What are the Factors that are Impacting Global Oil Prices?

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Market and Price Developments

Over the past year, the global oil market transitioned from a glut to a more "normal" state regarding observed commercial inventories in the Organization for Economic Co-operation and Development (OECD) countries. Excessive inventories accumulated after 2014 as producers ramped up production and U.S. shale oil proved resilient to lower prices. The daily price of West Texas Intermediate (WTI) crude oil fell from a high of $107 per barrel in the summer of 2014 to a low of $26 in February of 2016. Since the beginning of the modern oil market in 1859, crude oil price busts have terrified the oil industry and have often induced producers to restrain production collectively. The price plunge to $26 was no different: over the course of 2016, Saudi Arabia and Russia assembled a new coalition of producers with the aim of eliminating oversupply to prevent oil prices from falling to further ruinously low levels. Their efforts were uneven but partially successful due to the robust demand for oil and a spate of unfortunate events in the second half of last year that disrupted crude and refined product supply. These events included the Harvey superstorm, Keystone and North Sea pipeline outages, and geopolitical disruptions in northern Iraq. The combination of these factors has mostly removed the inventory glut, enabling prices to recover from their lows.

Of course, most consumers and businesses do not see "crude oil" prices but instead are exposed to the prices of refined products such as road diesel and heating oil. Global crude oil prices, however, are the primary determinant of refined product prices. In the United States, refined product prices usually follow crude oil prices with a roughly three-week lag. Like crude oil, gasoline and diesel pump prices have also recovered.

The Oil Market is in a New Era Marked by Boom-and-Bust Price Swings

Before delving into detail about both recent and prospective oil prices, let me step back and note that crude oil prices have exhibited unusually wide swings over the last 15 years. In modern times, crude oil prices do not nearly quintuple over several years, absent a war in the Middle East. And they don't normally plunge by 60% in six months, as happened in 2014, without a recession or sudden supply surge. Oil's unusually wide swings reflect the transition from a nine-decade era of supply management to one in which there is arguably no effective supply manager (McNally, 2017).

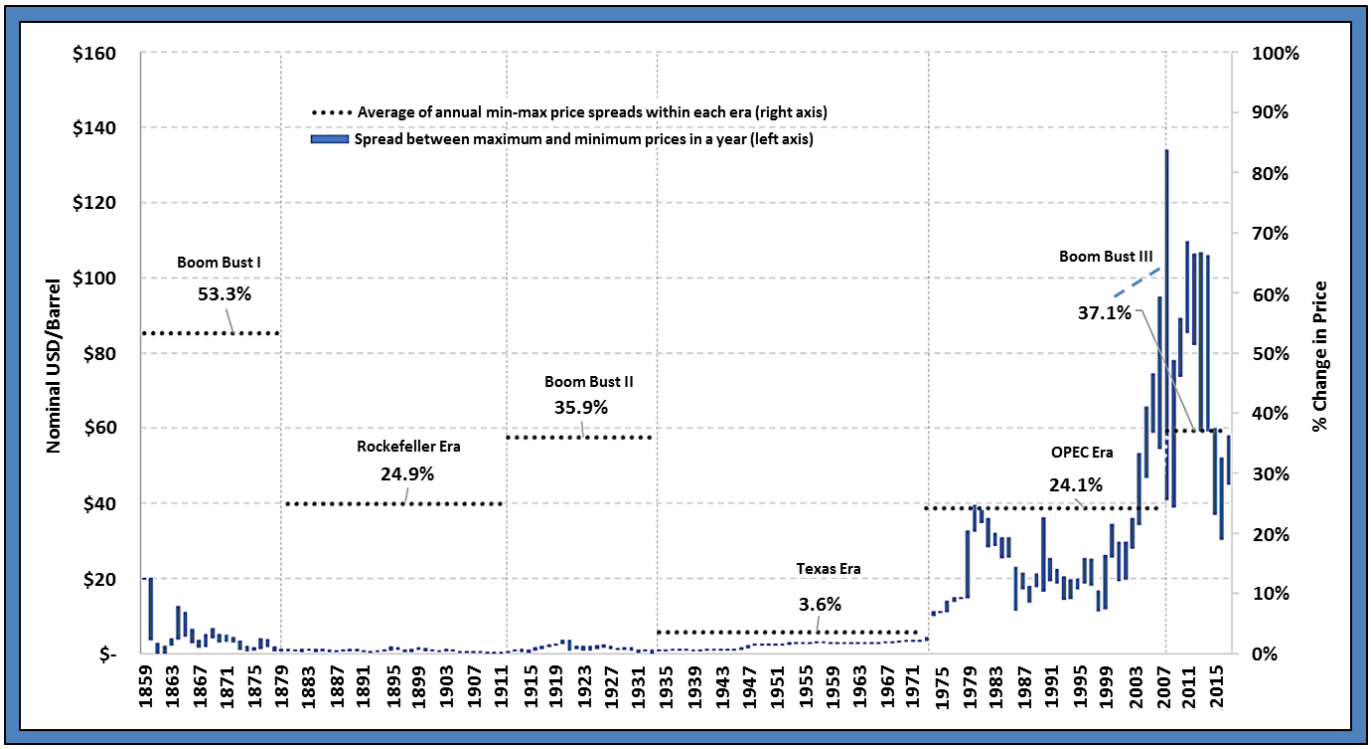
Oil prices are unusually prone to volatility because both supply and demand are insensitive or "sticky" in responding to price changes in the short term while storage is limited and costly (McNally, 2017). Oil's notorious price volatility has troubled not only the oil industry but broader economic and governmental actors, given oil's vital importance for economic growth and security. To vanquish oil's wild swings and stabilize oil prices, governments and producers have (at least in the past) resorted to regulating crude oil

production with the goal of preventing big surpluses (inventory builds) or deficits, which can result in destabilizing price busts and booms, respectively.

Unpopular boom-and-bust oil prices during the two decades following the breakup of Standard Oil in 1911 deeply rattled the country and by the early 1930s convinced the U.S. to become the world's first and most successful supply manager or "swing producer." Texas regulators, along with other oil states, the federal government, and major international oil companies, exerted strong control of production over four decades. The Texas Railroad Commission imposed quotas well-by-well, field-by-field, for forty years. The Organization of Petroleum Exporting Countries (OPEC) took over from the U.S. in the early 1970s, though not as successfully, and has been ineffective since 2008.

Figure 1 shows how crude oil price volatility has varied through history depending on whether an effective swing producer or supply manager was controlling the market.

Figure 1
Annual Ranges of Monthly U.S. Crude Oil Prices, 1859-2017



Data Sources: Rapidan Energy Group, based on *The Derrick*, American Petroleum Institute, Federal Reserve Bank of St. Louis, Energy Information Administration (EIA), and The Bloomberg.

The crude oil price bust in 2016 spawned a new group comprised of some OPEC producers (led by Saudi Arabia) and non-OPEC producers (led by Russia), which has attempted to play the role of swing producer, but its impact is limited and its future success is uncertain.

Shale Oil is Neither Swing Production nor Spare Capacity and Will Not Keep Oil Prices Stable

When in late 2014, Saudi Arabia and other OPEC producers refused to cut production under soaring U.S., Canadian, and Brazilian supply, many hoped that U.S. shale oil producers would replace OPEC as the swing producer, thereby keeping oil prices stable. These hopes were disappointed, however, and for good reason: U.S. shale oil producers are in no way a replacement for swing producers, and shale oil does not constitute the "spare production capacity" that the market has traditionally relied upon to stabilize oil prices.

Shale oil production is *more* responsive to price signals than conventional production with lead times for new supply measured in months or quarters instead of years. But shale does not respond fast and large enough to prevent global inventory imbalances and large price swings. To ensure long-term price stability, swing producers must be able, willing, and legally authorized to change oil supply in large amounts, within weeks, and for long periods of time. In some respects, swing producers are akin to central banks that control the supply of base money. The Texas Railroad Commission, the Seven Sisters oil cartel, and OPEC (mainly Saudi Arabia) all constituted genuine swing producers. Shale oil is produced by many dozens of highly idiosyncratic public and private companies, each competing with each other to maximize reserves and production. Shale producers are extremely diverse regarding resources and capital structure, they pursue growth targets instead of price stability, and they abide by punitive anti-trust laws that prevent them from even appearing to cooperate in stabilizing prices.

Shale oil production has also proven much more resilient to price declines than many expected in 2014, primarily due to a combination of widespread capital availability and efficiency gains with the latter driven by innovation and service-cost reductions.

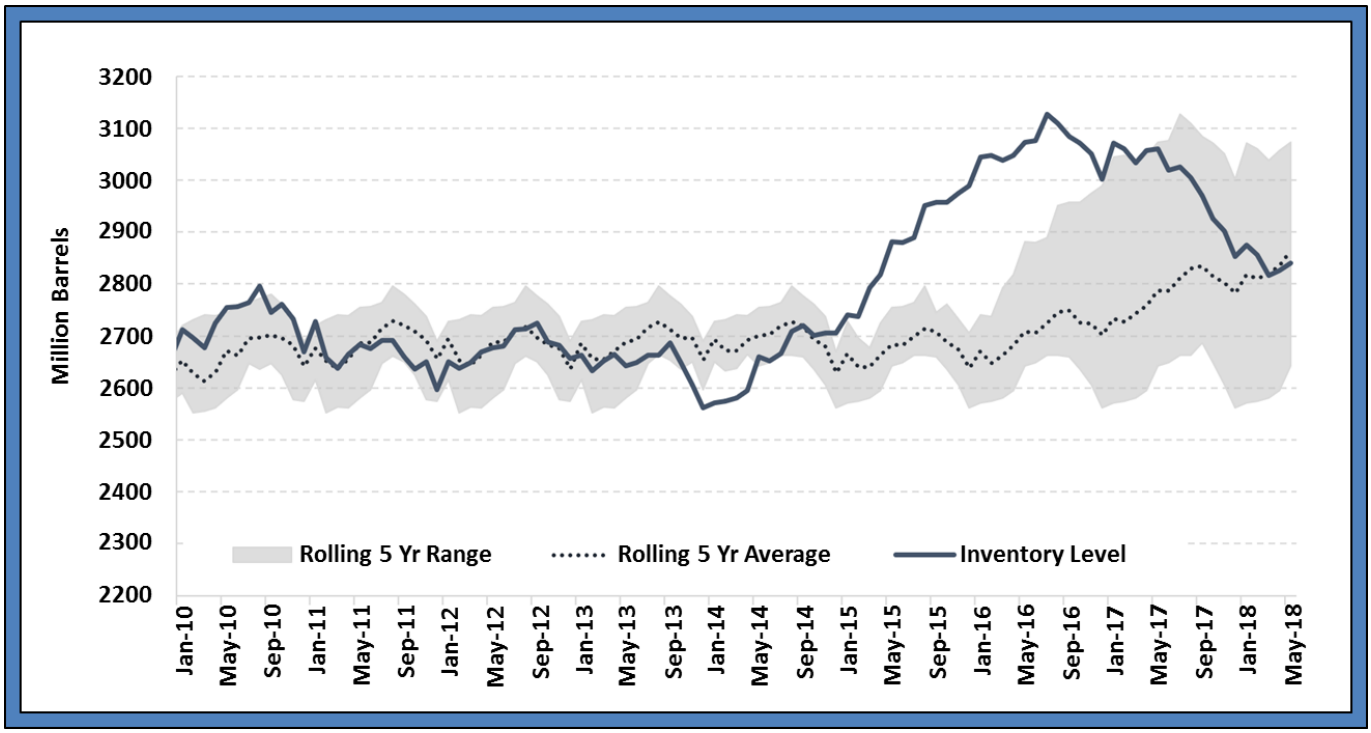
A more plausible replacement for OPEC than U.S. shale is the new entity founded by Saudi Arabia and Russia, comprising some 25 OPEC and Non-OPEC producers, which I call the Vienna Group, but is also known by "OPEC-plus" or "ROPEC." This group agreed to restrain production starting in early 2017 and, as noted above, contributed to the normalization of inventories and recovery of crude oil prices.

The jury remains out as to whether this new Saudi-Russian led entity will prove to be a successful long-term supply manager or instead join the list of *ad hoc*, temporary cartels formed after price busts but that dissolved afterward. Saudi Arabia and Russia's recent decision to maximize production despite opposition from Iran and other members of the Vienna Group will put the entity's cohesion to the test.

Commercial Inventories May Have Normalized, But the Risk of Big Crude Price Moves Remains High

Turning to the recent past, by mid-2018 the oil market shifted from oversupply to "normal," characterized by commercial inventories near their five-year range, as shown in Figure 2 on the next page. That said, the range itself has risen in recent years since the average captures the glutted levels post-2014.

Figure 2
OECD Commercial Crude and Product Inventories



Sources: International Energy Agency (IEA) and Rapidan Energy Group.

The return to normal inventories by mid-2018 was due to the following four factors:

- Oil demand generally surprised to the upside. For example, oil demand grew by nearly 1.6 million barrels per day (mb/d) last year, some 23% higher than initially projected by the International Energy Agency.

- Unexpected production outages due to geopolitical disruptions in Venezuela, Iraq, and Libya occurred.

- Large storms Harvey and Nate along with major pipeline outages in the U.S. and the North Sea in the second half of last year also took place.

- Production restraint by Saudi Arabia, Russia, and other OPEC and non-OPEC producers, starting in early 2017, took effect.

But the "normal" to which the oil market has returned is precarious and may well be fleeting. Extraordinary shifts and risks arising from supply and demand, geopolitical trends and events, and policy demands are likely to extend this 15-year old era of boom-and-bust price cycles, especially if an effective swing producer remains absent.

Looking forward, the outlook for crude oil prices resembles a "tug of war" between supply-and-demand factors that point to lower oil prices on the one hand, and geopolitical disruption risks that point to higher prices on the other hand. My firm expects geopolitical risks will keep a floor under crude prices near term, but by next year the weight of expected new supplies should exert downward pressure on prices. However, we see pronounced risks that oil prices could rise or fall much more than currently expected. A recession could lead to much lower prices while geopolitical risks and disruptions, for example in Iran, Libya, and Venezuela, could send crude oil prices back into the triple digits and prices well above $3 per gallon.

Low Spare Production Capacity and High Geopolitical Disruption Risks

With inventories back to normal and geopolitical disruption risks proliferating, a critical question becomes the amount of quickly producible oil the world can call on in case of an outage – commonly called "spare capacity." Oil supply is vulnerable to disruptions from geopolitical conflict, storms, and accidents. The rigidity of oil demand in the short term means a supply outage can trigger large price spikes. Having a sufficient "spare capacity" buffer is critical for crude oil price stability in general and especially for preventing unexpected outages anywhere from triggering economically harmful prices spikes everywhere, including here. Former EIA Administrator Adam Sieminski has summarized academic research, which found that spare production capacity reduces oil price volatility and generates between $170 and $200 billion of annual economic benefits (Sieminski, 2018).

Genuine power in the oil market comes less from how much a country produces and instead whether it can stabilize prices and offset major disruptions. Spare capacity is one measure of that power. The U.S. and Seven Sisters cartel controlled spare capacity from 1932 until 1972. Since then Saudi Arabia has held the lion's share of spare capacity. But with the Kingdom's decision earlier in the year to surge production, it has likely approached zero spare capacity. Whether zero or extremely low, spare capacity *is* very tight. Tight spare production capacity poses a risk of oil price spikes, given the large number of disruptions and threatened disruptions present in the oil market, some of which are summarized below.

Venezuela's production has fallen over 0.7 mb/d in the last year and is expected to continue to implode slowly. The fast exodus of workers at PDVSA (Venezuela's national oil company), the lack of sufficient chemicals for blending and upgrading Venezuela's heavy crude oil, and PDVSA's severe cash constraints will continue to drive production lower. Prospects for a recovery in oil production are bleak – even if President Maduro were to leave office tomorrow, Venezuela would struggle to boost production back to previous levels.

By contrast, Libya has seen sharp, but so far temporary disruptions as armed factions (both local and national) seek to gain leverage ahead of expected elections later this year, keeping production in a 0.8-1.0 mb/d range. In western Libya, the lack of a unified security force exposes oil facilities to attacks by militias seeking to extract payoffs, contracts, and other resources from the national oil company and the government in Tripoli. In the east, oil production that was relatively stable under the control of the Libyan National Army (a coalition of eastern militias fighting under the command of General Khalifa Haftar) is likely to be increasingly rattled as Libya's most significant actors jostle for power.

As of the writing of this article, the oil market is grappling with a new disruption risk in the form of the loss of a large amount, if not all, of Iran's 2.5 mb/d of exports. Uncertainty about how sanctions might impact Iran's oil exports arises from several factors:

- There is market uncertainty about the number of exemptions that the Trump administration will grant over time, and for how long, to Iran's current importers.

- It is unclear whether Chinese, Indian, and other state-owned oil companies may increase imports to offset losses from other customers wary of violating U.S. sanctions.

- It is not known whether Iran will choose to escalate tensions by eventually resuming enrichment or threatening safe passage of the roughly 19 mb/d that passes through the Strait of Hormuz, the world's most important choke point.

Looming Regulations on Marine Fuel Sulfur Limits Could Roil the Oil Market Next Year

Oil is bound up with many policy debates and discussions, from climate change to ethanol and fuel economy standards. But one important policy issue preoccupying the oil industry and likely to impact oil prices has so far gone largely unnoticed in Washington: there will be a mandatory reduction in sulfur limit emissions for ocean-going ships starting on January 1, 2020, commonly referred to as "IMO 2020." IMO 2020 is expected to reverberate onshore and impact consumer oil prices, especially for trucking and airline companies as well as home heating oil consumers. The International Energy Agency referred to IMO 2020 as "easily the most dramatic change in fuel specifications in any oil product market on such a large scale," according to *Financial Times* (2017).

By way of brief background, in October 2016 the United States along with other nations participating in the U.N. International Maritime Organization (IMO) confirmed an earlier, tentative decision to implement a reduction in the sulfur content of the fuel used in ships on the high seas ("marine bunkers") from 3.5% to 0.5% sulfur as of January 1, 2020. Ship owners have two main compliance options to meet the looming regulations.

First, ships could continue to burn high-sulfur fuel but install exhaust gas cleaning systems commonly called "scrubbers" to remove sulfur from the ship's emissions. Only a small fraction of ships have installed scrubbers however and insufficient time remains to install many more before the deadline. Therefore, most will opt for a second option, to switch from high-sulfur, heavy fuel oil to lower sulfur, heavy fuel oil or middle distillates (which are also referred to as "gasoil" or "diesel.")

A major question hovering over the market is whether a big new demand wave for low-sulfur distillate from shippers would overwhelm the refining industry's ability to supply it while meeting demand needs by other users such as motorists, airlines, and home heating oil consumers. While IMO had considered a 2025 implementation date, the decision taken in 2016 to start in 2020 was backstopped by a report commissioned by IMO that found "the refinery sector has the capability to supply sufficient quantities of marine fuels with a sulfur content of 0.5% or less ... while also meeting demand for non-marine fuels" (CE Delft *et al.*, 2016). A rival study, in turn, commissioned by shipping and oil industry groups in 2016,

and updated this year, concluded that implementation of IMO regulations in 2020 could lead to spikes in petroleum-complex prices during a "scramble period" (*The Motorship*, 2018).

Indeed, as the IMO 2020 deadline fast approaches, leading official forecasters and private sector experts expect implementation will trigger a large spike in the price of crude oil and refined products, particularly for "middle distillate" fuels. IEA (2018) concluded that the *global* refinery system would not be able to produce a sufficient amount of low-sulfur fuels in 2020 and at least for a few years afterward. As a result, shippers facing a new IMO mandate will bid low-sulfur distillate away from the other users mentioned above. The IEA expects the scramble for clean distillate could trigger a 20 to 30% spike in the price of heating oil and diesel fuel. Further, this "sharp increase in the price of [distillate] following the 2020 IMO changes [would] penalize demand in other sectors," noted IEA (2018).

Moreover, the IEA has warned that IMO 2020 could push up global crude oil prices and therefore pump prices:

> A worrying number of refiners, including large integrated oil companies, have publicly stated that one of their options to meet the new sulfur specification would be to use lighter and sweeter crude oil that requires less intensive hydrotreatment. As the two important futures benchmarks, Brent and WTI, are based on light sweet crude oil output, the increased demand for this type of crude oil may fuel a sharp increase in futures prices, with consequences felt across all product markets (IEA, 2018).

Benefits and Winners from Lower Sulfur Limits in Marine Fuels

There will be clear environmental and human health benefits from reducing sulfur emissions from ocean-going ships. And domestic, deep conversion refiners will benefit from their competitive advantage regarding the production of lower sulfur fuels. If, as the IEA cautioned above, IMO 2020 also boosts lighter crude oil prices, our domestic producers will benefit. Longer term, low-sulfur regulations could also enable liquefied natural gas to see wider use as a bunker fuel.

If Policy-Driven Peak Demand Disappoints, Oil Prices Will Rise Sharply

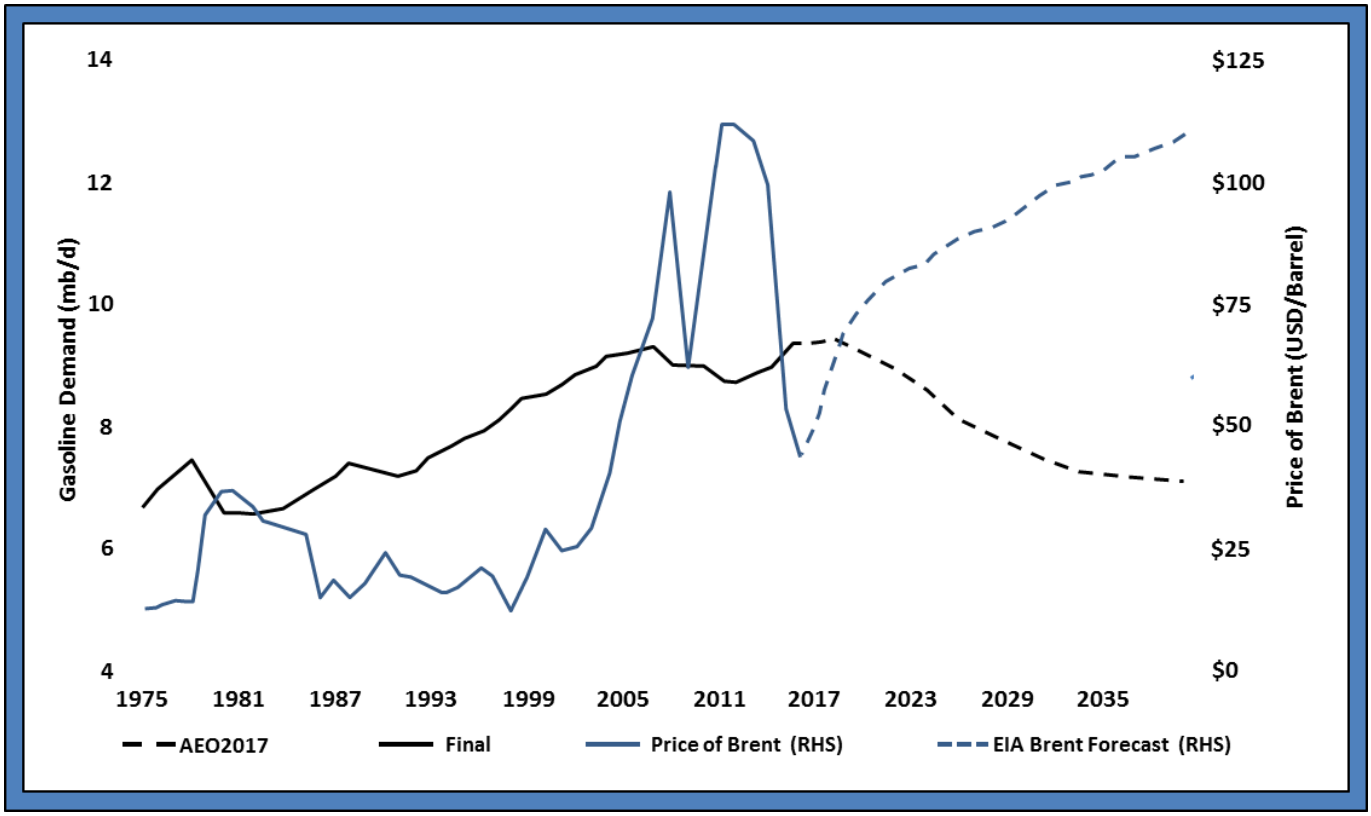
Lastly, a crucial factor driving longer-term oil prices is the outlook for oil demand growth in transportation. Transportation accounts for 56 percent of global oil demand though petrochemicals are an important growth sector for oil use (IEA, 2016). Oil market participants and analysts have been preoccupied with the future rapid displacement of oil in transportation due to policies aimed at increasing efficiency or non-petroleum transportation fuels, primarily via electric vehicles (EVs). An interesting aspect to this debate – referred to as "peak demand," "energy transition," or "decarbonization" of transportation – is the role that autonomous vehicles (AVs) may play in future oil demand.

Leading official forecasts, from both the EIA and IEA, assume decarbonization policies will significantly curtail future oil demand growth. For example, both the EIA and IEA assume that U.S. gasoline demand will peak this year and then decline sharply in coming years and decades, largely due to federal fuel

economy regulations and California's Zero Emission Vehicle (ZEV) Mandate. The EIA's predictions are illustrated in Figure 3 below. Notably, the peak and decline in U.S. motor gasoline demand that the EIA forecasts would be the first to occur without a recession.

There are good grounds for caution that we will see such a big, imminent "policy peak" in gasoline demand in the United States. In the past, the EIA had predicted peak gasoline demand in the 1980s after a big oil price run up and implementation of federal fuel economy standards. But lower oil prices, strong consumer preference for larger vehicles, and accommodative public policies (including the federal government easing Corporate Average Fuel Economy (CAFE) rules in the late 1980s and mid-1990s) ended up proving these forecasts premature. My firm studied the U.S. CAFE and California ZEV programs last year and concluded, for largely the same reasons, that they are unlikely to drive a peak in U.S. gasoline demand in coming years (Rapidan Energy Group, 2017).

Figure 3
EIA Annual Energy Outlook (AEO) Gasoline Demand vs. Oil Prices (Including Predictions), 1975 – 2040



Source: Chart based on EIA AEO.

Whether or not U.S. gasoline demand peaks in the coming years will resonate globally. The U.S. gasoline demand market is massive – accounting for nearly one in ten barrels per day consumed on the planet – and it enjoys symbolic importance among leading energy media, forecasters, and analysts. My firm also tracks decarbonization policies around the world, particularly those impacting transportation, and took a hard look at the top 20 most material of such policies – from 9 countries accounting for 57 mb/d or 58%

of global oil demand. What we found is that when accounting for the realities of actually implementing these policies like the U.S. CAFE program – the use of credits, different testing procedures, and other features that reduce stringency – those policies only resulted in about 53% of the demand destruction assumed "on paper" by the regulations.

Automated Vehicles Could Significantly Boost *or* Reduce Oil Demand

National Renewable Energy Laboratory (NREL) researchers have noted that AVs could have a "wide range of possible energy impacts" (Brown *et al.*, 2013). Energy impacts of widespread AV adoption are highly uncertain with estimates ranging from a 60 percent decline to a 200 percent increase (Chase, 2018). Factors that could increase energy demand include ease of travel, lower perceived and actual cost per mile, and underserved populations obtaining travel services.

But whether mass adoption of AVs would increase or decrease oil demand depends largely on which fuels – oil or electricity – AVs will use. Many assume that AVs will be EVs. If so, oil demand growth would sharply slow. But if widespread AV adoption occurs before EVs proliferate, then oil demand could increase significantly. For example, a 2014 NREL study found that mass adoption of conventionally powered AVs could have the "unintended consequence" of doubling fuel demand (Brown *et al.,* 2014). More recently, a 2016 NREL study found that widespread AV adoption could *triple* U.S. gasoline consumption from current levels of 9.3 mb/d (2017 average), assuming a fully autonomous fleet, petroleum-fueled vehicles, $3 gasoline and current fleet-wide efficiency (Stephens *et al.*, 2016).

If future global oil demand turns out to be stronger than many governments and companies currently expect, oil prices would be higher than currently anticipated. Strong demand would then collide into insufficient investment in oil production.

While a recession could send oil prices lower, I expect the next boom phase in oil prices will arise due to faster-than-expected demand, both because policies will turn out weaker than expected and because the recent bust has encouraged demand while hampered investment in new oil fields and production facilities. Again, oil's demand rigidity means price increases could be significant. And with spare production capacity wafer thin, geopolitical disruption risks could be expected to eventually result in further oil price spikes.

Conclusion

In 2012 I had the honor of testifying before the U.S. House of Representatives Small Business Committee. At the time, I noted that crude oil, and therefore pump prices, had entered a new "Space Mountain" era of boom-and-bust price cycles (McNally, 2012). I continue to maintain that view. If a new swing producer does not emerge, we should all buckle up for a continued, roller-coaster ride on "Space Mountain."

Endnote

This commentary is based on McNally (2018).

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Mr. Robert McNally is the founder and President of Rapidan Energy Group, an independent energy consulting and market advisory firm based in the Washington, D.C. area. Mr. McNally's clients include leading global energy market investors, producers, and traders. Mr. McNally's 26-year professional career includes senior financial market and official posts spanning economic, security, and environmental aspects of energy market analysis, strategy, and policymaking. Mr. McNally started his professional career in 1991 as an oil market analyst and consultant with Energy Security Analysis, Inc. In 1994, he joined Tudor Investment Corporation and for twelve subsequent years analyzed energy markets, macroeconomic policy, and geopolitics for Tudor portfolio managers, earning promotions to Vice President and Managing Director. From 2001 to 2003, Mr. McNally served as the top international and domestic energy adviser on the White House staff, holding the posts of Special Assistant to the President on the National Economic Council and, in 2003, Senior Director for International Energy on the National Security Council.

Mr. McNally earned his double major B.A./B.S. in International Relations and Political Science from American University and his M.A. in International Economics and American Foreign Policy from Johns Hopkins' Paul H. Nitze School of Advanced International Studies (SAIS). He was co-chair for energy policy on the 2008 Romney Presidential Campaign, served on the Policy Advisory Committee for Senator Marco Rubio's 2010 Senate campaign, and regularly advises congressional and administration officials on energy policy and markets. Mr. McNally is a Member of the National Petroleum Council and is a non-resident fellow at Columbia University's Center on Global Energy Policy.

Mr. McNally has testified to the House and Senate on energy markets and national security and speaks to professional conferences on energy markets, policy, and geopolitics. He has been published in *Foreign Affairs* (co-authored essay with Michael Levi, July/August 2011) and has been interviewed by CNN, *The Economist, Fox Business, The Financial Times, The Washington Post, National Journal,* Platts Energy Week TV, PBS' "Great Decisions in Foreign Policy" series, *Bloomberg News*, *Aviation Daily* and other programs and journals. He is the author of the acclaimed and award-winning 2017 book, Crude Volatility: The History and the Future of Boom-Bust Oil Prices, published by Columbia University Press.