The Oil & Gas Industry's New Normal: Rethinking Innovation Priorities in the Age of Low Prices

EXECUTIVE SUMMARY

The oil and gas industry is facing a new reality, as many forces are debunking industry orthodoxies. The resilience and innovation velocity of the US unconventional sector will see a continued rise of production and declines in costs, which, for the long term, will cap oil in the $45 to $60 range and gas in the $2.50 to $3.50 BTU range. As a result, this scenario will lock in the most significant structural change to the production landscape since the rise of the Organization of the Petroleum Exporting Countries (OPEC) in the 1970s.

The impact is far reaching, and in order to drive optionality in their businesses, industry players must be able to envision the future. Will international oil companies (IOCs) be able to drive new levels of simplification, lock in new lower capital expenditures (CAPEX) and operating expenses (OPEX) levels, and capitalize on emerging technologies? Will unconventional operators systemize their innovations into standard platforms to progress from their entrepreneurial days that unleased the shale phenomena? Will the services sector respond with speed, flexibility, a more collaborative style, and adopt new business models demanded by their customers?

Or will there be a new tide of emerging digital companies that will disrupt traditional incumbents, much like Silicon Valley startups have done in other asset-intensive industries, like healthcare, finance, automotive, and aerospace?

A new world is emerging. Who will come out on top?

BUSINESS CHALLENGES AND LEVERS

Each of the industry players faces unique business challenges and implications, be they IOCs, national oil companies (NOCs), or the predominantly US-based unconventional operators.

Market Segment	IOCs	Single-Basin Unconventional	Multi-Basin Unconventional	NOCs Gulf & Russia
Business challenge	Maintaining position as a premier dividend yield stock needs radical decline in breakeven cost per barrel to deliver sufficient free cash flow	Returns and debt servicing	Free cash flow and share-holder value	Increasing free cash flow to support national budgets set at $100 per barrel
Primary levers to address challenge	• Shift profitable recovery to above 35% • Need to reduce OPEX by 50% + • Need to reduce CAPEX by 30% + • Improve platform uptime from %s in the 80s to 90% +	Increase recovery from 10% to 35%	• Increase recovery from 10% to 35% • More wells on a single pad • Standardization & simpli-fication from pads to the supply chain	Push profitable recovery beyond 35%

The implications are significant. In our survey of more than 20 key organizations in the global oil and gas ecosystem, conducted jointly by the KIN and Clareo, five issues emerged across the industry:

1. **Market forces are fundamentally reshaping the industry.**
   a. IOCs are struggling to sustain their dividend policy.
   b. Unconventional production will keep prices in the $45 to $60 per barrel range for some time.
   c. Access to capital has shifted.
   d. NOCs are focused on maximizing free cash flow.
2. **Companies are simplifying, moving away from the traditional high-cost, complex system.**
   a. There is a drive towards standardization and simplification.
3. **The primary operating system of the industry ecosystem is under threat.**
   a. The business model is shifting to a mixed world of Silicon Valley-like companies and proprietary solutions developed by E&P companies.
   b. Value capture is shifting to intelligence.
   c. Unconventional producers are turning away from big service companies.
   d. Transparency of performance data weakens big brand equity.
4. **Players must speed up the "idea to adoption" process.**
   a. Companies are learning from the unconventional approach and their speed of innovation.
   b. Startups and Silicon Valley leaders provide solutions.
5. **Maximizing asset productivity is critical.**
   a. IOCs have a radical goal to increase platform uptime from the low 80s to mid to high 90s percentage.
   b. Drill in the right place.
   c. Push unconventional recovery from 10% to 35%.
   d. Reduce reservoir decline and lower CAPEX needed.
   e. Improve profitable recovery in conventional fields beyond 35%.

Market forces are fundamentally reshaping the industry.

IOCS ARE STRUGGLING TO SUSTAIN THEIR DIVIDEND POLICY

Since most IOCs are dividend yield stocks, those companies are committed to paying dividends at the same or similar levels as they have in the past five years. However, they are struggling to generate enough free cash flow to pay dividends and invest in growth at current price levels.

Here are the effects:

- The breakeven price per barrel needs to be reduced by 30% to 50%. For example, the deep sea breakeven price needs to move from about $80 per barrel to $40 - $50,

in order to provide necessary free cash flow to fulfill the dividend policies.

- The traditional squeezing of the supply chain isn't enough to achieve sustained free cash flow goals.
- Operators can't achieve necessary reductions if projects are unique and highly customized.
- Because of this, there's declining investor appetite for massive, long-term and complex projects; the speed of payback and investment certainty are becoming more crucial for investors.

UNCONVENTIONAL PRODUCTION WILL KEEP PRICES IN THE $45 TO $60 PER BARREL RANGE FOR SOME TIME

Unconventional oil and gas in the US is driving everything at the margin. Operators have speed, flexibility, and an innovative approach that will continue to drive rapid efficiencies that increase profitable production, hence keeping prices capped. This means that:

- High-cost producers will struggle to thrive or survive.
- There is an urgent industry-wide imperative to become profitable at $45-55 per barrel. While unconventionals act as a cap on oil prices (i.e., the accelerator), OPEC and the NOCs in the Middle East, particularly Saudi Arabia, control the other end (i.e., the brake). Both influence the industry's market dynamics.

ACCESS TO CAPITAL HAS SHIFTED

Investors are less enamored by large IOCs, making debt more difficult to access. Investors are also looking for proof that IOCs are applying technology to standardize and simplify to reach new cost levels and provide more certainty around capital budgets. Private equity firms and hedge funds are driving the growing investment in unconventional production. In this environment, companies that apply technology to create value and perform may be more attractive to investors.

NOCS ARE FOCUSED ON MAXIMIZING FREE CASH FLOW

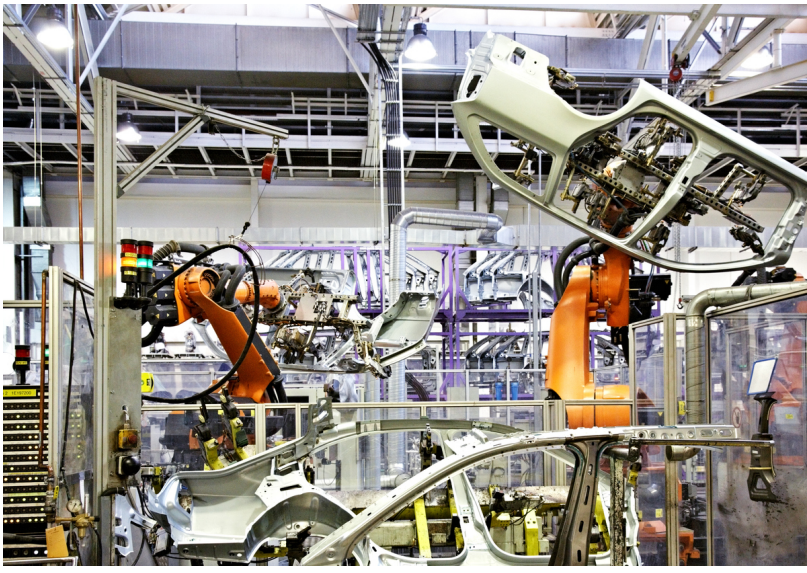
NOCs must meet the fiscal requirements of their countries to ensure governments can fund their promised budgets. NOCs with lower production costs will look to maximize production from existing fields to generate more cash, as they need to monetize their country's resource. They will look to partner with service companies for technology innovation, particularly equipment and hardware, although less likely in the digital/software space.

Relatively higher-cost NOCs are looking to partner with service companies to lower their CAPEX and OPEX costs. A lack of investment from traditional sources means they're also increasingly seeking capital from atypical sources, such as Chinese equity[2]. This impacts their government/sovereign debt and operating company structure, and often results in the emergence of innovative financial engineering. An example of this is Schlumberger's investments in Ecuador[3], amortized through a tariff per barrel while also effectively creating pull through for their products and services.

Companies are simplifying, moving away from the traditional high-cost, complex system.

THERE IS A DRIVE TOWARDS STANDARDIZATION AND SIMPLIFICATION

Operators are seeking to understand where and how to standardize and simplify their operations. The complexity in oil and gas operations carries an enormous cost, especially in the conventional space. One executive cited that large construction projects, often with more than 5,000 employees and contractors, have idle times that exceed 35 percent. As a result, the traditional business model of service and engineering, procurement, and construction management (EPCM) companies, which thrives on complexity, is under threat.



Could the oil industry learn to standardize from the automotive industry? Daimler has standardized 26 of its operating plants, with large factories being adjusted to have an average output of 300,000 cars with the same production methods. This has enabled Mercedes to make an average of four different cars per production line, but could accommodate more types of vehicle per line. This flexibility gives it a decisive competitive advantage.

The current business model, with multiple uncoordinated vendors and technologies with differing agendas, is out of step with market conditions. This environment opens the door for new entrants and new business models, particularly those with a more Silicon Valley approach – startups who can slice the market into small opportunity segments, attack them one at a time, and rapidly erode incumbent's shares.

With standardization, the threat of equipment and technology commoditization increases significantly, and new market entrants may gain share more easily. As one executive put it, "We don't need a super computer when an iPad will do the job; it's all about practicality and implementation now." Another executive from a major IOC stated that their goal is to reduce CAPEX and OPEX on a $10 billion platform by 50% through a combination of standardization, simplification, and proprietary IP developed in-house.

The primary operating system of the industry ecosystem is under threat.

THE BUSINESS MODEL IS SHIFTING TO A WORLD OF SILICON VALLEY-LIKE COMPANIES AND PROPRIETARY SOLUTIONS BY E&P COMPANIES

E&P companies increasingly want to own and develop areas they believe will provide them with competitive advantage. They are looking to non-traditional players as partners, pushing back against the industry status quo to "solve their own problem". They rely less on the service companies for these digital needs, and are investigating and working with Silicon Valley tech companies[4]. Smaller, nimbler service companies and technology companies will increasingly thrive in such an environment. The level of competition is likely to increase, similar to the computer and automotive industries.

One major IOC executive mentioned that their internal innovation focus is below the surface, where they would like to own the IP. Another is piloting digital technology with Palantir, a leading Silicon Valley data analytics company valued at $25 billion. A major unconventional operator has made innovation a key focus, with innovation managers appointed for each basin that it operates in, and increasingly working with basin-level service companies and engaging Silicon Valley companies on key technologies like data analytics and machine learning.

VALUE CAPTURE SHIFTS TO INTELLIGENCE

With the growth of the Internet of Things (IoT), sensors, and resulting data, E&P companies indicated a huge interest in applying AI and machine learning, but want to better understand where "intelligence" plays and can create value. This drives a shift to asset-lite business models and companies. One executive said that the real source of IP in the future is not going to be in equipment and data conveyance, which will be commoditized, but in the intelligence, for which they're willing to pay.

One implication of this is that equipment and service companies need to add intelligence into equipment and monitoring to make it valuable, e.g. to eliminate false positives in alarms and alerts. This further drives standardization and commoditization of equipment and hardware. Traditional business approaches and the lack of speed and agility of the equipment and service companies makes it less likely they will be the winners unless they can adapt, and do so quickly.

UNCONVENTIONAL PRODUCERS ARE TURNING AWAY FROM BIG SERVICE COMPANIES

Unconventional producers see regional service companies better aligned to their needs based on their business model, price, flexibility, knowledge, and speed. This trend is also accelerating in conventional oil and gas, and even IOCs are looking to learn from unconventional producers' innovation approach, which emphasizes lightning speed from idea to adoption. In many basins, this has driven staggering efficiency improvements and cost reductions.

The perception is that traditional service companies live and thrive in a "big field" world and they don't seem fast enough to respond to what is happening locally. An executive stated that their share in unconventional spending has gone from 45% to 25%, and may continue to decline. E&P companies are also looking to raise their internal competencies to reduce reliance on contractors and service companies. This "big field" dominance is now under threat, especially in the digital space.

TRANSPARENCY OF PERFORMANCE DATA WEAKENS BIG BRAND EQUITY

Several executives stated that equipment and service company quality perception is no longer driven by label or brand alone, but rather by the delivery of real performance metrics. This opens the door to smaller companies that can provide acceptable performance metrics. Such transparency is also key to adoption of new business models, such as co-ops, at the basin level.

Players must speed up the "idea to adoption" process.

COMPANIES ARE LEARNING FROM THE UNCONVENTIONAL APPROACH AND THEIR SPEED OF INNOVATION

Large IOCs increasingly view their unconventional operations as innovation labs, and seek to apply these learnings to the conventional context. They believe that their speed of adoption from the idea phase will create a competitive advantage. The speed of technology adaptation and adoption is critical, and many executives shared that they are looking for partners who can demonstrate this effectively. However, many conventional E&P companies and large service companies will likely struggle to adopt this new approach to innovation.

STARTUPS AND SILICON VALLEY LEADERS PROVIDE SOLUTIONS

The rise of asset-lite business models and new technology development means that the traditional barriers of entry, capital and asset intensity, are no longer relevant. This is evidenced by Silicon Valley players, such as Palantir[4], entering the oil and gas market, and the disruption of capital intensive industries by companies like SpaceX in aerospace.

There is also a significant influx of venture capital into the industry, as the landscape is conducive to simpler solutions that can solve complex and urgent problems. An executive remarked that IoT and cloud technologies are creating data transparency that is tearing down barriers for new suppliers. Traditional service companies may lose their points of value capture if they are unable to upgrade their knowledge and expertise to compete with new entrants. Another trend is the rise of corporate venture capital (CVC) funds in the upstream sector, which are addressing a broad range of technologies ranging from specific upstream technology to renewable and alternative energy.

One CVC focused on O&G stated they saw 500 start up plans in 2016, 70% of which were based around digital technologies. They expect to see more of these plans in 2017, with an even greater percentage being digital.

Intense pressure to both reduce costs and improve reliability and safety is pushing drillers and equipment makers to change. Contracts signed over the past the past year by Diamond Offshore Drilling and Transocean, covering a total of 20 offshore drilling units, give technology and service providers more responsibility, and some risk, for maintaining well control equipment. The goal is to ultimately reduce downtime and maintenance costs, and help equipment makers engineer better equipment. TRANSOCEAN

Maximizing asset productivity is critical.

IOCS HAVE A RADICAL GOAL TO INCREASE PLATFORM UPTIME FROM THE LOW 80S TO HIGH 90S PERCENTAGE

This is a huge area of value creation for many IOCs, as an executive mentioned that every 1% increase in platform uptime (production) can positively impact the bottom line by $300M+. Many offshore platforms were developed in the mid-1980s, and cannot reach availability levels in the 90s. Many factors conspire to deliver these low levels of availability, even on more recent platforms – lack of standardization, ingrained complexity, uncoordinated platform systems largely written in the 80s and 90s, etc. IOCs have a massive focus on this area, and some players are already making gains by applying technologies for predictive maintenance and machine learning.

DRILL IN THE RIGHT PLACE

Operations with drilling inefficiencies, such as dry holes, do not attract capital investment. Companies are focused on precision and digital modeling as potential solutions. NOCs will be interested in such solutions, and look to partner with outside companies due to technological complexity.

Robotic drilling systems[5] are an example of innovation in this area, and some IOCs are looking to implement drilling sequence optimization for increased automation. A major IOC is piloting with digital drill plans that are optimized and then sent to a drill robot. They key for operators is the ability to take pragmatic steps in this innovation path, and not just pilot grand visions like the earlier 'Digital Oil Field of the Future.'

IMPROVE UNCONVENTIONAL RECOVERY FROM 10% TO 35%

Recovery rates in unconventional oil and gas are very low, averaging less than 10% for tight oil, and less than 25% for shale gas[6]. A huge challenge for increased subsurface recovery is the lack of understanding of an unconventional reservoir, with limited ability to model and simulate it.

There is limited, if any, technology crossover from conventional to unconventional. However, improving the recovery rates has the potential to unleash a big supply of lower cost oil and gas that may further dampen interest in big projects and hurt higher-cost producers.

REDUCE RESERVOIR DECLINE AND LOWER CAPEX NEEDED

The IEA estimated that for fields which have passed their peak, observed output declined on average by 6.2% in 2013[7]. This is indicative of a trend caused by the growth of smaller fields, which tend to decline faster than larger fields. An IOC executive said that majors spend 50% of their CAPEX just to keep reservoir depletion at about 5%. This is a huge waste of financial resources and presents an opportunity to keep the reservoir from depleting faster. Another E&P company shared that digital innovation has allowed them to address decline in recovery and move from 5% to 3%.

Reducing reservoir declines would increase the life of each asset, and possibly require fewer new projects. Technology automation, analytics, and optimization are key to achieving this. One IOC cited success from standardizing on four to five well designs and daisy chain well solutions with simple templates and a fast-track concept.

IMPROVE PROFITABLE RECOVERY IN CONVENTIONAL FIELDS BEYOND 35%

The situation is particular urgent for NOCs, as many countries, such as Malaysia and Australia, are demanding recovery rates in excess of 35%. NOCs are unable to address this effectively. Malaysia's government requires every field to produce at least 50%, but production costs are much more expensive when recovery rates go beyond 35%, according to one executive. Thus, NOCs have the most to gain from breaking the profitable recovery barrier.

Improving profitable recovery could also result in reduced need for new project development. IOCs are increasing their attention to EOR on their existing fields to avoid investing in new mega projects. One major IOC is licensing its proprietary EOR technologies to several NOCs in the Middle East.

Looking Ahead

It is clear that the upstream oil and gas industry landscape will face continued volatility, pressure, and uncertainty. The changing dynamics between IOCs, unconventional companies, NOCs, and technology and service companies will create both challenges and opportunities. Innovation and digital technologies will be key to addressing these challenges. However, it is far from certain who the winners will be. Will it be the IOC companies that grow their internal innovation capabilities, or will the unconventional companies win? Will Silicon Valley tech companies upend another asset-intensive industry and capture value from incumbent technology and service providers? Will the conventional E&P companies successfully implement unconventional approaches, and who will they look to partner with for this journey? While there are no clear answers for many of these questions as of yet, our goal is to provide a deeper look into the business imperatives and key innovation levers that will determine the ultimate winners.

The challenge ahead is to adjust to the new reality, create new points of value capture enabled by digital solutions, develop new business models, and operate with the speed and agility that is inherent in the Silicon Valley model and being demonstrated by the unconventional companies.

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Founded in 2003, the KIN is a global platform for collaboration between Kellogg School of Management faculty, corporate innovation leaders, non-profit organizations, and the government. KIN's mission is to facilitate dialogues that promote innovation-led growth and build long-term prosperity for industries and society worldwide. Through events like KIN Global, KIN Dialogues, and KIN Catalyst, KIN is building a network of thought leaders who have the collective ability to advance the global prosperity agenda. Keynote speakers from past events include management theorists Gary Hamel and Phil Kotler, former U.S. Secretary of Defense Bill Perry, former Supreme Commander of NATO Admiral James Stavridis, former Kraft Co-CEO Betsy Holden (also a KIN board member), Republic of Colombia President Juan Manuel Santos, and Abbott Labs CEO Miles White.

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