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# ARE OIL COMPANIES READY FOR THE NEXT ENERGY TRANSITION IN THE US?

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**F**OR OIL COMPANY EXECUTIVES in the US, the future may be closer than it appears. Low oil and gas prices and the Trump administration's decision to leave the Paris climate accord might lead some to believe that the fossil fuel industry is immune from disruption. But we believe fundamental forces in mobility and power generation could pressure traditional oil and gas companies to transform the way they do business in the US.

Over the next two decades, changes to the US energy landscape could cause a steep decline in domestic gasoline demand while increasing the share of natural gas in the energy mix. In the absence of supportive federal regulations, these changes will mainly be driven by state-level clean-energy initiatives, global energy efficiency trends, and technological developments. Judging from the experience of other industries, the transitions—when they come—will happen faster than established players expect.

Regardless of individual views about the

causes of climate change, the business risk of not being prepared for disruption is too high to ignore. Executives need to take a holistic approach to their planning. They need to understand the potential effects of future market developments and identify which parts of their company's portfolio are at risk and over what time horizon so they can embrace opportunities and manage uncertainties.

## How the Future for Automobiles Will Affect US Refiners

US consumers' love affair with the automobile has been good for the country's refineries; gasoline accounts for 60% of their output, and exports are increasing. Americans have shown a remarkably resilient appetite for gasoline-powered cars, especially sport utility vehicles and pickups. However, we believe that gasoline demand in the US could dip by as much as 35% by 2035 if electric-vehicle penetration grows and internal combustion engines become increasingly fuel efficient.

**Conventional vehicles are becoming more efficient.** Despite the administration's review of the Corporate Average Fuel Economy (CAFE) standards—the US's progressively tougher rules on automobile fuel economy—advances in engine technology, driven by demand from international markets, will make conventional automobiles increasingly efficient over the coming years.

Faced with slow domestic growth, US car makers are targeting overseas markets, such as China, that promise strong growth but have more stringent vehicle fuel economy requirements. Between now and 2030, annual Chinese new-car sales are projected to be between 25 million and 35 million vehicles; by comparison, sales of new cars in the US will be around 16 million to 17 million vehicles per year.

Some argue that car makers will sell energy-efficient vehicles only in these overseas markets, while continuing to manufacture less efficient cars for US buyers. However, the scale benefits of making vehicles on a single rather than on multiple platforms will likely mean that car companies will manufacture the same vehicles for all markets.

**Electric vehicles could go mainstream.** EV ownership could rise dramatically over the next decade, eroding demand for conventional vehicles. Countries such as France and the UK will stop selling new gasoline and diesel vehicles in 2040. China is also considering a ban. Even if the US doesn't follow suit, global EV demand is likely to increase, driving costs down further and supporting US adoption.

Lithium-ion batteries, which represent a third of EV costs, have already plummeted in price in just a few years. Improved battery density will enable EVs to travel greater distances before recharging. Charging times (currently more than an hour for a full 300-mile charge on a Tesla Model S at a supercharger station) and the availability of recharging stations will also improve as manufacturers continue to invest. Spending on recharging infrastructure rose to \$6 billion in 2016.

Electric vehicles may remain an urban phenomenon until their range increases and recharging stations proliferate. But US urbanites still represent a highly addressable market, accounting for 81% of the total population and 67% of miles traveled by US drivers.

**Ride sharing and self-driving technology will accelerate EV adoption.** Digital technologies and changing attitudes to car ownership are likely to accelerate EV penetration. For US millennials (people born between the early 1980s and the early 2000s), owning a car is not the aspirational milestone it was for their parents. This generation is a key target audience for the ride-sharing platforms developed by West Coast technology companies Uber and Lyft.

Further down the track, autonomous cars could become ubiquitous once tech firms and car makers overcome the obstacles that are holding back their development. In 15 years' time, if self-driving technology is mature, autonomous cars will be a major disrupter because of their greater convenience, better service levels, and ability to use energy more efficiently than conventional cars.

These trends will bolster the shift to fleets of electric vehicles. For the companies that offer shared vehicles, EVs are a better option than conventional cars because they require less maintenance. Users of these vehicles will benefit from other cost advantages as the expense of parking, upkeep, and depreciation is split. In Chicago or New York, we estimate that the cost per passenger mile of a shared, autonomous electric vehicle could be between 40% and 60% less than that of a conventional car. (See *The Reimagined Car: Shared, Autonomous, and Electric*, BCG Focus, December 2017.)

Assuming these trends develop as expected, electric cars could represent more than 20% of US new-car registrations by 2030. Our research suggests that gasoline demand in the US would drop by 10% to 15% by 2025, and by 30% to 35% by 2035, as a result (compared with 2015 levels). Moreover, the use of diesel by heavy trucks in

the US could to some extent be replaced by compressed or liquefied natural gas if oil prices stay above \$60 per barrel. Electric-powered trucks could further erode demand for diesel in the long term, once range and refueling infrastructure improve.

### Coping with Falling Demand for Gasoline

Demand for refinery products for which there is no credible low-carbon substitute—such as jet fuel, marine fuel, and other refined products used in petrochemicals—will mitigate the decline in gasoline demand but won't compensate refiners entirely for the loss in revenue. (See the exhibit.)

US demand for jet fuel and desulfurized marine fuel could grow by about 1.5% a year, an increase of 30% to 35% between now and 2035. The need for lighter automotive components and energy-efficient insulation will boost demand for chemical products such as ethylene. US petrochemical plants using cheap natural gas as a feedstock have a cost advantage over international rivals. Consequently, demand for products from the US chemicals sector could grow by 2% to 3% a year—an increase of 60% to 65% from 2015 to 2035.

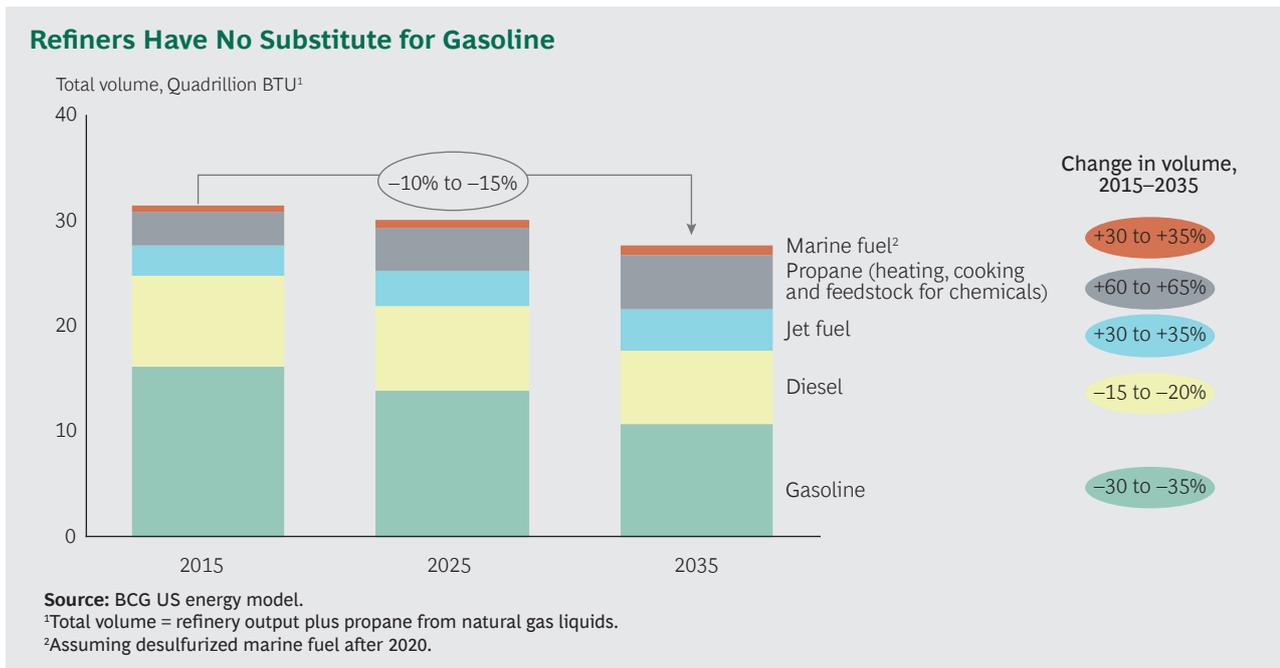
But these three sources of demand account

for less than 20% of the total output from US refineries. Refineries on the right side of the merit order curve—which ranks assets according to cost level—may be rendered obsolete by the decline in gasoline demand, an argument for refiners to become much more efficient. Exports of competitively priced US gasoline could make up for some of the lost volumes, helped by growing car ownership in developing markets. Yet these markets may try to increase their own refining capacity rather than become too reliant on US product.

### Natural Gas Will Fuel the US Power Sector

We anticipate that demand for natural gas will increase, providing a fillip for oil and gas companies. The US shale gas revolution has shown that the industry can innovate to boost cost efficiencies, and new digital technologies can ensure that this innovation continues. As a result, gas prices are likely to remain competitive, at \$2 to \$4 per million metric BTUs.

**Gas will take market share from coal.** Several policy initiatives underway in the US are likely to provide support for its coal industry. Even so, natural gas—the cleanest fossil fuel—will remain more competitive than coal. Existing coal-fired plants cost



more to operate than gas-fired plants and will become costlier still as they age, while energy from a new coal plant is as much as one-third more expensive than power from a new gas plant.

**Renewables will take market share from coal and gas.** Renewables will take some electricity market share from coal- and gas-fired power stations, particularly less efficient “peaker” plants. However, because of the intermittence of solar and wind energy, base load gas plants will still be needed when there’s insufficient sun or wind.

According to our models, installation costs for utility-scale solar and wind farms could fall by about 20% over the next ten years. This would make subsidy-free renewables cheaper than gas in regions with abundant sunlight, such as California, but not in others. Still, many states—including those in the Northeast—will continue to expand their renewables portfolios, regardless of federal government policies, because of their expected environmental and job creation benefits.

Overall, our models indicate that US demand for natural gas could rise 5% to 10% by 2035. For renewables to compete effectively with gas, energy storage costs would need to be between one-fifth and one-tenth of today’s price. While this will be difficult to achieve, it is not unthinkable given that worldwide investment in grid-scale, battery-based energy storage reached \$1 billion in 2016. For oil and gas companies, this could be a significant disruptive factor.

## The Road Ahead for US Oil and Gas Companies

Faced with these accelerating developments, oil companies operating in the US will have to act nimbly if they are to defend their core business. They will need to make smart decisions to increase the proportion of natural gas in their portfolios. And they must embrace digital technologies that can increase operating efficiencies as part of a relentless drive to contain costs and stay competitive with new energy solutions.

Some oil and gas companies will be able to adapt their refineries to increase production of jet fuel and petrochemical products, thereby compensating for the sharp drop in gasoline demand. But retrofitting plants with auxiliary units carries a significant cost and will need to be supported by careful analysis of local market needs. Because gasoline is a natural byproduct of other refinery products, US refiners will also have to improve their trading and marketing expertise, especially as exporters such as China, India, the Middle East, and Russia expand their roles.

The rise of EVs and more fuel-efficient vehicles may force gasoline stations in some US states to close, which will affect oil companies’ downstream retail operations. As a result, companies may have to find other ways to differentiate their brands from those of rivals and build brand value. And increasing concern about climate change among millennials may require companies to further examine the strategic implications of their own carbon footprint.

Along with protecting their traditional business, smart companies will accept that the energy landscape is changing and position themselves to benefit. In Europe, for example, France’s Total is investing in solar energy and battery storage, while Norway’s Statoil is developing offshore wind farms and carbon capture and storage projects. Shell is also investing in offshore wind farms and increasing its footprint in other renewable sources. In the US, ExxonMobil directs part of its R&D budget toward alternative energy and carbon footprint reduction projects.

Betting heavily on changes in the energy landscape is the exception, however. At most of the major oil and gas companies, the dedicated budget for alternative energy, energy efficiency, and clean mobility projects is less than 5% of their total annual capital expenditure. There are several reasons for this. For starters, oil and gas companies invest heavily—rightly so—in upstream operations so that they can maintain fossil fuel production levels.

But some of the obstacles are structural.

The new wave of technology-driven energy transitions (such as localized “behind the meter” power generation) often require a nimbler, more direct relationship with customers, whereas oil companies are traditionally behemoths that focus on large, capital-intensive projects.

Technologies that would leverage these companies’ project management and geological expertise—such as carbon capture and storage—are still largely immature and will require significant investment, regulation, or subsidies to be cost effective. Renewable and energy efficiency technologies, such as battery storage, solar, and wind power, are more advanced, but they are also further from oil companies’ traditional skill sets.

Complicating matters is the fact that oil companies’ past forays into renewable energy have not always been successful. Furthermore, at companies where alternative energy accounts for a tiny part of the capex budget, renewables do not fit into traditional organizational structures and so can fail to gain momentum.

Despite these drawbacks, oil companies have assets that can work in their favor in an evolving world. These include:

- Using their size and large R&D budgets to shape future market developments
- Leveraging their well-known brands to build stronger customer relationships
- Redeploying retail networks to support renewable and clean-energy infrastructure
- Deploying their risk management expertise to handle the uncertainties of energy transitions
- Using their experience in joint ventures to forge effective partnerships with smaller and more agile innovators

US oil companies cannot afford to ignore the energy transitions that could significantly alter their businesses over the com-

ing decades. On the plus side, the US—with its large discrete regional markets, variety of regulations, and unparalleled drive to innovate—can be a testing ground for companies facing similar pressures elsewhere.

## How to Navigate the Changing Energy Landscape

Before taking action, companies should examine the potential impact of different disruptive scenarios on their existing business activities, consider how their current portfolio may evolve over time, and set operational efficiency targets to make these businesses more resilient. They should also consider how stock- and bondholders might react to a change in strategy.

We suggest that oil and gas companies considering energy transition opportunities take the following measures to increase their chances of success:

- **Set out the ambition.** Companies should understand which parts of the portfolio are at risk of disruption, over what time frame, and subject to what future market changes. By defining these parameters, executives send a strong internal signal about the need to reallocate resources. Externally, owning and tackling their carbon footprint will enhance the reputation of their brand and enable companies to defend their license to operate.
- **Build a portfolio outside of fossil fuels.** Companies will need to build a portfolio of initiatives that may include technologies far from their core skills. Because the pace and final winners cannot be predicted with certainty, these will need to include competing technologies as well as short- and long-term opportunities. Companies should consider teaming up with innovative startups—or taking small stakes in them—as they learn about new markets.
- **Establish good governance.** Companies must put in place effective governance procedures to manage

energy transitions and respond to market developments. Determining which senior executives will be responsible for the company's alternative and clean-energy portfolio is key to success. By using clear accountability structures, such as a steering committee that reports regularly to senior leaders, companies can maintain momentum as they develop new solutions, fail fast, and respond quickly to energy evolutions.

- **Be alert to new opportunities.** Companies must use monitoring mechanisms to recognize market signals and change their scenarios accordingly.

They should also consider investment opportunities where their scale and R&D budget can shape the direction of the market, such as the development of refueling infrastructure at gasoline stations.

**B**Y TAKING DECISIVE steps now, US oil companies can road-test strategies to navigate a changing energy landscape, allowing them to learn from their mistakes while many of these developments are still in their infancy. Those that do so will be well placed to manage risks arising from the nature and timing of these shifts and to benefit from future winning technologies.

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