



# The Exploration Conundrum

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In a world awash in oil, discoveries are at an all-time low.

The global outlook for crude oil and natural gas production might seem complicated. But really, it's arithmetic. The more oil and gas resources the industry discovers or identifies today, the more oil and gas the industry can produce in the future.

And that might be a problem.

Oil companies made huge cuts in their exploration budgets during the 2015-17 industry downturn, canceling or postponing up to \$1 trillion overall in scheduled and planned projects. At the same time, success rates for international exploration dropped to 50-year lows.

The outlook for future reserves has stumbled, if not tumbled.

Not only does the oil and gas industry need to keep exploring, it has to explore both efficiently and effectively if it wants to provide sufficient production to meet the world's energy requirements in the decades ahead, according to industry experts.

"Exploration is critical today and will continue to be critical to the oil and gas industry. What you tend to see in a downturn is that people cut back on their exploration budgets, and we saw that in the recent downturn, as companies went into survival mode," said John England, a partner specializing in oil, gas and chemicals for consulting firm Deloitte LLP in Houston.

### **'Chronic Underinvestment'**

"Something we saw in the downturn is that you can do more for less," England added, a sentiment echoed by Andrew Slaughter, executive director of Deloitte's Center for Energy Solutions in Houston.

"Operators need to fill the exploration funnel so they have exploration projects for the years ahead," Slaughter said. "For total capex I think 2017 was a low year with a bit over \$20 billion expended on exploration, but we got a few more wells in there" through efficiency and cost reduction, he noted.

Exploration investment "is always going to be the minority, the riskier part of capex. This notion of doing more with less, I think it's positive for exploration," Slaughter observed. "You're getting more for the dollars you spend, so the unit costs per barrel are continuing to improve."

In its report "Oil 2018," the International Energy Agency noted that the current oil price rally has rewarded Saudi Arabia, Russia and other companies taking part in output cuts, while also unleashing a new wave of production growth from the United States.



"Coupled with gains from Brazil, Canada and Norway, oil markets now look adequately supplied through 2020. There is no call for complacency, however, and more investment is needed now to ensure secure supplies to meet robust demand growth," the report warned.

Global energy demand is rising steadily, so the response from the supply side is crucial, the IEA noted. The recovery from the historic drop-off in industry investment during the downturn "has barely started, investment was flat in 2017, and early data suggests only a modest rise in 2018," it added.

“This is potentially storing up trouble for the future. An added concern is that investment is overwhelmingly focused on the light tight oil sector in the United States. As a result, upstream investment may be inadequate to avoid a significant squeezing of the global spare capacity cushion by 2023, even as costs have fallen and project efficiency has improved,” the IEA report said.

According to the Baker Hughes international rig count, 1,925 oil and gas rigs were operating in the United States in November 2014. By the start of 2017, that number had fallen to 683. During the same period, the worldwide active rig count dropped from 3,670 to 1,918. The oil industry veered sharply away from exploration and focused on increasing production from known fields.

“When we have a downturn, everybody goes to drilling development wells and appraisal wells. They’re trying to get their production up,” said Bob Fryklund, chief upstream strategist for IHS Markit in Houston.

Ironically, the industry’s success in increasing production, coupled with an influx of oil and gas from unconventional resource plays, deepened and extended the price downturn. Executives began to use the phrase “lower for longer” and generally shied away from long-term exploration commitments. The industry began eating up its own reserves without filling the pantry for coming years.



Bob Fryklund

“In the simplest form, without exploration you don’t have any new resources to develop,” said Julie Wilson, research director of global exploration for research and consultancy firm Wood Mackenzie in Houston. When companies increase production, she explained, “you’re still depleting a known resource. But when you go out and do exploration, you find new resources you can develop.”

Under-investment in exploration in recent years has generated speculation about a future production shortfall, especially in crude oil, a gap between demand and supply if un conventionals can’t offset declining conventional production.

An analysts’ note in July from New York research and brokerage company Sanford C. Bernstein and Co. said “chronic underinvestment” by the oil and gas industry is setting the stage for the next oil price spike, which could take crude to \$150/barrel or more. Investors who’ve been urging management “to reign in capex and return cash will lament the underinvestment in the industry,” the analysts predicted.

“Any shortfall in supply will result in a super-spike in prices, potentially much larger than the \$150 a barrel spike witnessed in 2008,” the analysts wrote. “If oil demand continues to grow to 2030 and beyond, the strategy of returning cash to shareholders and underinvesting in reserves will only turn out to sow the seeds of the next (boom/bust) super-cycle.”

## Reserves Replacement

Not everyone agrees with that outlook.

“We don’t necessarily believe what everybody else is talking about, that there’s going to be this big gap,” Fryklund said. Historically, when more production is needed to meet demand, “the industry arises to solve the problem,” he noted.

Today, the industry is coping with what Fryklund calls “the exploration conundrum – discoveries right now are at an all-time low not seen since the 1950s. Yet we’re awash with oil.” He said most of that added oil came from field growth, the increase in a field’s productive capacity through improved techniques and technologies, as well as increased output from unconventional plays.

But a third important element for production – reserves replacement – could be in jeopardy. Bernstein and Co. reported that proven reserves of the world’s largest companies have dropped by more than 30 percent on average since 2000, with only Exxon and BP having any increase, bolstered by acquisitions. Companies draw on their known reserves to produce oil and gas, and most companies try to replace the reserves they deplete each year to ensure production in the future – and for large companies with lots of reserves to replace, that can be a problem.

Deepwater exploration, an expensive form of oil and gas hunting, continued during the downturn and goes on today because companies want “legacy assets” from large-scale discoveries, Wilson said. Those legacy assets can boost reserves for years and years, even decades. “They throw off tons of cash flow throughout their lives,” she noted. “Companies expand their drilling and see further exploration opportunities to tie wells back in.”

“Legacy assets like that don’t come along every year. You don’t find them all the time. They are rare beasts, but when you get one they’re company-makers, even for a major,” Wilson said.

While the industry has made some significant offshore discoveries in recent years, discoveries overall have become smaller and more remote, she said. “In the pre-crash boom years, what we were finding was that discoveries were becoming less and less commercially viable. You needed a very high price for those small, frontier discoveries, and the cost environment was suffering from high inflation,” Wilson observed. “We saw a lot of volumes being found in giant discoveries, but they were finding a higher percentage of natural gas.”

“What they’re looking to do offshore is to bring resources online more quickly. Operators now are looking to be more nimble and begin production quicker,” she said. “In areas where, before, they’ve needed a very large discovery for commercial production, the size needed for commerciality might come down with this new nimble approach.”

Fryklund talked about this change more in terms of flexibility, especially for offshore megaprojects.

“Companies do need to have more flexibility now,” he said. “There’s an inherent conflict in our business that says you have to manage for the future, but you have to deliver today – i.e., pay your dividends quarterly.”

“It’s this whole concept of capital flexibility and that generally means a shorter-term tie up. The problem is, if you look at the offshore it takes a lot longer. How do you compress that?” said Fryklund.

“The global average (for deepwater) was seven years from discovery to first oil. And you had billions of dollars tied up,” he noted, adding that offshore projects are coming onstream faster now. “People have been working on giving the offshore and megaprojects more flexibility.”

## **‘Niche’ Exploration**

Wilson said the industry has seen a change in exploration philosophy recently. Some companies are moving to become pure play operators devoted to one type of play, choosing an offshore or unconventional or conventional onshore niche, or operating in a limited geographical area. “Since the downturn we’ve seen exploration shift. Companies have high-graded their portfolios. In deepwater, they’re going after the best-quality reservoirs they can target,” she observed.

“The U.S. Gulf of Mexico is interesting now because some of those mid-sized companies have exited to focus onshore, Noble Energy being one. You’re seeing a bifurcation,” she said.

“Anadarko used to be one of the biggest wildcatters in the U.S. Gulf of Mexico, but they’re currently not active there.”

“The departure of some of the mid- and large-caps is part of that pure-play evolution. In the past, companies had a diversified risk profile, and investors accepted that, but now investors want them to have one risk profile, then they can pick and choose which risk profile(s) they want to invest in,” she noted.

Some of the most active companies in the U.S. Gulf are backed by private equity, Wilson said. “They have a niche position. They tend to go for plays and projects they can turn around more quickly,” exploring near existing infrastructure, conducting a great deal of preplanning and even working out tariffs in advance.

“Part of today’s shift is for companies to focus on their particular niche. The majors are so large they will be in everything. In order to grow, they have to participate in all growth avenues, like acquisitions and discovered resource opportunities as well as exploration. But when we think of exploration around the globe, more and more companies are working toward their niche,” she said.

## **Large-scale Projects Needed**

Somehow, maybe because it conducts big offshore exploration and production activities, the oil and gas industry developed a reputation for being adept at large-scale projects. That’s one of the least deserved business reputations of all time. Not only has the industry been, in general, bad at megaprojects, it’s often been downright terrible.

Angus Rodger, research director for Wood Mackenzie in Singapore, said during the last decade the average industry development started six months later than planned and began \$700 million over budget.

“The scale of under-performance was staggering,” he noted.

Late delivery and cost overruns became so routine that the top 15 project failures of the last decade were a cumulative \$80 billion over budget, Wood Mackenzie reported.

But here’s some good news: A growing number of medium-to-large industry projects have been delivered on target during the past year, including areas notorious for cost blowouts like the Arctic and the Caspian Sea, according to WoodMac.

Eni’s supergiant Zohr gas field offshore Egypt is often cited as a poster child for the industry’s new level of efficiency. After a slick exploration program opened Zohr, the largest gas field in the Mediterranean, the company began production in December 2017 – less than two and a half years after discovery. Eni claimed the fast online start was a record for that type of project.

Other examples of improvement include BP’s West Nile Delta and Atoll deepwater projects and its shallow-water gas Shah Deniz Phase 2 development, and Woodside’s Persephone and Wintershall’s Maria subsea tie-backs.

Earlier this year, Shell brought onstream its Kaikias oil and gas field in the Gulf of Mexico, with four wells completed subsea in 4,500 feet of water, nearly a year ahead of schedule. Kaikias “epitomizes how the deepwater sector has – for now – transitioned to a simpler, lower-cost business model,” the WoodMac report noted.

There are reasons for this kind of improvement in exploration and production operations. First and foremost, the price collapse in the recent downturn scared everybody, leading to a laser-focus on efficiency and reduced costs.

In addition, WoodMac cited several other contributing factors:

- Spare capacity throughout the supply chain, leading to better performance and lower costs: In some basins, including the Gulf of Mexico and the pre-salt play offshore Brazil, drilling efficiency has improved dramatically.
- Service sector collaboration and alignment on contracts, mostly in northern Europe
- Improved project management, with operators having more people focused on looking at fewer elements, and under-utilized service companies offering their best team for each major contract
- Greater corporate discipline, as tougher project screening and more stringent investment hurdle rates have increased the industry’s attention on execution and cost control
- More planning before the final investment decision, with more contracts signed and sealed pre-sanction, often with preferred partners versus putting everything out to bid
- Reduced project scope, and more tie-backs and brownfield projects that use existing infrastructure

Some of the improvement in on-target and on-budget project delivery comes from the industry deemphasizing megaprojects in the recent downturn, the WoodMac report observed, but added, “This is not sustainable longer term in an industry underpinned by large, cash-generative assets.”

Translation: The oil and gas industry needs large-scale projects to generate sufficient future production.

“For exploration to make a comeback, it also needs better project delivery,” Rodger said.

“Because for exploration to get back into the black and become a value creator, it’s not only about capitalizing on cheaper rigs and more cost-efficient development solutions, but also ensuring they can be consistently executed.”

“Investments won’t hit more stringent 15-20 percent IRR (internal rate of return) hurdle rates if half of that is lost through bad delivery,” he added.

Hydrocarbon explorers “by their very nature like to go to new, untested and often frontier provinces,” Rodger noted. “For companies to have faith they can make money from remote new plays, and therefore invest in exploration, they must also have renewed confidence in their own ability to competently execute new greenfield projects, both small and large in scale,” he said.

## **Project Efficiency and the Digital Revolution**

Whether or not oil companies can hold on to the efficiency gains and cost reductions they secured during the downturn is “the burning question for the industry,” said Deloitte’s England.

“History will tell you that costs will go up with prices, pretty much in lockstep. Some people are saying, ‘This time will be different.’ And there’s some evidence of that,” he noted. “I think we are in the first stages of the digital revolution, and that will help the industry retain those efficiencies.”

Given that revolution, “the opportunities we’re seeing are amazing. Even just drilling rigs, the amount of digital technology people are putting into drilling rigs is fantastic. And that not only makes them more efficient but, over time, also safer,” England said.

Digitalization is “taking off in more and more places, in more and more companies. They’re working with their suppliers and their services to bring in digital technology,” Slaughter added. He co-authored an article for Deloitte that stated “advancement in technologies, the falling cost of digitalization, and the ever-widening connectivity of devices provide a real competition-beating opportunity to upstream oil and gas companies who play the digital revolution right.

“The lower-for-longer downturn and moderating operational gains have provided an extra incentive – or turned the opportunity into a need – for companies to save millions from their operating costs and, most importantly, make their \$3.4 trillion asset base smarter and more efficient.”

Digital efficiencies show up throughout the oil industry now, from remotely controlled offshore drilling rigs to sensor-packed intelligent wells. Coupled with other advanced technologies, they have helped drive the development of unconventional resources. And un conventionals are making the industry see the concept of “exploration” in a new light.

*(Editor’s Note: This is the first of a two-part series. Look for Part 2 in next month’s EXPLORER, which will discuss how innovations in un conventionals, geopolitical tensions, environmental concerns and economic implications will affect the “Exploration Conundrum.”)*