

# Keeping the Flow

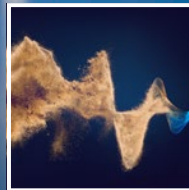
*Water management faces challenges and opportunities as the industry continues its recovery*



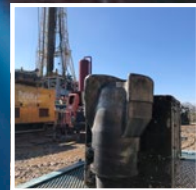
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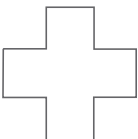
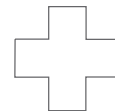
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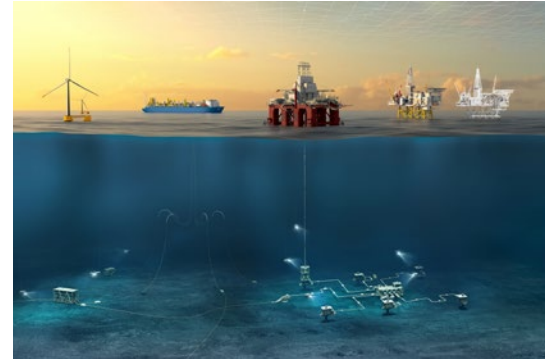
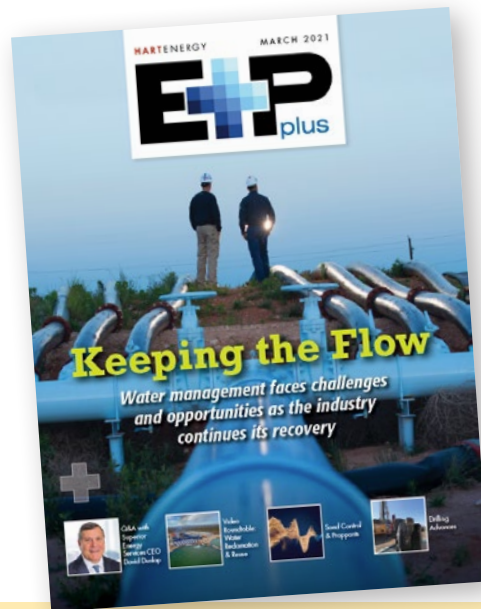
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**About The Cover:** Water management is playing a key role in the upstream sector as it emerges from the downturn, from identifying secure and reliable sources to recycling to adopting the latest technologies to keep the water flowing. (Cover photo courtesy of XRI; Cover design by Alexa Sanders; Bottom images from left to right courtesy of Superior Energy Services; Sobrevolando Patagonia/Shutterstock.com; Tendeka and TGT; and Brian Walzel/Hart Energy)

**Coming Next Month:** The April cover story will focus on ESG and technology and will also feature an emissions video with Schlumberger. The Executive Q&A will feature an exclusive video interview with TGS CEO Kristian Johansen, and the Company Spotlight will highlight Upwing Energy.

As always, E&P Plus will include its exploration, drilling, completions, production and offshore features in every issue. While you're waiting for your next copy of E&P Plus, be sure to visit HartEnergy.com for the latest news, industry updates and unique industry analysis.

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# Online Content+

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## IP Week: Eni shares insight on making carbon capture goals a reality

By Velda Addison, Group Senior Editor

Eni is moving forward with carbon capture projects as part of its goal to decarbonize all of its products and services by 2050.

## Exxon Mobil R&D VP talks 'technology gap' in energy

By Velda Addison, Group Senior Editor

Collaboration and innovation are crucial to advancing technologies needed to meet the growing push for sustainability and cleaner forms of energy, Exxon Mobil executive says.

## Industry of debt: oil and gas M&A looks for 2021 reset

By Darren Barbee, Senior Editor

As more debt is restructured or discharged, the drag on M&A should lessen, which could lead to the return of deal-making in the oil and gas sector to pre-pandemic levels, Deloitte says.

## Missed the CERAWeek conference?

Catch up with Hart Energy's coverage of the event:

## DOE's Granholm encourages role for oil and gas industry in energy transition

By Joseph Markman, Senior Editor

New U.S. Energy Secretary Jennifer Granholm envisions oil and gas companies contributing expertise to develop low-carbon fuel sources as part of the energy transition.

## Qatar Petroleum, Exxon Mobil CEOs talk LNG, natural gas

By Velda Addison, Group Senior Editor

Qatar Petroleum and Exxon Mobil are betting big on LNG and natural gas as the demand outlook appears promising for both.

## US climate envoy Kerry: resistance to energy transition is futile

By Joseph Markman, Senior Editor

John Kerry, Biden's special envoy on climate, tells the oil and gas sector that he wants to work together on plans to reduce emissions to meet global goals.

## Partnerships 'incredibly important' to oil industry's low-carbon future, bp CEO says

By Mary Holcomb, Associate Editor

Oil and gas companies attaining global sustainability goals will depend on partnerships formed across sectors—like bp's deal with Amazon, says CEO Bernard Looney.

## HART ENERGY VIDEOS

By Jessica Morales, Director of Video Content

### Building a case for an ESG-ready future

How are boardrooms across the energy industry looking at their executives these days in terms of measuring their success? In an interview with Hart Energy's Jessica Morales, Akin Gump partners share what oil and gas producers need to do to prepare for an ESG-ready future.



### EOR tech to help oil producers reach ESG goals

Sustainable biosurfactant solutions offer a promising solution for oil and gas producers to boost oil production and achieve ESG goals, Jonathan Rogers, CEO of Locus Bio-Energy Solutions, told Hart Energy's Faiza Rizvi.



### Baker Hughes, C3 AI discuss 'ecosystem' of AI solutions

In an interview with Hart Energy's Jessica Morales, executives with Baker Hughes and C3 AI explain the recently launched Open AI Energy Initiative and why they believe this ecosystem will transform the energy industry.

**View more exclusive video interviews at  
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## Conferences

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In surveys, our attendees always cite two principle benefits from business conferences. They value *programming* – the topics addressed, by whom, and “lessons learned” – and they value *net-working* – collaborative interactions with fellow professionals. Our goal is to inspire new business ideas and opportunities for every participant in any of our events.

Months of physical isolation taught all of us to work remotely, yet we value the unique benefits of face-to-face communication, whether virtual or “live” at appropriate distance. Connections between human beings propel the beating heart of business.

***Please keep the opportunities shown here top-of-mind in planning your own 2021 calendars.***



VIEW EVENTS

VIRTUAL CONFERENCE



March 25, 2021

VIRTUAL CONFERENCE



March 31, 2021

IN PERSON

CONFERENCE & EXHIBITION



May 26-27, 2021  
Shreveport, Louisiana  
Shreveport  
Convention Center

IN PERSON



June 2, 2021  
Houston, Texas  
Omni, Houston

IN PERSON



June 8-10, 2021  
Pittsburgh, Pennsylvania  
David L. Lawrence  
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**Sept. 28-29, 2021**

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Fairmont Hotel - Dallas



**Nov. 2-4, 2021**

Midland, Texas  
Midland County  
Horseshoe Arena



**Water Management**  
April 14, 2021  
Virtual Conference



**Minerals Conference**  
April 28, 2021  
Virtual Conference



**Energy Transition**  
May 19, 2021  
Virtual Conference



**Carbon Management**  
August 25, 2021  
Virtual Conference



**Digitalization in Energy**  
October 6, 2021  
Virtual Conference



**Natural Gas & Hydrogen**  
November 10, 2021  
Virtual Conference

*For more information, visit*  
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As I  
See It

## O&G industry needs to walk a fine line

*Operators and service companies need to provide the world with traditional energy sources while also planning for a clean energy future.*



(Source: P.V.R.Murty/Shutterstock.com)

The oil and gas (O&G) industry is not one to wallow in its own adversity. It may not be necessarily fast to act, but at least its hope is eternal. When the industry found itself in both the pricing and demand basement in late spring and early summer, the near-immediate discussion on Zoom calls was “What will the industry look like on the other side of this?”

The shellshock had barely settled in when, for better or worse, we all were trying to see better-case scenarios. And while the industry certainly isn’t “on the other side” of anything—demand destruction and COVID-19, to name the main ones—it does appear we have at least made it through the dark tunnel. Oil prices have stabilized in the \$50/bbl range, even having a cup of coffee in the \$60/bbl range in late February. Rig counts continue to climb ever so slightly. There’s even a chance a few companies might make some money this year.

But the reality that does seem to be settling in is that oil and gas—and in particular, shale—will likely never return to its heydays of the past. Most analysts agree that oil demand is unlikely to rebound to pre-COVID-19 levels. A recent report by McKinsey & Co. suggests oil demand will peak in just eight more years, and gas in 2037.

Aspectus recently reported that, “Over the long term, the impacts of behavioral shifts due to COVID-19 are minor compared to the ‘known’ long-term shifts such as decreasing car ownership, growing fuel efficiencies and a trend toward electric vehicles, whose impact is estimated to be three to nine times higher than the pandemic’s by 2050.”

Despite a world that seems to be (very) slowly weaning itself off of fossil fuels, the O&G industry is not going anywhere anytime soon. The same report noted that by 2050 more than half of all global energy demand will continue to be met by hydrocarbons. One of the keys to long-term sustainability for the O&G industry is how it responds to the energy transition.

The net-zero goals set by many supermajors and service providers admittedly seem lofty, and it’s unlikely the step changes toward those goals will be noticeable on a macro level. Instead, they will be incremental—a new technology adopted here, a reduction in flaring emissions there. If enough companies take enough such actions, it will add up.

The transition to carbon reduction goals for the O&G industry is an instance of the whole being greater than the sum of its parts. And the foundation of the movement is being established: carbon capture, produced water recycling and flaring mitigation are the low-hanging fruits of ESG compliance.

If the O&G industry is going to not only serve global demand, but thrive such that it finds new avenues for growth, it will need to walk a fine line. It will need to operate under its traditional role of providing the world oil and gas for reliable energy while also being good stewards of the environment, appeasing investors and seeking new avenues for energy creation.

Diversification, anyone? +



**Brian Walzel**  
Senior Editor  
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**Despite a world that seems to be (very) slowly weaning itself off of fossil fuels, the O&G industry is not going anywhere anytime soon.**

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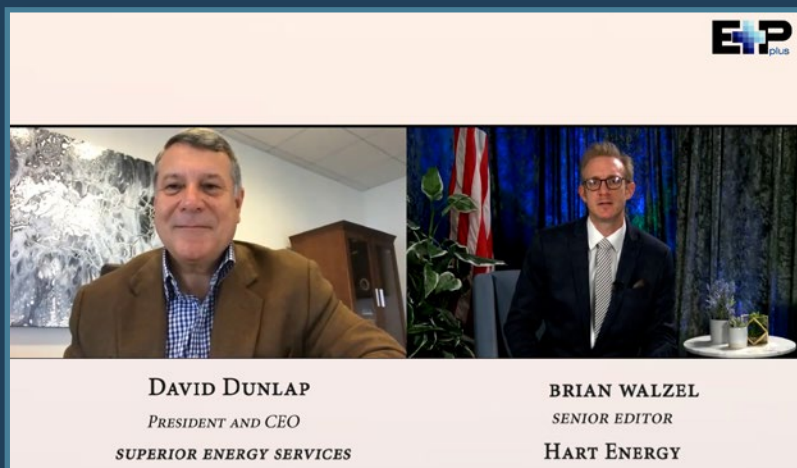
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# QA



In this exclusive video interview for E&P Plus, Superior Energy Services CEO David Dunlap shares his insights and the company's strategies after the company emerged from its restructuring.

## Superior Energy Services CEO talks achieving success post-downturn

*CEO David Dunlap discusses the company's position after successfully completing its bankruptcy and emerging from the restructuring.*

**Brian Walzel**, Senior Editor



**David Dunlap**

**H**ouston-based Superior Energy Services provides tools and systems throughout the life cycle of the well, including drilling products and services, offshore completion and workover services, production services and technical solutions. Its services span the globe, with operations in Africa, Asia-Pacific, the Middle East, Latin America and North America.

Superior Energy Services was among those service providers hard hit by the demand destruction and price collapse of 2020, and subsequently it filed for bankruptcy in December.

In February 2021, the company successfully completed its Chapter 11 bankruptcy, having shed more than \$1.3 billion of existing debt. Superior Energy Services emerges from the restructuring with about \$242 million in cash and a \$120 million asset-backed credit facility.

CEO David Dunlap recently sat down with E&P Plus for an exclusive video interview where he discussed the company's position emerging from its restructuring and how service providers can achieve success in a post-downturn environment. +





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With more than 170,000 STRYDE Nodes™ deployed or purchased globally, STRYDE is helping customers around the globe acquire an understanding of the subsurface. (Source: STRYDE)

## Seismic technology startup experiences ‘rapid’ growth

*STRYDE CEO Mike Popham shares details about the company’s progress since being spun out of bp as well as its new nodal technology, 2021 plans and emerging trends.*

**Ariana Hurtado**, Senior Managing Editor, Publications

**F**ormed in 2019, STRYDE is a seismic technology startup spun out of bp. STRYDE’s node receiver technology is the smallest on the market and delivers high-quality subsurface images at a low cost, according to the company. The technology is designed to reduce environmental footprint and HSE risk as well as provide faster surveys and significant operational efficiencies. The first field trial was completed in 2013, and in 2019 the nimble node receiver project was commercialized.

“STRYDE was set up in August 2019 with a primary goal in mind—enabling clients in any industry to access high-definition seismic images, whether those clients are in oil and gas, geothermal, CCUS [carbon capture, utilization and storage], mining or even archaeology,” STRYDE CEO Mike Popham said. “Until STRYDE was available, very few industries and companies could afford to acquire the quality of seismic they needed.”

In an exclusive interview with E&P Plus, Popham went into detail about this new technology and others in R&D, shared his insight on emerging trends and spoke about the company’s 2021 plans.

### **E&P Plus: What has STRYDE accomplished since separating from bp in 2019?**

**Popham:** Eighteen months on, we have clients in 12 countries, spanning six industries (geothermal, oil and gas exploration, archaeology, mineral exploration, microseismic and seismic risk) and four continents, proving that we were onto something. With this rapid take-up, we’ve also doubled our team to more than 47 employees across seven countries.

### **E&P Plus: How was the company able to navigate through 2020?**

**Popham:** Like any other company in this market, it’s been a difficult year to get through. Normally, we win work by bringing our technology to clients’ sites and showing them what our technology can do compared to what they are used to. With the pandemic, those in-person trials have been harder to arrange. COVID-19 has also affected a lot of the conferences and events where we would showcase our technology,

with many cancelled or shifting to digital-only platforms. So far, we've managed to participate in six online conferences over 2020.

However, even working remotely, we have still been able to significantly grow our client base, with more than 135,000 nodes supplied.

In a year when oil prices have been on the downturn and upstream companies need to think carefully about their operating costs, we've seen this kind of major interest in our technology due to the simple fact that these nodes are lighter, cheaper and faster than anything else on the market.

### E&P Plus: What are the company's goals for 2021?

**Popham:** This year, we expect to have close to 1 million STRYDE nodes on the market, which unlocks huge potential across the industry. For a long time, many operators have recognized that certain land seismic acquisitions really require this level of inventory, but it simply hasn't been available. Furthermore, until now, the cost profile and HSSE risks would have made using such an inventory prohibitive.

We will also significantly grow our client base in key regions and industries where we can make the biggest impact. For example, one key goal for us in 2021 is to bring our commercial systems into Russia. Our technology was tailored to drastically improve the environmental impact, pace, cost and safety challenges in some of their extreme sites, so this will bring things full circle to bring our now fully developed technology back to these environments.

Our technology is ultimately agnostic to its use-case. So as companies across the oil and gas industry start to diversify and explore new sectors, such as CCUS and geothermal energy, we will do whatever we can to support this diversification with high-definition seismic.

### E&P Plus: Can you provide any recent case study details on your nodes?

**Popham:** We're proud of a trial of our technology in UAE [United Arab Emirates], which was conducted during the R&D phase in early 2019. This set a new world record for land seismic trace density. Combining our nodal technology, with simultaneous source technology, we delivered 184 million traces per kilometer.

As we see time and time again when people use our systems, we achieved a significant image uplift while moving rapidly over the ground with very few people. To put that in numbers, a line crew of 36 people working on average 6 hours per day were laying out 10,000 nodes and retrieving another 10,000 nodes per day.

Right now, one of our early clients is conducting a large-scale 3D trial with STRYDE in the Middle East. We will share more details on this, and similar acquisitions we have ongoing in two other continents soon [in early 2021].

### E&P Plus: What is the biggest challenge your clients are facing? What emerging trends do you see taking place?



**"Across the sector, there is still so much that needs to be done to make seismic even more cost-effective and time-efficient for the end client throughout the process."**

– Mike Popham, STRYDE

**Popham:** The past year has been inundated with challenges, from COVID-19 to weak oil prices. We're also continuing to see trends emerging, which personally I think are very positive. For example, more and more companies are considering their environmental impact. While there is a pessimistic perception that there is nothing oil and gas can do as the industry inherently results in emissions, there is still so much that can be done to reduce overall environmental impact across the whole sector.

In particular, we've found that many companies involved in exploration and reservoir development are openly challenging or reconsidering practices that used to be commonplace, such as line-clearing of forestry to make way for bulky seismic equipment. With STRYDE providing nodes that weigh just 150 g each, coupled with emerging advances for similarly nimble sources, companies are now able to not only reduce the number of vehicles and personnel needed to lay out seismic technology—and thereby safer, more cost-effective operations during pandemic times—they're also able to drastically reduce and even eliminate any negative impact on the surrounding area's forestry.



A 2019 trial of STRYDE technology in the United Arab Emirates set a new world record for land seismic trace density—184 million traces per kilometer. (Source: STRYDE)



A number of companies are proactively making these moves toward leaner, more environmentally friendly operations proactively. But as climate change continues to gain more and more focus from governments across the globe, we will start to see even more operators opting for smaller, lighter nodes to stay compliant with incoming government regulations.

### E&P Plus: Does the company have any new technologies in the R&D phase?

**Popham:** We have a huge amount planned for the year ahead. In addition to our research into the potential uses of passive seismic, we are well advanced in our creation of an additional node variant, which will supplement our current node to further extend what our users can achieve.

We also constantly strive to make our system even faster, lighter and smaller because this benefits any and every market we operate in. We have already managed to scale down an acquisition system to the point that you can comfortably fit our NIMBLE system and several thousand nodes into a small office with plenty of space to spare or even in the back of a pickup truck, which makes frontier exploration far easier than it was 12 months ago. Despite this, we believe we can go even further.

More broadly, our R&D is focused on meeting what operators and acquisition contractors in the market tell us that they need. Whilst that's an obvious statement, it's not something that many companies in our market do. The STRYDE technology itself is a good example of this; for many years, the seismic technology sector heard the same requests for lighter, faster, significantly cheaper nodes from operators so that together we could lay out more channels and ultimately get a superior image whilst in parallel, reducing risk exposure and environmental impact. We will continue to stick with this approach, listening to the demands of the industry and designing what operators want in collaboration with them, rather than producing small, incremental steps of what they want.



(Source: STRYDE)



(Source: STRYDE)

### E&P Plus: Where do you see the future of seismic acquisition and imaging? What other improvements can be made or are needed?

**Popham:** Firstly, I believe that there is huge untapped potential to use seismic imaging for new applications across a range of industries. I already know that STRYDE alone will bring seismic to at least three further industrial sectors in 2021. And where I'm saying this in early January, I expect the end figure will be far higher. This expansion of how seismic is used is good news for everyone in our industry.

Over the past year, I have also been fortunate to test some really encouraging advances in the seismic technology sector from other companies. When good innovations are combined, you can transform the industry further than any one technology can on its own.

The challenging side is finding the right commercial models, partnerships and end customers to integrate these innovations and unlock the overall true potential we all have available to us already.

I also think it's important to explore what we can do today but isn't yet being widely utilized. For example, passive seismic, where an active source isn't utilized, has huge potential for a range of applications. There isn't a technology barrier to acquiring it as most nodes record continuously, collecting large quantities of passive seismic data. What's interesting is that when it comes to processing, most of these passive data are discarded, and people aren't often able to come back to see what they've thrown away. We've been able to explore how these data can be used and now have access to a large dataset across a huge range of environments. We are researching the potential level of valuable information that can be gathered by passive seismic and are seeing some very encouraging results.

Across the sector, however, there is still so much that needs to be done to make seismic even more cost-effective and time-efficient for the end client throughout the process. At the moment, the timeline from starting a large acquisition and actually accessing useful products is far, far too long.

STRYDE allows a client to significantly cut down the acquisition phase, but even then, there's so much potential to improve speed and efficiency elsewhere in the life cycle of a seismic project. We're open to collaborating with companies, big and small, who can help accelerate the whole seismic project timeline. +

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Water management is playing a key role in the upstream sector as it emerges from the downturn, from identifying secure and reliable sources to recycling to adopting the latest technologies to keep the water flowing. (Source: XRI)



# KEEPING THE FLOW

*Brian Walzel, Senior Editor*

## *Water management faces challenges and opportunities as the industry recovers.*

**O**perating almost as an industry unto itself, upstream water management is facing similar challenges as is the whole of the oil and gas industry as it emerges from one of the worst downturns in its long history. Water management is also facing challenges unique to itself, with growing seismicity concerns leading to increased regulations and an ever-growing push for ESG performance spurs operators to inject less produced water and recycle more.

While it deals with these questions, the upstream water management industry also faces the growing pains that come with any nascent business. Determining where and how digitalization technologies like Big Data applications fit and facing increasing competition among new entrants will dictate the path water management charts for itself, particularly in the coming few years.

But in the short term, water management, like so many other industries, is bouncing back from a 2020 that proved costly, from an operations and financial aspect.

Speaking at Hart Energy's recent Executive Oil Conference, B3 Insight CEO Kelly Bennett noted that disposal volumes in Texas and New Mexico—a strong indicator for the water management business as a whole—were down significantly from their March 2020 peaks.

"We observed a pretty significant drop from the peak in March to the trough in May for disposal of water in the Permian Basin," he said. "In Texas, it was about a 26% drop; in New Mexico it was a little more, about a 28% drop."

The cause of the disposal volumes drop was a result of widespread well shut-ins, as prices and demand plummeted over the late spring and early summer.

"We started to see those wells come into production over the course of late June, July, August and September," Bennett said. "And that's what accounts for (an increase) through July in disposed water volumes. Since then, we've started to see those volumes fall again. While there are some wells being completed, it looks a little more like a natural decline in water volumes."





Progress continues despite recent weather challenges in West Texas on Select Energy Services' treatment facility. The facility features a 2-MMbbl storage capacity with an expected throughput of 50,000 bbl/d of treated produced water. (Source: Drew Smith, Select Energy Services)

Although this year is likely to see some small amount of production growth, Bennett explained much of it will come from the estimated 1,000 or so DUCs throughout the Permian, as companies continue to reduce capex in favor of generating returns. He said it could take some time before the water management industry recovers the approximate 20% of disposal volume it lost last year.

"In the water management industry, which is still in a fairly nascent stage, there are companies that did far better than this and far worse," he said. "So when we talk to our clients and work through some of the challenges that they have, anecdotally there are some companies that lost 50% or more of volumes in their

key facilities, and there are some who weathered this far better."

#### **Growth after the downturn**

Even before the double headwinds of 2020, operators began to transform from a grow-at-all-costs mindset to placing a priority on reducing expenses and generating cash flow. Those efforts have included identifying efficiencies in their water management program and working with service providers to achieve the best possible price on sourcing, recycling and disposing of water.

"Operators are looking for ways to drive efficiencies through their operations while simultaneously lowering costs," said Andy Adams, senior director water management and infrastruc-

ture with Select Energy Services. "One way they are doing that is through the use of large-scale, centralized treatment facilities. Select has multiple facilities planned or under construction in the Permian."

In February, Select announced it had been awarded two recycling facility contracts for producers in the Permian Basin. According to the company, the first facility is a new fixed infrastructure produced water recycling facility project serving the core of the Midland Basin in both Martin and Midland counties, Texas. Select believes the \$5 million facility should be fully operational by the end of the first quarter of 2021.

"This project is supported by a long-term contract with a leading,





large independent operator in the Midland Basin for the purchase and delivery of recycled produced water,” the company stated in a release. “This facility will support the recycling of up to 50,000 barrels of water per day while providing 2 million barrels of recycled water storage capacity. Additional incremental capacity beyond the contracted volumes creates additional opportunity for growth with the contracted customer as well as the opportunity to further commercialize the facility to support the needs of other operators in the area.”

Select is also developing a centralized produced water recycling facility for a major integrated operator in Loving County, Texas,

**“Operators are looking for ways to drive efficiencies through their operations while simultaneously lowering costs. One way they are doing that is through the use of large-scale, centralized treatment facilities.”**

—Andy Adams, Select Energy Services

in the Delaware Basin. The facility is designed to recycle up to 30,000 bbl/d of produced water and will be supported by 1 MMbbl of adjacent recycled water storage capacity. Select expects this facility to also be fully operational by the end of the first quarter of 2021 as well.

“The scale of the facilities we are

building today is changing the economics of oilfield water treatment by allowing operators to achieve the high-volume output required for 100% produced water fracturing over a short period,” Adams said. “A 1-million-barrel facility capable of supporting multiple frac crews is becoming the norm.”





SitePro's technology provides automation of water storage and treatment facilities. (Source: SitePro)

### **Adopting digitalization in water management**

Like essentially every other component of the upstream oil and gas industry, water management is entering the era of digitalization. Automation technologies are helping companies keep track of where their water is going, where it's coming from, how much is needed, how much is being used and how much it's costing them.

SitePro applies SCADA systems to remotely monitor and control assets in fluid management.

"We put our systems on production batteries, pits, ponds, pipelines, disposal wells and interconnected closed-loop systems," said SitePro co-CEO David Bateman. "And we offer people the ability to manage this stuff on their computer or from an applica-

tion on their phone. It's somewhat the traditional automation, remote monitoring and control combined with a commercial transaction element for managing a lot of tickets and loads, whether that's by truck or pipeline."

Bateman said those capabilities can synchronize data into an accounting or billing system that can serve as an analytical tool for understanding the analytics behind water management. Additionally, SitePro has initiated some work as well into produced water recycling technologies.

"We've put our systems on those facilities as well, where we're monitoring water quality and water chemistry to help make decisions for blends and mixes," Bateman said. "And even in water wells, we help manage and monitor any kind of water quality

issues that may exist downhole."

As far as how automation and digital technologies can improve water management efficiencies, Bateman said they can provide an array of benefits.

"For instance, if you own a water midstream asset, you can use analytics to see which customers are bringing you the most water by volume and what the quality of that water is," he said. "And you can learn what service companies are using it, when peak demand is [and] when low demand is. I would call that market intelligence."

He added that automation technologies can be applied to pumps, drives and valves that can provide data that can measure wellbore integrity, predictive analytics and equipment maintenance information.



**BRIAN WALZEL**  
SENIOR EDITOR  
HART ENERGY

**JOHN DURAND**  
PRESIDENT AND VICE CHAIRMAN  
XRI

In [this exclusive video interview](#), John Durand, president and vice chairman with XRI, speaks with Hart Energy's Brian Walzel about how the water management industry navigated through 2020, where the sector stands now and what the future holds.

### Natural gas foam

One method to curtail freshwater usage as a fracking fluid is to nearly bypass water as a whole altogether. In early March, the Southwest Research Institute (SwRI) announced it had completed a pilot-scale facility to create and test natural gas foam as an alternative to water for fracturing. According to the SwRI, the six-year project is part of an effort to show that stable natural gas foam can be generated on site at a fracturing location using commercially available products.

"Fracking doesn't always occur near water resources, so the water has to be trucked in," said Griffin Beck, the project's principal investigator. "That process is time-consuming and can wreak havoc on local roads and related transportation infrastructures, not to mention the tens of millions of gallons of water consumed by the fracking process."

Beck and his SwRI colleagues took note of the abundance of natural gas being flared and began exploring natural gas foam as an alternative to water. The team initially determined that the most efficient way to create the natural gas foam was to use standard compressors to pressurize the natural gas and then mix it with water to create the foam.

"The foam is created by jetting the



SwRI has completed a pilot-scale facility to create and test natural gas foam as a safe and stable alternative to water for hydraulic fracturing. (Source: Southwest Research Institute)

natural gas stream into the pressurized water," Beck said. "The process utilized up to 80% less water than typical fracking treatments."

The SwRI team found that the foam's viscosity was capable of carrying sand particles into well fractures as efficiently as pressurized water. Beck also found that the foam's properties produced less swelling in clay environments and could possibly improve production rates.

"We created a reservoir model to test the foam's efficiency," Beck said. "We compared production to a reservoir treated with water and with natural gas foam. The model showed a 25% improvement in cumulative oil production."

According to the SwRI, the next step is to field-test the foam. The project is scheduled for completion in March, with \$2.67 million in funding from the U.S. Department of Energy.



### Evaporation

For operators in remote areas without easy access to disposal wells and facing high trucking costs, one option for managing produced water is evaporation.

Gradient Energy Services (GES) recently brought to market its Carrier Gas Concentration (CGC) technology. Gradient completed a pilot of the project for a supermajor in the Permian Basin in 2019.

According to GES, the process involves evaporating water and concentrating dissolved solids in the wastewater stream via a multistage bubble column humidifier. GES has designed its fully automated and mobile system to run with limited supervision. The company stated on its website that the process results in clean vapor released into the atmosphere and a concentrated brine that can be used for drilling, workovers and completions or simply to reduce disposal volumes.

“Disposal constraints are becoming a major concern for operators in the Permian,” said Kushal Seth, vice president of applications and business development with GES. “Longer term, excess produced water volumes will create higher disposal costs, potential environmental liabilities and limited disposal capacity for E&Ps operating in the basin.”

The CGC system was recently adopted by an operator producing about 2,000 bbl/d in the Marcellus facing high disposal costs. As a result of logistical and policy challenges, the northeast has limited disposal sites and evaporation has faced regulatory challenges.

“Operators have considered evaporation in the past, but one of the key requirements for evaporation technology is strict regulatory permitting, specific to particulate matter [PM] emission levels,” GES stated in a recent case study. “Several evaporation technologies, such

as submerged combustion or flash evaporation, will not meet the strict PM emission requirements and also require high levels of energy. As a result, operators would truck the majority of produced water to Ohio. This came at an extremely high cost of \$8 to \$15/bbl just to dispose of the produced water.”

GES provided the CGC for a trial, which evaporated 67% of the influent total, according to the company. Of the highly concentrated brine, about 33% was saturated to concentrations greater than 220,000 mg/L, which could then be used by the operator for drilling operations or disposal.

“The client was able to manage the water production while cutting the disposal costs by over 45%,” GES reported.

### Operational flexibility

The first challenge for operators when addressing water management

is securing the millions of barrels of water needed to fracture even a single well. Setting up adequate water supply, identifying water sources, negotiating rights-of-way, installing pipeline and storage units, and pumping water to the well site can take months of preparation.

Oftentimes, the distance between the water supply and well site can extend more than 10 miles, which requires the installation of miles of temporary pipeline. Flow-Sync is a specialty skid-based water transfer pump control system for fracturing operations that optimizes and simplifies complex water transfer logistics. Flow-Sync utilizes Bedrock Automation’s Open Secure Automation technology that enables better control of the complex pump control to manage water flow.

“Water is probably a more difficult problem to solve overall when in fracking than most other parameters



**Bedrock Automations’ Flow-Sync system provides real-time visibility into all operations to monitor multiple pumps remotely, giving each person control over a larger portion of the water transfer operations. (Source: Bedrock Automation)**

because you need so much water,” said Albert Rooyakkers, Bedrock Automation’s founder and CEO. “You’re in a place where there is so little of it, and you have to produce the water to use it, and then you have to store it and treat the water once you’re done with it. So it’s a significant management problem for the users. And what Flow-Sync is doing is exploiting that process and providing this highly flexible infrastructure.

They can run miles of flexible piping in days instead of months or years in order to run water infrastructure across miles of Texas or New Mexico or many other places.”

Rooyakkers explained that the entire Flow-Sync system is mobile, including the pumps, the flexible pipes and power generation. But total automation, he said, is what is paramount to drive costs down.

“You can control pressure more accurately, [and] you can control the sequential startup and shutdown of pumps more accurately,” Rooyakkers said. “With basic flow metering, you can conduct leak detection. Once you have some simple data, you’re not having to drive 10 miles to the next pump to manually check it. You can instantly get this data. By having the wisdom of human intelligence, looking at the data in a centralized location, you’re going to be able to achieve a lot of improvements in safety, reliability and operational integrity.”

### Seismicity

A growing concern among producers and service providers in the water management industry is induced seismicity in the Permian Basin. Seismic activity can often occur in areas around saltwater disposal wells. While most instances of seismic activity are modest, more severe instances have been trending upward in the Permian over the past few years.

According to the Bureau of Economic Geology’s TexNet Seismic

**“If we have more smaller wells injecting into those formations where we already know there is some overpressurization, or there is a potential for those issues, will that require more significant investment in transporting water farther away from the origin of production?”**

—Kelly Bennett, B3 Insight

Monitoring Program, between 2016 and 2018, there were 284 seismic events measuring a magnitude of 2 or greater. Since 2019, there have been 699. On March 26, 2020, a record 5.0 magnitude earthquake occurred in the Permian Basin.

“When we started looking at the growth rate of these, the growth rate has been really incredibly high,” B3 Insight’s Bennett said. “I would say over the last few years it’s grown over a 46% rate just in terms of the number of instances. And we’re also starting to see more and more of the Permian affected by it.”

Bennett noted that the increased number of seismic events are not just focused in the Delaware Basin, where many of the initial problems occurred early on.

“We see a significant impact across not just most of Reeves County, but also large parts of Ward and Loving counties,” he said. “The growing number of events in the Midland Basin is of growing concern to the operators there and the [Texas] Railroad Commission, and it’s starting to result in real implications for operators in disposal capacity.”

Those implications have included capacity reductions during the permitting process and additional special conditions being added to disposal wells in terms of requiring additional data gather, ongoing seismicity monitoring and the implementation of earthquake response plans.

“The Railroad Commission has

been looking at existing locations where there have been concerns about seismicity and adding conditions or simply saying [operators] need to revise permits,” Bennett said.

Reductions in disposal volumes have been credited with reductions in seismic activity in Oklahoma.

“In Texas what it means is that there is a lot more scrutiny on these permits,” Bennett said. “In New Mexico, it’s really starting to trend that way.”

According to B3 Insights, more than 500 new and amended disposal permits have been impacted by special conditions since 2019.

“When we think about the implications for the market, what we are seeing is that new wells being permitted today are smaller than they were last year, which were smaller than they were the year before that,” Bennett said. “So that really begs the question: If we have more smaller wells injecting into those formations where we already know there is some overpressurization, or there is a potential for those issues, will that require more significant investment in transporting water farther away from the origin of production?”

He added that such dynamics will likely continue to give rise to produced water recycling and reuse.

“These issues, a lot of them are local,” Bennett said. “But when you start thinking about them on a landscape scale, there is a lot of investment that is going to be needed to see this industry through.” +



# Water management in a post-downturn economy

*Leaders in water management discuss the industry's recovery.*



In this water roundtable discussion with Hart Energy's Jessica Morales, senior executives with Oilfield Water Logistics, WaterBridge and the Produced Water Society discuss water reuse trends and strategies.

**Brian Walzel**, Senior Editor, and **Jessica Morales**, Content Director of Events & Video

**W**ater management, particularly in the arid Permian Basin, has emerged over the past few years as an industry unto itself. With wells calling for as much as 650,000 bbl of water for fracturing operations, sourcing such vast amounts of water, and handling the volumes produced water that return from the well, the logistical and cost challenges are often enormous.

The water management industry emerged relatively rapidly and in a short period of time has evolved under such rapid growth. Today, a good water management program entails sourcing adequate supplies, properly treating freshwater for fracturing operations, securing disposal well capacity, trucking or piping water across hundreds of miles, and recycling and reusing produced water for new fracking operations. All of this is interwoven into an ever-evolving digitalization trend that helps operators and producers make decisions on the water management operations more quickly and with more information at their hands in a quicker amount of time.

In an exclusive video roundtable, Hart Energy recently hosted Oilfield Water Logistics CEO Chris Cooper, WaterBridge Co-CEO and CFO Steve Jones and Brent Halldorson, board member of the



(Source: Sobrevolando Patagonia/Shutterstock.com)

Produced Water Society, to discuss these and several other trends, including how the recent downturn has affected the water management industry. +

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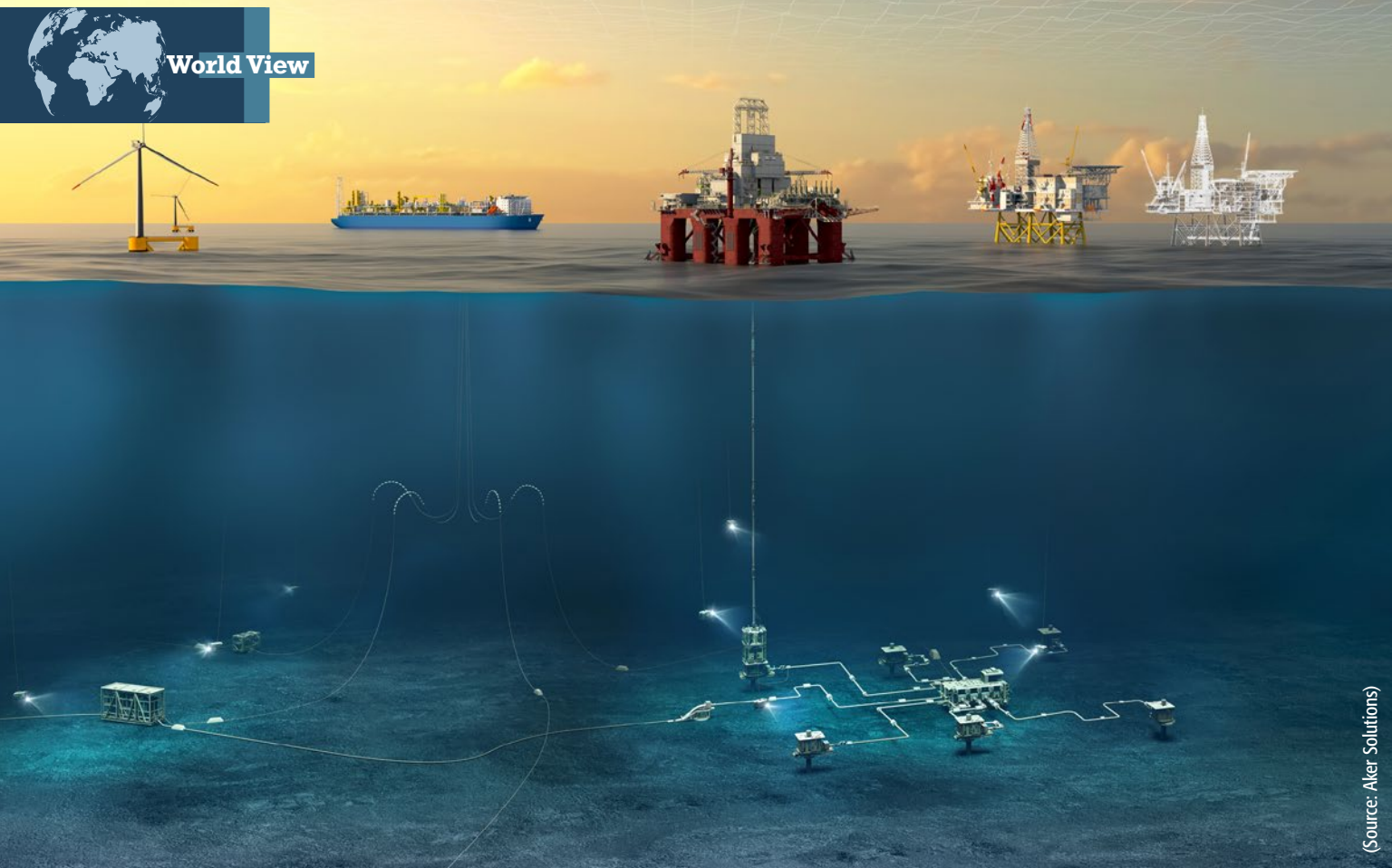
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# What prize remains for oil and gas in the UKCS?

*Though the reputational and financial gains to be made from the renewables sector are now more attractive and attainable for investors, oil and gas retains a crucial role in the energy mix going forward.*

**Sian Lloyd-Rees, Aker Solutions; and Jim Lenton, Worley  
SPE Offshore Europe 2021 Executive Committee members**

**D**espite turbulent pricing for oil and gas and a strong social pivot toward the energy transition and decarbonization, determination and cautious optimism prevails to make a success of the remaining life in the U.K. Continental Shelf (UKCS).

In its 2019 economic report, Oil & Gas UK (OGUK) asserted that North Sea firms were on track to produce roughly the same amount of oil and gas in 2020 as they did the previous year, regardless of the unforeseen challenges thrown up by the COVID-19 pandemic. However, with more than GBP35 billion of investment opportunities over the next 10 years included in companies' plans at the outset of 2020, the annual study concedes there is "real uncertainty" about the viability of many of these initiatives going forward.

As a mature basin, dealing with aging infrastructure and challenging recovery costs, those in the local market are competing

with easy and more profitable projects in other locations. However, it continues to be viewed as a resilient role model for burgeoning regions to concurrently reduce lifting costs and improve production in deeper, harsher and more demanding environments. Conversely, its fortune and fate also can act as a portent to oil and gas hubs reaching the dusk of life but where the sun still shines brightly.

## Making hay

According to research by McKinsey & Co., aggregate fossil fuel demand is set to peak in 2027 with oil peaking in 2029 and gas in 2037, partially due to the impacts of COVID-19. The study surmises that while hydrocarbon consumption will plateau, more than half of all global energy demand will continue to be met by oil and gas up to 2050.



There seems no doubt that standing still is not the answer. A different approach will be required to secure and sustain success in this new era for the energy mix.

In less than a decade, the playing field of the North Sea has undergone dramatic change with many of the supermajors departing and making way for a new generation of smaller, more nimble, independent operators. There has also been a significant shift in the size and type of field development being progressed to extend life in the basin. This renovation looks likely to continue for another decade as renewables, such as offshore wind, hydrogen and greater electrification, take time to upscale.

As one of the most mature provinces for oil and gas, the UKCS has continually evolved technologies to satisfy its specific requirements—many times ahead of other regions—which affords great opportunity. However, the counter point is now a very cost-focused culture where commoditization of the supply chain has ramped up, potentially hindering further investment in technology.

Though the reputational and financial gains to be made from the renewables sector are now more attractive and attainable for investors, oil and gas retains a crucial role in the energy mix going forward. As the transition starts to pick up pace, oil and gas production is still considered the cash cow for investors.

From a supply chain perspective, the ideal investment is one in which the technology being used to drive down the costs of remaining reserves can also build in efficiencies to lower carbon footprint and increase sustainability. Likewise, key to any kind of business, regardless of size or market, is learning to adapt to the conditions, adopt digital technologies and be agile in that change. Diversification into renewables also becomes increasingly important to spread the risk and increase the gains.

### Opportunity knocks

It need not be doom and gloom for the sector. In fact, the cyclical nature of the oil and gas industry makes it inherently more flexible to ride through the lows and take the prize with the highs. It's a myth to think of monolith organizations as dinosaurs seeking fossils. Adaptability whilst maintaining productivity has always been a necessary trait. Commercial prospects do exist in this sector, particularly as the U.K. boasts a fast-moving net-zero agenda and a highly qualified and highly skilled workforce with easily transferrable talent ready to expedite it.

**Aker Solutions engineers the products, systems and services required to unlock energy. (Source: Aker Solutions)**

For example, knowledge and experience gleaned from decades working with natural gas enhance the safe and sustainable adoption and implementation of hydrogen management, processing and transportation. A strong skills base in the North Sea today is vital or our future role will be limited.

As traditional oil and gas companies such as bp, Shell and Equinor evolve into international energy companies, the supply chain is pivoting toward those with strong provenance already in place.

The issue is one of 10 keynote program sessions at SPE Offshore Europe 2021 being held Sept. 7-10 in Aberdeen, Scotland. It will bring together the regulator and a selection of operators at different stages of evolution to share experience and insight and discuss what is needed to survive and thrive in this period of extraordinary change and pressure.

The sessions, which include transitioning to lower carbon solutions, oil and gas security of supply, lowering carbon footprint and emissions, and future collaboration models, are aligned to the overall theme and direction of the event: "Oil & Gas: Working Together for a Net Zero Future."

### Recipe for success in E&P

With the continuing need for the provision of oil and gas to satisfy energy demand, alongside new and broader sources of energy provision, there is a market for many types of energy providers. Like an elaborate quilt, the industry is a patchwork of diverse companies each approaching the marketplace on a range of routes. Some of the larger internationals are using technology to drive it while smaller businesses are using varying work processes and practices. The winners will be those that can balance and take into consideration the agenda for decarbonization as well as continuing safe and sustainable production.







**Worley is a global provider of project and asset support services in the energy, chemicals and resources sectors. (Source: Worley)**

For the future of E&P, which will be a major talking point at SPE Offshore Europe 2021, companies that can approach the marketplace with the right cost base and approach for managing and developing commercial deals and models, which may not be so heavily burdened with their own resources to keep costs lean, will make money.

Essentially, if the recovery continues and lifting costs can be kept at or below \$20/bbl, then there's still a profit to be made, even between US\$40 to US\$50/bbl. Anything is possible with the right combination of field, development plans and financial acumen.

This also affords the industry opportunities to work together and develop solutions to reduce flaring and venting, for example, and legitimize their social license to operate.

**United we stand and deliver**

For the U.K., there has been a huge jump forward in terms of government investment in the low carbon agenda. Over the past year, the Energy Whitepaper and the 10-point plan for a green recovery have been showcased. The outcome of negotiations on the North Sea transition deal also is expected over the next six months. This will map out long-term action for transforming the sector, delivering the energy transition and act as a vehicle

for creating new jobs as well as trade and investment opportunities.

All these are at a particular point in time where it makes sense for those working in the mature North Sea to look at the transition more strategically, whilst continuing the day-to-day delivery of oil and gas, now and for future energy requirements. It's a time when our industry must pull together and show its broad capability and focus. +

*References available.*

**About the authors:**



*Sian Lloyd-Rees and Jim Lenton are both SPE Offshore Europe 2021 Executive Committee members.*

*Lloyd-Rees is U.K. country manager with Aker Solutions. In a career spanning more than 25 years, she has extensive business experience as a senior leader in both energy and IT industries, having held a number of leadership roles in both blue chip and startup companies. She is the head of U.K. and a senior vice president with Aker Solutions. She is also co-chair on the board of OGUK.*



*Lenton is senior vice president of integrated solutions with Worley. With a background in chemical and process engineering, Lenton has built his career in oil and gas globally over 25 years. He is a fellow of the IChemE. Prior to being acquired by WorleyParsons in 2017, he ran the European operations for Amec Foster Wheeler in Northern Europe and CIS, and then the global asset support product line in the Oil, Gas and Chemicals division.*





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# From ambition to execution: a low-carbon future for the oil and gas industry

*Decarbonization is critical for oil and gas companies to be sustainable in a low-carbon future, but most companies are struggling to translate strategy into execution.*

**Matt Handford and Mitch Fane**, Ernst & Young LLP

**A**mid the fallout from the COVID-19 pandemic, oil and gas companies have been forced to confront a crash in energy prices, as some industries reduced production and transportation activity collapsed. Nearly three-fourths of energy executives in the EY Realizing Strategy Survey indicated that COVID-19 will impact or even cause them to pivot their organizations' medium- to long-term strategy.

While this crisis will hopefully be resolved in the short term, it is a prelude to a more gradual long-term reality for the sector, with a focus on decarbonization and its implications for demand. Companies continue to focus on managing cash flow, driving resilience and cutting costs to get through this period of turbulence—strategies that are useful and sustainable to survive the tumult of today but not necessarily the world of tomorrow. The energy transition to a low-carbon future has many paths, with a range of outcomes in both magnitude and timing, as examined in the EY Fueling the Future analysis.

For at least the next four years, President Joe Biden's administration will likely reorient U.S. regulatory priorities around reducing carbon emissions, aligning them more with the norm in Europe and the Paris Agreement.

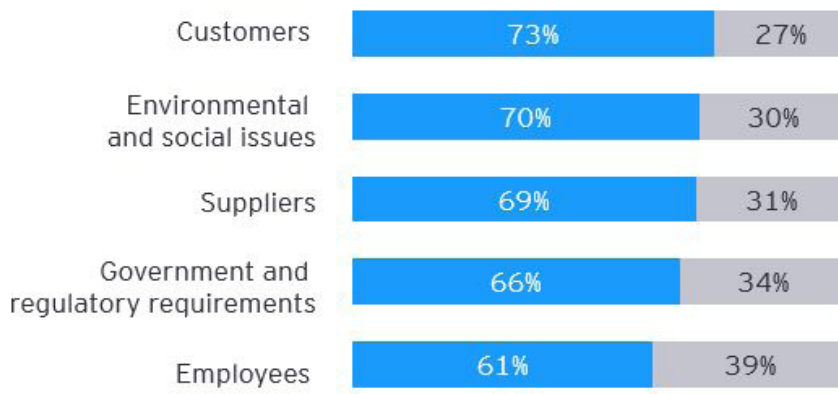
Regulations and subsidies also will influence the electric vehicle (EV) market. EVs could achieve price parity

with their gasoline-fueled counterparts within the next five years, per the EY Countdown Clock, and renewables could become the world's largest source of electric power within the same time frame.

With increased focus on climate risk and ESG issues, investors may stay on the sidelines rather than put more money in capital-intensive supply-side projects. Furthermore, the stakeholders that energy executives are beholden to are changing. A recent EY survey showed 70% of

**FIGURE 1. Greater set of stakeholders**

Customers, environmental and social issues, and suppliers are gaining traction and becoming more or as important than shareholders, according to energy executives surveyed.



■ More important than – or as important as – shareholders

(Source: EY Realizing Strategy Survey)

**FIGURE 2. The roles and opportunities in the alternative energy value chain**

Role	Opportunity
The technologist	Cost and performance of fossil fuel alternatives continues to advance. While tipping points are close, closing the market share gap will require further investment. Success will be determined by capacity to translate scientific breakthroughs to commercial application.
The developer	Substantial profitable investment opportunities are untapped to scale-up renewable portfolios. Success will be determined by capacity to organize and activate multiple activities (contractual, regulatory, engineering, financial) on coordinated timelines.
The capital aggregator	Capital providers are eager to put money to work, but there is too much money chasing too few deals and driving down returns. Success will be determined by the ability to evaluate project risks at compensatory pricing.
The builder	The population of EPC contractors experienced in bringing renewable energy capacity to market at scale is small relative to the expected demand for alternative energy projects. Success will be determined by the ability to translate development plans into operating hardware.
The operator	Operating large portfolios of alternative energy projects is highly concentrated and mostly in the power and utility sector. Success will be determined by capacity to monitor and improve operations and maintenance.
The trader	Most alternative energy projects are operated under long-term contracts with incumbent utilities. There is a known market for direct sales to end users and substantial opportunity for asset optimization via trading. Success will be determined by market reach and ability to creatively structure and execute contracts.

(Source: EY research)

energy executives believe environmental and social-issue stakeholders to be more than or as important as shareholders (Figure 1).

Clearly, decarbonization is no longer just noise from environmental activists. To address these challenges, oil and gas executives should consider the following five questions.

### What outcomes does your company want to achieve?

What is the business's primary need, beyond continued growth and relevance in a changing environment? Investor appetite? Social license to operate? A stronger brand with customers or consumers? Regulatory compliance and risk mitigation? All are likely factors, but how a company prioritizes depends on its purpose and place in the energy value chain.

The energy company of the future is likely to look very different than it does today. The intended outcomes should ultimately serve as the foundation for a long-term strategy and be focused on business fundamentals such as cash flow or balance sheet strength. There should be a clear link between ESG priorities, in particular decarbonization, and how they will drive the company forward.

### What is your carbon exposure now and in the future?

A company's carbon footprint is composed of both direct and indirect

emissions and can vary from one company to another. Making estimates requires looking at a company's entire operations: location, amount of acreage, efficiency, greenhouse-gas (GHG) intensity and other factors. Understanding the full dimensions of risk is necessary to mitigate them, and they're different across markets and subsegments of the industry.

With intensity-related targets, a company should explore efficiencies such as how to capture more dry gas coming off the wellhead rather than burning it off or using less diesel and process fuel in production. Some companies can use this exercise to strategize on broader changes: an integrated company may seek to balance carbon across its portfolio through a mixture of renewables, natural gas and crude, for example, in ways that other players in the ecosystem cannot.

The shifting political landscape in the U.S. creates another potential area of exposure to scrutinize: new regulatory and tax burdens on fossil fuels may be implemented alongside new incentives and subsidies for renewable energy. It remains to be seen if the carbon capture, utilization and storage (CCUS) tax credit, 45Q, remains a viable mechanism for the incoming administration. This will allow oil and gas companies to create partnerships with power generators and other technology startups (such as direct air capture) to develop operating models for injection or utilization of CO<sub>2</sub> that are economic at scale.



## Although it poses challenges, decarbonization shouldn't be seen as an existential crisis for the oil and gas sector.

### What type of emissions commitment should be set and at what future dates?

To address pressure from governments and investors on ESG and the long-term planning for the sector, companies should explore de-risking portfolio allocations and what targets make the most sense to build credibility in the market—whether they are absolute or intensity-based (normalized) or both. Most companies have reduction targets for scope 1 (emissions from owned assets) and scope 2 (emissions from purchased energy). Reducing scope 3 emissions, stemming from the use of a business's products, provide the biggest challenge for the sector. Very few upstream players, for example, have set scope 3 targets, while several supermajors have, particularly those based in Europe.

Regardless, executives should measure their company's emissions and determine how to follow through and disclose on GHG intensity-related or absolute targets. Intensity-related targets are focused on efficiencies, to limit the emissions from each barrel of oil to the extent possible with smooth operations. Absolute reduction targets for emissions lead to a drop in production, which for some players—particularly in upstream—do not make economic sense without a drastic rethinking of strategy and diversification.

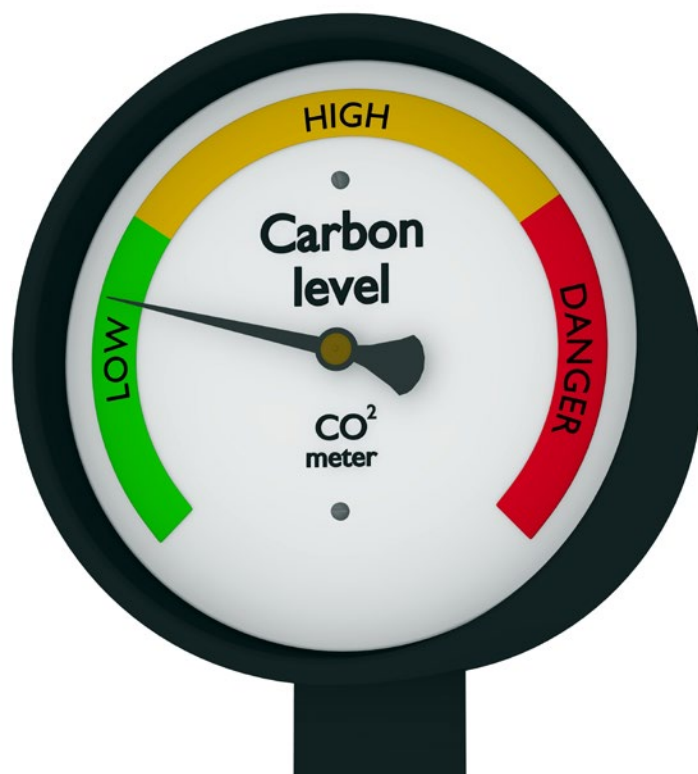
### What will be needed from the perspectives of data, funding and governance?

ESG has evolved to become a strategic business imperative as investor expectations of ESG disclosures and communication have grown. Most investors (98%) evaluate nonfinancial performance based on corporate disclosures, with 72% saying they conduct a structured, methodical evaluation, according to the EY Climate Change and Sustainability Services survey of 298 institutional investors globally.

Executives need to consider their internal controls and technology needs around data collection and reporting of sustainable information. Additionally, executives should consider how cost of capital metrics could increase as a result of either limited reporting or lack of planning around carbon intensity, as some capital providers lower their allocations to carbon-heavy projects. Understanding how investors are evaluating ESG performance will be critical for accessing capital moving forward.

### What's our opportunity in the alternative energy value chain?

Forward-thinking companies can position themselves to capitalize on new possibilities in efficiency, decarbonization solutions (e.g., CCUS), hydrogen and biofuels. There are reasons to expect that the economic



(Source: MZinchenko/Shutterstock.com)

equations for some energy solutions will continue to grow more favorable. Hydrogen, for instance, will take time for new advances to create scale and bring costs in line with current fuel sources. With investment in innovation, hydrogen's potential is very favorable as it can be delivered using existing infrastructure.

Midstream or downstream players have the flexibility to transmit natural gas or hydrogen (with some considerations); refineries also can go heavy into biofuels or retrofit processes for hydrogen. While gray or brown hydrogen isn't produced in a carbon-neutral manner, refineries can produce more environmentally friendly blue hydrogen with natural gas and by using carbon capture and storage.

While the energy transition and decarbonization has momentum, oil clearly isn't going away: Asia, Africa and Latin America will continue to drive demand, presenting companies a balance of different opportunities in the short and long terms. Companies are creating optionality through maintaining a core focus on oil and gas, with focus on low cost of supply and low GHG intensity, while investing a threshold amount in new alternative energy businesses (Figure 2).

Although it poses challenges, decarbonization shouldn't be seen as an existential crisis for the oil and gas sector. The world may be changing, but it will always need energy, and forward-thinking companies will be positioned to deliver it. Gaining an advantage tomorrow means plotting the way forward today. +

**Editor's note:** The views expressed are those of the authors and do not necessarily reflect the views of Ernst & Young LLP or any other member firm of the global EY organization.

Check out this issue's [Tech Trends](#) section, which showcases new technologies focused on reducing the carbon footprint.



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Seismic vibrator trucks prep for land seismic surveys in Thailand. (Source: CutePloy/Shutterstock.com)

# Seismic data ownership, entitlements and the cost of compliance

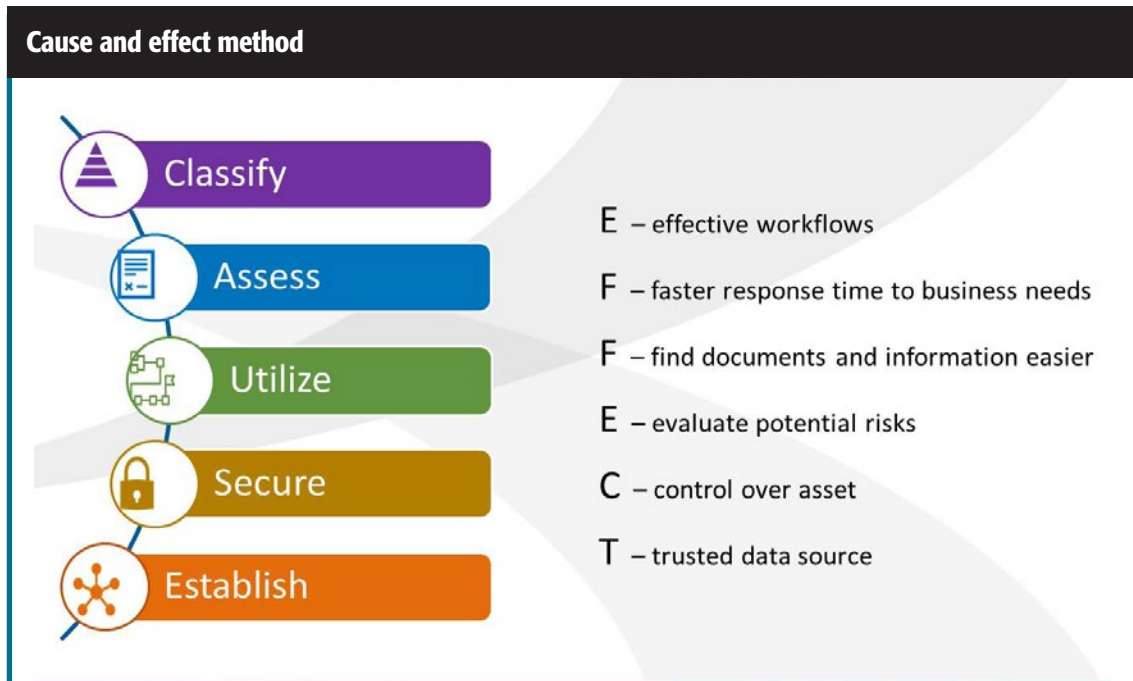
*Trish Mulder, SeismicZone, Catalyst Data Management*

*A seismic database is a very valuable asset for a company, but it can also present risk if ownership and entitlements are not well understood.*

**O**il and gas companies continue to search for and develop hydrocarbon resources, and seismic data remain an effective tool for identifying and delineating these resources. As a result, the inventory of seismic data that a company has continues to grow.

A seismic data library in most cases has been acquired over many decades, which makes keeping track of data contracts, ownership and entitlements a complex and challenging task for oil and gas companies. The consequences of not knowing ownership status and entitlements can be severe.

This article describes the processes by which an oil and gas company can establish a strong understanding of the ownership status and entitlements of their seismic assets. As a starting point, understanding the difference between ownership and entitlements is necessary and acts as a foundation for the rest of the process.



(Source: EY Realizing Strategy Survey)

### Ownership

Seismic data ownership informs an organization as to whether they have proprietary rights to their data. If they own the data, in many cases, it can allow the corporation freedom in how they handle it. It should be noted, though, that most companies only have proprietary rights to 10% to 25% of their seismic data. That means most of their subsurface database or asset is licensed or nonproprietary data, and there are many potential restrictions regarding usage to keep in mind.

### Entitlements

Entitlements inform on who has the right to access data and how those data can be used. These rules are outlined in licensing agreements. Given the majority of a company's seismic asset is licensed or nonproprietary, it becomes important to understand how one should use the data to ensure not to breach a contract.

As mentioned previously, the consequences for breaching entitlements conditions can be severe. In most cases

this is done through no ill will or intent but rather because the conditions of use are not well documented or understood. When these breaches happen, it can cost the company hundreds of thousands or even millions of dollars depending on the nature of the violation.

Because the stakes are so high, many E&P companies embark upon projects to thoroughly understand the ownership and entitlements of their seismic data to accomplish the following:

- Complete due diligence to divest or dispose of specific assets or the company as a whole;
- Mitigate corporate risk or reduce liability exposure; and
- In response to a current lawsuit or litigation.

The "cause and effect" approach has proven helpful when performing these types of projects.

### Cause & effect method

On the Cause side, there are five action steps to ensure that an organization

is using data appropriately: classify, assess, utilize, secure and establish. *Classify*: Classifying is a first step that defines which seismic data are proprietary and which are licensed or nonproprietary. It is a great place to start when trying to understand the overall status of a data asset.

*Access*: Access refers to entitlements, and it outlines what use is allowed or disallowed for the seismic data. It is an important step to focus on and involves asking a series of questions:

- Does the company have an understanding of the entitlements that are associated with the data in their subsurface database?
- Does the company know who can have access to the data? Is an external consultant allowed to interpret the data?
- Does the company have embargoed data that cannot be displayed?
- Can the license be transferred? In the case of a disposition, how the deal is structured may determine whether the license can be transferred.
- Can the data leave the premises? Most



## Exploration: Seismic Assets

contracts say that the data can go to a processor or storage vendor, but other restrictions are often in place.

- What are the specifications regarding data rooms? Documentation may be required to identify what companies and individuals attend the data room. If data are time sensitive, it may need to be removed after a certain period. One common disclosure clause prohibits copies, transcriptions, summaries or reproductions of the data of any type.
- What about termination of the license? Organizations must understand how to dispose of the data properly. They may be allowed to delete the data, but it's important to know if disposing of the data includes reprocessed data or derivative data/intellectual property. How to dispose of data is normally spelled out in an agreement or contract. However, if that contract is silent, companies cannot simply delete the data without clarifying the conditions to be met.

**Utilize:** When evaluating ownership, it is valuable to perform a risk assessment. The purpose of the matrix is to identify the current level of corporate exposure and determine what corporate risk legal is willing to accept. Green means confirmed ownership and entitlements. Yellow means confident in the ownership and entitlements. Orange means unknown.

The risk that a company is willing to accept for the use of unknown data will dictate the level of accessibility to the seismic data. There will inevitably be some surveys that the corporation cannot confirm, and the internal business unit will need to determine whether they are willing to have those data deleted. If the data are important to them or in a core area, they may want to repurchase a license.

**On the Cause side, there are five action steps to ensure that an organization is using data appropriately: classify, assess, utilize, secure and establish.**

**Risk Matrix**

Ownership Class	Entitlement		
	Grade A	Grade B	Grade C
100% / Exclusive Proprietary	Green	Yellow	Orange
Partnered Proprietary	Green	Yellow	Orange
Licensed / Non-Proprietary	Orange	Orange	Orange
Unknown	Orange	Orange	Orange
Can Not Confirm	Orange	Orange	Orange
Null	Orange	Orange	Orange

(Source: Catalyst Data Management)

**Secure:** The fourth step refers to securing documents. Gathering all documentation used to prove an organization's data usage rights should include securing those documents within the company's data management platform.

**Establish:** The last step is to establish a data access system. One example is to place users within the CRUDE access model: create, read-only, update, delete and extract. It dictates who can create within the asset, who can read-only, who can update or modify, who can delete or destroy, and who can extract and download.

If a company completes all five Cause steps, they inherently create a positive Effect on their subsurface data and work environment:

- **Efficiency:** workflows become more effective;
- **Faster:** the company has faster response times to business needs;
- **Find:** the company can find docu-

ments easier, which can be made accessible to the business so that they have that critical information at their fingertips;

- **Evaluate:** if the company acquires a new asset, these steps will help evaluate potential risks that come with ingesting that asset;
- **Control:** the company has direct control over the asset; and
- **Trust:** ultimately, the data will be looked at as a trusted data source from the business.

### Entitlement and ownership best practices

A seismic database is a very valuable asset for a company, but it can also present risk if ownership and entitlements are not well understood. Although agreements are typically well designed to direct what companies can and cannot do with those data, it is critical that the agreement is organized and available for reference. Due diligence regarding agreements has long lasting and beneficial impacts on a company, improves internal processes and materially decreases risk. +

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# Impact drilling system takes on hard rock challenges

*Brian Walzel, Senior Editor*

*Testing is in final stages for a new impact drilling system that Houston-based Particle Drilling Technologies says will help unlock currently inaccessible reservoirs of oil and gas.*

**W**hile production from unconventional reservoirs has vaulted the U.S. into the world's leading producer, a proliferation of pay zones both around the world and in North America remain inaccessible because of the poor economics needed to produce them.

In places like the Middle East, China and South America, vast reservoirs of

oil and gas are virtually locked because they are too expensive to drill, complete and produce. One of the barriers to accessing these reservoirs is the ability to quickly drill through hard rock. The time it takes to drill through hard rock strata makes hydrocarbon production not economically feasible. However, one company believes it has discovered the solution.

The Particle Impact Drilling bit doesn't rely on WOB, which helps reduce torque. The system relies on high-impact shot working ahead of the bit to break the formation. (Source: Brian Walzel, Hart Energy)

Particle Drilling Technologies Inc. is nearing commercialization of its Particle Impact Drilling (PID) technology that utilizes steel shot to break the rock ahead of the bit. The company has been testing the system in the Travis Peak Formation in East Texas, and after years of trials and errors, it believes it has finally found the right combination of operational efficiency and economics.

"The particle drilling technology itself is a bit designed, for lack of a better term, to obliterate the formation," CEO John Schiller told E&P Plus during an interview on site outside of Tyler, Texas. "We're hitting the formation 12 million times in a minute with BB shot, and we drill 3 to 4 inches off bottom. The harder the rock, the quicker we drill."

Schiller explained that the key to utilizing the PID system has been developing the surface facilities to deliver the shot into the mud stream, to get the shot out of the mud stream and to ensure it all occurs through a simple interface.

"The second thing, and where we have spent the last three years, is improving the bit so the bit can take the wear and tear downhole," he said. "We call it the bit; it's really a nozzle carrier. Because we have our nozzle delivering shot at the velocity we need to obliterate the rock and then get everything out from under it."

As Jim Shamburger, vice president of technology with Particle Drilling, further explained, the drilling system does not utilize cutters "of any type," and consequently, does not need torque to drill.

"Once we have the shot down the drillstring coming out and coming back up the annulus, the off-bottom rotating torque declines," he said. "There are no moving parts. It's not a drag bit [and] it's not a crush bit; it's an ablation bit. We're ablating the formation, and then we recover our shot and turn it around and reuse it again and again."

More conventional drill bits require



**The components of the PID system include the particle injection unit, the drill bit and the particle recovery unit. (Source: Particle Drilling Technologies)**

20,000 to 60,000 lb of weight on bit (WOB). According to Particle Drilling, the PID system drills with no WOB, which the company said greatly reduces torque, drillstring vibration and eliminates buckling of the drillstring. Ultimately, this can reduce the tendency of wellbores to deviate.

"This [hard rock] was a realm that PDC bits can't get into," Shamburger said. "By the time you imbed the cutters into something like the Travis Peak, your torque is extremely high. Your vibrations are extremely high, and you run into a lot of difficulties with other things due to the way you're failing the rock. For us, torque is never high. We drill with maybe 2,000 to 3,000 pounds of visible weight, but that's essentially the particle pushback force. To me, this is a giant step change in many ways for rock failure."

The components of the PID system include the particle injection unit, the drill bit and the particle recovery unit, which recovers particles from the drilling unit before they reach the mud tanks. The particle processing and storage unit separates particles from the drilled solids and a small amount

of the return drilling fluid and serves as storage for the recycled particles prior to reinjection.

Schiller and Shamburger believe the PID system will eliminate hard rock drilling problems that lead to increased number of days on location and escalated costs.

"A lot of places have potential horizontal targets, but their problem is the tough vertical to drill through," Schiller said. "Bolivia, Colombia, Algeria, all of those places that have super slow vertical parts of the hole before they can get to where the product is, they can't develop the resource they know they've got because the economics won't work."

Schiller added that Particle Drilling has been in discussion with companies in many locations where hard rock drilling is a challenge. He also said the PID technology would work well on multiwell pads.

"On a six-well pad, you could keep us parked off to one side, bring us in for the three or four days you need us, park us back on the side, skip to the next rig and bring us back in," he said. "Those are where the economics really start to improve." +





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# Shale frac designs move to just-good-enough proppant economics

*Howard Melcher, Mike Mayerhofer, Karn Agarwal and Ray Ellis, Liberty Oilfield Services*

*There is no clear evidence that higher conductivity proppants (either white sand versus regional sand or ceramic proppants versus white sand) result in better well performance and economics.*

**S**electing appropriate proppants is an important part of hydraulic fracture completion design. Proppant selection choices have dramatically increased in recent years as regional sands have become the proppant of choice in many liquid-rich plays. But are these new proppants the best long-term choices to maximize production? Do they provide the best well economics?

As the shale revolution pushed into lower-permeability reservoirs, the concept of dimensionless fracture conductivity has pushed our industry to use ever lower-conductivity materials—away from ceramics and resin-coated proppant to white sand in some Rocky

Mountain plays and more recently from white sand to regional sand in the Permian and Eagle Ford plays.

Proppant selection is historically based on the particles crush resistance to stress loading and fracture conductivity under various flow conditions, all while ideally having the lowest possible cost. The article explains how much fracture conductivity is adequate for a given effective fracture length and reservoir permeability and then looks at the economics of achieving “just-good-enough” target conductivity.

### Laboratory testing and results

Among the main findings, Liberty Oil-

field Services sees no clear evidence that higher conductivity proppants (either white sand versus regional sand or ceramic proppants versus white sand) result in better well performance and economics (Figure 1). The exception may be in the deeper, higher-stress Eagle Ford formation where white sand could provide slightly better economics. It should be noted that well location with respect to local sand mines has a large impact on the economics.

Laboratory conductivity testing shows that the median 100 mesh and 40/70 mesh white sand has 1.8 times and 2.4 times conductivity,



respectively, as compared to the same size regional sand (Figure 2). This clearly shows that, using the same laboratory test conditions, white sand provides higher conductivity than regional sand. Proppant mesh size is even more important. Laboratory data show that 20/40 white sands have the highest median conductivity (Figure 2) being about eight times higher than the 100 mesh regional sand. These laboratory results may tempt operators to use the highest conductivity proppant, but the more important question is if these higher conductivities are actually needed relative to the very low flow capacity of unconventional reservoirs.

**Conductivity**

While laboratory conductivity measurements and comparisons provide important baseline information, they cannot fully answer the question about required conductivity to provide “just-

good-enough” proppant economics. This question can be answered with production modeling tools such as numerical reservoir modeling, which was used to determine the minimum fracture conductivity needed (“good-enough fracture conductivity”) to maximize short-term oil production (one to three years) for a given fracture half-length, fracture spacing and reservoir permeability.

In this study the numerical reservoir model was intentionally kept simple to focus on first order effects of fracture conductivity by assuming a single reservoir layer, single 10,000-ft wellbore in the center of a 2,000-ft by 11,000-ft drainage area flowing at a constant bottomhole pressure (BHP) of 1,000 psi.

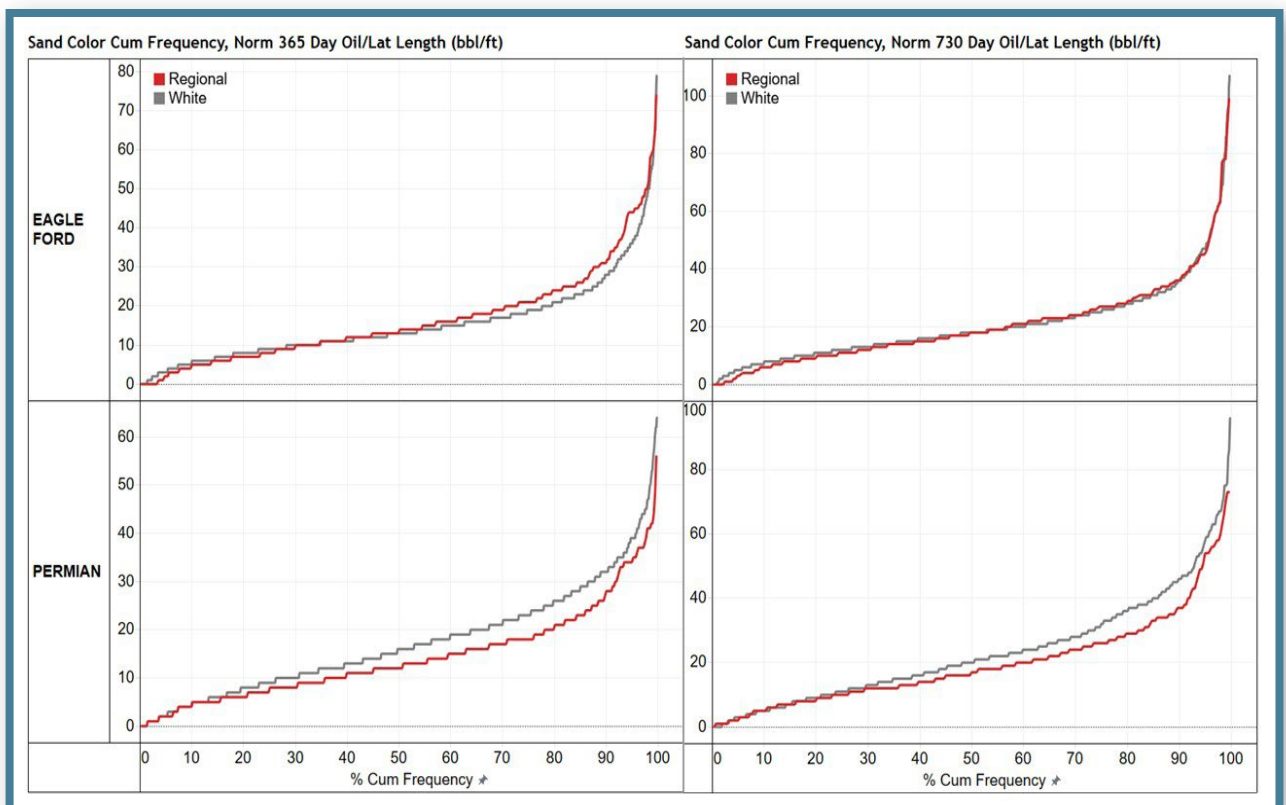
The following steps were performed in the modeling:

1. Assuming a base case of 300 ft effective fracture half-length and fracture spacing of 18 ft (25-ft cluster spacing with 45-degree frac

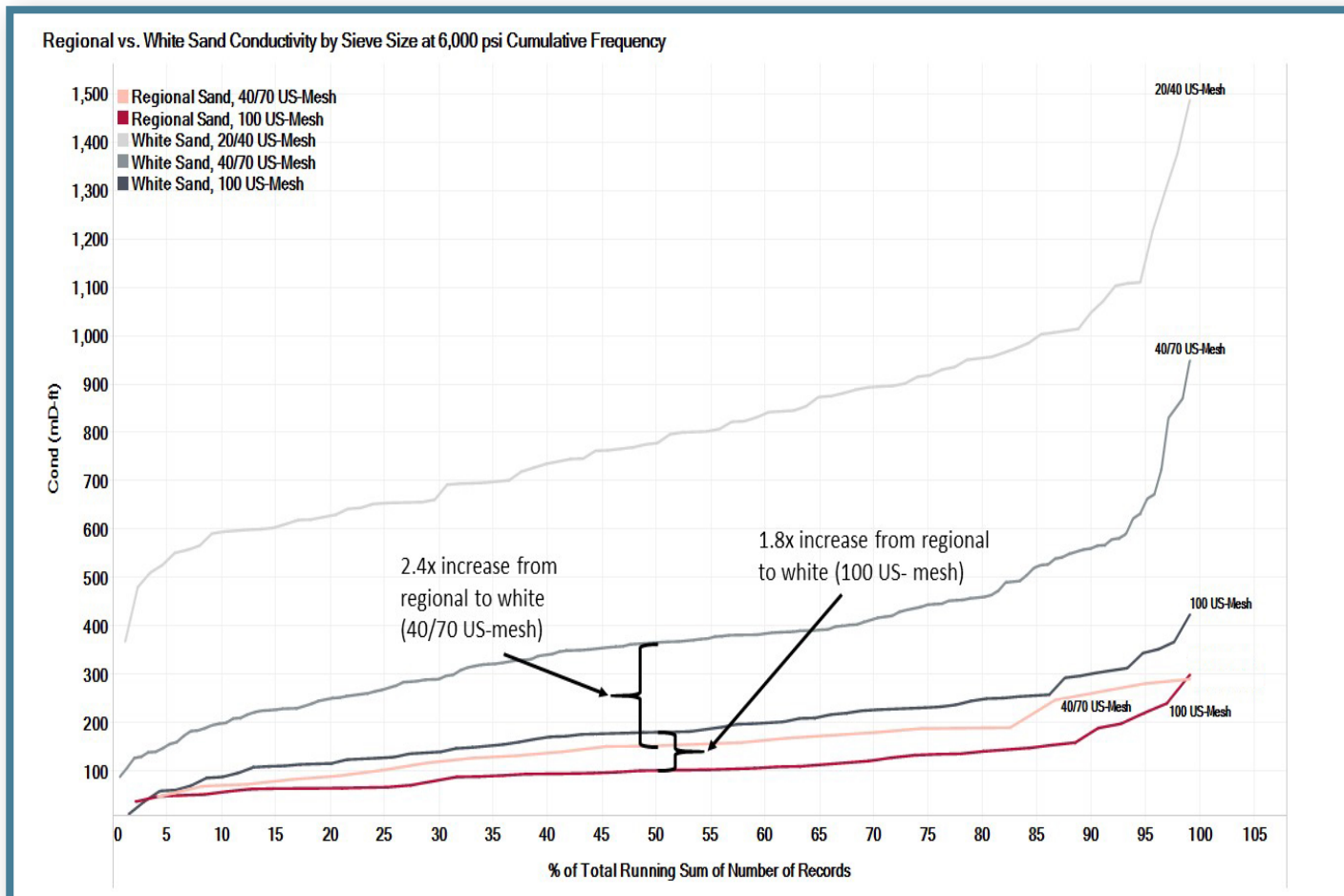
angle relative to wellbore), multiple scenarios of reservoir permeability ranging from 0.00005 md to 0.1 md were modeled for one year and three years of production.

2. For each reservoir permeability scenario, different fracture conductivities were explored to determine the minimum fracture conductivity needed to have less than 1% difference in cumulative oil production from the maximum achievable in the given time frame. It is important to note that these criteria do not represent an economic optimization of conductivity.
3. Repeated steps 1 and 2 for a fracture spacing of 36 ft (50-ft cluster spacing with 45-degree frac angle relative to wellbore) to demonstrate the effect of fracture spacing.

The results in the plots in Figure 3 provide a comparison of two different cluster (frac spacings) versus reservoir permeability and producing time (one



**FIGURE 1. A cumulative frequency plot for the Eagle Ford (top) and Permian (bottom) shows regional versus white sand at 365-day (left) and 730-day (right) oil production normalized per lateral foot. (Source: SPE-199755/Liberty Oilfield Services)**



**FIGURE 2. A cumulative frequency plot of PS-50 test results compares field samples of regional sands with white sands at different mesh sizes. (Source: SPE-199755/Liberty Oilfield Services)**

year versus three years). It shows that high-intensity horizontal completions in unconventional reservoirs with very small cluster and frac spacing require much less fracture conductivity (generally below 10 md-ft) than previous widely spaced clusters or vertical well completions. Also, the move to reduce fracture driven well interference with shorter frac lengths will additionally reduce fracture conductivity requirements for most unconventional permeability scenarios.

Summarizing the above results in a qualitative way, Liberty Oilfield Services sees that the minimum fracture conductivity needed for the range of permeabilities encountered in unconventional plays decreases with tighter fracture spacing and shorter fracture

half-lengths (the current trend in high-intensity completions as well as offset well frac hit mitigation).

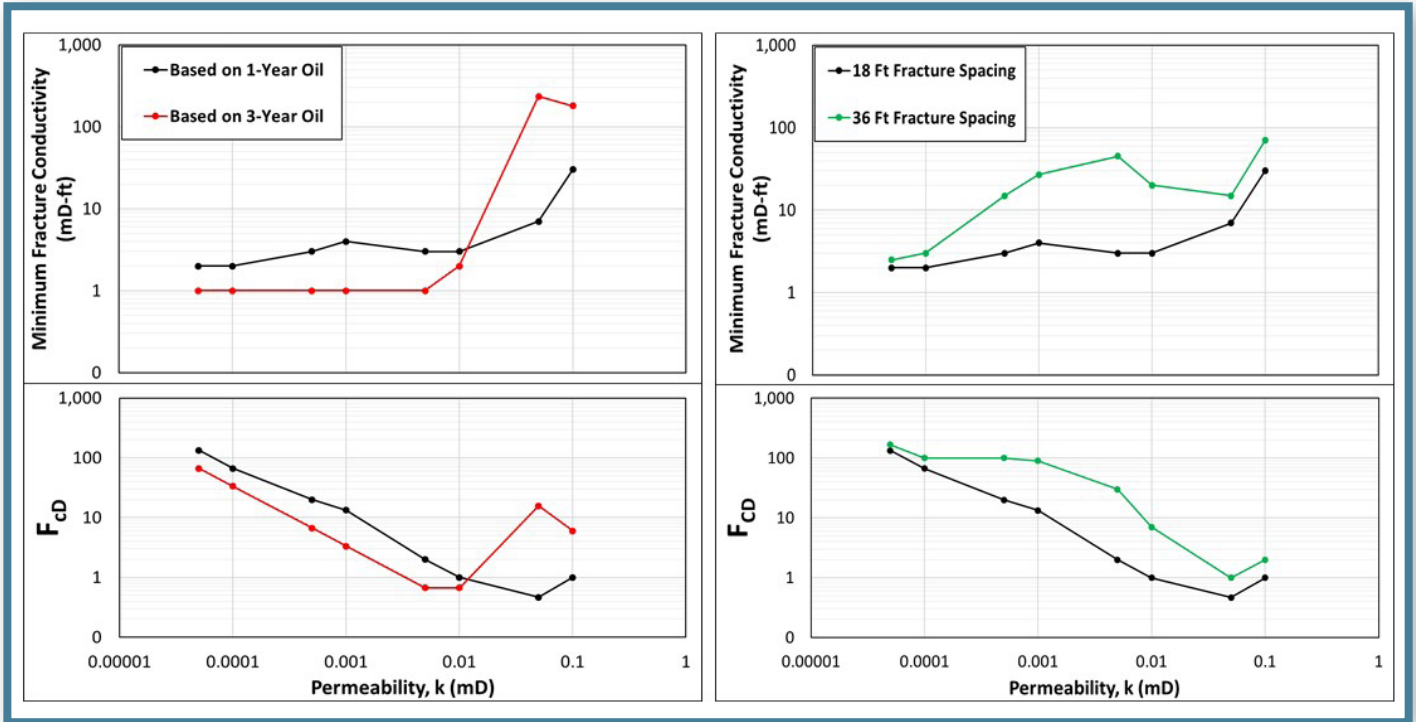
The results also indicate that the minimum fracture conductivity needed based on the concept of having sufficient dimensionless fracture conductivity is probably too conservative and represents an upper bound. This is because the traditional definition of dimensionless fracture conductivity assumes constant reservoir deliverability during the early time flow period, which is very high. With time, as fracture interference sets in and flow starts to transition away from linear flow, reservoir deliverability declines, and therefore the required fracture conductivity decreases as well (left plot in Figure 3). Although the

traditional concept of  $F_{D0}$  can be used for a rough initial conductivity estimate, it is a “moving optimum target” in unconventional horizontal wells since it is also a function of production time, cluster spacing and well spacing.

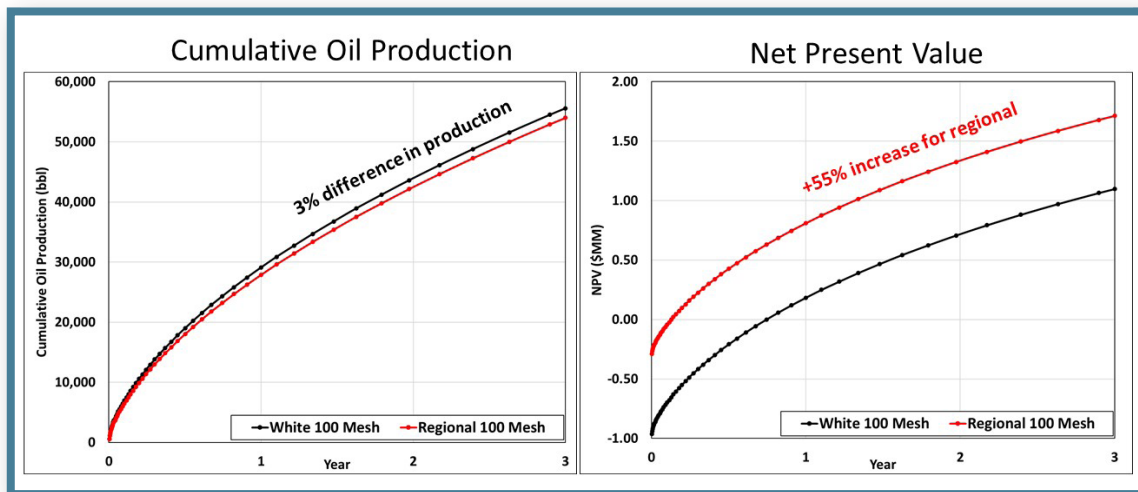
This implies that more detailed reservoir and fracture modeling in conjunction with net present value analysis using actual completion costs must be performed for each specific case to truly optimize required fracture conductivities.

The Midland Basin covers a wide range of reservoir conditions with estimations of regional sand usage exceeding 80% of the total sand in the basin. A Lower Spraberry modeling scenario (Figure 4) produces from a mid-length lateral with a modern





**FIGURE 3.** This comparison shows minimum fracture conductivity and F<sub>CD</sub> needed to maximize one-year oil production and three-year oil production at 18-ft fracture spacing (left) and 18-ft and 36-ft fracture spacing (right) at one-year oil production. Fracture half-length is 300 ft. (Source: SPE-199755/Liberty Oilfield Services)



**FIGURE 4.** This chart depicts Lower Spraberry cumulative oil production volumes by proppant type (left) and corresponding net present values by proppant type (right). (Source: SPE-199755/Liberty Oilfield Services)

completion design. The flow control uses a constant BHP for the term of the simulation. Three-year cumulative oil volumes are within 3% for the regional and white 100 mesh sand cases.

Though the white sand well produces slightly more oil, the economics

for the regional sand well are superior, given the difference in proppant cost. At the time of this analysis, white sand was 3.5 times the cost of regional sand.

This article shows the benefit of using a combination of Big Data statistical tools, laboratory test results,

fracture diagnostics and detailed physical modeling for holistic well performance evaluation with respect to proppant selection and completion optimization, which will be critical for the success of future unconventional oil and gas development. +



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Tendeka and TGT have created Sandbar to mitigate the costly consequences of sand control failure in wells. (Source: Tendeka and TGT)

# Collaboration combats sand control failures

*Paul Lynch, Tendeka; and Mohammad Abshenas, TGT*

*Bringing together two technologies in one service offering will ensure fast, accurate and tailored remediation to a variety of sand control issues.*

**I**n mature basins, sand issues can account for up to 10% of all shut-in wells either due to failure of the existing downhole sand control or onset of sand production due to pressure depletion and/or water production.

There are many reasons for sand or fine material entering and accumulating in the wellbore. Depending on the level of severity, the consequences need not be detrimental. However, the accumulation of sand production

downhole or in surface equipment can lead to production being killed, wells shut in or collapse of the formation.

As an inherent problem in the oil and gas industry, the first indication of sand issues downhole will often be as a result of detrimental effects that can occur at surface, such as fill-in separators or erosional damage to pipe work.

As existing solutions have been extremely limited due to their high costs and/or poor performance, Tendeka, an independent global com-

pletions service company, and TGT, diagnostic specialists, have created “Find Fix Confirm” to mitigate the costly consequences of sand control failure in wells.

## **Downhole monitoring and remediation**

The conventional process of thru-tubing sand control can be costly and time consuming. In many cases there is a requirement to remove sand from the wellbore prior to installing the chosen



**TGT's anechoic chamber completely absorbs reflections of sound waves, enhancing the company's acoustic diagnostic capabilities. (Source: TGT)**

sand control solution. Once installed, many traditional remediation techniques still allow the wellbore to refill with formation sand reducing productivity and increasing susceptibility to erosional failure.

Therefore, the major challenge is to regain sand control in existing completions and prevent sand from filling the wellbore, without the requirement to perform a workover or complex thru-tubing gravel packs.

Proper diagnosis is the critical first step to any kind of well remediation planning and execution. But determining the precise location and extent of sand ingress downhole has challenged the industry for decades, as previous attempts were unable to reliably distinguish between sand and fluid flow.

The challenge of locating and effectively mitigating sand production has now been addressed by combining the features of two products, one to accurately identify the locations of sand ingress within the wellbore and the other to quickly repair the damage.

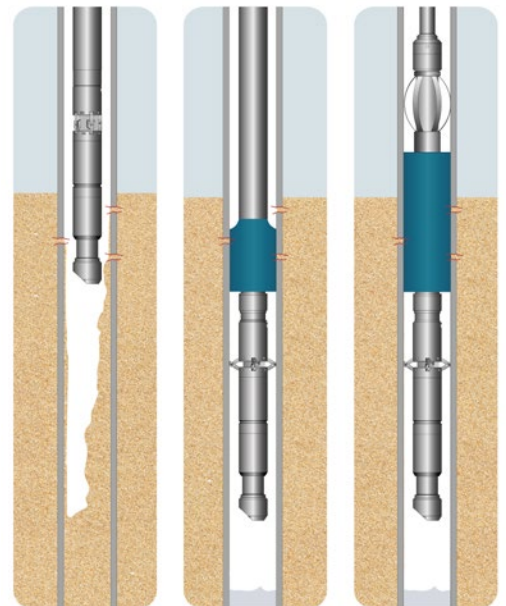
### Accurately eliminating sand issues

Managing and curtailing sand production issues is essential to maintain asset integrity and extend the life of the asset. This Find Fix Confirm approach to sand remediation is believed to be the first specialized, integrated approach to fully understand and fix sand production issues.

First, with the "Find" element of the solution, TGT's Sand Flow diagnostics precisely locate sand entry to the wellbore and provide a qualitative sand count, clearly identifying problem zones, even in turbulent flow conditions.

Although commonly used to diagnose a known sand production issue, Sand Flow is also used proactively to ensure downhole sand control measures are working correctly. This can include targeting unconsolidated formation that requires regular intervention, sand screen failure and surface equipment failure.

Sand Flow diagnostics are delivered using TGT's True Flow system and



**The installation of Filtrex has the potential to significantly improve the financial feasibility of restoring production to failed wells. (Source: Tendeka)**

Chorus acoustic sensing platform. Fluids traveling through the well system produce a rich spectrum of acoustic





**Filtrex is shown expanding out of a compression sleeve. (Source: Tendeka)**

energy, and Chorus captures and decodes the acoustic signature generated by sand particles entering the wellbore. Deployed in hole on wireline, Chorus reveals sand ingress locations and sand count by analyzing the acoustic power spectrum of acquired data and discriminating between sand flow and fluid flow. By flowing from the reservoir while the tool is in the well, the acoustic signature of any sand within the production stream can be characterized such that the sand entry points and sand rate can be identified. Chorus leverages high-fidelity recording across a wide dynamic range and sand-recognition analysis to deliver robust sand detection in a broad range of sand flow scenarios.

To “Fix” or regain sand control in existing completions and prevent sand from filling the wellbore, Tendeka’s one-trip, thru-tubing sand control Filtrex system is deployed via coiled tubing into the well and positioned across the target area to quickly repair the breach or damage.

As a retrievable thru-tubing system, the flexible, open cell matrix polymer filter can be easily installed by conventional means in a live well; this

includes thru-tubing and through tight nipple restrictions.

When self-centralized, it can expand in deviations up to 90 degrees and is understood to be the only product of its kind that can be run through larger casing/liner configurations (e.g., a 3.688-in. nipple and set in a 7-in. liner). It can be deployed in hole compressed within the running tool and compression sleeve. This offers full compliance to the damaged section once set. By dropping a ball from surface, a simple two-stage application of pressure sets the anchor and then releases the compression sleeve.

Upon removal of the sleeve, the matrix polymer expands to contact the wellbore and the deployment string can be retrieved from the well. Filling the annular gap with the open cell matrix polymer prevents further ingress of formation solids into the wellbore while still allowing passage of liquids or gases. The multilayer system ensures full expansion in the damaged screen section or casing and effective flow divergence regaining sand control in existing completions.

The device can perform sand cleanout and chemical treatments during live well deployment, thereby preventing multiple intervention trips. When deployed on coiled tubing, the installation of the system has the potential to significantly improve the financial feasibility of restoring production to failed wells. As it negates the need for a workover or complex thru-tubing gravel packs, the remedial system can also cut intervention timings and associated run changes by at least half.

The length can be modified to suit the application and lubricator length restriction. If longer lengths are required, these can be stacked on top the previous screen section. The system design allows the combination of many distinct layers with a range of cell sizes. This ensures the design has the flexibility to size the screening for each application to ensure appropriate retention of sand in reservoirs up to 110 C (230 F).



(Source: Tendeka and TGT)

Finally—and crucially—the service can “Confirm” the effectiveness of the solution with the redeployment of TGT’s Sand Flow diagnostics through the internal diameter of the Filtrex system to confirm that no sand is entering at that depth. This enables better use of resources and more reliable sand control outcomes.

**Innovation through partnership**

As a single approach, existing remedial methodologies to address sand management, such as running an insert sand screen, applying consolidation treatment or performing a remedial gravel pack, are disjointed, lack insight on the precise location of the problem and often fail to fully eliminate the problem. Likewise, their use can vary in complexity, cost, risk, longevity and effectiveness. Associated weaknesses

**The challenge of locating and effectively mitigating sand production has now been addressed by combining the features of two products, one to accurately identify the locations of sand ingress within the wellbore and the other to quickly repair the damage.**

can often result in reduced production or, in extreme cases, loss of surface containment due to erosion.

Bringing together two technologies in one service offering will ensure fast, accurate and tailored remediation to a variety of sand control issues at a fraction of the time, costs and risk of conventional solutions to this age-old problem. Being compatible with thru-tubing operations, including live well deployment and single-trip sand cleanout, provides greater flexibility and assurance.

Ultimately, it will empower operators to better understand the true sources of sand production and its behavior and ensure reservoir management decisions are precisely targeted for improved integrity and enhanced asset life. +

**About the authors:** Paul Lynch is the advanced completions director with Tendeka, and Mohammad Abshenas is TGT’s regional manager for Europe and Africa.

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HART ENERGY





# Thinking big and starting small by optimizing quality and logistics

*Emily Schubert, Validere*

*Add liquidity to the oil and gas industry with a software-as-a-service enabled marketplace backed by physical chemistry.*

**P**roduct quality directly drives hydrocarbon prices and determines where barrels can be delivered. It's a critical factor in optimizing how oil and gas is produced, transported and refined. Despite the importance of quality, it remains difficult to measure accurately and in real time. With products moving quickly and mixing constantly throughout the supply chain, maintaining an accurate record of quality is complicated.

Validere tackled these challenges by building models that act as a digital copy of a site. These models

provide data about the properties of the crude product as it moves through the facility. This made it possible to gain insight into a facility's operations, capabilities, and production volumes and qualities. As Validere onboarded more facilities, it became clear that there was value in facilitating mutually beneficial connections between clients. The added transparency has enabled market participants to gain efficiencies in transportation, blending and increase the value of their barrels.

**Upside for crude buyers and sellers**  
Trucking costs and/or pipeline tariffs

are one of the most common areas that producers leave money on the table. The biggest challenge in avoiding this pitfall is obtaining information about the most efficient and profitable option. It is relatively simple for a producer to consult multiple providers for cost estimates to the closest facility in their area and choose the lowest. This is the easiest and most realistic case for most firms.

It is much more difficult for a producer to know their buyer's blending facility quality specifications, volumes and exact demand, and then negotiate a higher price based on that knowl-

edge. This scenario simply isn't a reality for the vast majority of producers because this information is not generally available, or in some cases even known with certainty. However, this situation occurs more frequently than most clients realize, and there is huge upside for both buyers and sellers.

A hypothetical crude buyer may be an E&P firm that blends its own production with third-party barrels. Because there is no way for them to easily access quality data from producers nearby, they may not be aware that another producer just down the road is selling crude that would result in a higher netback if blended and if throughput is increased. By incorporating these products, a buyer may be able to sell a final blended crude that is either closer to grade specifications and thus more profitable, or that can be sold as a higher-priced grade.

The Validere platform can save significant time when sourcing niche, hard-to-find barrels outside of existing marketing relationships. The added optionality provides free insurance through backup supply points in case of disruptions, shut-ins and operational downtime. By being able to consider blend opportunities that were previously unavailable due to a lack of information, a buyer can increase their netbacks, find the optimal logistics and blending program, and have fail-safes integrated with their existing operations.

A hypothetical crude seller may be a producer with no blending facilities and limited optionality in barrel placement. Many sellers have very few options when it comes to choosing who to sell their barrels to. They may not have the required headcount, time to look into optionality, or tools and skillset to perform a more detailed analysis; thus, they are forced to accept the price they are offered.

Validere provides additional information points to verify and validate

current pricing arrangements, and it can act as a source of truth in negotiations and conversations about quality. For the producers that have more connectivity or are in more densely explored areas, Validere offers a wider look at purchasers and infrastructure that may be feasible to connect with. This also lowers risk through the diversification of buyers and end markets, and it reduces the dependence on a single party to be able to take barrels. For sellers that are looking to expand their operations, Validere allows an entity to evaluate options in new markets without hiring new individuals internally.

Validere's platform was created to reduce friction within the marketplace with transactions facilitated by a neutral third party. By only flagging an opportunity if both parties can realize higher netbacks, Validere provides

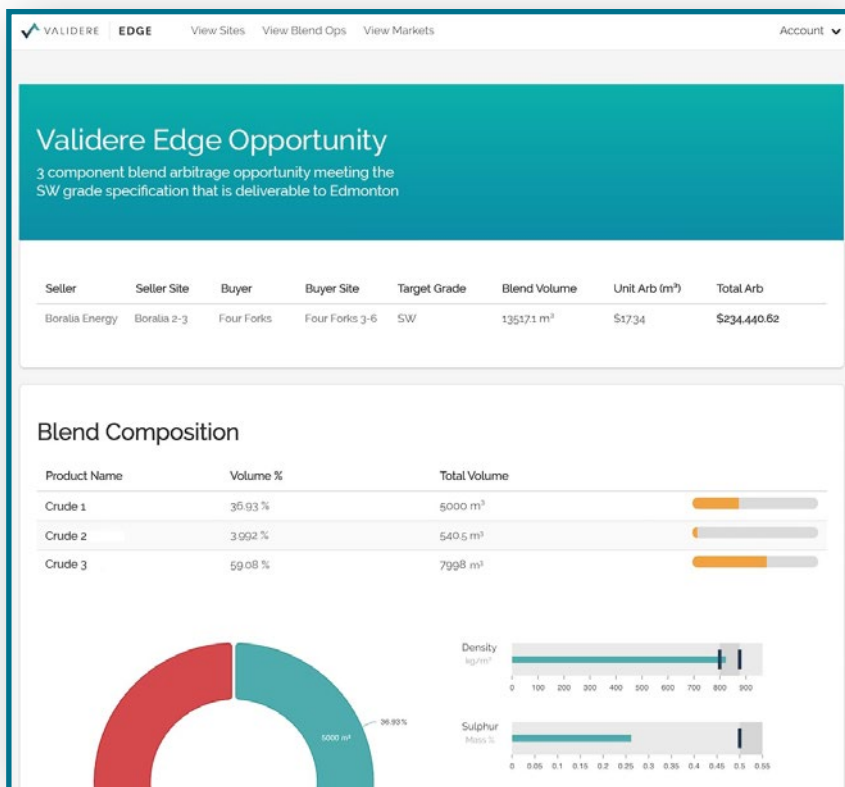
upside to buyers and sellers with low risk for both parties. The opportunities that are given are essentially free options: there is no overhead or obligation to transact, and proprietary data are not made public.

By optimizing transport and barrel placement, Validere also provides ESG value. The process of shipping crude is streamlined, reducing emissions from transportation. Detailed quality data prevents product contamination, leading to less waste and disposal challenges.

By knowing exactly what molecules a client owns as well as where they are, Validere provides a record of quality and adds certainty to the supply chain.

### Connecting clients to streamline production

The key to adding liquidity and



The user interface shows a hypothetical blending opportunity with economic breakdown and arb size, ratios, components and final blend qualities. (Source: Validere Technologies)



### Logistical Details:

- Seller Location : 8c6ff7719
- Buyer Location : d6aacc8c9
- Seller to Buyer : \$12.4393771663/m<sup>3</sup>
- Delivery Market : Edmonton
- Seller to Market : \$26.3777328591/m<sup>3</sup>
- Break-even Purchase Price : \$482.8108067083/m<sup>3</sup>

Logistical details of a hypothetical blend show distances between seller, buyer and market as well as component quality details of the two crudes being blended. (Source: Validere Technologies)

Error



### Component Quality Details:

4343bcb27

Quality Measurement	Value
kg/m <sup>3</sup>	817.6 kg/m <sup>3</sup>
% wt.	0.159 % wt.
kPa	44.4 kPa
cSt	4.1741 cSt
cSt	3.496 cSt
cSt	3.1745 cSt

ec8dd1c04

Quality Measurement	Value
kg/m <sup>3</sup>	840.5 kg/m <sup>3</sup>
% wt.	0.3362 % wt.
cSt	9.6857 cSt
kPa	24 kPa

streamlining the oil market is connectivity to a wide range of facilities. Validere has network width and depth, and the number of connected sites is constantly growing. The platform is used by more than 50 companies across North America, with operations in multiple basins dealing with crudes that have highly diverse quality properties. Currently, 383,283 bbl/d are logged on Validere, with an average opportunity volume of 13,000 bbl. As of January, there are 443 producer sites, 79 midstream terminals and four marketers with their full lease books connected through the platform. This means that Validere can quickly find the best home for any barrel, maximizing profit through blending

and ensuring the highest netback for buyers and sellers.

Between the six blenders currently using Validere, there are 219 unique blending facilities that crude sellers may be connected to. These facilities have the ability to blend a vast range of native production and often search for barrels with niche quality specifications. In total, clients on the Validere platform blend 42 different grades of crude.

So far, Validere has handled and created value for 906,000 producer barrels. When a new client joins Validere, they are presented with an average of 44 opportunities to choose from to take advantage of arb and optimize their strategy.

The average size of these arbitrage opportunities is \$62,500, which is a significant amount of capital that can be reinvested on a monthly basis. Increasing margins by \$3/bbl to \$5/bbl on average allows buyers to optimize their blending assets while sharing the profits with sellers to incentivize deals. These benefits will only continue to grow as more clients from different parts of the industry join and provide added optionality.

The network effect from the platform has increased dramatically over the last few quarters and shows no signs of slowing. The commodities marketplace in the future will enjoy higher liquidity, less friction and optimal pricing for all parties. +

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Source: Logan Industries

# Monitoring risk on critical equipment

*Dean Carey, Logan Industries*

***Drilling contractors and operators can benefit from a unique, proactive risk reduction and condition-based monitoring program for wireline riser tensioners.***

**W**ithout a reliable maintenance program underpinning everyday functions, offshore operations can prove to be untenable. Only by having a solid program in place behind the scenes can operators gain the peace of mind that enables them to get on with their key priority of maximizing hydrocarbon production.

In the first quarter of 2020, a 10-year contract was signed between Logan Industries and Diamond Offshore Drilling Inc. for Logan to provide a risk reduction and continuous based monitoring program aboard four of Diamond's vessels. Each vessel is equipped with 16 risers, with the

scope of the program encompassing 64 wireline riser tensioners (WRTs) plus a small number of spares.

By entering into a maintenance program with Logan, Diamond was primarily interested in establishing increased reliability in their mission-critical WRTs, each of which serves to hold up the riser in the water column and ensures that as the vessel heaves on the ocean surface, the wellhead does not. A fair degree of compliance between the vessel, the wellhead and WRTs is required as the WRTs act as compensators. As the vessel moves, the WRTs are continuously moving, acting and heave compensating, allowing movement to occur.

## **Devising a proactive program**

Diamond tasked Logan with devising a program that would safeguard the reliability and extend the life of its WRTs to ensure keeping the vessel working more efficiently. The following condition-based monitoring program was devised to meet this objective and to ensure that if any problems were observed, they could not be deemed a result of an error with the tensioners. The program included performing repairs and upgrades, monitoring the health of each machine periodically and placing filter carts on each machine. Risk reduction went hand in hand with delivering more predictable time frames for the operator, and an

emergency response team was made available for several types of events to further reduce risk and downtime.

### Cylinder upgrades

Logan harnessed its experience and knowledge in heave compensating cylinders and equipment to focus on making the WRTs more efficient through a number of upgrades to the cylinders. While performing repairs for Diamond, Logan devised several ways to modify the materials to make them more maintainable after an extended period of time exposed to saltwater in the field. Coatings were changed both inside and outside the cylinder to make them more durable and resistant to corrosion. Some of the seals were changed to make them less sticky, so they would exhibit better compensation properties in practice.

### Health monitoring

Another portion of the program that was devised to help maintain reliability and consistency in the WRTs was machine health monitoring. Over the course of the 10-year contract, periodic visual health inspections will be carried out by Logan's engineers on each vessel, with the aim of detecting damage or wear points before they progress to failure. Fluid samples will be taken and evaluated periodically. A checklist of items will be measured to gauge how the equipment is performing on each of the 64 tensioners. These regular health checks will give an impression of emerging problems that may need to be attended to quickly in the form of a repair or upgrade.

### Installing filter carts

Similar to a car, if the oil in the WRTs is not kept clean, damage can begin to occur and the machine will not work with optimum efficiency. An additional aspect of the program was the installation of fluid cleaners (filter carts) to clean the fluid in each ten-

sioner on every vessel continuously. A key aspect of this program is keeping each WRT separate from the other. Each WRT will have its own filter cart. Logan's inspection crews will be informed of cleanliness levels through regular readouts, so fluid trends can be established and the life of the WRTs can be extended wherever possible.

### Emergency response

Another important element to the program is enabling emergency response. With the program, Logan has planned for rod replacement at sea, if events call for it. Enough rolling stock of "ready spares" was made available to enable Logan to respond when needed. A team will be sent to pull a leaking rod and replace it immediately on the vessel without the need to rely on an external supplier for equipment. Similarly, a complete upper sheave assembly is held in reserve and can be replaced at sea if necessary. These types of immediate response kits will allow Logan to provide immediate action when called upon.

A set of spares will be kept on hand at Logan's facility in Hempstead, Texas, at all times so that when a unit presents for repair and/or upgrade, the time frame required for such work

can be reduced dramatically to, in most cases, less than eight weeks. By decreasing the amount of time that a machine is off the vessel while it is undergoing an upgrade, the operator is provided with a more consistent and predictable type of a repair, further reducing risk by removing another layer of potential unknowns and receiving their equipment back when they need it.

### Program outlook for Diamond

The 10-year service program encompasses Diamond's entire "black" fleet, which includes the *Black Lion*, *Black Rhino*, *Black Hawk* and *Black Hornet*. By the end of the 10-year contract, every wireline tensioner in the fleet will have been completely upgraded to a state-of-the-art level, with new seal packs, coatings, glands and filter carts. At this point, Diamond's fleet of WRTs will be fully monitored, diagnosed and cleaned. Comprehensive logs and inspection forms will provide a baseline for every tensioner to make it clear when units need to be upgraded. Each vessel will have a Logan technician determine ranking for their tensioners, one through 16 (one indicating the most urgent attention, 16 being the least critical).



**An offshore compensated coiled tubing lift frame was first deployed on the Atwood Condor. (Source: Logan Industries)**



### **A forward-looking approach**

Traditionally, drilling contractors would buy their own subsea pressure control equipment, maintain them and track them as assets in a somewhat complex process. More recently, there is a move toward drilling contractors instead renting subsea pressure control for their wellheads and transferring ownership and maintenance responsibilities to a trusted supplier. Although Diamond still owns its WRTs, it confers responsibility to partner companies like Logan for the maintenance of those machines, freeing the drilling contractors up to focus on their main concern, which is ultimately producing hydrocarbons.

The adoption of these types of innovative and comprehensive maintenance programs is not currently widespread across the industry. However, Diamond has long been an industry leader in regard to their approach to maintenance.

Essentially, the program detailed here is a way in which operators can gain more control over future eventualities in their operations that might otherwise cause them unforeseen degrees of expenditure. When a drilling contractor or operator is experiencing a period of financial squeeze, investing in a program like this is still an attractive proposition due to the reduced risk, improved reliability, increased consistency, better planning parameters and fewer variables that can be delivered to the client. The program should not be seen as a luxury addition but something to be invested in when a company wants to gain a tighter hold on expenditures going forward.

### **Conclusion**

Active engagement with clients to clarify the bigger picture of their machine maintenance program will help to balance their short-term budgets with long-term goals. This type of risk reduction and contin-



**This soft rope traction winch has been in service offshore for more than 11 years. (Source: Logan Industries)**

uous based monitoring program is of particular value to many drilling contractors and operators because it enables them to reduce the risk in their offshore operations. By adopting this type of approach, operators can stop being reactive and become

more proactive. Future failures can be predicted and planned for by taking baseline measurements and continually logging and monitoring to track trends and react quickly with a rolling stock of spare parts on hand. +



A photograph of an oil pumpjack in a field of tall grass at sunset. The pumpjack is dark with red safety covers. The sky is a mix of blue and orange, and the grass in the foreground is blurred.

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# New technologies focused on lowering carbon footprint

*Energy companies around the world are investing in technologies and collaborating with tech giants to reduce their carbon footprint.*

## New digital platform to support energy transition for oil and gas companies

Eni, the Boston Consulting Group (BCG) and Google Cloud have announced they are building a new open digital platform supporting sustainability in the industrial supply chain. Starting from the energy world, the platform will progressively extend to all industrial sectors. The platform will allow all players in the energy sector throughout the value chain to share their experiences in sustainability, growth plans and information in compliance with the existing regulations. The idea stems from the common interest of the three companies to support a path of energy transition and sustainability in the industrial sectors.

Each of the partners will bring its expertise to help develop a collaborative and noncompetitive culture to establish better understanding and best practice sharing around sustainability throughout the industrial chain. Eni will contribute its industrial skills, the quality of its supply chain and its strategic commitment to a fair and sustainable energy transition. BCG will bring its strategic angle on ESG objectives, a valuation and growth model, and the value proposition for the platform. Google Cloud will contribute its excellent competency in cloud computing, Big Data and artificial intelligence.

## New project to reduce expenditure and emissions in offshore drilling operations

A collaborative, green solution developed between Kongsberg Maritime, COSL Drilling Europe AS and NOV is poised to generate major environmental and financial savings in offshore drilling operations. COSL's Energy Control project has been launched as a means of simultaneously slashing greenhouse-gas emissions and substantially lowering fuel and maintenance overheads on the company's rigs situated on the Norwegian shelf in the North Sea.

Collaboration between the firms arrived at an integrated solution that combines Kongsberg Maritime's energy management systems with NOV's research into energy optimization. A core principle of the joint solution was to limit and optimize generator usage, and it was soon established that the rig would still be able to carry out full drilling operations using only three of its diesel generators on average. By halving the generator capacity, the engines operate at higher loads, which in tandem with the switch-off of the other units' results in radically improved fuel efficiency, a sharp decrease in carbon deposits and a concurrent reduction in maintenance requirements. The annual figures are impressive: fuel consumption will be reduced by about 2,300 tons, CO<sub>2</sub> emissions by 7,300 tons and NO<sub>x</sub> by 125 tons, equating to an

overall saving in fuel and emissions of more than 25%. The project is approved and supported by the NO<sub>x</sub> Fund, a Norwegian government initiative for reducing NO<sub>x</sub> emissions.



**The Kongsberg integrated control system keeps the vessel's position, monitors and controls vessel functions, and actively distributes energy across onboard consumers.**

(Source: Kongsberg Maritime)

## Companies partner to develop lower carbon hydrogen solution for LNG trains

Baker Hughes and PAO NOVATEK have signed a cooperation agreement aimed at reducing carbon emissions from natural gas and LNG production. The two companies will cooperate on the development and implementation of innovative compression and power generation technology solutions from Baker Hughes for NOVATEK's LNG projects, supporting NOVATEK's emissions reduction, raising efficiency and supporting long-term sustainability. The agreement

will begin with a pilot program to introduce hydrogen blends into the main process for natural gas liquefaction to reduce CO<sub>2</sub> emissions from LNG facilities, including NOVATEK's Yamal LNG complex. Baker Hughes will provide engineering and turbomachinery equipment to convert existing natural gas liquefaction trains at Yamal LNG to run on hydrogen blends rather than solely run with methane from feed gas.

### Mobile power system achieves emission compliance, improves frac performance

Thriving in today's hydraulic fracturing market requires reliable power and performance while reducing emissions. NRG Technologies, an AFG Holdings Co., recently field-tested their novel technology alongside its DuraStim electric powered fracturing pump. The DuraPax mobile power unit performed successfully and surpassed strict emission standards despite severe heat and varying power loads. The technology delivers 3.6 MW of continuous duty power per trailer, while fully complying with EPA Clean Air Act standards. No additional exhaust stacks or catalysts are required. The power unit's NO<sub>x</sub> emissions are 40 to 50 times cleaner than blended fuel systems. At full load, it is 75% lower than EPA CO<sub>2</sub> emission requirements. This remote power system achieves emission compliance and high operational performance across a broad range of operating parameters. Reliable, economic operation is ensured by continuous run times as high as 750 hours before preventive maintenance is due. Versatility is further enhanced by a low, 60-psi to 100-psi gas supply requirement, versus 535-psi turbine demands. Generator output of 480 v is easily transformed up or down to meet specific voltage requirements. Powerful enough for hydraulic fracturing, the versatile mobile unit also provides emissions-compliant economic electricity generation to run rigs and other wellsite operations, along with the option to sell back to the grid.



**The DuraPax mobile power system features a modular design, providing scalable power for oil and gas field applications, petrochemical, mining, general industrial and other commercial and emergency power needs. (Source: NRG Technologies)**

mance objectives. The dissolvable hollow ball is also being evaluated for restimulation processes whereby existing fissures in surrounding geologic formations can be temporarily closed for refracturing. The ceramic hollow balls naturally dissolve in surrounding frac fluid and are removed in dilute concentrations with brine flowback as oil and gas flow are reestablished. +

### Environmentally friendly water dissolvable ceramic tooling offers faster completion, reduced costs

Victory Elements has released water dissolvable ceramic tooling for hydraulic fracturing and maintenance of oil and gas wells. The novel system, featuring solid frac balls and hollow delivery balls, fully dissolves in water and brine solutions without acidification and eliminates mechanical processes to remove or retrieve standard frac balls. The system provides performance and cost advantages compared to conventional practices including faster completion times, reduced completion costs, enhanced well performance and less environmental impact. Another development is Victory's water dissolvable hollow ball that can deliver additives, such as paraffin breakers, acids and antimicrobials, to targeted well locations for timed release and activation. This targeted delivery capability can minimize the volume and cost of additives rather than saturating wells with costly materials to meet perfor-

**Editor's note:** The copy herein is compiled from press releases and product announcements from service companies and does not reflect the opinions of Hart Energy. Submit your company's updates related to new technology products and services to **Faiza Rizvi** at [frizvi@hartenergy.com](mailto:frizvi@hartenergy.com).





# HART ENERGY

## CALL FOR ENTRIES

### 2021 Special Meritorious Awards for **ENGINEERING INNOVATION**

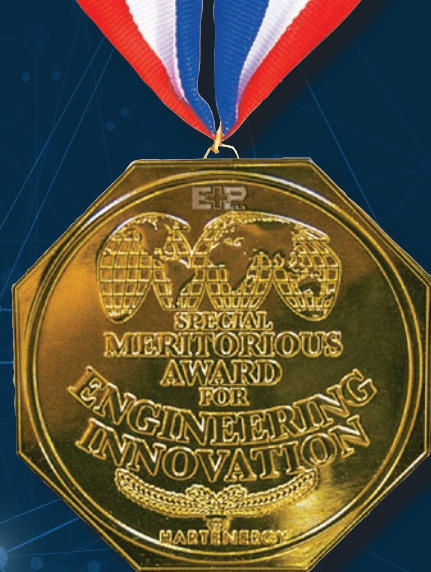
Annually Hart Energy bestows the **Special Meritorious Awards for Engineering Innovation (MEAs)** to honor the best new products, methods and services for finding, developing and producing hydrocarbons.

**MEA** entries are judged by respected industry professionals based on game-changing significance, both technical and economic. The judges are well-versed in their respective award categories and have engineering experience and technical backgrounds specific to the areas being evaluated.

Nominate your product or technology to be recognized among the **MEAs**. Entry is free, and awards will be presented virtually in October 2021.

### Submit your Entry in 3 Easy Steps!

- 1** Gather the required documents to support your award submission. A complete list is available at **MEAentry.com**.
- 2** Go to **MEAentry.com** and create an online account.
- 3** Use your personal entry page to submit and edit your entry. **Enter at MEAentry.com**



## MEA AWARD CATEGORIES

- Artificial Lift
- Carbon Management
- Digitalization
- Drillbits
- Drilling Fluids/Stimulation
- Drilling Systems
- Exploration/Geoscience
- Floating Systems and Rigs
- Formation Evaluation
- HSE
- Hydraulic Fracturing/Pressure Pumping
- IOR/EOR/Remediation
- Marine Construction & Decommissioning
- Nonfracturing Completions
- Onshore Rigs
- Subsea Systems
- Water Management



**Deadline for submissions is July 30, 2021.**

Contact [meainfo@hartenergy.com](mailto:meainfo@hartenergy.com) with any questions.



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DATE**

**May 26-27, 2021**

**Shreveport, Louisiana  
Shreveport Convention Center**

**DUG Haynesville will  
be in-person this May!**

CONFERENCE & EXHIBITION

**DUG**  
HAYNESVILLE

**Hart Energy's DUG Haynesville Conference & Exhibition** returns to its standard in-person format **May 26-27, 2021** at the **Shreveport Convention Center!** This hybrid event will provide a comprehensive view of Louisiana's drilling and production activity.

It promises to deliver unsurpassed opportunity to get face-to-face with major players and make valuable business connections.

DUG Haynesville conference sessions and related exhibits historically attract a deep group of qualified professionals.

After a quarantine year, they're eager to network with like-minded peers and colleagues and share the latest industry trends and technology applications. Attendees can expect to walk away with actionable intelligence for planning and managing successful operations.

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### 1 Guyana

Exxon Mobil is underway at exploration well #1-Bulletwood in the Canje Block offshore Guyana. According to the company, Bulletwood is a 500-MMbbl oil prospect of Late Cretaceous Campanian age and is comparable to Exxon Mobil's Liza Field channel complex in the Stabroek Block. The well will evaluate Upper Cretaceous prospects in the Liza play fairway with some possible deeper reservoir targets. The Canje Block will be the first block offshore to test prospects on the basin floor, which have the potential to contain larger accumulations of recoverable hydrocarbons. Exxon Mobil is the operator and partners include Total, Mid-Atlantic Oil & Gas, and Westwood Energy.

### 2 Suriname

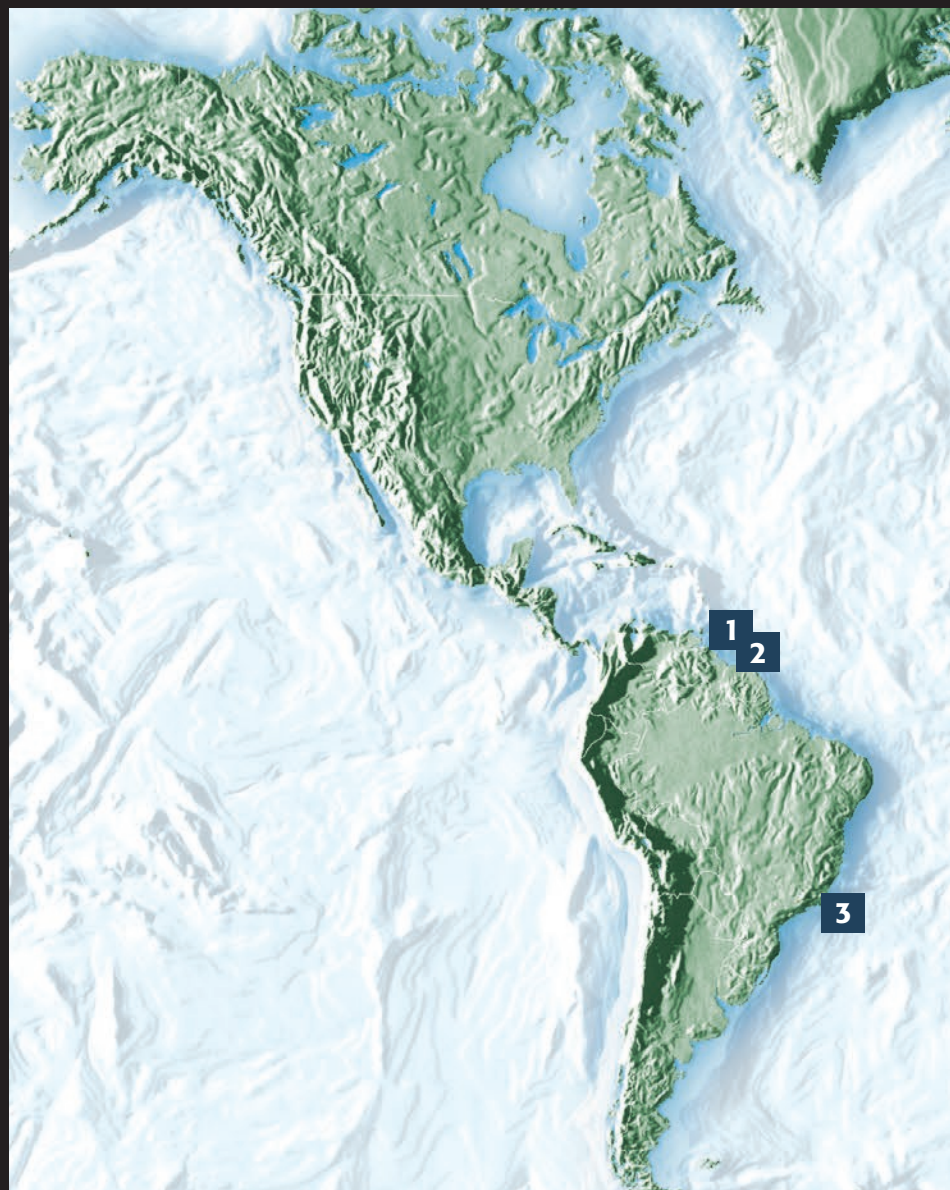
Total completed a new oil and gas discovery in offshore Suriname Block 58 at #1-Keskesi East. According to the company, the well hit a 63-m zone of net oil pay with 58 m (net) of black oil, volatile oil and gas pay in Campano-Maastrichtian reservoirs, along with 5 m (net) volatile oil pay in Santonian reservoirs. The well was drilled in approximately 725 m of water, and the rig is drilling ahead to a deeper Neocomian aged targets. Total assumed operatorship of Block 58 and #1-Keskesi East in 2020.

### 3 Brazil

Exxon Mobil has scheduled its first offshore Brazil exploration well in almost 10 years. The presalt formation venture will be the #1-Opal wildcat in Block C-M-789 in the Campos Basin. The company also announced plans for a second wildcat at #1-Titan in the Tita presalt Santos Basin, which will be drilled after #1-Opal.

### 4 Norway

An oil discovery was announced by ConocoPhillips in offshore Norway PL 891 at wildcat well #6507/5-10 S. The discovery is north of Heidrun Field in the Norwe-



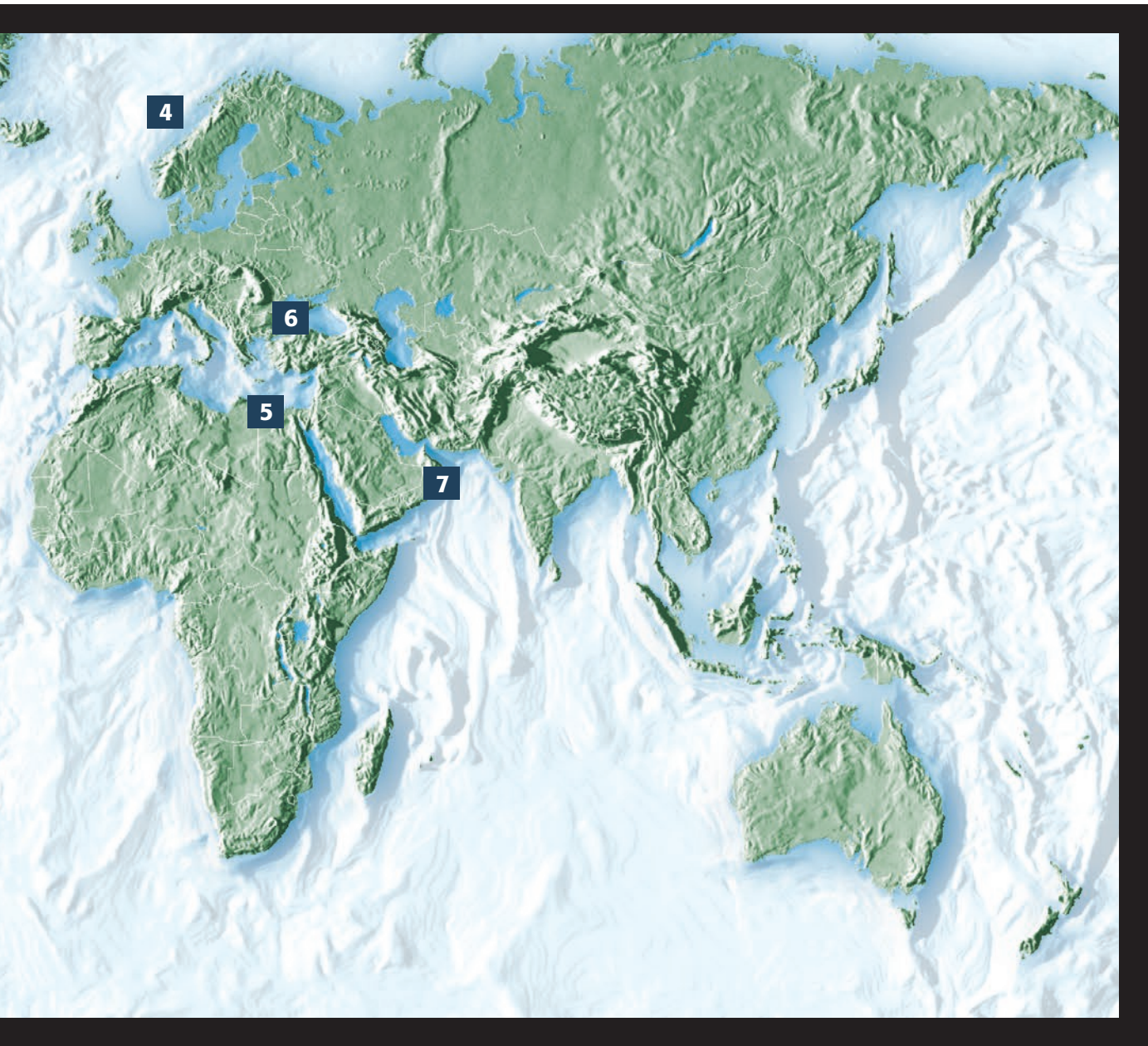
gian North Sea. The well encountered a total oil column of 270 m in Åre and Grey Beds formation, with 90 m of sandstone layers with very good reservoir properties. The preliminary calculation of the size of the discovery is about 4.1 MMbbl to 11.3 MMbbl of recoverable oil equivalent. The objective of the well was to prove petroleum in reservoir rocks from the Early Jurassic Age (Åre) and Triassic Age (Grey Beds). No formation tests were conducted, and additional testing, sampling and assessment are planned. This is the first exploration well in PL 891. The venture was drilled to 2,179 m, and the true vertical depth is 2,214 m. Area

water depth is 355 m, and the well will be permanently plugged and abandoned.

### 5 Egypt

An oil discovery was reported in Egypt's Western Desert by Apex International Energy in the Southeast Meleiha Concession. The #11X-SEMZ hit approximately 65 m of oil pay in the Cretaceous sandstones of Bahariya and Abu Roash G. An initial flow test of Bahariya had a peak rate of 2,100 bbl/d of oil and no water. According to the company, additional uphole pay exists in the Bahariya and Abu Roash G that can be added to the production stream. The venture is about 10





km west of Zarif Field and was drilled to a total depth of 1,759 m. The #11X-SEMZ is the second of a three-well exploration program. The first well, #1-SEMZ, was drilled to about the same depth and flowed 100 bbl/d of oil. The company plans to fracture-stimulate #1-SEMZ at a later date. A third well is planned at #3-SEMZ and is targeting Bahariya.

#### 6 Turkey

Turkish Petroleum Corp. has reported that the #1-Tuna venture has now been estimated to contain more than 405 Bcm of gas after identifying an additional 85 Bcm of gas. The deepwater exploration well

is located in Block AR/TPO/KD/C26-C27-D26-D27 in the Black Sea. It was drilled 2,115 m of water to a total well depth of 4,525 m. It encountered more than 100 m of gas-bearing reservoir in Pliocene and Miocene sands. The company had previously announced that the well data and geophysical studies at #1-Tuna showed a potential of 320 Bcm of lean gas. It is currently the largest discovery in the Black Sea.

#### 7 Oman

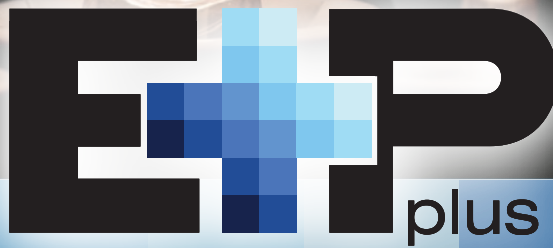
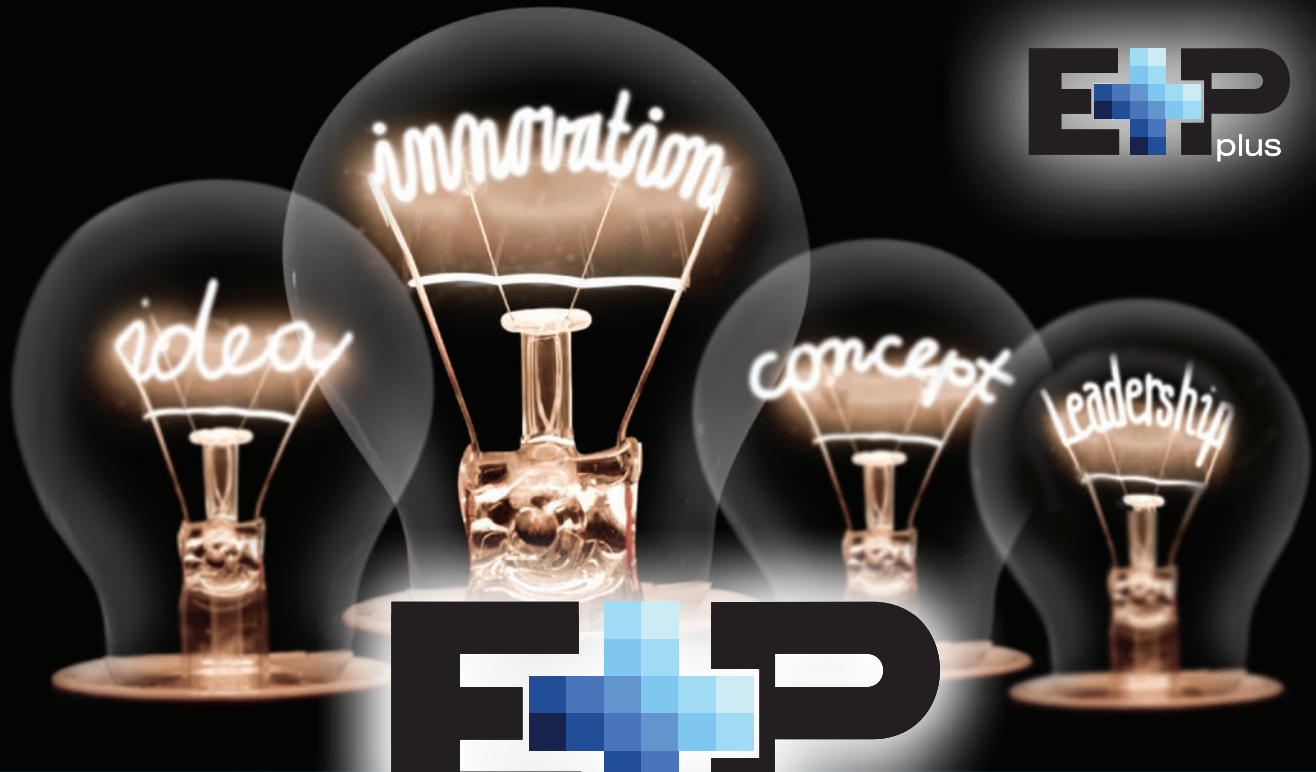
Masirah Oil is underway at a second development well, #2-Yumna, in offshore Oman's Yumna Field in Block 50 in the Arabian Sea. A wildcat venture, #3-Yumna,

is also planned in the same block. The original block discovery at #1-Yumna initially flowed more than 8,000 bbl/d of oil. Recently, a mobile offshore production unit was installed in the field along with a 75,000-bbl capacity storage tanker. Masirah Oil is the operator of Block 50 and the Yumna Field with Rex International. +

—By Larry Prado, Activity Editor

*For additional information on these projects and other global developments, visit the drilling activity database at [hartenergy.com/activity-highlights](http://hartenergy.com/activity-highlights).*





# 40 Under Forty Awards

Recognizing Today's Rising Technology Influencers



**We invite you to nominate professionals under 40 who are moving the industry forward.**

We encourage you to nominate individuals who have demonstrated leadership and made significant contributions to advancing oil-and-gas-related technologies. Their impact can be demonstrated by innovations that enhance (or have potential to enhance) a company's mission or the industry's long-term success.

By nominating rising stars for this awards program, you can help recognize the diverse nature of today's oil and gas industry.

### When and how will the nominees be honored?

Honorees will be announced in the summer and their profiles will featured in a standalone supplement that will publish in August. Honorees will be interviewed by Hart Energy journalists to flesh out the details of their stories based on information from the nomination form. The honorees will be named in a press release and featured in E&P Plus social media once the supplement is complete.

### Categories:

- + Geology & geophysics
- + Drilling & well logging
- + Well construction & completion
- + Production & facilities
- + Onshore field development
- + Offshore exploration & operations
- + Research & product development
- + Data analytics, AI & machine learning
- + Digital oilfield applications
- + Energy transition
- + Offshore Wind
- + Renewables

HARTENERGY

Submit your entry to <https://hartenergy.live/EPP-40underforty>

Deadline for submission is **March 31, 2021**



**PEOPLE**

Schlumberger New Energy, the CEA and partners have appointed **Florence Lambert** CEO of the Genvia clean hydrogen production technology venture.

Gilmore, a provider of flow control solutions, has appointed **David Nemetz** CEO.



Green

Well-SENSE has named **Annabel Green** CEO to accelerate its global business strategy and drive further adoption of its proven downhole sensing technology.

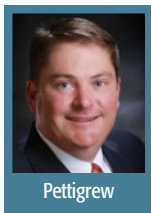


Scullion

OSSO, formerly Centrifuges Un-limited, has appointed **James Scullion** CEO to spearhead the company's international growth.

Phillips 66 has named **Mark Lashier**, president and CEO of Chevron Phillips Chemical Co. LLC, as its president and COO, effective April 1.

ConocoPhillips has announced the retirement of **Matt Fox** as the company's executive vice president and COO, effective May 1.

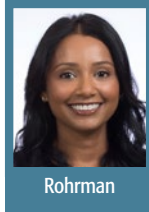


Pettigrew

Stratagraph, a provider of geological services to the global oil and gas industry, has named **Ashby Pettigrew** president.

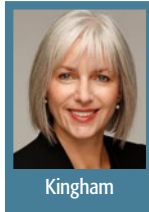
Enverus has appointed **Manuj Nikhanj** president, where will be responsible for executing the company's vision as a leader and innovator in the energy sector.

TechnipFMC has named **Alf Melin** executive vice president and CFO.



Rohrman

FutureOn, the global software company specializing in the energy sector, has appointed **Suba Rohrman** vice president of Asia-Pacific to drive growth in the region.



Kingham

bp has announced that **Peter Mather**, bp's U.K. head of country and senior vice president for Europe, will leave the company at the end of the year. **Louise Kingham** OBE, CEO of the Energy Institute for more than 20 years, will join bp in May.



Muir

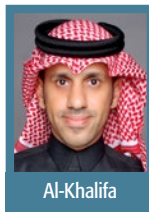
EnerMech has appointed **Steven Muir** to a newly created post of IT director. Based in Aberdeen, Muir will be responsible for enhancing EnerMech's technology components as

the company strengthens its entry into the renewables and infrastructure sectors.



Christie

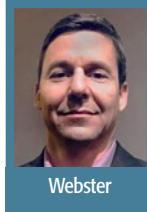
THREE60 Energy, a global energy services group, has named **Matthew Christie** business development director for its engineering, procurement, construction and commissioning service line.



Al-Khalifa

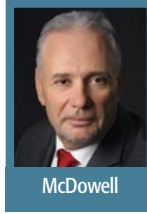
ChampionX has appointed **Mohammed Al-Khalifa** to the newly created role of general manager of Saudi Arabia to spearhead the region for further growth in 2021. In his

new position, Al-Khalifa will play a central role in implementing the business' long-term strategy and streamlining its current operations to support ongoing demand for its services.



Webster

Twin Brothers Marine, a provider of heavy steel fabrication, has named **Jason Webster** general manager.



McDowell

BCKC Holding Co. has appointed **Fraser McDowell** director of strategy and business development (renewables).

**Pavel Krylov** has been replaced as head of Department 335 and director general of Gazprom 335 by **Viktor Sharokhin**, former first deputy director general – chief engineer of Gazprom 335. In his turn, Krylov has been appointed first deputy director general of RusKhimAlyans.

Excelerate Energy LP has named **Alisa Newman Hood** general counsel and **Amy Thompson** as chief human resources officer.



Al Jaber

The Crown Prince of the Emirate of Abu Dhabi, **Mohamed bin Zayed bin Sultan Al Nahyan**, has been named the chairman of the board of directors of state oil firm Abu Dhabi National Oil Co. (ADNOC). In addition, **Dr. Sultan Al Jaber**, CEO of ADNOC Group, will be the company's managing director.

**COMPANIES**

**Edge Gathering Virtual Pipelines 2 LLC's** new facility in Midland, Texas, will hold operating equipment of both Edge LNG and Galileo Technologies, its exclusive technology partner, and will be home to the first training center for both companies.

**Ring Energy Inc.** has relocated its corporate headquarters from Midland, Texas, to



## On The Move



the greater Houston area. Additionally, the company closed its Andrews, Texas, field office, downsized its Midland office and plans to close its Tulsa, Okla. office at the end of first-quarter 2021.

**TWMA**, a specialist drilling waste management company, has secured new headquarters in Aberdeen to support business growth and deliver remote operations for its customers.

**mCloud Technologies**, a Vancouver-based firm specializing in ESG technologies for the oil and gas industry, has relocated its global headquarters to Calgary.

**DNV GL** will combine its current Oil & Gas and Power & Renewables businesses into one new business area called Energy Systems.

**Enerplus Corp.** has agreed to acquire all shares of **Bruin E&P HoldCo LLC** for total cash consideration of \$465 million. The deal was scheduled to close in early March.

**bp** and **Equinor** completed the formation of their strategic U.S. offshore wind partnership. This includes bp's \$1.1 billion purchase from Equinor of a 50% interest in two major lease areas off the U.S. East Coast. The new partnership will develop up to 4.4 GW through two projects—Empire Wind and Beacon Wind—and together pursue further growth in the U.S. offshore wind market.

**Datagration** has acquired **Mosaic Petroleum Analytics**, a data analytics, reservoir simulation and economics platform designed to optimize unconventional reservoirs. +

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# A practical guide for accelerating energy transformation

*Energy sector leaders must act decisively to reinvent their businesses for the future.*

**Arno van den Haak**, Amazon Web Services;  
**Venkat Venkatraman and David J. McGrath Jr.**,  
Boston University Questrom School of Business

**I**n the Fourth Industrial Revolution, digital is becoming the foundation of every industry. Energy sector winners will be defined by their ability to leverage digital technologies to design sustainable and profitable business models. This does not mean merely applying the latest tech to existing business processes—a “digital varnish” approach that is fraught with pitfalls. Digital technologies must be embedded across the value chain, from exploration to production to distribution to consumption, and extended to customers and ecosystem partners.

To accelerate business transformation in a logical and coordinated way, energy sector executives must embrace a more structured and systematic approach. The Industry Transformation Matrix (ITM), developed by Amazon Web Services (AWS), is a useful tool for managing business transformation across the organization and creating pathways for transformation. The ITM plots transformation in a company’s business and technical domains across time to define four mandates that are integral to successful business transformation. The efficiency mandate represents technical areas that support current business strategy and operations. Efficiency requires continuous assessment and assimilation of new digital functionality to keep technical infrastructure effective and streamlined.

The effectiveness mandate gauges how digital technologies such as robotics, drones, artificial intelligence (AI) and machine learning are used to link and unify siloed activities to optimize workflows across the company and the entire energy value chain.

The innovation mandate focuses on the benefits and risks of integrating digital technologies and imagines novel ways of using them to drive new business opportunities.

Finally, the reinvention mandate plots the company’s future business models, looking at the business from the outside in, imagining a new future and working back to today.

## Guiding principles

Successful business transformation is an ongoing, dynamic

process and companies should embrace, embed and measure progress against the following guiding principles to adapt to changing market conditions and take advantage of new digital opportunities.

**Work back from the future state.** Projecting business transformation from the current state typically results in limited change. Instead, define the desired future state and work back to today to determine the best path forward.

**Create a connected value stream.** Take an enterprisewide view of business processes and value metrics, and extend it to customers and ecosystem partners.

**Learn from experimentation.** Rapid experimentation is a great way to adapt and reengineer operations and processes. Think of experimentation as a portfolio of learning objectives that offer insights for follow-on initiatives whether they succeed or fail.

**Orchestrate a network.** Doing everything internally will not lead to reinvention. Align with partners and vendors to manage today and design for tomorrow.

**Augment human skills.** Identify areas where machines and humans can work together, especially where one augments the value of the other.

**Measure business impacts.** Transformation is first and foremost about business and should be defined by business goals and tracked against business metrics.

**Adjust the speed of transformation.** Digital transformation and innovation take place in weeks, not years. Pace business transformation with the speed of the market and competitors.

**Tackle big problems.** Solving complex problems promotes innovative thinking, expedites new relationships and provides insights that can accelerate business transformation.

Energy sector leaders must act decisively to reinvent their businesses for the future. Applying the ITM to coordinate transformation efforts across the business and embracing the principles above to guide the journey will help drive efficiency today and effectiveness tomorrow. +

