The Implications *of* Oil's Surprising Collapse

The new threats are global warming, fracking, and electric vehicles.

By Philip K. Verleger, Jr.

IBM celebrated its centennial in 2011 by noting, "Nearly all the companies our grandparents admired have disappeared. Of the top twenty-five industrial corporations in the United States in 1900, only two remained on that list at the start of the 1960s. And of the top twenty-five companies on the Fortune 500 in 1961, only six remain there today."

And further: "The demise of most came about because they were unable simultaneously to manage their businesses of the day and to build their businesses of tomorrow." With respect to its own business, IBM warned, "The technology field is cruel to those who fail to make the leap from era to era, but tech firms are hardly alone. The hand of commoditization spares few."

The world's oil industry was exempted from the forces of commoditization for decades. Seven oil companies were among the top twenty-five firms on the Fortune 500 in 1970. Half of the top twenty-five companies in 1980 were oil companies. But in the 2019 list, just Exxon Mobil, Chevron, Phillips 66, and Valero were present in the top twenty-five. Only Exxon Mobil made the top ten.

Even Exxon Mobil is being buffeted by the "brutal forces of commoditization." The firm had been one of the largest on the S&P 500 until August 2019. At the end of that month, Bloomberg reported that "Exxon Mobil Corp. is poised to drop out of the S&P 500 Index's ten biggest companies for the first time since the index's inception some ninety years ago."

The oil industry's rapid fall from its commanding position atop the world's financial markets can be attributed to three developments: global warming, fracking, and electric vehicles. Increased public concern

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regarding the effects of global warming led to pressures on fossil fuel producers, pressures the industry ignored until it was too late. Fracking brought the forces of "relentless commoditization" as described by IBM to the oil sector, dooming companies to no-profit futures. Finally, the introduction of electric vehicles created an opportunity for consumers to free themselves from the gasoline station, an institution described by marketing guru Theodore Levitt as a "tax collector."

The loss of investor support matters to those in the oil industry. It should also worry policymakers, those in other sectors, politicians, and the public because investor disdain for oil could cause significant oil price increases over the next few years. Such increases will occur if oil supply falls faster than consumer demand. Those in the industry would solve the problem through increased investment in drilling—thus boosting emissions of the harmful gases that cause global warming. A majority of the world's citizenry would no doubt prefer that measures to replace oil with conservation or renewables be accelerated, effectively speeding the industry's demise.

Locating and extracting oil and gas resources has become a declining-cost business, a development that has turned one hundred years of industry history on its head.

CIRCUMSTANCES CHANGE

The momentum to slow and then reverse anthropogenic global warming began slowly forty years ago but has gained momentum, especially following the 2015 United Nations' climate change conference in Paris. Governments across the world have stepped up their efforts to restrict hydrocarbon use, including petroleum. Volkswagen's emission-cheating scandal accelerated the introduction of measures to block vehicles with internal combustion engines from some areas. Such attempts to slow warming have received support from an increasingly large group of investors. Today, the managers of more than $7 trillion in assets have divested or threatened to divest shares in the oil industry. In March, for example, Norway's trillion-dollar sovereign wealth fund decided to sell its shares in firms searching for oil. Consequently,

Two Tesla Semi prototypes in 2018. Their specifications claim a 300-mile range for the base model, and acceleration of zero to sixty miles per hour in twenty seconds, fully loaded. The base price is $150,000. Production of "limited volumes" is expected to begin in 2020. According to Equipment World, *"electric trucks will require less maintenance since they feature fewer moving parts and require less fluid changes."*

the oil sector has seen its portion of the global equity market shrink.

The success of smaller firms using fracking technologies has also contributed to the decline in investor interest. The rapid increase in global oil supplies combined with the United States' emergence as a significant crude oil exporter has kept oil prices from rising significantly. The absence of price rises has depressed the returns and share prices of oil exploration companies. The lack of sector profitability has further discouraged investors.

Possibly the most important cause of the oil industry's loss of attractiveness, though, is the emergence of electric vehicles as replacements for internal combustion vehicles.

At its centennial, IBM discussed its decision to abandon the personal computer. The PC had become a commodity, one that was rapidly being replaced by cellphones and tablets with far greater computing capacity. Technology changed quickly.

Fracking is the oil industry's equivalent of the PC. Oil exploration and development had become more and more costly over time until September 2008, when fracking emerged as a viable drilling practice. Before then, the increasing costs led to the merger wave that created the multinational supermajors.

The supermajors were formed at the end of the twentieth century. They grew out of the remains of the once-mighty international integrated oil companies such as Texaco, Mobil, Standard of Indiana, British Petroleum, Arco, and Gulf Oil, companies that had been decimated by the financial industry's entry into their business, the commoditization of oil, and the collapse of oil prices in the late 1990s.

Six supermajors—BP, Exxon Mobil, Chevron, ENI, Royal Dutch Shell, and Total—came into being through mergers to address a problem that was expected to dominate the twenty-first century: scarcity, particularly the scarcity of oil. Experts, including this author, asserted that the new behemoths were needed to develop the additional global reserves of oil and gas required to fuel a global economy that would increasingly be propelled by rapid growth in Asia, especially China. The size was essential because geologists warned that most of the world's remaining oil and gas reserves would likely be found in the most inhospitable parts of the world. Only firms that could mobilize billions for investment in risky projects, some of which would not pan out, could survive in this daunting world.

Fracking broke the model.

Half of the top twenty-five companies in 1980 were oil companies. But in the 2019 list, just Exxon Mobil, Chevron, Phillips 66, and Valero were present in the top twenty-five.

Then came fracking, the circumstance that changed. Fracking's relatively inexpensive techniques opened up vast known but previously unreachable resources to development. They also produced large oil volumes over a short time at a cost well below the price level desired by the major oil-exporting countries.

Locating and extracting oil and gas resources has become a declining-cost business, a development that has turned one hundred years of industry history on its head. Energy economists have always correctly asserted that oil and gas finding costs increase over time. They based this assertion on the fact that the size of discoveries tended to decrease while expenses went up as exploration moved steadily into more challenging areas.

Shale is different. Costs seem to decline with every well, even as well sites become more technically problematic. An "experience" or "learning" curve may apply today to the development and production of shale oil. The concept is well-known and straightforward: economists have observed that, in many activities, unit costs decline as the number of units produced increases.

Rystad Energy, a Norwegian consulting firm, tracks the costs of developing various types of oil fields. It also estimates how many years are required to recover the cost of developing projects. In a recent report, the firm noted that there were around 300 billion barrels of oil that could be produced by fracking for less than $55 per barrel. Furthermore, the costs could be fully recovered in two years with a price of $70 per barrel and in four years with a price of $50.

In contrast, for the giant deepwater projects, full cost recovery would take eight years at an average price of $70 per barrel and twelve years if prices averaged $50.

The Central Bank of Oil

The attacks on Saudi Arabian oil facilities on September 14 should have sent oil prices up sharply. Market disruptions of that magnitude have always raised prices. Based on studies of past episodes, in this instance a price increase of more than 100 percent should have occurred.

But oil prices did not increase. A month later, they were 2 percent lower than before the attack. Markets remained stable for a very simple reason: Saudi Arabia acted quickly to address a potential supply interruption.

The world escaped economic disaster because King Salman had replaced Khalid al-Falih as the country's oil minister with his son, Prince Abdulaziz bin Salman, six days before the attack.

For two decades before the prince's appointment, engineers had set oil policy in Saudi Arabia. The oil minister from 1996 to 2016, Ali al-Naimi, trained as an engineer at Lehigh University and Stanford. He then worked his way up through Aramco, becoming chief executive officer before he became oil minister.

Naimi's replacement, Khalid al-Falih, also trained as an engineer, earning degrees from Texas A&M and King Fahd University of Petroleum and Minerals. He, too, rose through the ranks of Saudi Aramco.

The engineering backgrounds of Naimi and al-Falih seem not to have prepared either for dealing with commodity market volatility.

Saudi Arabia's actions after the September 2019 attacks were critical to preventing oil prices from increasing. Prince Abdulaziz announced that production was being restored and vowed that Saudi Aramco would honor its commitments to customers that month by drawing from reserves.

Today the market has only one backstop—Saudi Arabia.

A *Wall Street Journal* report two days later indicated that Saudi Arabia was buying crude oil from other producers to meet its needs.

These and other actions were precisely what the market needed. Over those weeks, a central bank of oil emerged.

The willingness to supply liquidity is what immediately distinguishes central banks from other institutions. These banks do not assure markets that "supplies are adequate." Bankers meet customer demands. Such actions stop panic and thus remove or avoid any risk premium in the market.

Prince Abdulaziz bin Salman *was named Saudi Arabia's energy minister by King Salman one week before the September 2019 attacks on the country's oil facilities. The prince holds the work of former Federal Reserve Chairman Alan Greenspan in high esteem in large part thanks to the latter's adept management of the U.S. economy from 1987 to 2006. During that period, Greenspan had become famous for the "Greenspan Put"—the belief that he would never let the market fall sharply. It remains to be seen whether the world will see a "Prince Abdulaziz Put."*

The United States could play the role if it were willing to offer supplies at the first sign of panic. European governments that own inventories could also do this. However, despite many opportunities, these governments have never acted substantially. In past disruptions, oil prices and risk premiums always rose.

The United States, Japan, Germany, France, and China all have developed strategic crude oil reserves. Besides their unwillingness to use these stocks, consuming nations also cannot deliver the oil held in them quickly or in some cases at all.

In Europe, private companies hold a significant portion of strategic stocks. However, these companies understand that any oil released will need to be replaced later with oil that will likely be more expensive. Oil shipments from the United States' reserves can take as long as two months.

Thus, today the market has only one backstop—Saudi Arabia—and whether it continues to take that role depends essentially on the new oil minister. For now, however, the country's action staved off a large oil price increase and may have prevented a recession.

Saudi Arabia acting as a true central banker of oil, should it keep doing so, may return OPEC, or the core of OPEC, to its position as the dominant player in the world market.

—P. Verleger

The attractiveness of oil to investors was the promise of increased profits tied to the expected rise in prices. Established firms enjoyed an advantage from the low costs associated with their existing reserves. Price hikes were anticipated as new, more expensive fields were developed to supply needed incremental supplies. But fracking broke the model and eliminated the prospect of rising profits.

RISE OF ELECTRIC VEHICLES

The widespread introduction of electric vehicles further reduces the oil industry's attractiveness for several reasons. Driving electric vehicles frees consumers from having to pay the tax, described by Levitt, to the oil industry for the use of their cars and trucks. Second, producing electric vehicles offers the auto industry a way to cut ties to an industry most automobile executives hate: oil. Third, government officials in many countries and U.S. states are willing to offer incentives for using low or zero-emission vehicles to reduce global pollution. Drivers who own electric vehicles benefit, for example, from tax breaks and speedier travel on restricted lanes.

Oil is particularly disadvantaged when electric vehicle owners can reach their destinations faster than internal combustion vehicle owners. Norway and California have made this possible. In Norway, electric vehicles have access to bus lanes in some cities. Furthermore, municipal parking charges are zero, and fees on ferries are less than half those for internal combustion vehicles. Road taxes have been waived, as has the VAT on electric vehicle purchases. As a result, Norway has more electric vehicles than any other country. Indeed, 56 percent of new car sales there were electric vehicles during the first half of 2019.

Dependence on OPEC will likely be even higher absent an accelerated transition away from petroleum use.

California has followed a similar policy. The state offers tax benefits to electric vehicle owners and requires auto manufacturers to sell a specified number of low and zero-emission vehicles. Regulations also allow electric vehicle owners to drive alone in fast carpool lanes. These measures seem to be working. The miles traveled in California continue to rise as fuel sales drop quickly.

The auto industry has had good reason to break with the oil industry for at least two decades. Those in oil like high oil prices; those in autos do not. The auto executives' aversion to higher prices is understandable. As James Hamilton of Brookings Institution showed in a 2009 analysis, the five U.S. recessions since 1973 caused in part by higher oil prices were exacerbated by the impact of those prices on the auto sector.

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With this background, it seems that the auto industry would welcome the opportunity to design, build, and sell vehicles that did not depend on petroleum. Manufacturers selling to 60 percent to 70 percent of the world market have grabbed this chance to desert oil. The transition has been accelerated by Volkswagen's ill-considered ploy to foil auto emissions tests. Even without this added push, though, the automakers' ostracism of oil was probably foreordained. We can expect these firms to hasten their separation from the hated oil industry once a reasonable, reliable battery alternative to internal combustion engines becomes available.

While many observers remain unconvinced of the coming age of electric vehicles, government regulations in Europe, almost certainly China, and states in the United States following California's lead look to force internal combustion-powered vehicles, gasoline and diesel, out of circulation. Privately, many in the auto industry may welcome this compulsory divorce from the oil industry.

The impact of this shift on the global oil market could be significant. The IEA's *World Energy Outlook* envisions a scenario in which more than half the vehicles on the road in 2040 are electric vehicles. This development would drop world oil use for road transportation eighteen million barrels per day below 2019 consumption levels. The IEA also apparently noted that oil prices would remain at present levels with rapid electric vehicle penetration but double if the penetration trend continues at current rates.

LIMITED INVESTMENT BY A SHUNNED INDUSTRY

Industry executives have noted the investor aversion to oil shares and warned of the consequences. Investor disdain has forced multinational companies to fund their ambitious capital expansion plans from cash flow, debt, or sales of operating assets. In the past decade, the companies chose to issue debt while trying to maintain the dividends demanded by investors. That pathway is now closed. More recently, the firms have focused on asset sales. Even so, they need to reinvest cash flow from harvesting existing assets to continue pushing ambitious exploration programs.

The industry, though, needs to invest today. BP's chief economist Spencer Dale observed in January 2019 that global supply from existing fields would decline at a rate of 3 percent per year without further investment. His point was echoed by Ben van Beurden, Shell's CEO, who stated, "For decades and decades to come, the industry will have to invest in [oil and gas] in order to basically supply demand."

Investors, though, have resisted all invitations despite the high dividend rates offered by the companies. The trend in the market capitalization of seven of the oil companies is essentially flat. Little new money has come into the industry. At the same time, large institutions have been moving out. To keep investors, companies must, in the absence of price increases, cut investment and boost dividends.

In November, one of the largest U.S. independent oil companies, ConocoPhillips, acknowledged reality, announcing a strategy designed to appease investors. Unlike other firms, shareholders were favored over drilling. The firm promised to allocate almost half of its free cash flow over the next decade to share buybacks and dividends. The change in strategy acknowledges that the oil industry has become a maturing and now shrinking industry.

IMPLICATIONS

The economic consequence of underinvestment will be gradual but important. Available oil supplies will not increase at the rate required to meet projected demand levels unless prices are high enough for firms to fund necessary investments and meet shareholder dividend and share buyback demand from existing cash flows. These higher prices will especially be needed if additional supplies from "short-cycle" fracking projects in the United States do not materialize.

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The precarious position is captured by data from the IEA's medium-term forecast issued in March 2019. The IEA sees global consumption increasing 7.2 million barrels per day from 2018 to 2024, which will be met by a 6.2 million barrels per day increase in non-OPEC output, most of which comes from the United States. Rising U.S. output accounts for 70 percent of the global supply increase in the IEA forecast.

The financial condition of the private energy sector puts this projection in doubt. Investors have cut the cash flowing to the independent oil companies that drove the boom in U.S. output. Recent data indicate that U.S. production is falling behind the IEA's forecast for 2019. The agency expects an increase of 1.4 million barrels per day from 2018 to 2019 and a further rise of 2.7 million barrels per day from 2019 to 2024. On present trends, it appears that the 2019 increase will be less.

The lower increase in U.S. output will require a compensating boost on the part of oil-exporting nations.

Oil-exporting countries will be willing to supply some of the incremental oil but probably at prices as much as 50 percent higher than today. For Saudi Arabia, the higher prices would help fund the ambitious development program being pursued by Saudi crown prince Mohammed bin Salman.

The higher prices would also increase the burden on consumers. But unlike in previous price cycles, they are unlikely to spur a significant drilling boom, although many focused on the oil industry think otherwise. The view here is that the adverse reaction from investors—who, unlike oil company executives, are concerned about global warming—would prevent higher prices from stimulating drilling increases of the magnitude seen before.

Looking past 2024, the last year of the IEA forecast, one can suggest that dependence on OPEC will likely be even higher absent an accelerated transition away from petroleum use, particularly in transportation. This prospect highlights the necessity for moving more rapidly to replace oil in the global energy system, preferably with renewables. Economic growth in key oil-consuming nations will probably otherwise be restrained while oil-exporting nations enjoy yet another (and probably the last) surge in income from their resources.

The key factor regarding oil's future will be the electrification of the transportation system. Rapid replacement of internal combustion vehicles will hasten the transition. The good news is that Chinese, European, and Japanese manufacturers are already moving in this direction. ◆