



# INSIDE ENERGY'S TECHNOLOGICAL REVOLUTION

TAKING STOCK OF A RAPIDLY EVOLVING  
CRUDE OIL MARKET

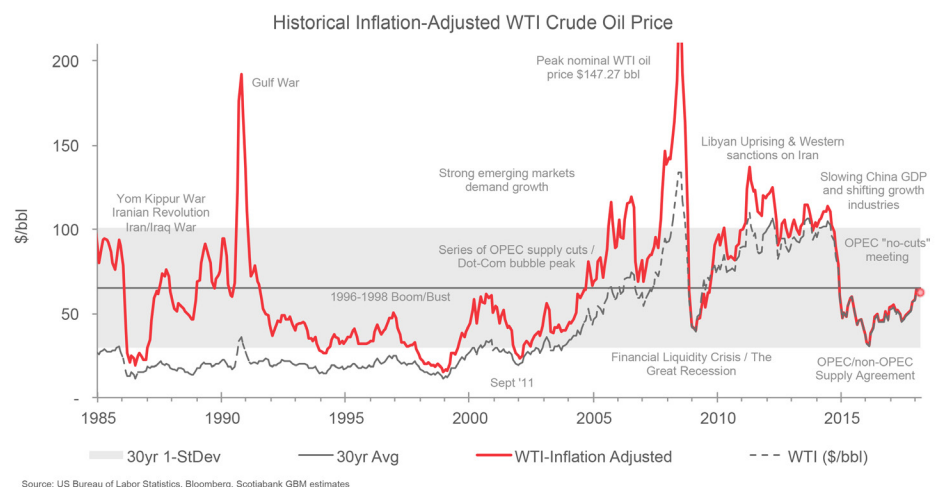
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# INSIDE ENERGY'S TECHNOLOGICAL REVOLUTION

## TAKING STOCK OF A RAPIDLY EVOLVING CRUDE OIL MARKET

Energy markets are currently undergoing a rapid transition. The consumption patterns of oil, natural gas and other forms of energy is changing with the emergence of new technologies and consumer behaviour patterns. In this time of flux, what is forecast today may not always hold tomorrow. History has served up these tectonic shifts before, and it's no surprise that the energy sector is undergoing a technological revolution – one that is reshaping the way that energy is produced and ultimately consumed.

During the Industrial Revolution, mass mechanization of the manufacturing process dramatically enhanced productivity and provided the impetus for economic growth and catalyst for accelerated societal change. Today, widespread advances in technology are again driving substantial change. The technological revolution currently underway is innovative, transformative, disruptive – and eminently pervasive.



Unsurprisingly, the ubiquity of ground-breaking technology (figuratively and literally) also stands at the forefront of the energy sector. Modern technology poses both threats and opportunities for energy markets, particularly the oil value chain.

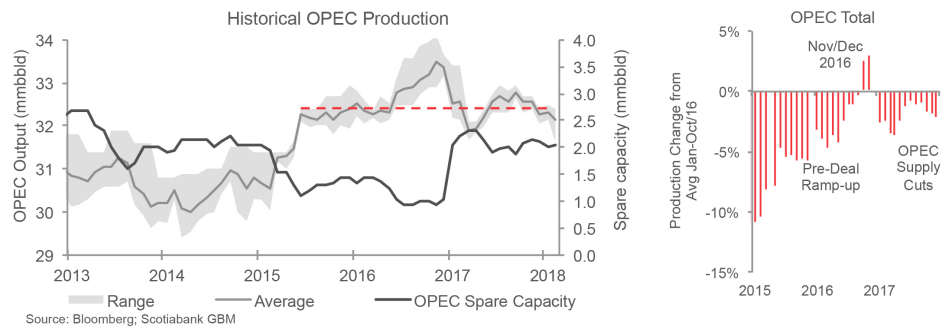
Despite recent volatility in the energy complex, many industry experts maintain a positive long-term view. Global demand is robust and projected to continue growing for the next two decades. If demand doesn't peak until at least the mid-2030s, it portends a buoyant oil market between now and then. Considering the scale and scope of economic expansion in emerging markets like China, India and many areas in Africa, growth in those regions over the next 20 years could be momentous, boding well for oil.

## CHALLENGES TO OIL ON THE HORIZON

This positive outlook for oil must be tempered to account for potentially changing dynamics in the market that might not seem apparent today. After all, who could have predicted a decade ago that electric vehicles (EVs) would quickly become a mainstream transportation option? Today, there is a concentrated – but expanding – array of EVs available and major automobile manufacturers are committed to the electric and hybrid markets.

Having EVs infiltrate the automobile marketplace signifies a seismic shift in demand dynamics as crude oil historically commanded the lion's share of the transportation market. However, that's just one factor affecting oil prices.

With the spectre of market saturation at hand, the Organization of the Petroleum Exporting Countries (OPEC), as well as other oil-producing countries, have banded together to cap supply and create a greater supply/ demand imbalance.

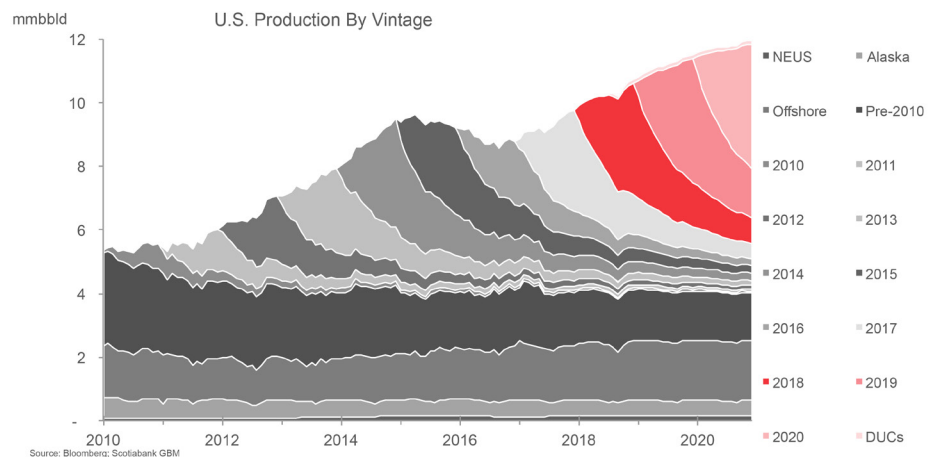


OPEC's motivation for capping supply was to support oil prices modestly higher in the near term, but also to prevent prices from spiking through the triple digits in the future. If oil topped US\$100 per barrel, the appeal of substitute-demand sources like EVs would increase, jeopardizing the longer-term economic viability of major oil-exporting countries. While EVs might represent the future, internal combustion engine (ICE) vehicles are currently cheaper and more accessible for emerging markets consumers. If a shift arrives in terms of price competitiveness between ICE vehicles and EVs, it might not take place until the mid- to end of the 2020s. Therefore, demand for crude oil is not disappearing anytime soon.

BETTER  
TECHNOLOGY  
FUELS BETTER  
PRODUCTION

The question remains: should energy companies drill to recover existing but steadily declining oil production or replace with other forms of energy? To maintain production levels – or to at least replace production lost from normal decline rates – energy companies must persistently drill, find new resources and develop them. This means that oil prices must be high enough to justify investment in replacing declining daily production.

On the other hand, with the advent of technologies like EVs that may rely upon electricity generated from power plants, oil is no longer alone in the transportation space. Today, entrants from natural gas, nuclear, solar, wind, and other alternative energy sources are vying to uncover economically feasible ways to extract energy from the ground, sun or wind for transportation and other use.



With EVs, fuel can come from almost any source. This creates competition in a market that oil had previously cornered, thereby disrupting a value chain that had been built up over decades. But barriers to entry remain. To build the same value chain from wind, for example – from the wind turbine, through the power grid to homes and then into cars – requires time and significant capital expenditure (capex).

Increased competition is catalyzing technological advancement in the oil industry. To compete globally, energy companies must develop more effective, profitable ways of extracting oil by exploiting economies of scale. This is why large-capitalization exploration and production (E&P) firms, also known as the “supermajors,” are gaining prevalence. Drilling one well at a time is a competitive disadvantage. Technological advances have been the catalyst for innovations in “pad drilling,” where multiple wells are drilled from one location to facilitate extraction with less working capital and higher efficiency. Moving from single-well drilling to pad drilling to “cube drilling” (where an underground 3D-cube approach allows for simultaneous drilling and fracking) increases the efficiency of large-cap E&Ps and helps supermajors compete across the entire energy complex.

Predicting the next impactful trend is difficult. Cube drilling is a relatively nascent technology that could be a game changer. The trend that follows could easily be infrastructure-related or facilitated by broader access to financial markets. North American supermajors are succeeding because they can employ new technology, partly owing to their ability to access capital markets and finance these initiatives.

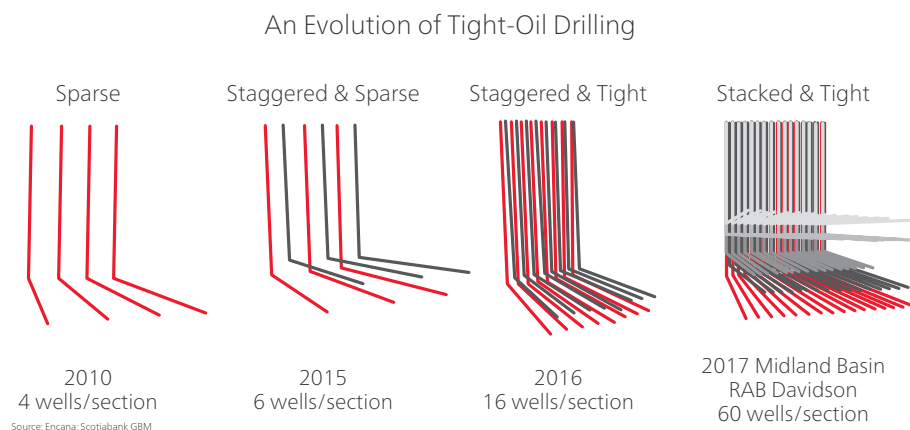
## THE RISE OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Other sophisticated technologies are surfacing as well. Using artificial intelligence (AI) to identify sweet spots in basins is rarely discussed because those technologies are highly proprietary to the companies employing them. However, they’re garnering attention from E&Ps. And for good reason. AI might offer an edge over more antiquated methods. Also, intelligent robots with AI capability can help bolster the productivity

and cost-efficiency of exploration and production, while mitigating safety risks for human workers.

Machine learning – a subset of AI – creates and uses complex algorithms to generate data predictions, and can be employed in different ways to execute the AI function. For instance, in the exploration phase where drilling may be cost-prohibitive without guarantee of success, machine learning can interpret sets of technical information about the drilling site, undertake “virtual tests” to determine the site’s viability and then recommend suitable drilling techniques for this site without needing to deploy physical equipment and crews.

Up to the early 2000s, most U.S. companies drilling single, vertical wells couldn’t compete with oil-rich regions like the Middle East as evident from declining production volumes at the time. Then, about 10 years ago, U.S. companies started drilling at an angle. They could steer the drill bit in different directions to tap into sweet spots where they believed oil reserves would be. With newer technology available, oil companies started drilling down – and then horizontally out – into these long, horizontal planes, hyper-pressurizing the basin and essentially creating a 2D fracking area. This 2D approach may augment initial production and ultimately increase the recovery of resources within the basin.



NOW TRENDING:  
DIGITIZATION  
AND THE INTERNET  
OF THINGS

Digital oil is a trend that involves digitizing the entire effort of drilling, extraction and processing, from crude inventories to trucks, sand and more. The digitization of oil allows for tracking of the entire value chain and mining a comprehensive database that informs how operations are faring in real time. Digitization enables the Internet of Things for the energy space.

The Internet of Things lets companies track drilling equipment, trucks and other service equipment related to productivity and operations at the wellhead. Real-time tracking of inputs, such as the type of crude being produced, rigs used, human resources involved, inventories on hand, etc., ultimately allows companies to better allocate resources. As a result, companies can be more accurate and judicious with real-time deployment of capex and resources. In turn, this helps to decrease working capital, shorten the drilling window and provide healthier returns for the companies' stakeholders and shareholders.

Technology is vital to energy companies at this juncture. That's why significant technology investments by the supermajors and their partners will continue. If North American companies embrace a mix of technologies that help them to level the playing field with OPEC – by leveraging emerging technologies such as horizontal fracking, cubic drilling, machine learning/AI aided operations, and others – this increases the chances that they will continue prospering. It's all about sustaining viability and relevance in an evolving world. Technological improvements can help achieve greater efficiency, productivity, and profitability in the energy sector, both now and into the future.

For more expert insights on how technology is revolutionizing the energy sector and opening the door to new investment opportunities, please contact:

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