opportunities for NGL-based petrochemicals produced in the U.S. to move abroad. Enterprise, ranked No. 4 on this publication's Midstream 50 list of the largest publicaly held midstream players, started up a new isobutane dehydrogenation unit earlier this year at the big Mont Belvieu, Texas, NGL hub, east of Houston. Enterprise said the unit eventually will have a 25,000 bbl/d capacity, producing nearly 1 billion pounds per year of both high- and low-purity isobutylene—a feedstock for lubricants, rubber goods, alkylate for high-octane gasoline and methyl tertiary butyl ether.

Worth watching in the decade ahead: The push by some environmental groups to move U.S. regular-grade gasoline to a higher octane rating—in keeping with the standard in Europe—would require a substantial increase in alkylate production.

Cheaper, U.S.-produced ethane and other gas liquids have found growing markets overseas as feedstocks for polyethylene and polyproplyene, backing out naphtha.

In January, Enterprise and Navigator Holdings Ltd. announced the first cargo of ethylene had been shipped from their 50:50 joint venture (JV) marine terminal located at Morgan's Point, along the Houston Ship Channel. The Liberian-flagged *Navigator Europa* carried 25 million pounds of ethylene for Japan's Marubeni Corp.

The new terminal features two docks and the capacity to load 2.2 billion pounds per year of ethylene. A refrigerated storage tank for 66 million pounds of ethylene is being built onsite

PROJECTED U.S. LNG EXPORTS

Year	Bcf/d
2019	5.0
2020	6.5
2021	7.8
2022	8.0
2023	9.0
2024	9.0

Source: Enverus

Operator Looks To Lift Helium Sales

Perhaps the most valuable export produced by the U.S. oil and gas business isn't oil or gas. Rather, it's helium, that ultralight, inert gas vital to products ranging from party balloons to MRI scanners to nuclear bombs.

Helium prices routinely float well above $100 per thousand cubic feet. Yes, you read that number right.

There's just not much of it on earth, but the largest commercial source lies in natural gas fields below the Texas and Oklahoma panhandles, extending to western Kansas and eastern Colorado. The region's Hugoton Field has been the largest helium souce for decades but is in steady decline.

Tumbleweed Midstream LLC recently acquired the Ladder Creek helium plant in eastern Colorado from DCP Midstream LP in hopes of cashing in on strong helium demand here and abroad.

"The U.S. is the world's largest helium producer," Durell Johnson, Tumbleweed CEO, told *Midstream Business*. "At the same time, the world supply of helium is suffering from a multiyear shortfall. This has boosted prices for natural gas with a high helium content and has begun to raise red flags in industries that depend on helium.

"The helium is there; it's highly valuable, and by extracting it Tumbleweed can return premium netbacks to the producers in the region," Johnson added. Some fields feeding the plant have 3% helium concentrations–among the highest anywhere.

Ladder Creek has a capacity to process 40 million cubic feet of natural gas per day (MMcf/d), expandable to 50 MMcf/d. From that stream, it can extract as much as 1.5 MMcf/d of helium.

Some 730 miles of gathering lines either side of the Colorado/Kansas border support Ladder Creek. The plant's NGL production flows to the Conway, Kan., fractionator via a DCP pipeline.

–Paul Hart

and will increase the capability to load ethylene up to a rate of 2.2 million pounds per hour. Tank construction is expected to be completed in the fourth quarter.

Gassing up

The unconventional plays produce natural gas in abundance, leading to woeful domestic prices. The Permian Basin's Waha Hub spent much of 2019 in negative price territory: Producers had to pay somebody to take methane off their hands. New gas pipeline capacity out of the Permian will be a priority for the next few years.

Kevin Sakofs, senior analyst for North American natural gas for S&P Global Platts, told Hart Energy that activity levels across key dry gas plays have dropped precipitously since June 2019, and "this is largely due to a softening dry gas commodity backdrop." Appalachia and the Permian have been particularly hard hit.

Adding to worries is a challenged global gas market and its potential impact on LNG exports, which Sakofs said is a critical component of the demand forecast. About 2.7 Bcf/d of additional liquefaction capacity is expected this year, pushing feed gas flow to terminals to new highs, the analysts said. However, market conditions could impact the growth.

"A lot is riding on Asia having a cold winter," but it doesn't have much storage. That means LNG molecules must flow elsewhere, Sakofs said, questioning whether Europe—which has high storage—could be the balancing mechanism again next year.

But how much worse would the situation be without exports? See adjoining stories in this issue for additional information on LNG exports.

Mexico's midstream muddle

But not all gas exports must be liquefied.

"The Mexican market is critically important to Permian producers," RBN Energy said in a report published last year. "Rising gas demand south of the border …" is key to producers' "plans to significantly increase production of crude oil, which brings with it large volumes of associated gas. All that gas needs a market, and nearby Mexico is a natural." Mexico's electricty provider, Comisión Federal de Electricidad, has worked to add multiple gas-fired power plants and the gas pipelines needed to support them.

The U.S. Energy Information Administration estimated gas exports to Mexico at 5.1 Bcf/d in late 2019—up 10% from year-earlier figures.

However, the Mexican gas market has not grown as quickly as Permian producers have hoped due to construction and regulatory slowdowns south of the border. "But what pipeline capacity has been added across the border from West Texas is already changing Mexico's gas market," RBN noted. "The El Encino Hub in Northwest Mexico is one such area where there are signs of a shifting supply-demand balance."

Product possibilities

But wait, there's more: The U.S. has a great story to tell about refined products. Some of the largest and most efficient refineries in the world can produce gasoline, diesel, etc., cheaper than smaller, dated plants overseas.

"U.S. net imports of crude oil and petroleum product fell from an average of 2.3 MMbbl/d in 2018 to an average of 0.5 MMbbl/d in 2019," the U.S. Energy Information Administration (EIA) said in its January *Short-Term Energy Outlook*. "EIA estimates the United States has exported more total crude oil and petroleum products than it has imported since September [2019].

"EIA forecasts that the United States will be a net exporter of total crude oil and petroleum products by 0.8 MMbbl/d in 2020 and by 1.4 MMbbl/d in 2021."

Entering the export business can be daunting. It's, pardon the expression, a different world. One mistake newcomers make is to view the foreign market as a monolith, Kenneth Haynes, senior international trade specialist with the U.S. Department of Commerce, told *Midstream Business*. Nations' policies and politics vary widely.

"Certain regions of the world are a little bit more problematic … the Middle East, certain countries in Africa, and some Central and South American countries, all pose unique and complex business and political climates. The U.S. Department of Commerce [and] U.S. Commercial Service is in place to assist U.S. companies with navigating some of those complexities," he said.

Haynes cited one Latin American example.

"The new president of Brazil has moved the needle in regards to ease of access to the Brazilian market. Past complications have come in varied ways, from project approvals to the issuance of visas. As of September 2019, Brazil does not request a visa for entry and Brazil has adopted Global Entry. If you, as a U.S. company, have a Brazilian partner, Global Entry allows greater ease for your partner to visit your U.S. operations.

"Small- and medium-sized companies are who we primarily work with," Haynes said of the U.S. Commerce Department and Commercial Service. "Unfortunately, not all companies have the expertise to go abroad on their own. U.S. Commercial Service has foreign contacts that can be of great assistance," he added.

"If you're a small- to medium-sized company, I would say one of the best things you can do is to do a joint venture, either with a large U.S. company that's going into that particular market or with an international company. We can assist you with that."

Regulatory changes

But JVs have their own complications, thanks to recent changes in federal law.

A number of new federal regulations on exporting took effect in February, Robert Soza Jr., partner with Jackson Walker LLP and an oil and gas export law specialist, told *Midstream Business*. The Treasury Department issued regulations implementing the Foreign Investment Risk Review Modernization Act of 2018 (FIRRMA). The greater impact will be in such areas as restrictions on upstream technology, Soza said.

"There are a number of oil and gas installations that are covered there," he said. Specifically, "individual refiners with the capacity to produce 300,000 or more barrels per day of refined product, or the capacity to produce in aggregate 500,000 or more barrels per day of refined oil and gas products.

"Also, storage facilities that have the capacity to hold 30 MMbbl or more, and it covers all the LNG export areas." The regulations "also cover interstate rural pipelines that have the capacity to transport 500,000 bbl/d or more of crude, or 90 million gallons per day or more refined product. Also, current pipelines with an outside diameter of 20 or more inches.

"So, if you're one of these facilities as listed here, and you have someone who's going to become a foreign investor, you have to really be careful about how you're going to structure that foreign investment," Soza added. "Because that foreign investment allows the investor—the foreign investor—to have access to nonpublic technical information, either because they get a seat on the board, or because they have a right to it pursuant to due diligence, or they have a right to involve themselves in substantial decision making with the company.

"You're going to have to file one of these Committee on Foreign Investment in the United States (CFIUS) disclosures. You're going to have to go through the CFIUS process, which could take somewhere in the neighborhood of anywhere from three to six months. So this could cause some delays in some of your deals that you do in this area."

He added the procedure has created "a Hart-Scott-Rodino-type of approval process for foreign investment that was going to be more focused on national security."

There's room for growth in the new decade, and early-2020 political trends make export opportunities even more important. As noted earlier, the Mideast's lingering political instability makes the U.S. an attractive supplier to wary energy customers. Also, a prospective settlement to the U.S.-China trade dispute looks promising, even as the coronavirus scare upsets world trade. The first phase of a deal calls for China to increase U.S. energy imports above 2017 levels.

"Larger purchases of U.S. crude oil exports will be the primary method for China to comply with this agreement," Ann-Louise Hittle, vice president-macro oils at Wood Mackenzie, said in statement after the two nations announced the deal. But meeting that multibillion-dollar target is going to be challenging. Hittle noted China imported about 300,000 bbl/d of U.S. crude oil in 2017, valued at $5.8 billion, she said. ■

"So, if you're one of these facilities… and you have someone who's going to become a foreign investor, you have to really be careful about how you're going to structure that foreign investment."

– **Robert Soza Jr.**, *partner, Jackson Walker LLP*

***Velda Addison** contributed to this report.*

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

CONFERENCE & EXHIBITION

DUG PERMIAN BASIN

April 6-8, 2020

Fort Worth Convention Center | Fort Worth, TX

The Permian at 100

Foundation for the Future

Attend DUG *Permian Basin* April 6-8, 2020 to:

- Hear in-depth presentations and unique Q&As by 20+ executives from the most active Permian producers
- Find out what operators are doing today to improve results, cut costs and drive positive cash-flow
- Explore efficiency-focused solutions on the exhibit floor and get questions answered in real-time.
- Get face-time with peers and other industry professionals during 13+ hours of dedicated networking

Never attended a DUG conference? Then learn for yourself what makes "the DUG experience" distinctively different among industry events. The potent blend of "what works, what doesn't, and what's next?" delivers takeaway value throughout the year.

Register today at DUGPermianBasin.com

April 6

Permian Basin Water & Sand Forum
10:30 AM - 4:45 PM

A&D Forum
1 PM - 4:30 PM

Separate registration required.

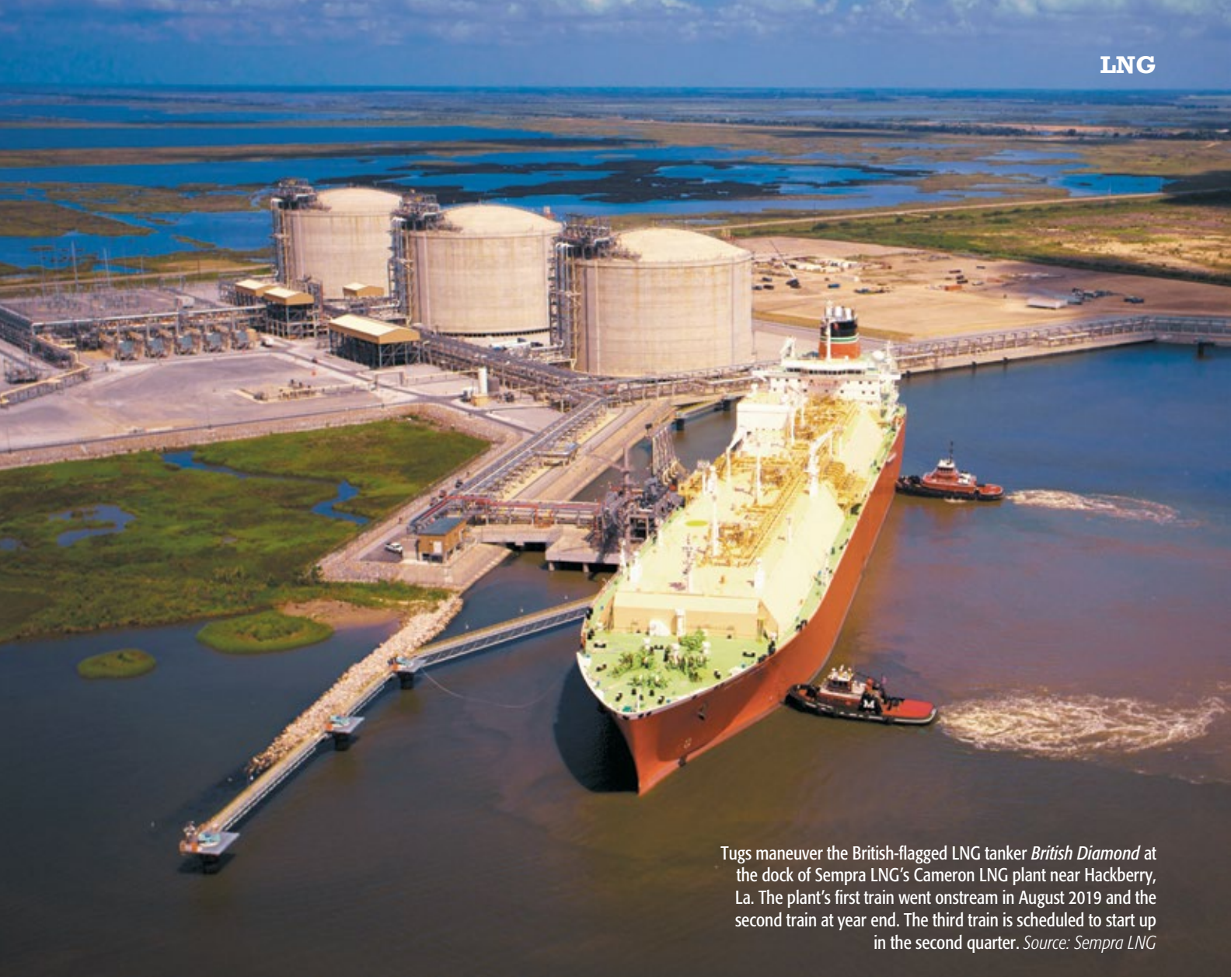
Sponsored by:

Premier: Freemyer Industrial Pressure L.P.; NSAI Netherland, Sewell & Associates, Inc. Worldwide Petroleum Consultants

Platinum: Universal Pressure Pumping, Inc.; Universal Wireline

Presented by: HARTENERGY

Hosted by: E&P; Oil and Gas Investor; Midstream Business



Tugs maneuver the British-flagged LNG tanker *British Diamond* at the dock of Sempra LNG's Cameron LNG plant near Hackberry, La. The plant's first train went onstream in August 2019 and the second train at year end. The third train is scheduled to start up in the second quarter. *Source: Sempra LNG*

'A New Gas Order'

Growing U.S. LNG exports reshape the world's market for gas.

By Scott Weeden

The International Energy Agency reported in its World Energy Outlook 2017, "A new gas order is emerging, with U.S. LNG helping to accelerate a shift toward a more flexible, liquid global market."

U.S. LNG exporters are certainly turning world markets topsy-turvy. Since Cheniere Energy Inc. began commercial operations at its Corpus Christi Train 1 in Texas in 2016, the U.S. has overtaken Malaysia as the third largest exporting country.

"The U.S. has truly been a game changer for the industry. We think that U.S. LNG competition has resulted in a more dynamic, more competitive and more resilient trade system, which is good for everyone," said Andrew Walker, vice president of LNG strategy and communications for Cheniere, at last fall's Gastech Conference in Houston. "It is making LNG more abundant, more affordable and more secure for buyers."

Diverse customers

Cheniere now has 20 long-term customers. Walker noted that when looking at these customers, there are different types, including national oil

companies, international oil companies (IOCs), trading houses and utilities as well as different geographies.

Most companies are generally in agreement on LNG trade. Shell said in its LNG Outlook 2019 that LNG trading reached 313 million metric tons (MMmt) in 2018. The company expects LNG demand to reach 384 MMmt this year.

China has emerged as the world's largest gas importer with LNG imports doubling in two years. LNG exports grew by 27 MMmt with half of the growth coming from Australia.

"Encouragingly for the long-term health of the global LNG market, the average length of contracts doubled from around six years in 2017 to about 13 years in 2018. There were more than 1,400 spot cargoes in 2018," according to Shell.

"A rebound in new long-term contracting in 2018 could revive investment in liquefaction projects. There is a potential for a supply shortage in the mid-2020s unless more LNG production project commitments are made soon," said the company.

In three short years, the industry has gone through a major transformation when it comes to contracts, indexation, pricing, gas supply, markets and players. More change is on its way.

Peak demand

"Global gas demand will peak in 2033, then slowly decline to 2050 with some variation in supply sources. Conventional onshore gas production will peak in 2033 with offshore gas production peaking in 2040," according to DNV GL's Energy Transition Outlook 2019.

"Unconventional onshore gas is forecast to continue rising slowly to [2050]," said Hans Kristian Danielsen, marketing and sales director, oil and gas, at DNV GL, in a recent presentation. "We see gas continuing to grow. It will actually surpass oil as the world's primary energy source in 2026 and continue to grow into 2033."

Demand for LNG will follow a similar trend. The company's model shows that 298 MMmt of LNG were traded in 2018. For 2019, it predicted total trading of 320 MMmt. In 2050, the model predicts a little less than 1,200 MMmt.

The predictions point to a rosy future for U.S. LNG. There are now 42 LNG importing markets. A record for new sanctioned capacity is expected for the 2019-2020 period. "That's over 100 million metric tons of new capacity … alone and quite a few of those have already reached final investment decision," said Elizabeth "Betsy" Spomer, board adviser for Gas Strategies Group Ltd.

But there are some potential difficulties as with all complex negotiations. The new capacity "is going to have huge implications going forward as this market probably stays unbalanced to the buyers' benefit," she said.

Portfolio players

"One of the things that has allowed this to happen is a breakdown in the development of supply through the emergence of portfolio players—the big IOCs that take equity positions in these projects and then use their balance sheets to support sales and purchase agreements with or without designated markets. It will be interesting to see how this imbalance plays through the next several years," Spomer continued.

"Gas Strategies projects the market is going to stay on into the late 2020s based on what's been achieved to date. You have a 250 million metric ton variance between supply and demand in 2035. That's massive," she said.

At the Gastech conference, Spomer questioned, "Where are the deals? Why haven't we seen a whole slew of deals announced? Where are all pending FIDs [final investment decisions]? I think uncertainty and current low prices have been a drag on all these things."

Blackstone Energy Partners CEO David Foley said the developers of the next wave of U.S. LNG projects will face "tougher" market conditions for bringing new plants online at the conference.

"In terms of liquefaction capacity that gets FID from the U.S., the hit rate will be a lot higher on projects either sponsored by major oil companies or expansions of existing facilities. I think the hit rate will be pretty low if you don't have a customer that is willing to do a long-term offtake and its investment grade," he said.

Permits might get tougher after the election this November, and pipeline construction might too, Foley noted.

"The hit rate will be a lot higher on projects that are either sponsored by major oil companies because they can contract themselves or are expansions at existing facilities. You might have one or two new startups that might make it," he said.

Blackstone committed $2 billion in equity to Cheniere seven years ago for liquefaction at Sabine Pass. "Cheniere has done a fantastic job in terms of bringing those facilities on time and on budget—actually a little bit ahead of schedule—and delivering reliable service to the customers. The whole idea of the Henry Hub-based prices has really taken off globally," he said.

"Getting long-term contracts from investment-grade companies that could stand behind the contract and provide a good sensible basis for project financing wasn't easy then, but it seems to be even harder in the current market. LNG is in something of a glut right now, which makes it harder to sign up a long-term contract," Foley added.

The new model

One of the major changes in the LNG industry has to do with increased competitiveness, according to DNV GL's Danielsen.

"On the demand side, people are really looking for more flexible contracts. Many potential buyers don't have the consumption or outlook to agree to 20-year, 1 million metric tons per year contracts," he said.

In other words, there is a changing landscape in the LNG portfolio.

"We're moving away from the old model with one operator controlling the full value chain—export, transport and import, like Shell, Petronas, etc.," Danielsen continued.

On the international supply side, there's plenty of activity in Australia. "Our forecast suggests that Australia's competitiveness will lead to more LNG trains," he said. "Qatar is also starting to build more trains, which should bring capacity to 110 million metric tons. Russia is also high on the radar with

The East Coast gained its second LNG export operation in late 2019 with the startup of Kinder Morgan's Elba Island plant near Savannah, Ga. Dominion's Cove Point, Md., liquefaction operation on Chesapeake Bay, entered service in 2017. *Source: Kinder Morgan Inc.*

Arctic LNG 2 and Yamal coming onstream."

Where is the gas going? Look to China, which increased its imports by 38% from 2017 to 2018 to 56 MMmt.

In first-half 2019, "China had imported 28 million metric tons, which would lead to a 17% increase from 2018," Danielsen said, adding that "we see a massive increase in demand from India."

The market is definitely moving more toward flexible contracts. "Our forecast shows that North American LNG has become even more competitive," Danielson said.

Competition's benefits

This competition is helping the LNG marketplace. Buyers have more options to supply and manage their markets and more ability to choose the supply that suits them best, noted Cheniere's Walker.

"We embrace competition. We think that U.S. LNG competition has resulted in a more dynamic, more competitive and more resilient trade system, which is good for everyone. It is making LNG more abundant, more affordable and more secure for buyers," he said.

The background to the whole story is U.S. resources.

"We have tripled the resource base over the past decade. The Potential Gas Committee released their assessment for 2018 for future gas supply at 38 Tcf [trillion cubic feet]," he said. "That also has been developed at reduced prices. Average gas price was over $8.50 per million British thermal units [MMBtu] in 2005. Today year-to-date the price is $2.66/MMBtu."

Most markets and trades tend to evolve toward increasing competition. "LNG is doing that. We are in a very different business in the U.S. with that latent supply than we would be without it," he said.

"Price diversification is something we offer in the U.S. that allows people to move away from the secondary indexation against oil. Destination flexibility has really changed the industry and is creating liquidity and a sustainable low-cost supply over the long run," Walker continued.

The U.S. has increased industry diversification because the U.S. does not export as a national player. "It allows project-on-project competition unlike many exporters. We're really seeing increased competition interproject, increased commercial competition, increased technology and cost innovation. It is going to drive liquidity," he said.

"The U.S. is driving competition in the marketplace but more importantly driving liquidity. You can appreciate the impact this is having in the marketplace," he added.

Premier provider

Sempra LNG said in an early 2020 announcement that its goal is to become the "premier" North American LNG company. The firm revealed an interim participation agreement with Aramco Services Co. for its Port Arthur, Texas, project.

"The measure of 'premier' for us is reaching 45 million metric tons per year," said Justin Bird, president at Sempra LNG. "Our focus is really on building the infrastructure in North America so that we can export clean-burning U.S. natural gas to other countries around the world as they make a clean-energy transition."

The company's plan to reach that goal includes three trains at Cameron LNG, Phase 1 at Energia Costa Azul (ECA) in Mexico, the first two trains at Port Arthur LNG, Phase 2 at Cameron LNG and Phase 2 at ECA.

The first step in the plan began last year with commercial operations with Train 1 at Cameron LNG. The second train started liquefaction operations in December 2019, with the third train coming online in second-quarter 2020. That will be the first 12 MMmt/year, Bird explained.

Sempra has much of its capacity under contract, memorandum of understanding or heads of agreement. "Cameron Phase 1 is fully contracted to Mitsui, Mitsubishi and Total. Total has signed an MOU to take up to 9 million metric tons per year of capacity of both Cameron Phase 2 and ECA LNG, which would be an expansion. It is likely the customers would be the same as Phase 1," he said.

Getting it wrong

Sempra has learned quite a few lessons between the development of Cameron LNG as a regasification facility and its redevelopment into a liquefaction plant.

"We got regas so wrong, as did many others, but it became pretty attractive for liquefaction. I would say being able to take underperforming assets and turning them into wonderful projects is a great experience. That really worked well," Bird said.

Sempra has taken advantage of both Cameron LNG and ECA being

brownfield projects. "Cameron Phase 1 was a regas asset that was being underutilized. What it allowed us to do is take a lot of that infrastructure and use it to see significant savings versus a newbuild. Some of the common facilities are in place. Right now the parties are figuring out what is the optimal design for the Phase 2 expansion to make it very cost competitive," Bird said.

Port Arthur is a greenfield project.

"What's really different there is that you have a site that is expandable up to eight trains. We have some parties that want a significant equity holding. Port Arthur is a project where they can have equity," he added. "Saudi Services is interested in Port Arthur for three reasons: Sempra can build it economically, there is a large site capable of significant expansion and they can have a significant equity holding," he continued.

Although Cameron LNG is a tolling facility, both Port Arthur and ECA will be based on sales and purchase agreement models. That means Sempra will be responsible for gas supply to the plants. "At ECA, we will basically use existing U.S. infrastructure, probably with adding a compressor or other minor upgrade. The pipelines in Mexico are operated by our affiliate IEnova," Bird said.

For ECA Phase 2, Sempra would build a new pipeline from the Permian Basin to ECA, which would be located in either Mexico or the U.S.

"For Port Arthur, we see the Gulf Coast as a draw. We're comfortable that the Permian revolution is what is underpinning a lot of the U.S. LNG. There are vast amounts of natural gas looking for foreign markets because it is associated gas. The options are to flare or stop oil production. Through our infrastructure, we can help that gas find a home around the world," he said.

Bullish on LNG

The industry has a bullish 2020 forecast for FIDs, based on record numbers in 2019. The prognosis is generally good for mid-scale liquefaction.

"The preferred model, certainly for North American liquefaction and export, is mid-scale where total plant capacity is achieved through multiple modules rather than a single large train. Mid-scale developers are specifying lower costs per metric ton of LNG produced and shorter project timescales versus traditional baseload," said Paul Shields, director of marketing for Chart Industries Inc.

At the opposite end of the LNG chain, small-scale import terminals, like the Klaipeda, Lithuania, floating storage and regasification unit, are proving the economic and technological viability of small-scale LNG storage and distribution. Standardization and modularization are crucial in reducing cost and timescale, and small-scale terminals also provide operational flexibility.

Integrated systems, comprising storage, vaporization and delivery, bring natural gas power to off-grid locations through the LNG virtual pipeline. Chart has experience with both large projects, such as powering generator sets at mines, through to enabling small/medium enterprises to switch to natural gas from other liquid fuels.

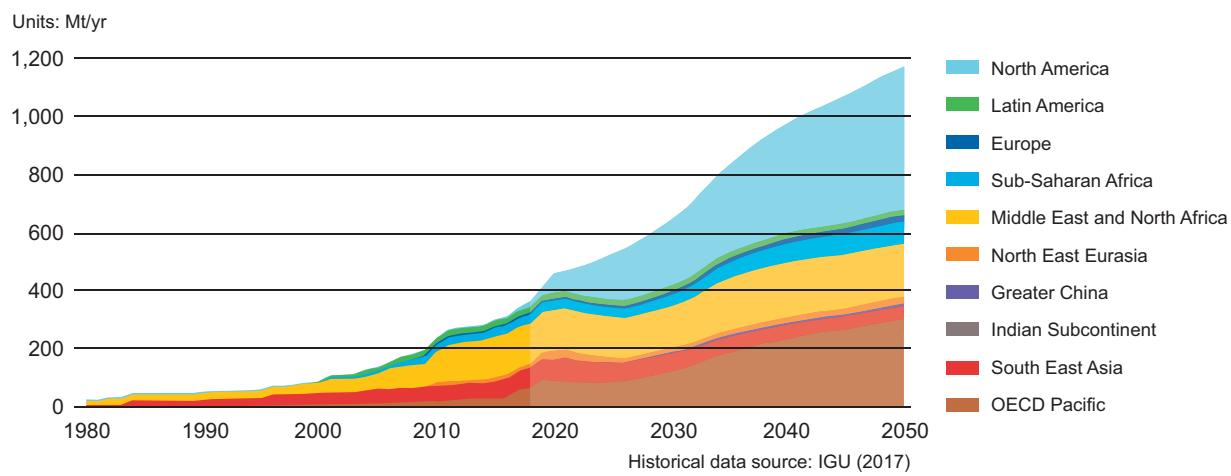
In the marine sector, new International Maritime Organization regulations mandate that sulfur content in marine fuels has to be reduced from 3.5% to 0.5% and to 0.1% in emission controlled areas. LNG achieves this. Consequently, there has been a large increase in the number of LNG-fueled vessels on the water, under construction and ones classed as marine ready.

That means that greater investment is needed in the bunkering infrastructure, and there are a number of new facilities in operation or being built, both land-based and bunkering vessels.

In Europe, there are a number of companies investing in developing the refueling infrastructure for LNG trucks. Main drivers promoting LNG over diesel are environmental and, in particular, the elimination of particulates. ■

__Scott Weeden__ is a Houston-based writer specializing in oil and gas industry topics.

Gas Liquefaction by Region



Source: DNV GL

JASPER VENTURES

VERITAS
GAS PROCESSING

VULCAN
FIELD CONSTRUCTION

VANGUARD
PROCESSING SOLUTIONS

VIKING
DEW POINT CONDITIONING

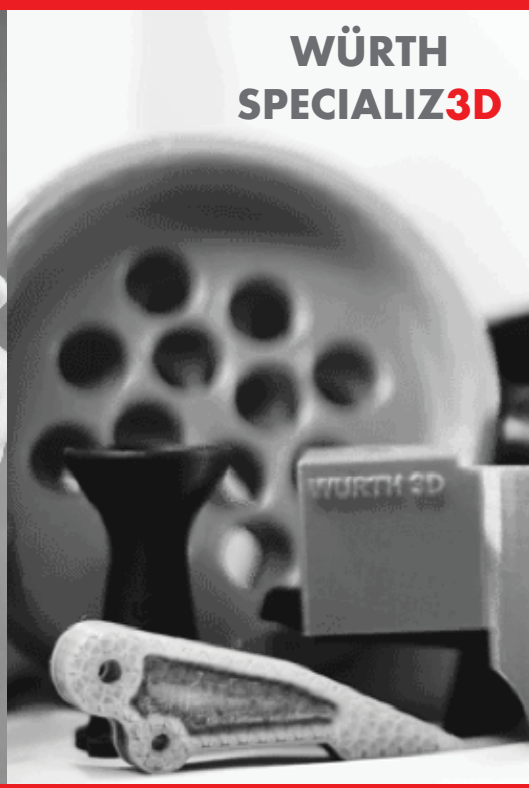
The Jasper Ventures (JV) family of companies has been serving needs of midstream customers in the hydrocarbon industry since 1992 and our track record of delivering cost-effective, on-time, efficient solutions speaks for itself. We are a true end-to-end turnkey provider who engineers, designs, constructs, installs, operates and leases state-of-the-art modular gas processing plants and mechanical refrigeration units (MRUs).

Give us a call @903-939-1555 or visit www.JasperVenturesInc.com to learn more about how we can help maximize ROI for you and your investors.

facebook.com/jasperventuresinc
linkedin.com/company/jasperventuresinc
www.jasperventuresinc.com
101 Glenda St. Whitehouse, TX 75791

WÜRTH

GLOBAL SUPPLY CHAIN SOLUTIONS
FOR THE OIL & GAS INDUSTRY
Fasteners | MRO | Safety



API 20E Fasteners to BSL Level 3 & Up to 6"∅

Engineering Assistance

3D Printed Tools & Parts

Würth Industry North America
(877) 99-WURTH
www.wurthindustry.com

WÜRTH FAMILY OF COMPANIES

DOKKA FASTENERS · marine FASTENERS · NSI Northern Safety & Industrial · Weinstock Bros.

The Port of Bayonne, N.J., is a petroleum products hub. It's showing growth after years of decline and now has the ability to handle larger vessels. The facility hopes to export crude oil in the near future. Newark Liberty International Airport lies in the distance at upper right.
Source: International Liquid Terminals Association

Answering 'A Sea Change'

Export terminals make sales to foreign markets work—and the U.S. needs more of them.

By Jeff Share

Many experts agree that the future of America's oil and gas industry will be determined by export terminals designed to reduce the glut of fossil fuels unleashed by the shale revolution, ultimately providing price stability.

Time is essential in exporting LNG as markets, especially China and India, seek to meet growing energy demand while using less coal. Though there is a currently large excess natural gas supply, that excess is expected to decline within five years, Reuters reported.

In the news

Exports are in the news. Headlines this year include:

- Plans advance for a Marcellus LNG export facility to be built on property owned by Philadelphia Gas Works.
- The U.S. National Oceanic and Atmospheric Administration reports effects of the proposed Jordan Cove LNG terminal and 230-mile feeder pipeline would be "short term or on a small scale and dispersed broadly across 250 miles." The controversial project

"The economics of commodities are changing. You can't ensure that your pipeline shipment is exactly coordinated with the arrival of a ship because those oceangoing vessels have a 48-hour window—in the best cases—when they're likely to arrive."

— **Kathryn Clay**, *president and CEO, International Liquid Terminals Association*

in southern Oregon would be the first petroleum export terminal on the West Coast, but it faces federal, state and local challenges.

- Sempra Energy and Saudi Aramco subsidiaries sign Interim Project Participation Agreement for the multibillion-dollar Port Arthur LNG export project under development in southeast Texas. Sempra plans to develop five "strategically located" LNG projects in North America.
- Enterprise Products Partners LP and Navigator Holdings Ltd. export the first cargo consisting of 25 million pounds of ethylene to Japan from their jointly held marine terminal along the Houston Ship Channel.
- New York-based New Fortress Energy LLC receives an $800 million loan to fund LNG terminals and infrastructure in northern Pennsylvania to be connected to an export pier that they will build on the Delaware River.
- Sixteen states announce opposition to administration proposal to transport LNG by rail, citing safety concerns.
- Kinder Morgan Inc. asks federal regulators for approval to put a fourth liquefaction train in service at its $2 billion Elba Island LNG export terminal in Georgia. The first export cargo from Elba left in December 2019.

And in late 2019:

- Cheniere Energy Inc., the leading LNG producer and exporter in the U.S., receives approval for its Corpus Christi Stage 3 expansion, which includes seven midscale liquefaction trains.
- Tellurian Inc., led by former Cheniere executives, receives approval for site preparation for its big Driftwood LNG export terminal in Louisiana. Construction should begin this year with first production in 2023. The project includes a 625-mile, 42-inch pipeline from Waha Hub in West Texas to the Lake Charles area. Purchase memoranda of understanding have been made with France's Total S.A. and India's Petronet LNG Ltd. Financing is to be completed this year.

Impressive numbers

Domestic LNG exports have approached 7 billion cubic feet per day (Bcf/d), making the U.S. the world's third largest LNG exporter in barely three years, trailing Qatar and Australia. The International Energy Agency predicts the U.S. will add 30% of global gas production through 2030 and could reign as the largest exporter by 2025.

Including projects under construction, U.S. LNG export capacity is expected to reach 9.6 Bcf/d this year and 10.3 Bcf/d in 2021, from 7.6 Bcf/d in January. In 2019, the U.S. Department of Energy granted 11 new long-term LNG export approvals, including two under the new small-scale export rule. Meanwhile, two new large-scale terminals came online along the Gulf Coast, and the U.S. now exports two cargos of LNG almost daily. When the first wave of projects is built out, exports may reach 60 to 70 million tons of LNG per year.

In September 2019, the U.S. exported 89,000 barrels per day (bbl/d) more petroleum—crude oil and refined products combined—than it imported, the first month this happened since monthly records began in 1973.

Crude oil exports are the largest contributor to U.S. petroleum export growth, from 591,000 bbl/d in 2016 to 2.8 million bbl/d in 2019.

With this in mind, the Trump administration wants to revise the National Environmental Policy Act to ease permitting by removing "cumulative impact," or climate change, as a consideration for national infrastructure projects such as natural gas pipelines. Reviews would be limited to two years and disputes quickly settled.

Credit shale

"It's development of the Permian Basin and all of the shale plays around the country. Bulk exports through Houston and Corpus Christi [Texas] are seeing

a significant surge as well as liquefied petroleum gas [LPG] terminals resulting from the rise in drilling activity and liquids and NGL production," Jason Feer, global manager of business intelligence for Poten & Partners Inc., a Houston-based energy and ship brokerage, told *Midstream Business*.

Kathryn Clay, president and CEO of the International Liquid Terminals Association, told *Midstream Business* that she agrees.

"It's all very connected to the shale oil/gas revolution and resulting boom in production that hydraulic fracturing unleashed, increasing production beyond domestic demand and leading to the oil export ban being lifted in December 2015. On top of that, our refining infrastructure is set up for heavier crude than the light, sweet crude that comes especially from the Permian.

"The best alternative has been to export that sweet crude, which Europe has historically been better able to handle. Asian markets are also retweaking their plants to accommodate lighter crude," she added.

Feer said sweet crude production has been declining in the North Sea and West Africa. It pays to export the product because it sells for a higher price and is in more demand internationally while the nation continues to import Mexican and Middle Eastern heavy and medium sours, which U.S. refineries can easily handle.

Terminal timing

Clay detailed why terminals are essential to the export process.

"You can't import or export liquids without a set of terminals in place. From a pipeline to a vessel, you must have a terminal there; the alternative is a logistical nightmare. The economics of commodities are changing. You can't ensure that your pipeline shipment is exactly coordinated with the arrival of a ship because those oceangoing vessels have a 48-hour window—in the best cases—when they're likely to arrive. There are also cases where people will store the fuel, not because they can't sell it, but they're hedging for economic reasons."

Also driving demand for sweet crude in Europe and Asia is the new International Maritime Organization 2020 rule that requires global shipping vessels to use low-sulfur diesel as a fuel.

Yet the growth of terminals has been "stepwise" until recently because there seemed to be little need for change, Clay said.

"It's not a question anymore that we'll have to build new export terminals as we'll run out of the ability to expand existing terminals. In the last 18 months, you're seeing a lot of announcements of intended development of new export facilities. Almost anyone would tell you that they will not all be built; we are starting to see a shake-out."

Different products, different challenges

Feer said developers face different challenges depending on what they're marketing: oil, LPG or natural gas.

"The payback periods for petroleum projects tend to be a lot shorter, and the technology is simpler: pipelines, tanks, loading buoys, etc. Most are not project financed, so companies pay from their own equity resources. They make a call or judgment on what demand and production are going to be. Today the U.S. can't absorb any more LPG or sweet crude, so you have to export."

It's not a hard judgment for terminal operators and producers, he added.

"With LNG, it's different orders of magnitude in terms of the investment required. A cheap LNG train would be $2 to $3 billion, and developers on the Gulf Coast have been essentially startups. Cheniere, Cameron didn't have big balance sheets, so they had to project finance.

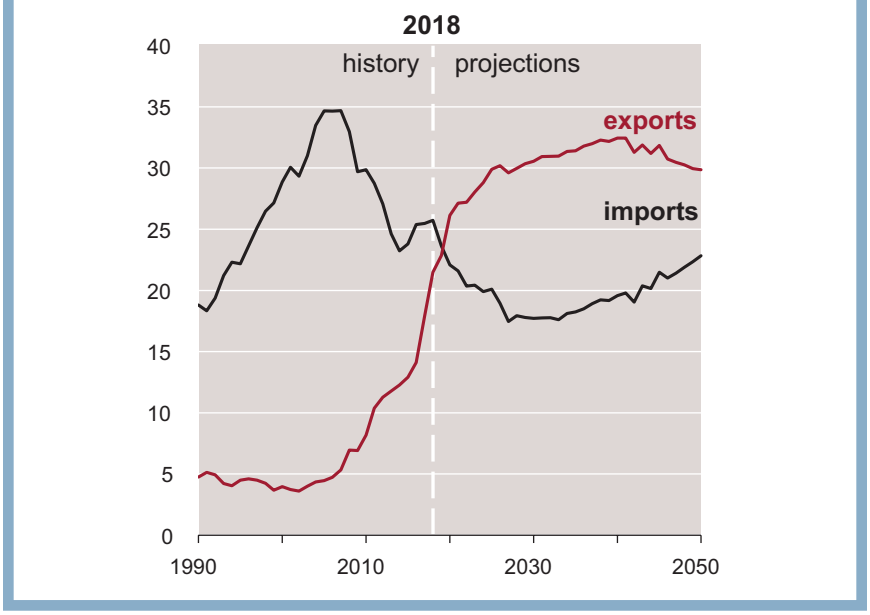
"In order to project finance something that involves that kind of investment, they had to find people willing to sign long-term contracts, 20-years or so, so they could tell banks that 'you're going to loan us a couple billion dollars, and we're selling LNG tolling services to these customers who are good for it; they're creditworthy international oil companies or Asian or European utilities,'" Feer said.

Similarly, export terminals and would-be developers of terminals are essentially competing by courting the same producers, Clay said.

"Until they secure those commitments, there is going to be a slowdown in the buildout. I think the strategy I can safely say for all of them is they're all working very hard to try to secure those contracts. They're all trying to meet with their prospective clients to make those commitments."

Feer added propane, used to make propylene, has seen a huge increase of exports from the U.S. "The Chinese have built propane dehydrator units as they are short of propylene. Particularly in

U.S. Gross Energy Trade (reference case in quadrillion Btus)



Source: U.S. Energy Information Administration

China, there is strong growth in demand for LNG and natural gas; Southeast Asia, India to a lesser extent."

Clay agreed China has been "the sink" for many global commodities. After the U.S.-China tariff war ends, she expects big increases in U.S. exports to China of crude, LPG and natural gas. In fact, many reports indicate that 2020 will be a record year for Chinese LNG imports. While energy demand is flat in Europe and Latin America, Canada remains a strong market because refiners are familiar with U.S. domestic grades of crude.

Big ships

Deeply concerning to Clay is the next round of investment necessary to build new export terminals, rather than expanding existing facilities. They must have the capacity to handle very large crude carriers (VLCCs). The Louisiana Offshore Oil Port in Louisiana is the only U.S. port able to fully accommodate the vessels. Meanwhile, the rest of the world is moving ahead.

Certain other U.S. ports have been modified to handle VLCCs, but the big ships must be topped off at sea to be fully loaded due to their deep drafts.

"We need to invest in our ports and infrastructure so that they are modernized and competitive," Clay continued. "That means building at least a subset of the planned terminals able to accommodate VLCCs. We used to have some of the largest ports in the world, but we've lost ground. As recently as 2002, we only had two of the top 10 largest ports in the world: Louisiana and Houston. Now eight of the top 10 are in China. The others are in South Korea and Saudi Arabia.

"It's vital, not just for terminals and petroleum, but for our ability to participate in world trade, that we make these investments. Terminals are certainly an important part of that.

"Forgive the pun, but it's quite a sea change in our port infrastructure and commerce," Clay added.

At the end of 2019, pipeline giant Enbridge Inc. and Houston pipeline and export terminal operator Enterprise Products Partners announced a letter of intent to jointly develop a deepwater crude oil terminal in the Gulf of Mexico capable of fully loading VLCCs, centered on Enterprise's Sea Port Oil Terminal.

However in a setback, last October the Carlyle Group quit a multinational effort for a $1 billion crude oil export terminal at Harbor Island in Corpus Christi. The Berry Group is now the sole owner and has indicated it plans to move ahead with the project, which would serve VLCCs once the Port of Corpus Christi is enlarged.

Patrick Long, director of Opportune LLP's process & technology practice, told *Midstream Business* to expect more alliances, given the heavy capital-intensive requirements and long time needed for regulatory approval at all levels.

"Not all projects will make it. It's natural for a company to want to look for a partnership to help offset some of the risk and financial burden, in exchange for giving up some of the upside. In the case of Enbridge and Enterprise, the companies operate where there is very little overlap of business. Therefore, it makes sense for a partnership and takes advantage of synergies to distribute product to end customers."

He agreed with Clay that logistic companies must broaden and diversify their reach in the supply chain through the extension of crude export terminals.

"Based on the logistics typically ending on land, the companies are missing out on the ability to tap into the VLCCs. So, I feel this is more about extending the supply chain and tapping into new customers and distribution methods as anything else.

"Think about the advantages of going with a logistics provider that can provide multimodal transport of crude to lock in a larger netback for the producer. Therefore, export terminals provide a reach to VLCCs as a means to extend sales channels," Long said.

Based on reports from shipping companies, there is an oversupply of VLCCs, which is another contributing factor.

"This has led to a fall in rates for transporting fuels. VLCCs provide a tremendous benefit and economy of scale for transporting supply and locking in a low per-unit cost. While not the main factor, it certainly contributes to help justify the business case. Excess shipping capacity will keep rates low and incent refiners to utilize this mode of transportation in order to transport feedstocks," Long added.

Among the key export players he identified are Enterprise, Phillips 66, Trafigura, Enbridge and Energy Transfer LP.

"The initial projects appear to have the strongest backers where those companies are natural logistic/pipeline companies. Those companies have the expertise in large-scale infrastructure plays. Their strategies are to secure and lock in producers so that they will have a committed capacity upon completion of the project," he said.

"The strategy is to extend the infrastructure and charge a tolling fee to shippers. With additional pipeline out to a VLCC, these logistics companies will extend their ability to collect a fee. They just need to maintain full capacity in order to justify the cost of the project."

Looming challenges

Long defines some key challenges facing the petroleum export sector, such as uncertainty around regulations.

"While it seems inconceivable that the lifting of the [crude export] ban would be overturned, the domestic politics are less moderate these days. Future administrations may not be so draconian in overturning the decision; they may pass additional legislation to limit it.

"When export projects were initially proposed, written and approved internally, there were a set of economic assumptions made to support the project. By the time projects are completed, the world will have changed. Who would have thought that there would be this extreme tension in the Middle East? Who knows what that will do to prices in the long-term (short-term effects already being felt)? Domestic crude price drops provide challenges.

"On the flipside, considering the instability in the Middle East, U.S. domestic crude seems favorable, so long as companies can lock in stable supplies at a comparable price," Long added. ■

Jeff Share *is a Houston-based Hart Energy contributing editor specializing in midstream energy topics.*

Expedition Water Solutions
Lead Arranger & Admin Agent
Nov. 2019

EVX MIDSTREAM
Lead Arranger & Admin Agent
Aug. 2019

H2O MIDSTREAM
Lead Arranger & Admin Agent
Aug. 2019

Lead Arranger & Admin Agent
July 2019

nuevo MIDSTREAM
Lead Arranger & Admin Agent
July 2019

SOLARIS MIDSTREAM
Lead Arranger & Admin Agent
June 2019

ASPEN MIDSTREAM
Lead Arranger & Admin Agent
May 2019

EVX MIDSTREAM
Lead Arranger & Admin Agent
March 2019

ELEVATE midstream partners II
Lead Arranger & Admin Agent
Feb. 2019

LAYNE WATER MIDSTREAM
Lead Arranger & Admin Agent
Jan. 2019

Contact us at **713-871-3963** or **midstream.energy@cadencebank.com**

CADENCE BANK, N.A. MEMBER FDIC South Community Lender

The Interview

Rod J. Sailor

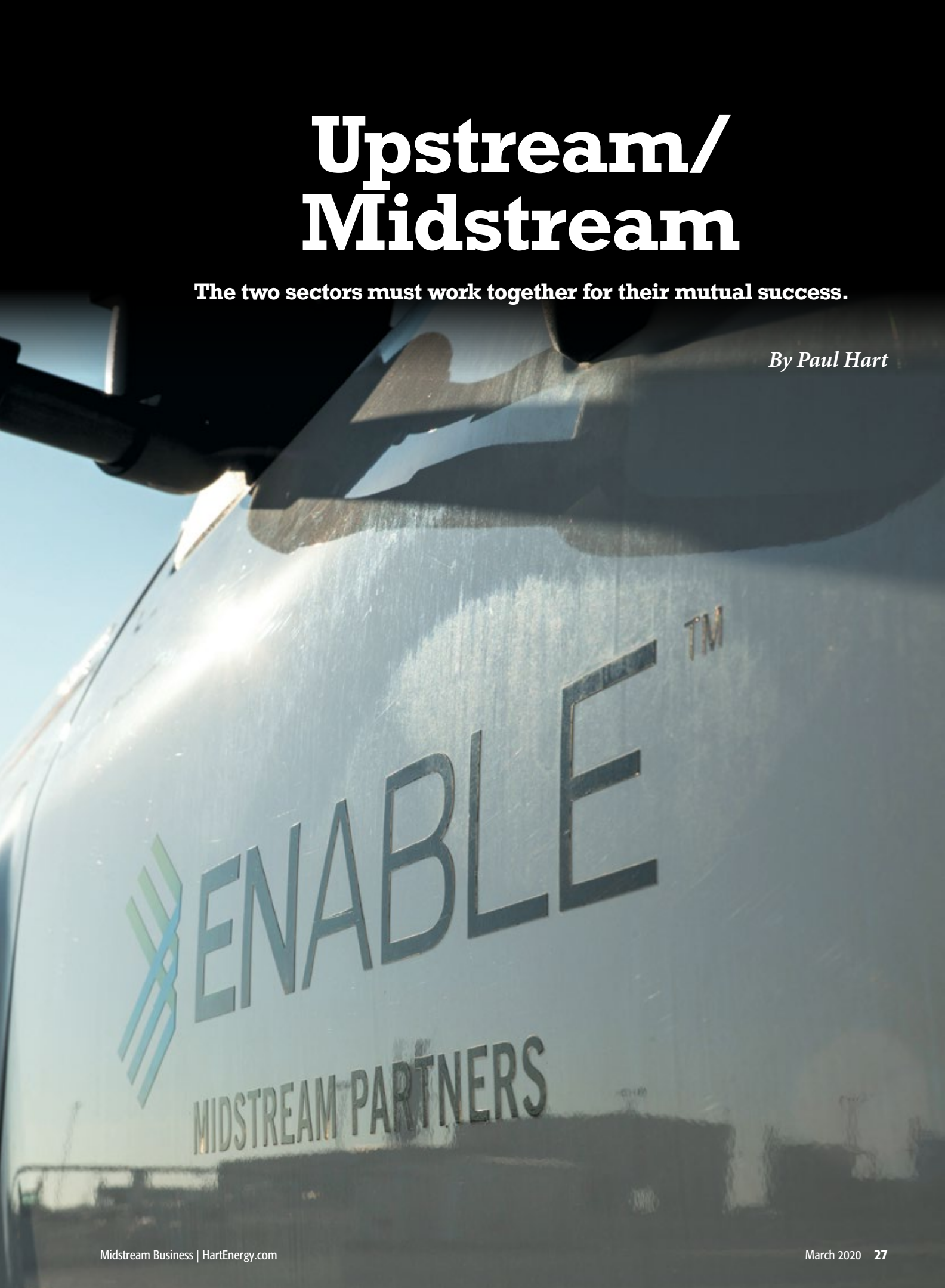
The BBC drama "Upstairs, Downstairs" highlighted the differences in the two social classes that made a classic British household function. In a similar manner, energy's upstream and midstream sectors must work together for success.

Rod J. Sailor, president and CEO of Oklahoma City-based Enable Midstream Partners LP, has served in executive positions for both. Enable ranks No. 17 on this publication's Midstream 50 of the sector's largest publicly held firms. Sailor recently took time to share with **Midstream Business** ***his insights on how the sectors differ—and how their entrepreneurial spirit will help both achieve profitability in the decade ahead.***

Upstream/ Midstream

The two sectors must work together for their mutual success.

By Paul Hart



MIDSTREAM How did you get into midstream, and can you talk about your time spent in the upstream side of the business?

SAILOR That is a great question. When I graduated from Oklahoma State University over 30 years ago, I was getting married and needed a job. I had a number of interviews and, given that I was in the Midcontinent, most of those interviews were with either energy or energy-related firms. I got a job at The Williams Cos. in the accounting group that wasn't even full time. But you know, I thought it'd turn into something permanent, and it did. I figured I'd be there four or five years—then I found myself 27 years later having done a number of things I really, really liked at Williams.

They gave me a lot of opportunities. Over my 27-year career at Williams, I moved on to focus on corporate finance, strategic planning and development, and international finance. These roles gave me broad exposure to Williams' midstream businesses, and I was even involved for a few years in a communications business that Williams built during my tenure.

During my time as treasurer at Williams, I was closely involved in the spinoff of Williams' E&P interests into WPX Energy [Inc.]. I joined WPX as CFO when it went public in 2011. I loved that opportunity to go over and focus on upstream with Ralph Hill [the first CEO of WPX, now CEO of ETX Energy].

After a few years at WPX, I decided that I needed to get back to the midstream side of the business because that is, as I look back over my career, the part of the energy business that I really enjoyed, what I call the horizontal part of the energy spectrum. I enjoy building long-term value, thinking about projects, thinking about long-term returns. It has always had sort of a special place in my heart. So, when I had a chance to jump back out of upstream into midstream for the CFO role at Enable in 2014, I relished the opportunity. I'm so, so glad that I was selected to come over here, and it's been a great ride during my six years at Enable.

MIDSTREAM How would you compare/contrast managing the two sectors?

SAILOR Obviously, both sectors have a significant focus on safety and the environment. I sometimes get frustrated, as I'm sure everyone in the energy industry does, with the view that we are not focused on the environment. I've always worked at companies where being a good steward of the environment was a fundamental tenet of the business.

One thing about the energy business that I have always enjoyed is its entrepreneurial spirit. Upstream and midstream businesses are always looking for the next opportunity because we deal with a depleting resource. We don't have the luxury of just standing pat.

The upstream industry is very focused on science and the high degree of technical expertise required to extract hydrocarbons. To survive, companies must own the right acreage in the right places and drill and complete wells in the most efficient and economical way possible.

The midstream business requires a long-term focus on asset and capital deployment. We're building 15-year, 20-year projects, and we've got to be sure we're designing projects that will generate returns over a long period of time. We are much more than a commodity business in midstream. Whether we are serving upstream or end-user customers, we have to make sure we are creating the right solutions to get products to the right markets.

Here at Enable, I really like to say we have a customer solution model, and customer service is a fundamental value at the company. I think that's something that differentiates the midstream space from the upstream space.

MIDSTREAM How can the midstream get in Wall Street's favor again?

SAILOR We clearly have faced some challenges over the last couple of years. The investor base in energy has changed. While Enable never cut its distribution, there were a number of restructurings and distribution cuts in the midstream space following the price collapse in 2014. Frankly, investors have had better places to put capital, and we've fallen out of favor. But this is a cyclical business, and we provide a needed product and service.

If you look at the business fundamentals, most of the top producers and midstream companies have done a really good job of building strong balance sheets, living within cash flow and focusing on returns rather than just growth. If we continue to execute well and run our businesses in a sound and prudent manner, investors will find us once again.

MIDSTREAM Your background's in corporate finance; is that a plus in the current business environment?

SAILOR Well, I would tell you that I think a good grounding in corporate finance matters in any environment, but right now I think it is especially important. Companies that have not demonstrated financial discipline continue to struggle. Markets can and do change quickly, and you must run your business with that in mind. At Enable, we're confident about our cost structure, our liquidity, our balance sheet. Every decision, every dollar we spend, is aimed toward long-term value creation.

MIDSTREAM Do you see a continuing role for the master limited partnership structure in the midstream?

SAILOR Yes, we've been talking a lot about that, both internally to our employees and to investors. I've seen a lot of structures come, and a lot of structures go—some in favor, some out of favor. Clearly, the MLP structure does not have the prominence in the space that it once did. At one time, you could have said MLP and midstream are interchangeable because I don't think there was a major midstream company that wasn't an MLP.

But it's changing, we have to recognize that. I still think that the public partnership model works, but we clearly will have to continue to think about making sure we're giving investors what they need. You've seen incentive distribution rights (IDRs) go away from a lot of our peers. You've seen better governance. You've seen that a lot of investors don't want a [IRS Form] K-1, they want Form 1099.

Enable Midstream Partners LP's Arkoma District serves producers in eastern Oklahoma and Arkansas. Its gas transmission network reaches from Oklahoma to Illinois and the Gulf Coast. *All photos, Enable Midstream Partners LP*

It's clear that the market is moving towards MLP 2.0.

The one thing I think we have to recognize is that corporate structure transformations generally come with a cost, and this cost must be considered when evaluating corporate structure changes. Also, many of the companies that converted to C-corps are not cash taxpayers today, but they will be in the future. In addition, the low tax rates that exist today are not guaranteed to continue forever.

Again, I think the structure works, and the Alerian MLP Index still represents over $250 billion of market capitalization. The MLP structure has given a lot of cash back to investors, and it continues to return a lot of cash back to investors.

MIDSTREAM How will the growth in U.S. hydrocarbon exports impact Enable?

SAILOR All of our customers now want to talk about getting to water, to access export markets. Everybody understands that hydrocarbons, whether it's natural gas, natural gas liquids or crude, are moving more and more towards the coast, and international demand is a key driver for most of the products we handle.

Get a map of the country out and look at where hydrocarbons are being produced and where hydrocarbons need to go. If you draw a line between those locations, you're probably going to cross some of our assets. We're already benefiting from the movement of natural gas to international markets with our Gulf Run Pipeline, where we'll extend our pipeline network all the way down to the Gulf.

We will continue to benefit as an industry from the continued export of hydrocarbons out of the United States. I would be remiss if I didn't mention that Harold Hamm of Continental Resources [Inc.], one of our largest customers, played a significant role in getting the 40-year-old crude export ban lifted in 2015, a change that is benefiting all of us.

MIDSTREAM Enable, like many sector players, pulled back on capex plans for this year. Do you feel you'll still be able to meet customers' growth needs?

SAILOR We meet regularly with our customers. We're always talking to them about their needs, and we are confident that our capital expenditures will be able to meet our customers' growth plans. Our gathering and processing capital expenditure program is very flexible, and we can ramp our spending up or down quickly as producer activity develops. We are also able to minimize our capital spending by leveraging the investments we have made over the past few years, including significant investments in processing, compression and pipeline capacity.

As an industry, we continue to look for ways to work together to leverage underutilized capacity. An excellent example of this is our Wildcat project, where we partnered with a competitor to access an additional 400 million cubic feet per day of third-party processing capacity and provide a customer access to the Texas intrastate natural gas markets.

MIDSTREAM That said, you do have some major projects in the works. Could you provide an update?

SAILOR I mentioned earlier Gulf Run, our biggest current pipeline project, which will extend our existing Louisiana system down to the Gulf to provide access to international markets. It is an exciting project that leverages our current pipeline infrastructure to provide customers access to some of the most prolific natural gas producing regions in the U.S. The project's cornerstone shipper is Golden Pass LNG, a partnership between Qatar Petroleum and ExxonMobil [Corp.], both leaders in producing, shipping and marketing natural gas worldwide. In 2019, we went through the pre-filing process for the project. In the first half of 2020, we plan to file a formal certificate application with FERC. We're already out getting right-of-way for that project and spending some capital dollars. Our intent is to put that project in service late in 2022.

MIDSTREAM You mentioned earlier you've been through a lot of

Enable's cryogenic McClure plant in Custer County, Okla., offers 200 million cubic feet per day of capacity to Anadarko Basin producers.

business cycles. Do you have any insights on how the current trough may be different?

SAILOR Yes, I do. The upstream industry has responded well to the current cycle. It's no longer about production growth and creating net asset value. Now, it's about running the upstream model more like our model—let's live within cash flow. Let's be prudent about our balance sheet, let's be prudent about getting some money back into investors' hands. As with past cycles, there will be winners and losers. As we move away from the growth mode of prior years, it will become more apparent which oil and gas plays can generate solid returns and which plays are more challenged.

MIDSTREAM How do you motivate your team internally during tough times?

SAILOR We really have talked to our folks about focusing on the things that we can control. It's easy to say, "Oh woe is me," but let's focus on what we can control. I think it's important to continually communicate. We remind our employees about the good things that are happening inside the company and that we've continued to execute at a very high level. We can't always control what happens outside the company, but we can control what happens inside the four walls of Enable.

We started a culture of continuous improvement back in 2016, and it continues to pay dividends. We're always seeking to improve how we serve our customers, execute our projects and manage our operating costs. We ask our folks to focus on making tomorrow just a little bit better. We tell employees that while we face challenges as an industry, the work you are doing matters.

MIDSTREAM We've begun a new decade; do you have any projections for the next 10 years?

SAILOR First of all, I would tell you that in this industry, even five years is an eternity. Things change that rapidly in this business, and it's hard to make predictions. But I do think there are some challenges that we, as an industry, need to recognize.

We're not attracting as much young talent into the energy space as we need. We need to continually think, how do we attract this talent? Because when I think about this business, it's fast-paced, it is technology-driven. There are a lot of opportunities for folks who want to take a little risk. All of these things, I think, are what a younger workforce is looking for, and they're here in energy.

I think that we're going to see some consolidation, we just have to. I think you will see some of the smaller players get together and cut costs. Hopefully that will be a catalyst for some of the money on the sidelines to enter the space.

And then we've got to continually focus on ESG [environmental, social and governance]. We didn't hear that term as much two years ago, and now we consistently hear that ESG is important to investors. I think we do a great job as an industry producing and transporting hydrocarbons in a safe and responsible manner, and I think energy is the engine that continues to run this economy. We can't lose sight of that, and we need to be sure we're telling our story. We live in the same communities where we operate, and safety and the environment are incredibly important.

MIDSTREAM To follow on your comments about attracting talent, suppose someone new to the industry, just out of college, came to you for advice. What would you say?

SAILOR I would say look, I think there are a lot of opportunities in energy. Just look at the things that I've been able to work on in my career—commercial projects, financing projects. I got to travel the world. There is an entrepreneurial spirit in energy; it is not an environment where you can just come in and sit still. It is constantly moving, which creates opportunities to grow.

I've always found there's never a dull moment in energy. There may be some frustrating times, but the good times will far outweigh any frustration you might feel with the cyclical nature of this business. It's been a great career for me. Coming to energy, you won't be bored. It changes every single day. If you embrace change, you will find a very rewarding career in energy. ■

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

A home for North American hydrocarbons

EDF Trading North America specializes in commodity price risk management solutions with a focus on leveraging its downstream demand to serve the upstream oil and gas sector. We are part of the EDF Group of companies, one of the world's largest generators of electricity and a global consumer of energy including Natural Gas, NGLs, Crude Oil, and LNG.

www.edftrading.com

Chris Beyer
chris.beyer@edftrading.com
281-653-1068

Ben Rich
ben.rich@edftrading.com
281-653-1736

Rafael Cruz
rafael.cruz@edftrading.com
281-653-1656

2020 Hart Energy Events:

CONFERENCE & EXHIBITION
DUG BAKKEN AND ROCKIES

Feb. 18-19
Denver, CO
Colorado Convention Center

20 Years in the Bakken

energy capital CONFERENCE

March 2
Dallas, TX
Fairmont Hotel – Dallas

INFLUENTIAL 25 Women IN ENERGY

March 4
Houston, TX
Hilton Americas – Houston

CONFERENCE & EXHIBITION
DUG PERMIAN BASIN

April 6-8
Fort Worth, TX
Fort Worth Convention Center

Permian Water & Sand Forum
April 6

A&D Forum
April 6

100 Years of the Permian

CONFERENCE & EXHIBITION
DUG EAST
MARCELLUS-UTICA MIDSTREAM CONFERENCE & EXHIBITION

June 16-18
Pittsburgh, PA
David L. Lawrence Convention Center

CO-LOCATED

NEW IN 2020

WELL INTERFERENCE FORUM

Sept. 1
Houston, TX
The Omni – Galleria

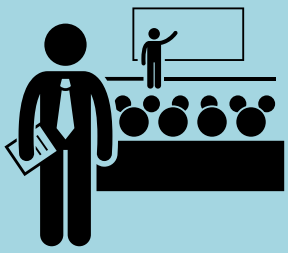
CONFERENCE & EXHIBITION
DUG EAGLE FORD

Sept. 9-11
San Antonio, TX
Henry B. Gonzalez Convention Center

DUG *Eagle Ford* Forum
September 9

HARTENERGY
Conferences

In 2019, Hart Energy organized ***14 events***



300+ *industry-leading speakers*

620+

sponsors

Rev. 02/07/20

Where Business Meets Opportunity

CONFERENCE & EXHIBITION
DUG HAYNESVILLE

May 19-20
Shreveport, LA
Shreveport Convention Center

CONFERENCE & EXHIBITION
MIDSTREAM TEXAS

June 2-3
Midland, TX
Midland County Horseshoe Pavilion

Pipeline Construction Forum
June 2

NEW IN 2020

ENERGY ESG CONFERENCE

June 9
Houston, TX
The Petroleum Club

CONFERENCE & EXHIBITION
DUG MIDCONTINENT

Sept. 22-24
Oklahoma City, OK
Cox Convention Center

A&D STRATEGIES AND OPPORTUNITIES CONFERENCE

Oct. 27-28
Dallas, TX
Fairmont Hotel – Dallas

EXECUTIVE OIL CONFERENCE & EXHIBITION

Nov. 3-4
Midland, TX
Midland County Horseshoe Pavilion

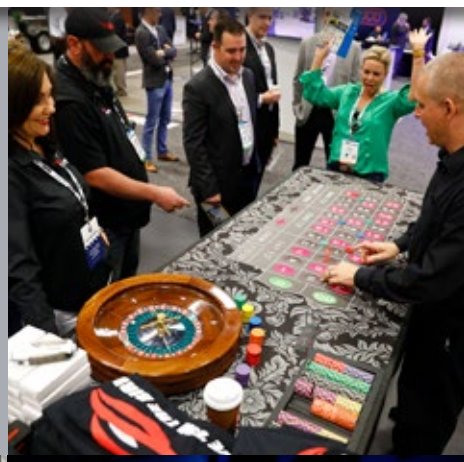
Folds of Honor Golf Tournament:
November 2

Permian Basin Water Forum
November 3

VETERANS IN ENERGY

Dec. 3
Houston, TX
The Westin Memorial City

Attracting more than
13,000 attendees



840+
exhibitors

For more information, visit ***HartEnergyConferences.com***

Independents Fuel America – We Make Sure *They* Know

IPAA
INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA

Sponsor These Upcoming Events

TEXAS WILDCATTERS' OPEN GOLF
March 26 | Cypress, TX

OGIS® NEW YORK
April 20-21
New York, NY

ANNUAL MEETING
June 29 - July 1
Newport Beach, CA

Contact Tina Hamlin at thamlin@ipaa.org or 202.857.4768
Sponsorhip information available online at **www.ipaa.org/events**

Wildcatters Fund
the political action committee of independents

ENERGYINDEPTH®

Endangered Species Watch
INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA

DIVESTMENTFACTS.COM

IPAA/PESA Energy Education Center

INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA | WWW.IPAA.ORG

Unlike Triceratops, a few incentive distribution rights still roam the midstream earth–but not many.
Source: Shutterstock/Ton Bangkeaw

IDRs Near Extinction

Incentive distribution rights aren't gone but prove increasingly rare.

By Frank Nieto

As master limited partnerships (MLPs) attempt to attract new investors, incentive distribution rights (IDRs) continue to lose popularity. IDRs haven't totally disappeared from the MLP space, but the majority of the sector has eliminated them.

According to Alerian, which benchmarks MLP performance, about 86% of the companies in its Alerian MLP Infrastructure Index have eliminated their IDRs. These rights provide higher distribution rates to the general partner (GP) of MLPs. The easiest way to think of an IDR is like trickle-down economics, in that it's designed to push GPs to raise distributions so they can increase their own share.

The increased cost of capital for MLPs is one of the primary reasons for the elimination of IDRs as the higher distributions reduced available cash and required companies to hit the debt market to secure funding for projects.

"Improvements in distribution trends among midstream MLPs have come alongside other positive changes the space has made, including leverage reductions, self-funding the equity portion of capital expenditures, and IDR eliminations. Distribution coverage has also improved significantly across the industry, providing investors with added comfort around yields that are above historical averages. While paying down debt, funding growth capital, and unit buybacks may take priority

over distribution growth in some cases, modest distribution growth from some MLPs is a welcome sign for investors that rely on midstream MLPs for a stable stream of income," Alerian said in a recent research note.

This tactic has worked as most MLPs grew their distributions for third-quarter 2019 on a year-over-year basis. Fourth-quarter and full-year numbers were not completely available as *Midstream Business* went to press. Two of the most prominent MLPs to eliminate their IDRs were DCP Midstream LP and Hess Midstream Partners LP. The firms rank Nos. 16 and 28, respectively, on this publication's current Midstream 50 of the sector's largest players.

The easiest way to think of an IDR is like trickle-down economics, in that it's designed to push [general partners] to raise distributions so they can increase their own share.

Investor equality

When announcing the $1.53 billion deal that eliminated the IDRs at DCP Midstream, Wouter van Kempen, the company's chairman, president and CEO, said that the firm sought to provide both clarity and a better return for investors.

"I think what eliminating the IDR does do is it takes uncertainty away for people. And I think that is important. The other thing that it does, it gives you an opportunity to, over time, think about raising the distributions in a way that everybody has kind of an equal part of the pie," he said during a conference call to discuss third-quarter 2019 earnings.

He added that it was important that any deal to eliminate the IDRs would be fair to all parties, specifically DCP Midstream as well as Enbridge Inc. and Phillips 66 Partners LP, the two partners in its GP. Enbridge ranks No. 1 on the Midstream 50 list, while Phillips 66 ranks No. 15.

Terms call for Enbridge and Phillips 66 to receive 65 million DCP common units, which is about a 9x multiple on total GP distributions.

"This transaction ensures complete economic parity between our common unit holders, Enbridge and Phillips 66. The elimination of our IDRs lowers our future cost of capital, positioning DCP for continued long-term success and continued ability to grow," he said, adding that the distribution is not at risk going forward.

DCP Midstream has a track record of never lowering its distribution, which van Kempen said will continue with the company also operating in a careful manner where increases occur at the right time and level.

A different tact

Hess Midstream's IDR change took a different approach—its conversion to an Up-C structure eliminated IDR payments to sponsors. This involves Hess Midstream acquiring its general partner, Hess Infrastructure Partners LP, and converting it to a publicly traded company called Hess Midstream LP.

"The Up-C structure really provides multiple benefits. It allows us to have access to a broader investor base, obviously together with the IDR simplification, we also will have a line interest between the sponsors and our public equity holders," said Jonathan Stein, CFO of Hess Midstream Partners.

This conversion also allows Hess Midstream to continue to be tightly integrated with Hess Corp., its anchor customer that it's tightly working with to develop assets in the Bakken.

While Hess Midstream and DCP Midstream cut IDRs and maintained distributions, Summit Midstream Partners LP took a different path by slashing distributions while also discontinuing its IDRs.

A Summit approach

In early 2019, Summit Midstream, No. 36 on the Midstream 50, cut its distribution by 50% and undertook a series of moves, including the IDR elimination and asset sales, to improve its financial position.

IDR and distribution payments for Summit Midstream's GP totaled $12.1 million in 2018 and were "an expensive vestige of a legacy MLP structure with many midstream investors now requiring IDR elimination as a prerequisite to future investment," COO Leonard Wayne Mallett said during a call to discuss the transaction.

As with the DCP Midstream and Hess Midstream IDR eliminations, Mallett said this move will not only make Summit Midstream more attractive to new investors but also will make it more competitive by lowering its capital costs for future growth projects. However, it also undertook the distribution cut with an eye to the future.

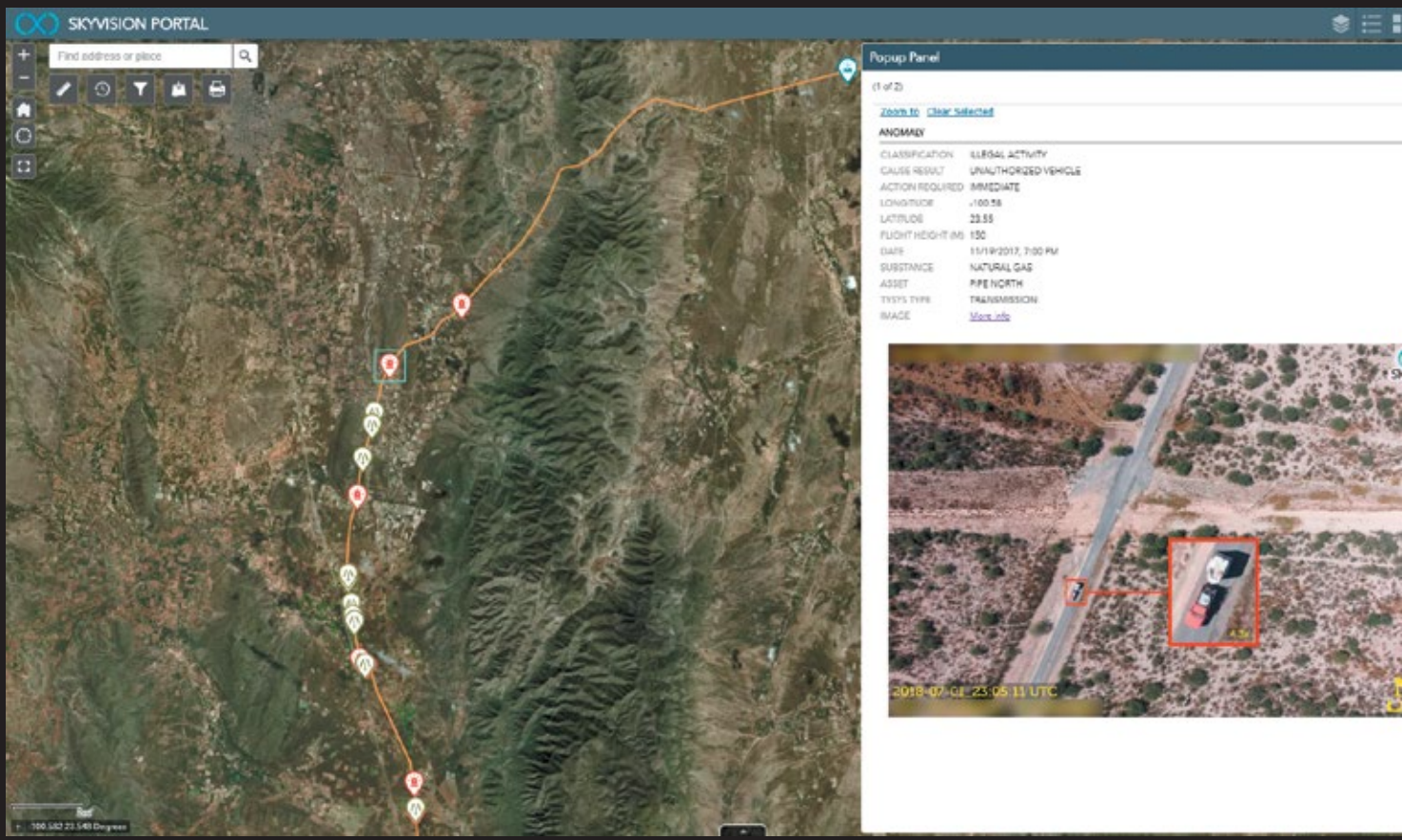
"Suffice it to say that the decision to reduce the distribution was not taken lightly. It was deliberated extensively in conjunction with our annual budget in a long-term planning process. Ultimately, we decided that the distribution reduction was in the long-term interest of Summit Midstream unitholders," Mallett said.

He noted that the Summit board had three primary objectives in deciding to reduce the distributions for fiscal-year 2019:

- First, increase its financial flexibility while also managing its long-term leverage profile;
- Second, provide incremental liquidity to fund strategic growth projects; and
- Third, reduce its reliance on equity capital markets with a long-term goal of being able to fully self-fund projects.

As MLPs continue to change their structures to attract different investors, more partnerships are likely to do away with their IDRs. Whether IDRs leave the sector entirely is another question as some MLPs may choose to continue to court the same class of investors they have for decades. ■

Frank Nieto *is a freelance writer based in Washington, D.C., with more than a decade of experience covering the energy industry.*



Advanced unmanned aerial vehicles can provide precise information about activity along a right-of-way, such as this pipeline in northern Mexico. *Source: SkyX Ltd.*

Pipeline Theft

Combining technologies allows operators to stay ahead of sophisticated thieves.

By Chuck Goldman

The air is cool as the sun hangs low in the sky. Nighttime draws near. Amidst the rustling of the trees in the wind, there's a faint buzz. It grows louder. It draws closer. Overhead, a drone flies past.

The drone is inspecting a pipeline right-of-way. Ahead of the drone stretches a corridor of flat land saddled by wild countryside. This is the third and final inspection of the day. From a remote office in a distant city, a pilot-in-command monitors the vehicle as it autonomously performs day-to-day inspections.

As the drone completes this leg of the mission, it lands at a ground station, begins to recharge for the next flight and transmits the captured imagery for analysis. A machine learning algorithm conducting change detection analysis parses through the imagery and identifies two anomalies in a small area. The first is a ground depression—that indicates recent excavation and fill—directly above the pipe. The second anomaly is a set of tire tracks.

Once the anamolies are reviewed by the asset operations team, a ground crew is dispatched to the coordinates, uncovers the pipeline and discovers a small lever valve.

This is an illegal tap, and here are the reasons why you might need drones and artificial intelligence (AI) to stop it.

Product theft

When you think of product theft from a pipeline, your mind likely turns to the extreme, multibillion-dollar losses to brazen theft in countries like Nigeria and Mexico. In the latter country, just one year ago, the world bore witness to the Tlahuelilpan pipeline explosion in the state of Hidalgo, where amidst a

fuel theft free-for-all, under geysers of fuel spouting from a pipeline, a static electricity spark triggered an explosion that killed 137 people.

However, illegal activity around pipelines across the globe is becoming far more pervasive and covert in nature.

In Europe, where hydrocarbon theft has historically been a minor issue, illegal activity is skyrocketing. In a five-year analysis of the performance of cross-country European pipelines, a 2018 Concawe report found that approximately 90% of spillage incidents were theft-related. When analyzed against 47 years of historical data, this represents an increase of 150% to 525% in comparison to historical five-year moving averages.

Keep in mind, the true nature of product theft is likely well beyond what we can discern from spills alone, as a successful operation will not result in a pipeline spill.

If pipeline companies operate without the means to adequately detect theft-related activity, amateur or abandoned taps can cause serious damage to the pipeline and surrounding environment.

Besting technology

Sophisticated criminals are getting the best of traditional leak detection technologies. The rampancy of product theft and theft-related spill incidents runs contrary to the gradual reduction in unintentional leaks such as mechanical failures, operational errors, corrosion, natural hazards and accidental third-party activity.

What does this mean? The status quo of leak detection technologies that pipeline asset integrity managers have come to rely on is being outpaced by experienced criminals. From the initial breach of a pipeline to transporting stolen product for sale, a successful product theft operation can conceal itself from numerous points of detection. Here are some of the challenges that operators face:

- **Illegal hot taps can go undetected by in-line inspections**—To minimize detection during ultrasonic analysis, small pinhole drillings of only a few millimeters in diameter are made into the pipeline, generally too small to trigger an alert. To evade detection from magnetic analysis of pipeline walls, some illegal hot taps utilize nonmetallic components to attach a valve to a line, but another common trend is to use legitimate pipeline fittings against the operator. By installing an illegal tap close to existing fittings, the inspection effort is likely to mistake the hot tap fixture for a normal fitting.
- **Slow siphon rates can deceive SCADA systems**—The advantage of using pinhole drillings is twofold for would-be pipeline thieves. Aside from evading in-line inspection tools, siphoning product at a slow rate from these pinholes avoids a substantial pressure change in the pipeline that would trigger an alert by flow measurement systems.
- **Sensor alerts can be difficult to pinpoint**—Commonly, leak detection systems only provide a general alert regarding the entirety of a pipeline segment. Once the alert is received, pipeline operators need to pinpoint the specific location of the problem. This can be exceedingly difficult to do on a stretch of underground pipeline that spans miles.
- **Illegal activity can remain well-concealed to the human eye**—Criminals can perform the initial hot tap under cover of night to avoid being caught, and the remaining evidence of an excavation can be difficult for a person to spot. Not to mention, careful steps are taken to ensure that the transfer and transport of the product is hidden. While the majority of transfers happen within close proximity to the pipeline, a substantial portion of theft operations run a hose 100 to 1,000 meters away from the pipeline to another area for transfer.

Pipeline operators cannot continue to rely on traditional leak detection technologies if they hope to properly address illegal activity. Criminals are evading sensor systems and exploiting gaps in aerial and ground crew inspections, but operators can level the playing field.

With the shortcomings of in-line technology and traditional methods of visual inspection, operators need to leverage a new echelon of precise, visual data in the fight against illegal activity. Two new technologies that stand to massively benefit pipeline operators in this effort are unmanned aerial vehicles (UAV) and AI. When leveraged together, these two technologies form the backbone of a hyperefficient aerial monitoring workflow that gets you the data you need to identify, pinpoint and deter illegal activity around a pipeline.

A UAV is the textbook definition of efficiency and repeatability for data collection, especially because it can perform missions without human intervention. With the right infrastructure in place, an autonomous UAV can take off from a launch station, fly a segment of pipeline, capture high-resolution imagery, land back on a station, transmit data for processing, recharge for the next flight and repeat the process again. All the while, the vehicle flies a precise, programmable flight path that ensures that the visual verification data sets remain consistent from each flight.

Whereas the UAV collects raw data, computer vision software using machine learning algorithms refine it into actionable insights. Machine learning algorithms are faster at analyzing an image and detecting indicators of illegal activity around a pipeline such as people or vehicles, tracks on the ground, excavation sites, construction debris and environmental indicators of a spill.

With every aerial inspection flown and new set of data collected, the software gains a better understanding of what a pipeline and surrounding right-of-way should look like and, by extension, can better detect minuscule anomalies that might merit inspection.

Keep in mind, machine learning technology isn't magic. It handles the heavy lifting of analysis, but a degree of human verification is required to determine whether a flagged anomaly should be actioned. However, as you

continue to give the software feedback on what matters and what doesn't, it gains a better understanding of what to look for and what to ignore. We now start to foray into the realm of predictive analytics.

With the right aerial data solution, operators can gain immediate advantages over would-be pipeline product thieves:

- **Deter hot tapping with frequent inspections**—Hot tapping a buried pipeline is a multihour effort. If you're at high risk for product theft, doing multiple aerial inspections over the course of the day makes it difficult for criminals to tap the pipeline without being caught in the act and increases the likelihood you catch evidence of activity—such as excavation or tracks—while they're still fresh. An autonomous aerial system provides the operational flexibility needed for frequent deployments.
- **Detect subtle evidence of illegal activity**—The combination of consistent aerial data and AI is highly effective at detecting anomalies such as unauthorized persons or vehicles, tracks, construction debris and excavation.
- **Get a bird's-eye view of a pipeline right-of-way**—While the majority of illegal tapping operations live and die in the immediate vicinity of the pipeline, a substantial portion transfer the product hundreds of meters from the pipe for transfer or storage. By flying at higher altitudes, the aerial system can provide a greater field of view of what's happening around the right-of-way.
- **Pinpoint and verify alerts from SCADA systems**—If an attempted hot tap trips a sensor alert, an autonomous aerial system can rapidly dispatch to inspect the affected pipeline segment. With high-quality visual verification data in hand, operators can quickly identify the problem and begin remediation efforts.
- **Counter covert efforts with the right payload**—To detect illegal hot tappers who are working under cover of night, or perhaps transferring product to an area with tree cover, infrared sensors can be used to spot them with ease.

Beyond the immediate value in day-to-day inspections, working with consistent visual data in the long-term will allow you to develop predictive analytics that can determine where the next event likely will occur and how to allocate resources for anti-theft efforts. Identifying the hotspots of illegal activity and taking action to prevent it will significantly reduce costs associated with stolen product and theft-related damage. ■

Chuck Goldman *is chief revenue officer for SkyX Ltd., a pipeline integrity management firm.*

CONFERENCE & EXHIBITION

DUG HAYNESVILLE

May 19-20, 2020
Shreveport, LA
SHREVEPORT CONVENTION CENTER

LOCATION, LOCATION, LOCATION

FEATURED SPEAKERS

Craig Jarchow
President & CEO
Castleton Resources LLC

Alan Smith
President & CEO
Rockcliff Energy LLC

Rob Turnham
President & COO
Goodrich Petroleum Corp.

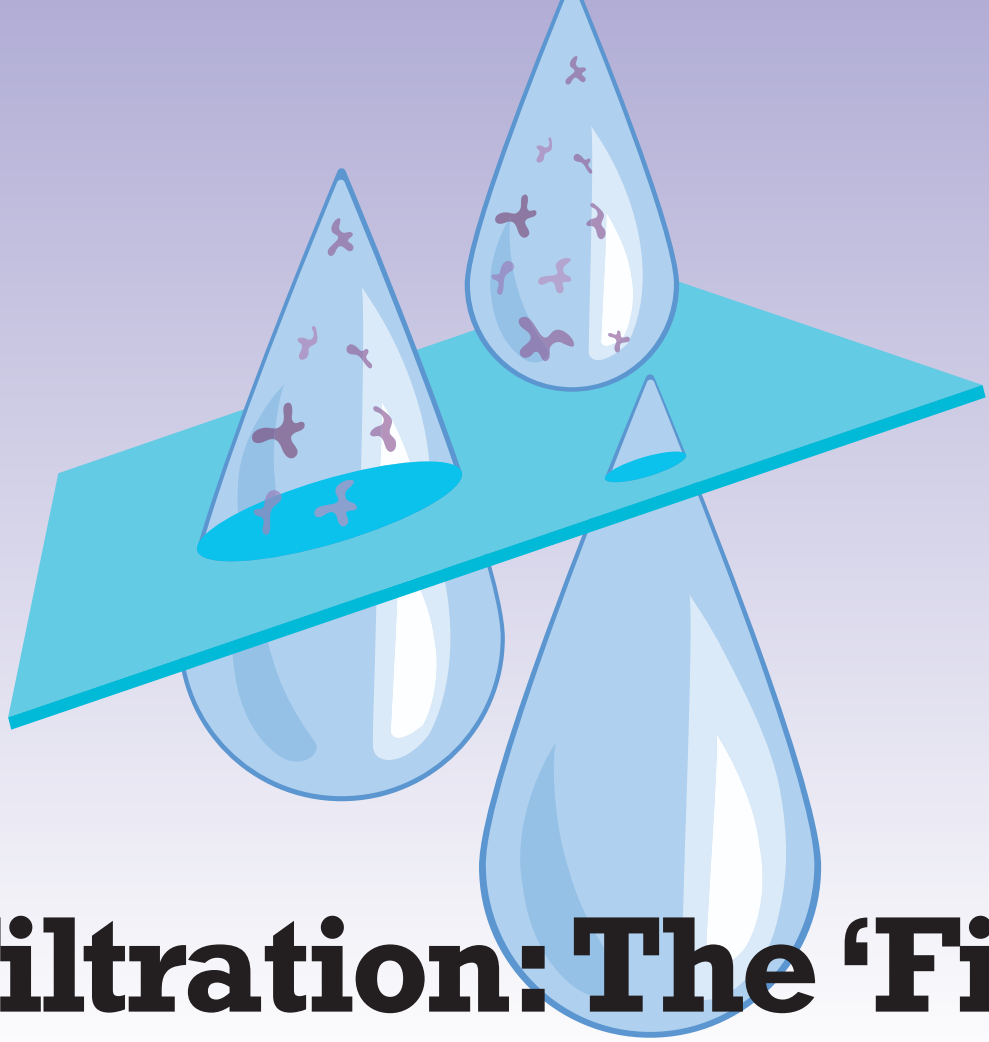
A LOOK BACK AT 2019

- **950** attendees
- **48** exhibitors
- **45** sponsors
- **22** speakers

Presented by:
HARTENERGY

Hosted by:
E&P · Oil and Gas Investor · MIDSTREAM Business

Register Today!
DUGHaynesville.com



Source: Shutterstock/Panda Vector

Filtration: The 'First Line Of Defense'

Multi-element, automatic self-cleaning strainers optimize production processing while minimizing maintenance and downtime.

By Glenn Mountain

For the oil and gas industry, coarse filtration of various fluids is critical to ensure reliable production, extend the life of a wide variety of upstream and downstream equipment, and increase the intervals between backwashing or necessary maintenance.

Upstream, production wells often use coarse filtration (from 30-100 microns) to remove sand, solids, or debris during secondary phase waterflooding—where clean, filtered water is introduced into a rock layer through injection wells to push residual oil to operating wells.

Deepwater production platforms may prefilter seawater to remove solids before further filtration for uses ranging from enhanced oil recovery, to heat exchangers, to producing potable water.

When oil is produced, liquid separation is used to separate produced water from the oil. Coarse filtration may be needed during the produced water treatment.

Processing requirements

In downstream applications, coarse filtration may be 125-3,200 microns. Refineries often prefilter raw water from lakes, rivers and aquifers to remove organic, aquatic, and other solids, which allows freshwater to be used as process and cooling water.

In cooling towers, filtration can improve cooling efficiency while reducing fouling and plugging. In process equipment, the removal of suspended scale and debris from heat exchangers and cooling systems can prevent the clogging of equipment and nozzles.

Without adequate coarse filtering of process fluids, oil and gas systems can be susceptible to expensive damage from large particulates. Raw or produced water that is not adequately prefiltered can cause excessive fouling, leading to decreased production as well as costly, premature replacement and unscheduled production downtime.

Fortunately, a growing number of oil and gas industry professionals are ensuring more reliable production with superior water or process fluid quality by using low maintenance, multi-element,

Rugged, well-engineered filter elements are designed to be cleaned in place by backwashing. Many installations have experienced an element life of more than 25 years. *Source: R.P. Adams Inc.*

automatic self-cleaning strainers. This approach provides a more effective first line of defense against equipment damage and downtime.

Optimizing reliability

Historically, the oil and gas industry has utilized certain types of sand or media filters, centrifugal separators and basket type strainers for coarse filtration. However, in many cases these have a number of shortcomings, including susceptibility to fouling and damage, which can require frequent cleaning, maintenance and early replacement.

Whether for upstream, midstream or downstream, the industry wants to keep production going 24/7. So, the goal is to avoid equipment damage, process interruption and having to pay maintenance technicians to open up filters for cleaning when they get dirty.

In response, many industry professionals now rely on multi-element, automatic self-cleaning strainers. R.P. Adams Inc. is among the firms manufacturing such equipment. The company first introduced and patented the technology in the 1960s and has over 10,000 installations worldwide today.

This design provides an alternative to sand and media filters, centrifugal separators, and basket type strainers. Unlike those designs, the multi-element, automatic self-cleaning strainers can provide continuous removal of suspended solids. When utilized as the first line of defense for oil/gas water or fluid filtration, the strainers can reliably filter out sand, silt and other suspended solids as small as 30-100 microns in size.

A significant feature of the multi-element design is in the engineering of the backwash mechanism, which enhances reliability. With many traditional strainers, the backwash mechanism comes into direct contact with the straining media. This can be problematic, as large, suspended solids often encountered with raw or produced water can become lodged between the straining media and the backwash assembly. The result is straining media damage and/or rupture that can compromise filtration and even other downstream equipment, hindering production. Instead, the multi-element design utilizes a tube sheet to separate the straining media from the backwash mechanism. This prevents the backwash mechanism from coming into contact with the media and damaging the elements.

Less backwashing

Operators often also need to consider how to best reduce membrane fouling and required maintenance. Traditional strainers, however, due to limitations in straining area, can become clogged quickly. When that occurs, cleaning, media replacement or backwashing is necessary, which adversely affects productivity as well as maintenance costs. In this regard, the multi-element design provides three to four times the surface area of traditional strainers and prefilters.

This translates directly into less frequent backwashing so less water goes to waste, less power is consumed and less maintenance is required.

While traditional media found in large basket designs can lead to collapse and failure under differential pressures as low as 35 pounds per square inch (psi), the smaller diameter of the media used in the multi-tube strainers also enables the strainer to safely handle differential pressures in excess of 150 psi. This protects production even under higher differential pressures in the field, which could otherwise result in significant downtime.

As an additional protective measure, the strainers also include a shear key, which sacrifices itself in the presence of excessively large debris. So, if large debris were to cause mechanical problems within the strainer, the shear key breaks, protecting the unit's rotating assembly, motor and gearbox by halting the drive shaft rotation. Filtration continues, but operators notice an increase in differential pressure as the backwash cycle is interrupted, and they can take action to clear the obstruction and replace the shear key.

For oil and gas environments exposed to highly corrosive elements, like seawater or salt spray, upgrade options to materials such as super duplex and duplex stainless steels, titanium, Monel, Inconel and Hastelloy can also provide further resistance to corrosion and corrosion-related damage.

When considering technology for oil and gas coarse filtration systems, automatic multi-element, self-cleaning filters are an increasingly popular choice and a reliable, cost effective solution. ■

***Glenn Mountain** is general manager for R.P. Adams Inc., a Buffalo, N.Y.-based manufacturer of industrial filtration and heat exchanger equipment.*

Commonwealth LNG plans to use "innovative but proven methods" to reduce costs as it builds a six-train LNG liquefaction operation on Louisiana's Calcasieu River, shown here in a designer's rendering. *Source: Commonwealth LNG*

Feeling The Chill

New waves of U.S. LNG capacity may go flat as the worldwide market for the fuel becomes well-supplied.

By Gregory DL Morris

"We have an extreme propensity in U.S. markets to overbuild infrastructure," Anthony Scott, an analyst with BTU Analytics LLC, said during a recent conference call to discuss the energy consultancy's 85-page "Getting to the Gulf—Can We Supply Wave 2 LNG?" report.

"If you look at LNG imports as an example, many of the LNG export facilities exist today because they were LNG import facilities that were ultimately never utilized."

The next wave of LNG demand, which the BTU analysts believe will last through 2030, will be much greater than it is now, especially with China and other Asian nations demanding more and more of the natural gas resource. The anticipation has brought about more investment projects for additional pipelines from natural gas producing basins like the Permian, Haynesville and Eagle Ford, as well as export facilities around the Gulf Coast.

Statistics show U.S. LNG exports rose 60% last year, and the nation is projected to be the world's largest exporter of the fuel by 2024. Reuters reported as 2020 began that prices in Europe and Asia were down by around 40% last year. Morgan Stanley and Energy Aspects Ltd. analysts said some U.S. LNG export terminals could shut temporarily this year due to lack of demand.

Lower prices and weak demand could threaten the multiple LNG projects currently in development. Yet some analysts are already speaking in terms of second and third waves of LNG export terminals around North America, with latecomers viewed as increasingly speculative. To be sure, a few of the original projects may stumble, while some of the aspirational plans are likely to push across the finish line and start making cold in the new decade.

Rio Grande

NextDecade Corp. announced in late 2019 that the Federal Energy Regulatory Commission (FERC) issued an order authorizing the siting, construction and operation of its proposed Rio Grande LNG export facility at Brownsville, Texas, and associated Rio Bravo Pipeline. Earlier in the year, Bechtel Corp. was awarded the engineering, procurement and construction (EPC) contract for the first phase of Rio Grande. NextDecade, and rival Tellurian Inc., are publicly traded pure-play operations. The initial stage of the Brownsville plan comprises three liquefaction trains, two 180,000-cubic meter storage tanks and two marine berths. An additional storage tank and truckloading facilities are being considered.

NextDecade plans to commence commercial operations in 2023.

In the midstream sector, NextDecade plans for the Rio Bravo pipeline to deliver gas from the Agua Dulce gas pipeline hub to Brownsville. The line is to comprise twin 42-inch pipes running 137 miles with three 180,000-horsepower compressor stations. Total capacity would be 4.5 Bcf/d. There would be interconnection with eight existing pipelines, with several additional pipelines planned from the Permian Basin's Waha hub to Agua Dulce. The company said each leg of the Rio Bravo pipeline would support three trains at Rio Grande LNG, implying a second-phase twin of the first with total projected liquefaction capacity of 27 million tonnes per annum (mtpa).

In addition to any expansion at Brownsville, NextDecade also has proposed a Galveston Bay LNG terminal at Texas City, Texas. Its projected operational date is set at 2027.

Meanwhile, Tellurian and Petronet LNG Ltd. India signed a memorandum of understanding to negotiate Petronet taking an equity stake in Tellurian, as well as the purchase of up to 5 mtpa of LNG from Tellurian's Driftwood liquefaction complex when it comes into service. A final investment decision (FID) could come in early 2020, with a possible start of liquefaction in 2023.

The companies said they hope to reach a formal commitment by the end of first-quarter 2020.

Petronet is India's largest importer of LNG. The Driftwood project includes natural gas production, gathering, processing and transportation facilities and, ultimately, as much as 27.6 mtpa of LNG on the Calcasieu River near Lake Charles, La. FERC authorized the LNG facility and the 96-mile pipeline to supply gas in 2019.

Shell slows

Royal Dutch Shell Plc delayed the start date for its planned LNG export terminal venture to 2025 in late 2019. Shell's 50:50 partner is Energy Transfer LP, which owns an import regasification terminal at Lake Charles that would be converted to liquefaction. Several trains are envisioned for a proposed capacity of more than 16 mtpa.

The project is fully permitted, uses existing infrastructure and benefits from abundant natural gas supply and proximity to major pipeline infrastructure in South Louisiana, including Energy Transfer's vast network. Shell's stated reason for the delay is the time needed to digest its acquisition of BG Group Plc, but the longer time line makes a virtue of necessity in avoiding an anticipated LNG glut in 2023-2024.

Commonwealth LNG filed permits with FERC for a proposed liquefaction project on the Calcasieu at Cameron, La. The project calls for as many as six gas liquefaction trains each with a capacity of 1.4 mtpa, for a total capacity of 8.4 mtpa.

Also planned are six LNG storage tanks, each with a capacity of 40,000 cubic meters, a marine-loading berth capable of loading LNG carriers up to a capacity of 216,000 cubic meters, and a 3-mile, 30-in.-diameter pipeline to connect to gas supply.

Commonwealth said it expects to take an FID on the project in the fourth quarter of this year, with commercial operations possible as early 2024. Commonwealth, formerly known as Waller LNG Services LLC, is a private venture. It has been in discussions with trading house Gunvor Singapore about a 15-year purchase agreement for 1.5 mtpa.

First wave

There are other projects, the tail end of the first wave, that appear to be on firmer footing and closer to making cold. These are in addition to multiple LNG liquefaction plants now in operation and exporting—among them Cheniere Energy Inc.'s Sabine Pass terminal in Cameron Parish, La.; Dominion Energy Inc.'s Cove Point operation on Chesapeake Bay in Maryland; and Kinder Morgan Inc.'s Elba Island facility near Savannah, Ga.

And as 2019 ended, Freeport LNG announced the startup of its first liquefaction train at its plant on Quintana Island near Freeport, Texas. It expects the second train to go on stream in May, with a third train to enter service later.

With all three trains, Freeport said the plant will have a capacity of 15 mtpa. A fourth train is under consideration. Freeport LNG said its limited partnership interests are ultimately held by Michael Smith, Global Infrastructure Partners, and Osaka Gas Co., Ltd.

Here's a review of selected U.S. LNG export projects further along in development:

Calcasieu Pass

Venture Global LNG announced an FID in August 2019 and the closing of project financing for its Calcasieu Pass project, as well as the associated TransCameron pipeline, in Cameron Parish, La. The project has 20-year LNG sale and purchase agreements with Royal Dutch Shell, BP Plc, Edison S.p.A, Galp Energia, Repsol S.A. and PGNiG S.A.

Stonepeak Infrastructure Partners provided a $1.3 billion equity investment for the project. The debt and equity financing fully fund the balance of the construction and commissioning of Calcasieu Pass. Full site construction has been underway since early 2019, and the project is expected to reach commercial operations date in 2022.

EnLink Midstream LLC has an agreement to provide gas. The midstream company expects to spend $20 million this year on the project, to be operational in 2021.

Venture has a turnkey EPC contract with Kiewit Corp. Baker Hughes Co. was awarded a contract to provide a proprietary liquefaction train system with 18 modularized compression trains

across nine blocks, for a total nameplate capacity of 10 mtpa.

Venture Global LNG Inc. also is developing the 20 mtpa Plaquemines LNG project and the 20 mtpa Delta LNG project, both in Plaquemines Parish, La. Under the master equipment supply agreement, Baker Hughes could ultimately supply liquefaction equipment to Venture for as much as 60 mtpa LNG capacity. Equipment deliveries are expected to begin in the second half of 2020. Chart Industries Inc. is providing cold boxes and brazed aluminum heat exchangers for Calcasieu Pass.

The modular liquefaction approach at Calcasieu Pass will be like Kinder Morgan's Elba Island terminal and a portion of Cheniere's Corpus Christi, Texas, complex. The modularized system is supposed to be a plug-and-play approach that enables faster installation and lower construction and operational costs. These modules will be manufactured, assembled, tested and transported from Baker Hughes' fabrication facilities in Italy.

Golden Pass

Zachry Group and its partners, Chiyoda International Corp. and McDermott International Inc., were awarded an EPC contract in early 2019 by Golden Pass Products, a joint venture of Qatar Petroleum and ExxonMobil Corp. affiliates, to build an LNG export terminal on Sabine Pass outside Port Arthur, Texas. The complex is to have three big liquefaction trains, each with a capacity of about 5.2 mtpa. Combined output will be close to 16 mtpa.

The facility is expected to be operational in 2024.

Golden Pass has a 20-year firm transportation agreement with Enable Midstream Partners to supply gas. Golden Pass also has secured pipeline capacity on Kinder Morgan's NGPL line.

As with some other new export projects, such as Dominion's Cove Point operation, Golden Pass is adding liquefaction capabilities to an existing import facility. Golden Pass will retain re-gas capabilities to provide the flexibility to both import and export gas in response to market conditions.

The current Golden Pass LNG terminal facilities include five 155,000-cubic meter LNG storage tanks, two marine berths capable of offloading various-sized oceangoing LNG carriers and process facilities capable of regasifying LNG to produce approximately 2 billion cubic feet per day (Bcf/d) of natural gas.

The new $10 billion facility will use the existing tanks, berths and pipeline infrastructure. New facilities for gas pretreatment and liquefaction will be built.

Pipeline upgrades will include installation of approximately 3 miles of 24-in. pipeline to facilitate bi-directional flow capability and improve system

Tellurian Inc. says its Driftwood project outside Lake Charles, La., will be among the lowest-cost LNG liquefaction operations. First production could come as soon as 2023. *Source: Tellurian Inc.*

Cheniere Energy Inc.'s Sabine Pass operation pioneered the current boom in LNG exports, entering service in early 2016. *Source: Cheniere Energy Inc.*

hydraulics. Installation of additional compressor stations will facilitate the receipt and redelivery of up to 2.6 Bcf/d of natural gas supply to the export facility.

Magnolia

Australia's Liquefied Natural Gas Ltd. received preliminary FERC approval at the end of third-quarter 2019 to increase liquefaction capacity at its proposed Magnolia LNG complex by 10%, from 8 mtpa to 8.8 mtpa. The four-train project is to be built adjacent to an existing LNG regasification terminal in the Port of Lake Charles, La.

According to the company, the "project is construction ready with all permitting, design, contracting and equity arrangements in place to enable construction to start immediately upon finalization of LNG offtake agreements."

Full project equity, up to $1.5 billion, has been arranged through Stonepeak Infrastructure Partners. Limited-equity participation is being offered to offtake parties. A consortium of lenders will provide the debt at about three times equity.

Design work is complete with the front-end engineering executed by contractor KBR, working with SK E&C USA. Ammonia and mixed-refrigerant compressors along with associated equipment for the first two trains have been pre-purchased from Siemens. The liquefaction cold boxes and brazed aluminum heat exchangers for the first two trains have been pre-purchased from Chart Industries.

Gas will come from the existing Kinder Morgan Louisiana Pipeline. The interconnect agreement stipulates 1.4 Bcf/d for 20 years.

The project site covers an area of 115 acres opposite the existing Trunkline LNG import terminal operated by Southern Union Co. The project will involve the construction of four 2.2-mtpa liquefaction trains, installation of two 180,000-cubic meter cryogenic tanks and construction of a berth jetty for tankers with capacity of up to 170,000 cubic meters.

A variety of gas tolling agreements have been signed with different customers since 2013. One was with Brightshore Overseas Ltd., an affiliate of Gunvor Group, for 1.7 mtpa plus another 300,000 tonnes per annum (tpa) of interruptible capacity for 20 years, extendable by five years. Another was signed with Naturgy Energy Group S.A., formerly Gas Natural Fenosa, for up to 1.7 mtpa. A term-sheet agreement was signed with West Face Capital Group for 1.7 mtpa. Another agreement was signed with AES Corp. Group for between 800,000 tpa and 1 mtpa.

Jacksonville Eagle

Eagle LNG Partners announced FERC issued authorization for its proposed on-water LNG facility in Jacksonville, Fla., in second-half 2019.

This will be the smallest of the currently planned liquefaction operations and will have more in common with a propane distribution hub than with the massive multibillion-dollar, deepsea complexes.

The $500 million Jacksonville Eagle project is to have a capacity of 1.65 million gallons of LNG per day, or close to 1 mtpa. It will have 12 million gallons of storage plus marine- and truckloading capabilities on site.

Eagle has not announced an in-service date more precise than "early to mid-2020s."

To be sure, export markets are very much intended. Most of these will be Caribbean islands, to which LNG will be shipped in intermodal tank containers.

"Numerous independent studies have shown that sourcing LNG for power generation allows Caribbean island nations the ability to substantially reduce power costs and simultaneously reduce CO_2 emissions by 30% to 40% as compared to fuel oil and coal," said Sean Lalani, president of Eagle LNG, in a statement.

In addition to providing U.S. gas to the Caribbean basin, once the Jacksonville facility is completed, its operations will be combined with Eagle LNG's Maxville Facility and the Talleyrand Bunker Station for fueling LNG-powered ships.

The new, strict limits on sulfur in marine bunkers are being imposed by the International Maritime Organization. As a result, ship owners are scrambling to retrofit their vessels to burn other fuels. Methanol, diesel and LNG are the favorites among early conversions.

Eagle LNG is a wholly owned subsidiary of Ferus Natural Gas Fuels, a privately held portfolio company of The Energy & Minerals Group, which is the management company for a series of specialized private-equity funds. EMG invests primarily in natural resources including upstream and midstream. EMG has about $15 billion of regulatory assets under management and $11 billion in commitments allocated across the energy sector since inception. ■

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

MAKE BETTER DECISIONS WITH A GROUP SUBSCRIPTION

A group subscription to HartEnergy.com equips your team with daily intelligence to stay ahead of the competition.

HartEnergy.com provides your business with daily intelligence about what is happening, why it matters and how it affects your company.

HartEnergy.com keeps your team abreast of business trends, energy markets, A&D&M transactions, E&P news, technology, policy changes, and midstream needs. And every issue of ***Oil and Gas Investor*** magazine, our playbooks, special reports, and ***E&P*** magazine (in a downloadable PDF) is included with each subscription.

Take Advantage of 2020 New Year Rates

Equip your team or your entire company with a license to **HartEnergy.com**. Discounted group rates start with as little as two subscriptions.

To start your access right away or for more information contact:

Chris Rasch
crasch@hartenergy.com
713.260.4669

HARTENERGY.COM

Connecting You to the Global Energy Industry

Working Around The Election

By Matthew Hite

Several initiatives in Washington, D.C., could impact the midstream industry in 2020, including federal pipeline safety and highway legislation, and new regulations for gathering lines, methane emissions and water permitting. While partisan divisions in Congress and the upcoming presidential election are likely to limit significant progress, particularly in the second half of the year, GPA Midstream Association will be closely monitoring the following midstream-related legislation and regulations in the coming months.

Let's take a look, starting with legislation.

Since Congress is split with the Democrats controlling the House and the Republicans controlling the Senate, there was more messaging than legislating going on over the course of 2019. Congress will be going into election mode this fall, so the timeline for Congress to realistically pass any legislation is getting shorter by the day.

However, two items that could see movement and impact the midstream industry are pipeline safety reauthorization and the highway bill:

- **Pipeline Safety Reauthorization**—Efforts to reauthorize the nation's pipeline safety laws saw a flurry of activity in 2019. The Senate's version of the bill is stalled, primarily due to objections over an amendment that would authorize the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration (PHMSA) to regulate methane emissions, an activity traditionally within the purview of the U.S. Environmental Protection Agency (EPA). Having abandoned efforts to develop a bipartisan bill last year, the House is currently pushing an anti-industry bill, with provisions that would discard long-standing exemptions for gathering lines, dramatically increase civil penalties and eliminate cost-benefit analyses for rulemaking proceedings. Even though the last pipeline safety reauthorization expired at the end of September 2019, whether Congress can overcome these divisions and finish the bill in 2020 is still a big question.
- **Highway Bill**—The Senate's version of the new highway bill contains a provision for expediting gathering line permits on federal lands to help reduce venting and flaring of natural gas. GPA Midstream strongly supports this provision, but funding concerns have proved a sticking point in past highway bill negotiations. The House is working on its own version of the legislation, so this is an area where we could see bipartisan agreement this year.

Since Congress is split … there was more messaging than legislating going on over the course of 2019.

Now let's focus on regulation.

With the upcoming November election cycle, new proposals or regulatory efforts that cannot be completed this year will likely be punted until after the election or into 2021. However, the Trump administration may move forward with higher priority proposals in the coming months. GPA Midstream is focusing on three important rulemaking proceedings:

- **PHMSA Gas Gathering Rules**—PHMSA is in the final stages of developing new safety standards and reporting requirements for gas gathering lines. In order to get this finalized this year, the effort needs to make it through PHMSA, the Department of Transportation Secretary's office, and the White House's Office of Management and Budget. This is a lot of ground to cover in a short amount of time.
- **EPA Methane Regulations**—EPA's revised methane regulations are composed of a technical package and a policy/legal package. These regulations will have a direct impact on the midstream industry. As of late January, there is talk that EPA is close to finalizing these revised regulations. The final rule is expected to still protect the environment and reduce emissions while doing so in a collaborative manner across all stakeholders.
- **EPA Navigable Waters Protection Rule**—EPA and the U.S. Army Corps of Engineers recently finalized the new rules for determining the applicability of the Clean Water Act's permitting requirements. The new final rule is a much more common sense regulation and less restrictive than its predecessor. It makes sure that it protects the environment while ensuring that resources are put in the places where most needed.

Time will tell, but there is a lot of work for Congress and the Trump administration to complete before the end of the year in and around an election. I will be providing a thorough review of current midstream legislative and regulatory issues at GPA Midstream's 2020 convention, set for April 19-22 in New Orleans. I hope you will have the opportunity to join me there. ■

***Matthew Hite** is vice president of government affairs for the GPA Midstream Association.*

TAILWATER CAPITAL

Growth Capital for the Energy Industry

JASON DOWNIE
Managing Partner

EDWARD HERRING
Managing Partner

DAVID CECERE
Partner

214.269.1183 | Email: info@tailwatercapital.com | **www.tailwatercapital.com**

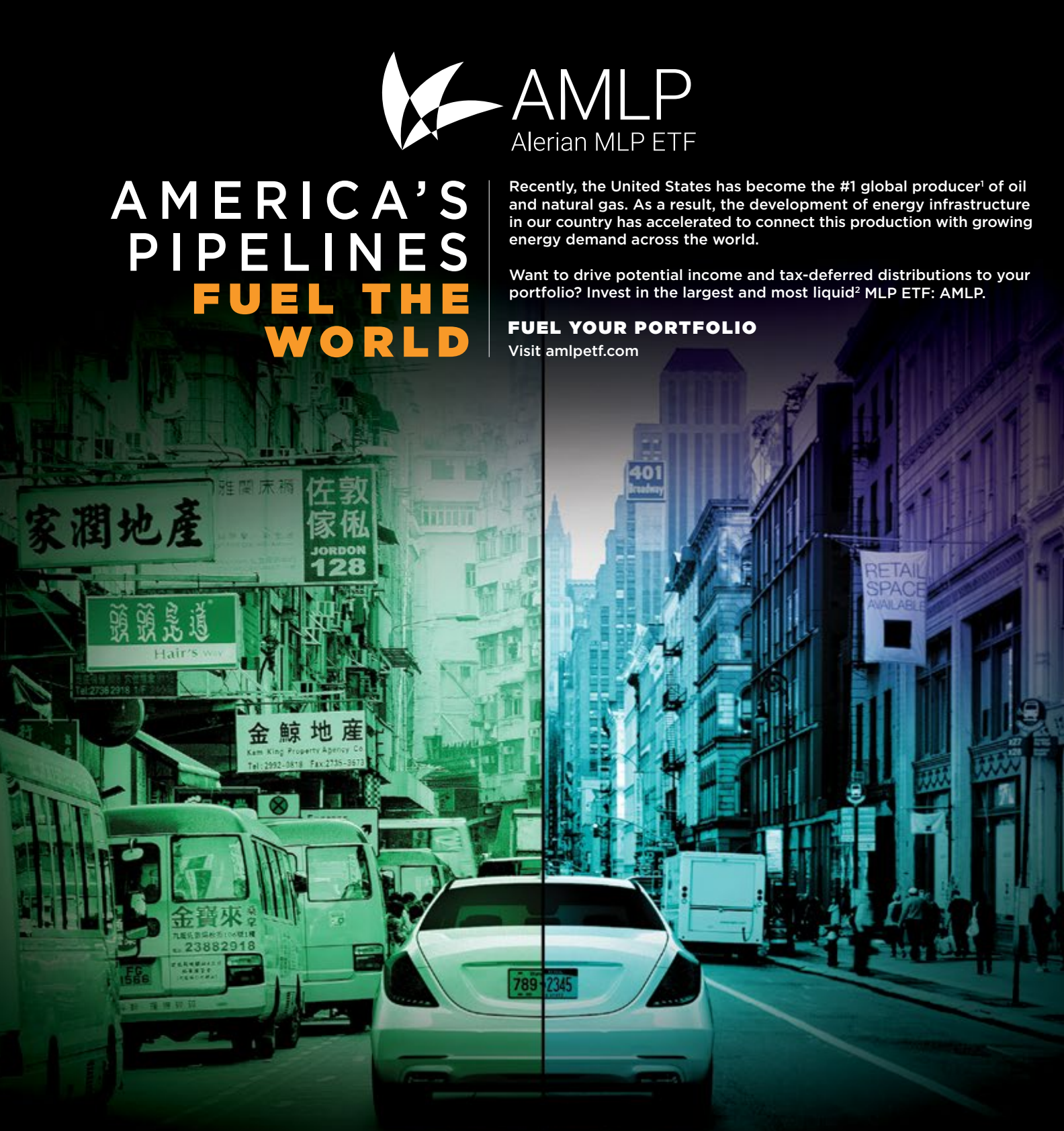
AMLP
Alerian MLP ETF

AMERICA'S PIPELINES FUEL THE WORLD

Recently, the United States has become the #1 global producer[1] of oil and natural gas. As a result, the development of energy infrastructure in our country has accelerated to connect this production with growing energy demand across the world.

Want to drive potential income and tax-deferred distributions to your portfolio? Invest in the largest and most liquid[2] MLP ETF: AMLP.

FUEL YOUR PORTFOLIO
Visit amlpetf.com



Investors should carefully consider the investment objectives, risk, charges and expenses of any exchange traded fund (ETF) prior to investing. For a prospectus containing this and other information, please visit amlpetf.com or call 1-877-398-8461. Please read the prospectus carefully before investing.

The Fund seeks investment results that correspond (before fees and expenses) generally to the price and yield performance of its underlying index, the Alerian MLP Infrastructure Index. An investment in the Fund involves risk, including loss of principal. Infrastructure master limited partnerships (MLPs) are subject to risks specific to the industry they serve including, but not limited to: reduced volumes of commodities for transporting; changes in regulation; and extreme weather. The Fund is taxed as a regular corporation for federal income purposes. This differs from most investment companies, which elect to be treated as "regulated investment companies" to avoid paying entity level income taxes. The NAV of Fund Shares will also be reduced by the accrual of any deferred tax liabilities. A portion of the Fund's distributions are expected to be treated as a return of capital for tax purposes. Returns of capital distribution are not taxable income to you but reduce your tax basis in your Fund Shares.

AMLP Shares are not individually redeemable. Investors buy and sell shares of the AMLP on a secondary market. Only market makers or "authorized participants" may trade directly with the Fund, typically in blocks of 50,000 shares. Fund distributed by ALPS Portfolio Solutions Distributors, Inc.

1. US Energy Information Administration, Short Term Energy Outlook, September 12, 2018. 2. Based on the ETF.com per group segment Equity U.S. MLPs, January 1, 2019.