

WEBINAR

# Briefing



## Technology's Impact on Energy

From the Privcap webinar "How Technology is  
Changing the Energy Investment Game"



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SAP



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# How Technology is Changing the Energy Investment Game

With prices for quality assets continuing to fall, technological advances are improving oil and gas extraction methods. And private equity investors are looking at a bright future in the sector.

## The Panelists



**Ken Evans**  
SAP



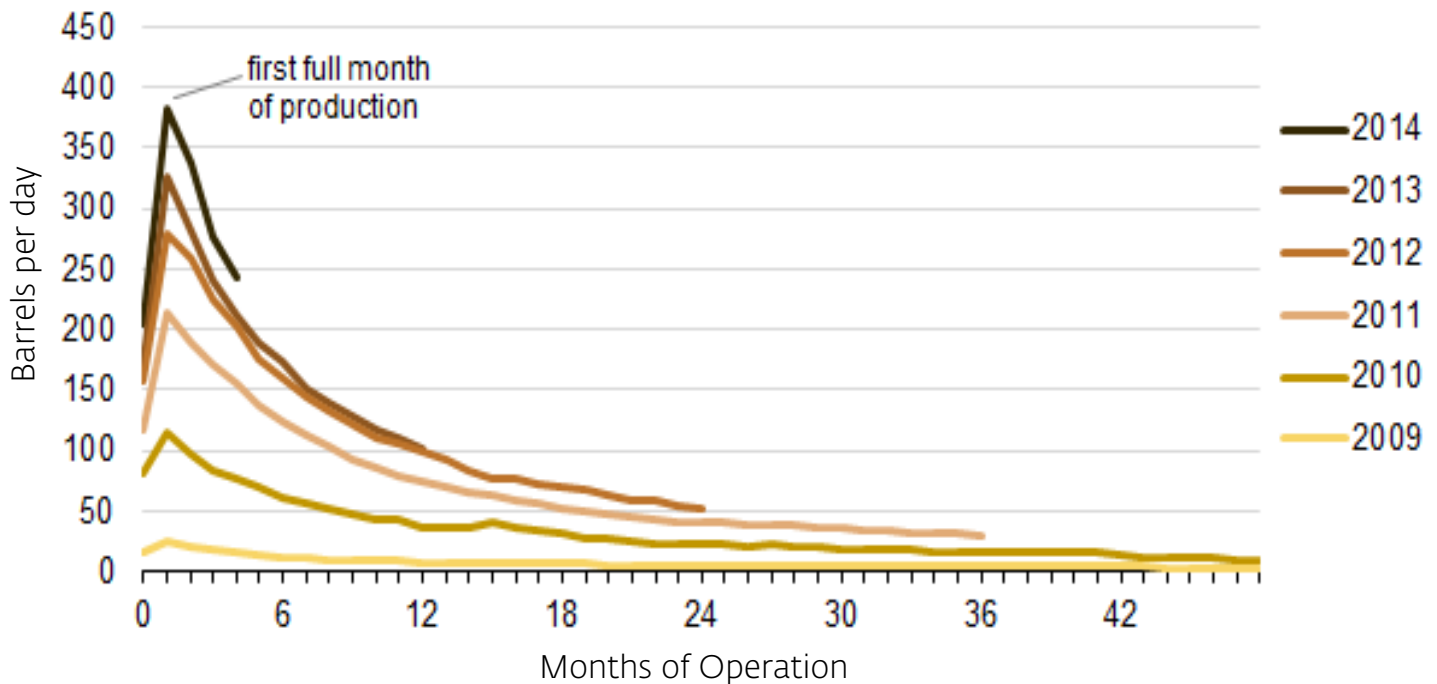
**Mukul Sharma**  
University of Texas-Austin

**Privcap: How is technology changing the productivity in the oil field in both upstream and downstream, and will this technological advancement allow private equity investors to continue to make money in energy?**

**Mukul Sharma, University of Texas–Austin:** Operators working the various shale plays and conventional plays, particularly in the U.S., have done a remarkable job of reacting to this very difficult price environment. We have a chart that shows the average oil production per well during the first 48 months of operation, going back from 2009 through 2014. And what it shows is the remarkable increase in well productivity that has been achieved through the application of various technologies—going from about 25 barrels a day at about 30 days of production to almost 10x that amount in the last year that reporting is available.

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## Average oil production per well during the first 48 months of operation



Source: EIA Technology continues to extend the production life of older wells. As advances are made, producers will be able to extract even more black gold typically left behind as a result of older fracking methods.

Over the same period of six years, the cost of the wells has dropped by a factor of two, and the production in these wells has increased by a factor of two, almost every year, which is why even at \$45 oil, many of these operators have been able to stay in business and actually make money.

#### Ken, what is your view on the role that technological advancement plays in the economics of production?

**Ken Evans, SAP:** It reminds me of Moore's Law, that computing capacity was going to double every few years. And we're finding that exact same trend applying here. It's the application of digital technologies that's largely at play in allowing the operators to do that experimentation to find where their optimal fracking volume should be.

#### Can you walk us through some of the most important technological advances that have allowed for greater productivity and lower cost in the oil field?

**Sharma:** Probably the most important one is the full utilization of what we call "pad fracturing," where instead of drilling wells individually, we now drill anywhere from four to 16 wells in a single pad. And that allows a tremendous amount of cost savings as a result of doing almost an assembly-line operation where you're drilling several wells from a single location on the surface. This has significant cost benefits, but it also has significant environmental benefits, because the pad that you have on the surface has a very small surface signature. This technology has essentially dropped the cost of drilling and fracturing these wells by a factor of two. Wells that were drilled over a period of 30 to 45 days can now be drilled in a matter of a week. All of these different things really have reduced the cost of operations by more than a factor of two over the last decade.

There are a lot of wells that have been producing for three to five years that still have a lot of potential. Within these unconventional reservoirs—particularly the oil reservoirs—we only produce about 6 percent of the oil in place

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Mukul Sharma,  
University of Texas-Austin

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and leave behind about 94 percent of the oil in the ground. There's a tremendous opportunity to go back in and refracture these wells.

**Evans:** The digital oil field has been around for about 15 years, but now we're finding opportunities to really leverage that data. What comes with that is also an increased complexity around the supply chain that has to be managed. We're seeing digital technologies able to be applied to standard supply chains that you would do in the downstream.

**Ken, you have an observation about the disruption that Uber brought to taxis and how a similar approach might be at play in oil and gas.**

**Evans:** As we think about the digital economy, it's pretty interesting to think that the world's largest taxi company today, Uber, owns no vehicles. The world's largest hotelier,

Airbnb, owns no hotel rooms. The world's largest music distributor, Apple, owns no music, and the list goes on and on. Could there be an Uber-like service that supplies something to truck dispatching in the downstream space? You could think about an Uber for hotshots in an upstream type of scenario. They can actually make that movement. It could have a dramatic impact on the overall supply chain.

**Mukul, would you mind walking us through some of the longer-term trends, starting with natural gas becoming an increasingly important part of our energy mix?**

**Sharma:** The consensus is that natural gas is going to replace coal, both in terms of transportation fuels and generating electricity. And those two are pretty large components of the way we use energy. This move towards natural gas will spawn new technologies.

**Ken, what's your view on the impact that technology will play in natural gas?**

**Evans:** At some point there's an opportunity for small-scale distribution. In some of the emerging parts of the world, what we're seeing from a technology perspective is the need to be able to manage LPG bottled distribution. Certainly the more we can automate all those routine activities, the more we can actually predict failures in the surface equipment that would have an impact and move to much more of a predictive or even a prescriptive maintenance activity, so that you're not having to guess what to fix.

**Mukul, what are some long-term trends that you're seeing?**

**Sharma:** Improved oil recovery [by using technology] in existing oil reservoirs is going to be an important part of what we do. We leave about 70 percent of the oil in the ground in conventional reservoirs after we deplete them, and about 90 percent-plus of the oil in the ground in unconventional reservoirs. It's important we try to go after the remainder of this oil, which requires the application of new technologies.

**Can you talk about technology being applied to the refinery and conversion space?**

**Evans:** I'm a former refinery operations manager, and one of the things that we always struggled with was how to

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actually maximize our yields and keep that unit running on an even basis. And the way we're seeing companies utilize technologies today, it really is the Internet of Things. We've got some examples where some partners we're working with are able to that, to be able to predict a heat-exchanger failure weeks in advance. All of those things are going to align to get much more capacity.

### **Is the production of experts able to harness the new technologies keeping pace with the technology itself?**

**Sharma:** Currently we have a lot of people who have been part of that boom cycle that have really developed the expertise as we've gone into increased drilling and increased completions and a tremendous increase in the productivity in the U.S. Those people have developed this expertise in the last decade, and my concern is not with today, where we do have enough human capital; my concern is five years from now. If the low-price environment persists for the next couple of years, we may lose a lot of these people who have gained expertise and developed this technology over the last five years. And in many cases, when we lose these people, we don't get them back.

### **Knowing what you know about advances in technology and where we are in the cycle, would you be an investor in private equity oil and gas right now?**

**Evans:** If we go back and we look at the bigger picture, the overall demand for energy is increasing. And that's the simple math of population, urbanization, and the rise of the middle class. The real question is just how sustainable and competitive the oil and gas industry is going to remain in that overall energy mix. There are huge opportunities.

**Sharma:** I've started and sold two oil and gas companies, so I'm extremely bullish on our business. Any time you have a challenging environment, with the way the prices of oil and gas have been, there are tremendous risks. But there are also tremendous opportunities. Longer term, there is no question that oil and gas prices will recover, and it's a matter of taking advantage of the right opportunities.

### **Ken, are there new domains that you feel are coming up?**

**Evans:** The whole realm of data sciences—being able to manage that intellectual capital and being able to license that sort of capital—is going to be interesting. We're seeing

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the emergence of what we call a digital energy network, to where companies are going to be able to all collaborate together from a supply chain.

**Since the oil business has added enough efficiencies, low-cost production will continue to drive oil prices lower, and higher-cost producers will be closed out of the business. Is this a secular shift as opposed to a cyclical phenomenon, where we need to look at energy differently going forward?**

**Sharma:** The dynamics of energy pricing, of course, has two sides to the equation. And anytime you have lower costs for energy, there's always an uptake in demand. You reach these tipping points where things change very quickly in terms of prices going up and down. The nature of the business is cyclical for exactly that reason.

**Evans:** Mukul's right, that it's going to remain cyclical and unpredictable. The challenge then is how can, as an organization, you become much more agile and resilient to those sort of changes. And that's where, from my perspective, [you can be] applying digital information to be able to do that. To be able to almost uncouple the value chain from a vertical integration to much more of a digital integration is going to allow companies to do that. ■