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## MUSINGS FROM THE OIL PATCH

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**Note:** *Musings from the Oil Patch* reflects an eclectic collection of stories and analyses dealing with issues and developments within the energy industry that I feel have potentially significant implications for executives operating and planning for the future. The newsletter is published every two weeks, but periodically events and travel may alter that schedule. As always, I welcome your comments and observations. Allen Brooks

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### ESG Investing And The Reshaping Of The Energy Industry

**The debate over climate change, which at one time was known merely as “global warming,” but lacked the punch required by environmentalists in their battle against fossil fuels, has been elevated into a key consideration when investors judge how companies are handling ESG issues**

The energy and investment worlds were shocked by the recent announcement from Norway’s Ministry of Finance recommending excluding holdings of oil and gas exploration companies from the nation’s \$1 trillion sovereign wealth fund. This announcement marks a significant victory for environmentalists attacking the legitimacy of the global petroleum industry due to its supposed role in promoting climate change. The debate over climate change, which at one time was known merely as “global warming” but lacked the punch required by environmentalists in their battle against fossil fuels, has been elevated into a key consideration when investors judge how companies are handling Environmental, Social and Governance (ESG) issues. To understand the significance of the Norwegian action, it is important to understand what constitutes ESG and how this standard is reshaping investment decision-making.

According to the web site, *Investopedia.com*, ESG is designated as:

“Environmental, social and corporate governance criteria refer to three main factors investors consider with regard to a firm’s ethical impact and sustainable practices. The criteria are used in ESG investing, also called sustainable investing, responsible investing, impact investing or socially responsible investing. Examples of ESG criteria used by investors include the company’s impact on climate change or carbon emissions, water use or conservation efforts, anti-corruption policies, board member diversity, human rights efforts and community development.”

ESG, as an investment principle, is often linked to the apartheid movement that overturned the segregationist policies that marked the history of South Africa from the end of World War II. The

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**Encouraged state repression of Black African, Colored, and Asian South Africans for the benefit of the nation's minority white population**

policies and laws that created apartheid arose from the authoritarian political culture based on *baasskap* (or white supremacy), which encouraged state repression of Black African, Colored, and Asian South Africans for the benefit of the nation's minority white population. That repression began during the Dutch empire development in the early 18<sup>th</sup> century. The laws instituting the social policies existed from 1948 to the mid-1990s, at which time they were repealed, although much of the social repression continues in practice.

The global pressure that eventually ended apartheid was aided by an aggressive push by global groups, especially those led by college students, to force financial institutions to divest their investments that benefitted from business done with South Africa. This effort began once it was realized that traditional methods of bringing economic pressure to bear on the South African government were not working since there were few products exported from the country to be boycotted. Strikes and marches also brought little pressure on the government. The divestment efforts started in the mid-1970s and continued into the 1980s and 1990s, with one major campaign being waged against Royal Dutch Shell (RDS.A-NYSE).

**The risk orientation of the firm lies at the heart of BlackRock's focus on the issue of ESG and its impact on shareholder wealth creation**

Today, one of the leading proponents of ESG investing is Larry Fink, the CEO of BlackRock, Inc., considered to be the world's largest asset management firm with over \$6 trillion under management. The firm, headquartered in New York City, operates through 70 offices in 30 countries around the world, and with customers from 100 different countries. Based on its assets, BlackRock is considered to be the world's largest shadow bank, and is, by asset-size, the largest global bank. The firm was founded by Mr. Fink and a group of his co-workers, who all worked at investment bank First Boston Corp., in 1988 as a risk management and fixed income asset manager. It has broadened its scope to include virtually every asset class. The risk orientation of the firm lies at the heart of BlackRock's focus on the issue of ESG and its impact on shareholder wealth creation.

Mr. Fink has identified ESG as critical to the long-term success of companies and the value of the shares held in his firm's investment portfolios. As part of the effort to influence company executives in creating long-term value, Mr. Fink writes an annual letter to the CEOs of the companies BlackRock is invested in. He focuses on the issues his firm considers crucial for companies to successfully navigate in order to grow profits and shareholder value. In his 2019 letter to CEOs, he wrote the following about the ESG issue:

"Purpose is not a mere tagline or marketing campaign; it is a company's fundamental reason for being – what it does every day to create value for its stakeholders. Purpose is not the sole pursuit of profits but the animating force for achieving them."

Mr. Fink went on to write the following comments about the issue:

“Purpose unifies management, employees, and communities. It drives ethical behavior and creates an essential check on actions that go against the best interests of stakeholders. Purpose guides culture, provides a framework for consistent decision-making, and, ultimately, helps sustain long-term financial returns for the shareholders of your company.”

“As wealth shifts and investing preferences change, environmental, social, and governance issues will be increasingly material to corporate valuations.”

“We have no intention of telling companies what their purpose should be – that is the role of your management team and your board of directors. Rather, we seek to understand how a company’s purpose informs its strategy and culture to underpin sustainable financial performance.”

**A key question about ESG is whether it actually improves investment returns and boosts shareholder value**

A key question about ESG is whether it actually improves investment returns and boosts shareholder value. In the 1990s, public debate and legal issues surrounded the question of the health risk from smoking. After years of battling studies and numerous court cases, the major tobacco companies were sued by a consortium of attorneys general of 46 states. That suit was ultimately resolved in a milestone agreement that settled the state Medicaid lawsuits for recovery of their tobacco-related health-care costs. The Tobacco Master Settlement Agreement was signed in November 1998. That agreement provided for the four largest U.S. tobacco companies to pay a minimum of \$206 billion over the first 25 years of the agreement to the states.

During the lead up to the tobacco agreement, many of those protesting against those companies pressured pension and endowment funds to divest their tobacco shares on the basis that the legal risks these companies carried had the potential to bankrupt them. The playbook these protestors were pursuing was similar to the pressure investors had utilized in the apartheid divestment campaign. One active participant in the tobacco divestment was the California Public Employees' Retirement System (CalPERS), which elected to sell all its tobacco stocks.

**The fund has forfeited an estimated \$3.04 billion in profits since it sold off its tobacco holdings in 2001**

A study in 2016 by Wilshire Associates, which advises CalPERS on its investments, said the fund has forfeited an estimated \$3.04 billion in profits since it sold off its tobacco holdings in 2001. At the time of the study, the fund was considering possibly banning investments in the coal and firearms industries, as well as companies doing business with Sudan and Iran. With respect to the tobacco investment, according to Joe DeAnda, a spokesman for CalPERS, “The thinking was, ‘Hey, maybe we should get out now, ahead of

**Because ESG are not clearly defined terms, almost every study is suspect to cherry-picking the stocks included in portfolios**

**"We found strong evidence that companies with strong ESG profiles are really better at managing risks and opportunities"**

further decline in the industry. That (decline) didn't happen." The question is whether divestment of oil and gas stocks might prove to be a similar lost-income opportunity.

The issue of ESG investing, which has been percolating for the past decade, raises the question of whether it leads to improved returns compared to an unrestricted investment portfolio. Because ESG are not clearly defined terms, almost every study is suspect to cherry-picking the stocks included in portfolios. Several recent studies have attempted to isolate the returns of an ESG selection criteria by focusing on a factor analysis impacting the stocks.

A 2018 report by Guido Giese, MSCI's executive director of applied equity research and an author of the report, "Foundations of ESG Investing: How ESG Affects Equity Valuation, Risk and Performance," attempts to answer the question of where the outperformance or risk reduction has come from. According to Mr. Giese, "We found strong evidence that companies with strong ESG profiles are really better at managing risks and opportunities." He went on to say: "For example, we've seen that companies with high ESG profiles have a much lower risk of suffering from incidents like the Volkswagen case [often dubbed 'dieselgate'], or the BP case [the Deepwater Horizon disaster]. This explains why high ESG ratings make for better investments — it is because they are better managed companies."

On the other hand, a 2019 report prepared by Factor Research and published by the CFA Institute, suggests that there are other considerations that may raise questions about the sustainability of ESG investing. This report was based on data about ESG scores aggregated by a U.S. provider and starting in 2009. The ESG stocks were divided into four main groups: Citizenship, Environmental, Employees, and Governance. Beta-neutral long-short portfolios were created, composed of the top and bottom 10% of US stocks as ranked according to the four factors. Companies in the portfolios had to have market capitalizations greater than \$1 billion. During the study, the portfolios are rebalanced monthly and were charged 10 basis points of cost per transaction in that rebalancing. The results of the portfolios show positive performance for all four categories over the study time period.

**Exhibit 1. ESG Factor Performance in the United States**



Source: Factor Research

**ESG factors are biased towards common equity factors**

Examining the returns suggested that the portfolios likely contained overlapping stocks. This was logical as companies caring about the environment may also show high regard for good governance and their employees. To gain better insight into the drivers of ESG performance, a factor exposure analysis was conducted. It shows that ESG factors are biased towards common equity factors. Note the negative exposures to Value and Size factors compared to the positive ones for Low Volatility and Quality factors. The R-squared calculation of regression analysis, from which the factor betas are derived, averaged 0.5, implying that the common equity factors explain the performance of the ESG factors reasonably well.

**Exhibit 2. Factor Exposure Analysis, 2009–2018**

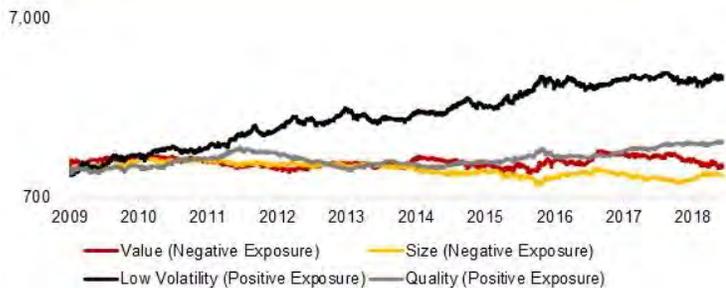


Source: Factor Research

**The positive exposure to the Low Volatility factor can be reconciled with an underweight in sectors like Energy and Materials, which are more volatile than the average stock**

The chart in Exhibit 3 shows how the positive factors translated into better performance than the negative ESG factors. The study made the following points about factor performance. “The negative exposure to the Value factor is reflected in the significant overweight in technology stocks, which trade at higher valuations. Tech companies also tend to have less debt and high profit margins, which explains the positive exposure to the Quality factor. Finally, the positive exposure to the Low Volatility factor can be reconciled with an underweight in sectors like Energy and Materials, which are more volatile than the average stock.”

**Exhibit 3. Selected Equity Factors in the United States**



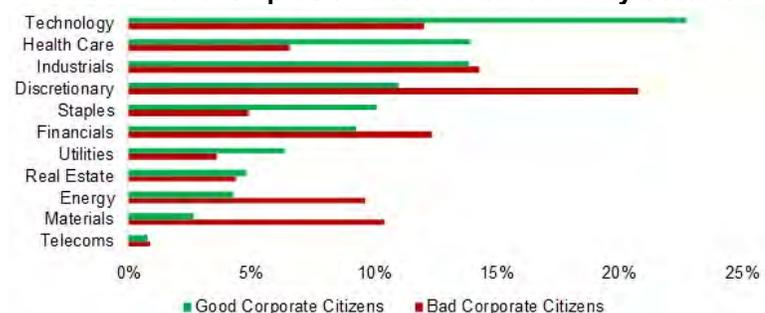
Source: Factor Research

The study also looked at the ESG stocks beyond the factor analysis and considered how they ranked based on corporate citizenship. There is no surprise that there was a bias by industry sector, as reflected in the chart in Exhibit 4 on the next page. Energy and

**Technology and health care are always cited as “great places to work” in surveys of younger people**

Materials ranked very poorly as Corporate Citizens. As we have noted before, these two investment sectors within the S&P 500 Index have been the worst or second worst performers over the past decade. Technology and health care are always cited as “great places to work” in surveys of younger people.

**Exhibit 4. Citizenship ESG Factor: Breakdown by Sectors**



Source: Factor Research

The conclusion of the report was interesting. It stated:

“The notion that companies that care about the environment, look after their employees, and exhibit good governance outperform is likely too good to be true.

“The drivers of performance since 2009 were common equity factors. While factor exposure might change over time, ESG investors currently run the risk of missing out if small and cheap stocks start outperforming low-risk and high-quality stocks.

“Historically, speculating on small and cheap stocks hasn’t been a bad bet. That may be true again.”

**“...as long as they don’t understand why ESG should really matter, then they are not really believing in it”**

Once again, we have battling ESG studies. It must be noted, however, that the ESG investment movement is growing and may provide fertile ground for asset managers. While we see Swiss Re, the world’s second-largest reinsurer, beginning to shift its entire \$130 billion portfolio towards ESG indices, one needs to always keep in mind the outcome of the CalPERS study on divestment. At the same time, BlackRock is aggressively launching products with high ESG ratings. Mr. Fink recently predicted assets under management in the ESG category at his firm will grow from the current \$25 billion to \$400 billion in 2028. However, as Mr. Giese of MSCI points out, “That [the inability to explain the reason for ESG factor success] has been quite frustrating for asset owners or asset managers who are interested in investing in ESG, because as long as they don’t understand why ESG should really matter, then they are not really believing in it.”

**The fund, which also holds the nation's direct interest in its national oil company, Equinor (EQNR-NYSE), formerly Statoil, was created to protect against the eventual decline in oil revenue and to smooth the disruptive effects of fluctuating oil prices**

Does the Norwegian oil and gas stock divestment decision add any insight to the ESG investment debate? The Norway Oil Fund was created in 1990 to invest surplus revenues from the Norwegian petroleum sector. The fund, which also holds the nation's direct interest in its national oil company, Equinor (EQNR-NYSE), formerly Statoil, was created to protect against the eventual decline in oil revenue and to smooth the disruptive effects of fluctuating oil prices. Besides stocks and bonds, the fund also owns real estate and private equity investments. It is managed by Norges Bank Investment Management, a part of the Norwegian Central Bank. Against its mandate, the decision is not surprising. The summary of the report by the Ministry of Finance to the Storting shows that the decision was tempered by the concern that 60% of the remaining petroleum resources, measured by net present value, will be extracted and transferred to the fund "over the next decade or so."

The examination of the divestment issue started in November 2017, and was further studied by a specially appointed group beginning in February 2018. The decision by FTSE Russell, the provider of the benchmark index whose performance is used to measure the Oil Fund's relative performance, to change the name of the oil and gas sector to energy sector, played a role in the deliberations. Recognizing that the fund was designed to mitigate the oil price risk, this decision says less about that risk and more about the possibility that "climate risk" needs to be examined in greater depth. The report concluded that divestment of energy stocks "will only make a limited contribution to further reduction of this [oil price] risk."

In reaching its conclusion, the Ministry of Finance's assessment of the risk of energy stocks considered the following issues.

- "The Norwegian economy is vulnerable to oil price risk.
- "The oil price risk has been significantly reduced over time, and the capacity to absorb such risk is now high.
- "An exclusion of the energy stocks in the GPFG will serve to further reduce the oil price risk, but the effect appears to be limited.
- "Sector level classifications of companies are inaccurate for reducing oil price risk.
- "To exclude exploration and production companies from the GPFG appear more accurate to reduce oil price risk.
- "Climate risk is an important financial risk factor for the GPFG.
- "Broad support for the financial objective of the GPFG is important, but cannot be taken for granted."

**The Ministry of Finance will work with Norges Bank to establish rules for phaseout of these investments**

The report concluded with the Norwegian government deciding to omit companies classified as exploration and production companies from the Oil Fund's benchmark index and its investment universe. The Ministry of Finance will work with Norges Bank to establish rules for phaseout of these investments. Importantly, the report stated

**The Government also has determined that climate risk is an important financial risk factor for the fund, and may impact companies in the portfolio, beyond energy companies**

that the decision “does not reflect any specific view on the oil price, future profitability or sustainability of the petroleum sector.” That is an important point. On the other hand, the Government also has determined that climate risk is an important financial risk factor for the fund, and may impact companies in the portfolio, beyond energy companies. Therefore, the Ministry of Finance is asking its advisor to review climate risk associated with all company investments in both the equity and fixed income portfolios.

**BP plc is the latest European oil company to say it would support an investor proposal for the company to expand its carbon emissions reporting and to describe how BP’s strategy is consistent with the goals of the 2015 Paris Agreement on climate change action**

It is likely that had the Oil Fund decided to divest all energy stocks from its portfolio, it would have been forced to sell its ownership in Equinor, a high-profile company in Norway with 17,600 employees working there out of a worldwide headcount of 20,200. That would have presented a potentially serious political issue in Norway. A justification offered for not divesting major oil and gas company shares is that they are diversifying their business models to include and grow low- and no-carbon energy sources. While welcomed by the international oil companies, the pressure for them to become greener and more attentive to ESG issues increases daily. Exxon Mobil Corp. (XOM-NYSE) continues to fight shareholder resolutions about climate change actions and reporting. At the same time, the company, as well as Chevron Corp. (CVX-NYSE), fight legal battles over climate change knowledge and the sale of petroleum products. The investor climate change effort is more intense, and appears to be more successful, in Europe in pressuring oil companies based there to re-shape their business model and openness to climate change mitigation. BP plc (BP-NYSE) is the latest European oil company to say it would support an investor proposal for the company to expand its carbon emissions reporting and to describe how BP’s strategy is consistent with the goals of the 2015 Paris Agreement on climate change action.

**The unanswered question is whether an energy divestment strategy will cost investment funds meaningful revenue in the future as the tobacco divestment did for CalPERS**

Climate change is a serious issue. The degree that it may impact future climate remains open to debate. The debate should include a discussion about the economic and social restructurings being proposed (ordered?) as solutions to the speculatively-derived projections for the world’s climate, economy and society. Just as protests aimed at pipeline investments have become a key strategy of climate change activists, ESG investing is becoming a popular alternative way to wage war against energy companies. The unanswered question is whether an energy divestment strategy will cost investment funds meaningful revenue in the future, just as the tobacco divestment did for CalPERS. In a world in which most pension funds are woefully underfunded, losing such revenue could prove devastating for beneficiaries. Energy company executives must be sensitive to these issues, but also remain focused on acting to create shareholder value. Walking that fine line is, and will likely continue to be, a significant challenge.

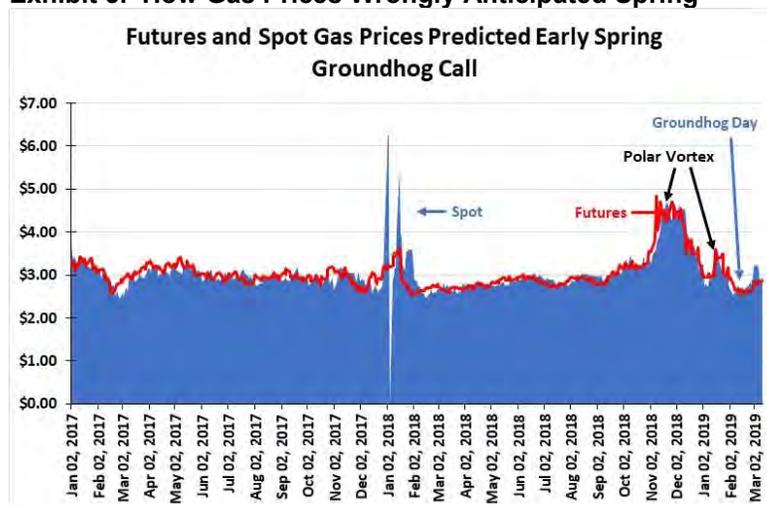
## Natural Gas Remains Most Misunderstood Energy Market

**The recent weeks of cold and snow prompted some media to want to charge Punxsutawney Phil with lying about the impending arrival of spring**

With all the extreme winter weather this year, one would have expected natural gas prices to have reached higher levels, even as we approach the end of heating season demand. Higher prices would have been in response to the large weekly gas storage withdrawals experienced in recent weeks due to the persistent cold weather. The recent weeks of cold and snow prompted some media to want to charge Punxsutawney Phil with lying about the impending arrival of spring based on him not seeing his shadow when pulled from his lair early on that February 2<sup>nd</sup> morning. Phil's message was that spring would be here in six weeks. But the continuing cold and snow is keeping people bundled up and hands on their snow shovels. Spring can't come soon enough for most!

Although natural gas prices are struggling to return to \$3 per thousand cubic feet (Mcf), an examination of recent price activity shows that prices essentially reached bottom on Groundhog Day and have been trending upward, ever so slightly, since. That is hardly a reward for gas producers, but this continues to be a strange market, which seems to be operating in response to new industry dynamics. Are these new dynamics sustainable? If so, do they mean we must rethink other basic assumptions about energy markets?

**Exhibit 5. How Gas Prices Wrongly Anticipated Spring**



Source: EIA, PPHB

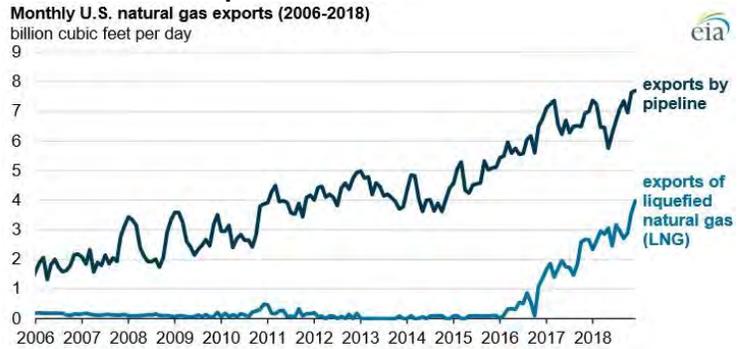
**Natural gas has gained market share in the power generation sector by undercutting coal both on price and environmental qualities**

Over the past few years, natural gas has gained market share in the power generation sector by undercutting coal both on price and environmental qualities. On the morning of March 15<sup>th</sup>, in New England, according to the Energy Information Administration's (EIA) web site that utilizes ISO-NE data, 45% of the region's electricity was being generated by natural gas-fired power plants. Another

**Dispatchable power continues to be the workhorse of electricity generation, especially during cold weather**

34% was coming from the region's nuclear power plants. Dispatchable power continues to be the workhorse of electricity generation, especially during cold weather. That phenomenon affects many regions across the United States. But, even after gaining market share in the power sector, and with growing exports of natural gas to neighboring countries by pipelines, or around the world as liquefied natural gas (LNG), domestic gas prices continue languishing below \$3/Mcf.

**Exhibit 6. Gas Exports Are New Growth Markets**

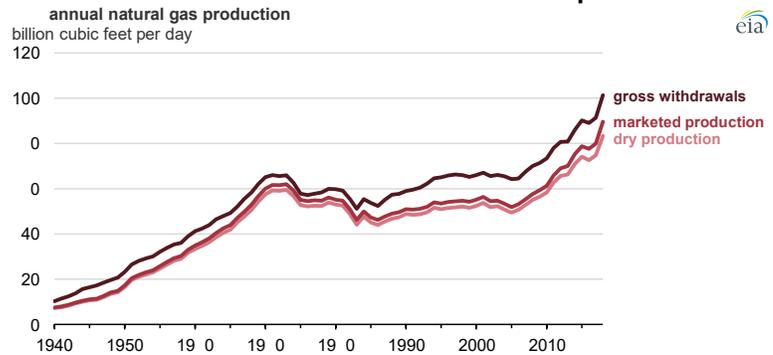


Source: EIA

**The STEO projects a 2.7% increase in supply over the next 12 months, and a 3% increase in output by December 2020**

The issue for natural gas prices appears to be the relentless rise in natural gas production. As the EIA reported recently, the U.S. established a new peak in gas production last year. Based on the EIA's Short-Term Energy Outlook for March 2019, total natural gas marketed supply was estimated at 96.14 billion cubic feet per day (Bcf/d) in February. The STEO projects a 2.7% increase in supply over the next 12 months, and a 3% increase in output by December 2020. Thus, gas producers are slated to continue to set production records for the next 22 months, and possibly longer. That outlook, assuming it comes to pass, provides comfort for natural gas consumers that adequate supplies will be available, and presumably at a reasonable cost, for the foreseeable future.

**Exhibit 7. The Relentless Growth Of Gas Output**

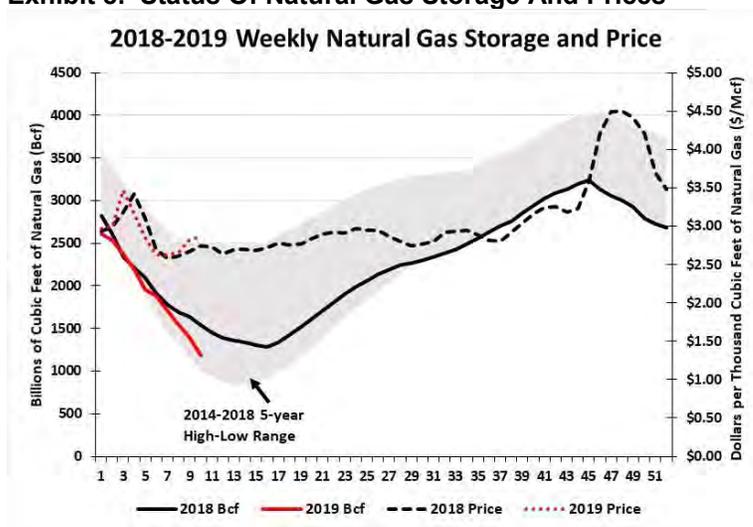


Source: EIA

**The assumption about adequate supply is critical in explaining why natural gas prices continue to languish around the \$3/Mcf level despite the sharp fall in gas storage**

The assumption about adequate supply is critical in explaining why natural gas prices continue to languish around the \$3/Mcf level despite the sharp fall in gas storage. As additional gas pipeline capacity is added to the nation’s gas transportation infrastructure and producers stop flaring associated gas coming from oil wells, the ability of the nation’s natural gas industry to satisfy domestic demand improves. We see all this playing out in the price action after we consider last week’s storage withdrawal of 204 billion cubic feet (Bcf) and where the remaining storage volume is relative to last year’s storage and the five-year high and low volumes. Current gas storage volumes are 23.2% below last year at this time, and 32.4% below the 5-year average. Exhibit 8 captures the storage and price picture.

**Exhibit 8. Status Of Natural Gas Storage And Prices**



Source: EIA, PPHB

**What is notable is that recent gas prices are trending up compared to last year, just as the latest weekly withdrawals have taken storage volumes well below those of a year ago**

As the chart demonstrates, natural gas prices so far this year have closely followed prices last year. That is not surprising given that the storage volumes for 2019 and 2018, as well as the 5-year low storage volume are very close. What is notable is that recent gas prices are trending up compared to last year, just as the latest weekly withdrawals have taken storage volumes well below those of a year ago. Despite the recent uplift in natural gas prices, as of last Friday, the near-month futures price was hovering around \$2.80/Mcf. It is clear the natural gas market believes gas supply will be adequate to meet the demand needs from all consumers – domestic and foreign – and will allow the rebuilding of storage this summer in order to be ready to meet next winter’s needs.

The only warning we would raise is for the New England region. It remains caught in a vise of falling dispatchable power – coal, nuclear, oil and gas – and rising intermittent power, putting increased pressure on gas-fired backup power. Without increased

**Without the gas from the Sable Offshore Energy Project and Deep Panuke fields offshore Nova Scotia, which is used to meet Canada's Maritimes' demand while also providing gas for export to the U.S. Northeast, New England may be facing higher power prices in the future**

gas pipeline capacity into the region, which means overcoming the blocking actions by New York state, the ability to grow gas-powered generation may be limited. This problem becomes more acute with the shutting down of Canada's East Coast offshore natural gas production. Without the gas from the Sable Offshore Energy Project and Deep Panuke fields offshore Nova Scotia, which is used to meet Canada's Maritimes' demand while also providing gas for export to the U.S. Northeast, New England may be facing higher power prices in the future, as the region is forced to rely on more expensive backup fuels during winter months.

The natural gas business continues its Rodney Dangerfield act - "I don't get no respect." It might be more appropriate to think of the players in the gas market following the mantra of *Mad* magazine's Alfred E. Neuman - "What, me worry?" Worry may only come when the first customer can't get the gas he wants at a sufficiently low price. Right now, who knows when, or if, that will happen.

## **Are We Watching The Demise Of Oil Supplier Venezuela?**

**Venezuelan President Nicolás Maduro attributed the outage to a cyberattack orchestrated by U.S. Senator Marco Rubio (R) and opposition forces working to overturn the Venezuelan government**

The weekend before last, Venezuela experienced further chaos when the nation's power grid failed, throwing virtually all of the country into a blackout. The massive power failure added to the struggle of Venezuelan residents dealing with the humanitarian crisis that has enveloped the country as its economy collapses. The power failure occurred in the late afternoon on a Thursday, just as rush-hour travel began. Venezuelan President Nicolás Maduro attributed the outage to a cyberattack orchestrated by U.S. Senator Marco Rubio (R) and opposition forces working to overturn the Venezuelan government. The reality is that the electricity grid collapsed due to the lack of maintenance and spare parts, as a result of the Venezuelan government's failure to adequately fund the system. This system's breakdown is similar to what is happening throughout the Venezuelan economy, and especially for its energy industry – the lifeblood of the government's revenue.

**In contrast to the previous nationwide electricity outages in 2008 and 2013, which were restored in about six hours, this blackout finds the government not only without adequate spare parts, but also lacking the knowledge and skills to repair the equipment**

The electricity blackout lasted for days, with power restored intermittently to Caracas and then to parts of the country, but a substantial portion of the nation had little relief. Rotting food due to a lack of refrigeration, lack of transportation and communications, along with deteriorating health conditions due to crumbling hospital infrastructures, generators running out of fuel, and a lack of medicines is worsening the humanitarian crisis. In contrast to the previous nationwide electricity outages in 2008 and 2013, which were restored in about six hours, this blackout finds the government not only without adequate spare parts, but also lacking the knowledge and skills to repair the equipment. Many of the skilled electrical system employees have left as part of the over 3.4 million people who have migrated from Venezuela since 2015, as the humanitarian crisis has worsened.

**Venezuela depends on hydroelectricity for 70-80% of its power**

Venezuela depends on hydroelectricity for 70-80% of its power. The El Guri hydroelectric power station, about 100 kilometers (62 miles) upstream from the mouth of the Caroní River in the Orinoco, was built in the late 1960s, and then upgraded in the late 1970s. (The dam is shown at the head of the Caroní River in the map in Exhibit 9.) Due to continuing power demand growth in Venezuela, the dam was further expanded in the late 1980s. This dam and power station are the linchpin of the nation's electricity grid with high tension power lines carrying the electricity generated there across the country.

**Exhibit 9 Venezuela's Energy Infrastructure**



Source: Shutterstock.com

**He claimed that 70% of the power output had been restored by Friday night, one day after the outage began, but was damaged again by mid-day Saturday**

In a weekend rally early in the blackout, President Maduro reported on the chronology of the five attacks on the electrical system, including physical attacks on generation stations, electromagnetic attacks on transmission networks and cyberattacks on the automated control system. He claimed that 70% of the power output had been restored by Friday night, one day after the outage began, but was damaged again by mid-day Saturday. He blamed the power outage on the electrical system designed by the United States and power company employees he called "infiltrators in the company." An early move by the government was to seek to identify and arrest those infiltrators.

An article in the *Caracas Chronicles* presented a sharply different story about the power failure based on interviews with current and former power company employees. Most of the details in this story have been verified by other major reporting sources.

“From people inside the electric industry, we know that an overheat alarm was triggered between the San Geronimo B and Malena substations, which are like nodes. San Geronimo B is just South of Valle de La Pascua (Guarico state, central plains); Malena is a bit in the middle of nowhere, between Bolivar's Trocal 19 and the Orinoco River.

“From San Geronimo B substation, comes the electric load to power all the TVs, light bulbs, blenders, etc. At Malena substation end the cables that come directly from the turning water wheels of the Guri dam. If you follow the lines from Guri, the country's main dam South of Ciudad Guayana, they go North from Guri to Malena and San Geronimo, and from there it splits into several lines going to the central region and then to the rest of the country (East and West).

“This particular corridor carries three 5 kV (kilovolts) power lines, which are the largest and most important lines of the country. One of these lines, apparently the one between San Geronimo B and Malena, went out and overloaded the other two, so all three died. When all of a sudden the lines went off and power wasn't getting through, not only all those TVs, blenders and lights went off: The water wheels started to spin out of control (in the industry we call this scenario a "load rejection"). Protections systems kicked in and the turbines shut themselves off, hopefully with no damage.

“Imagine the National Electric System as a bicycle. The rear wheel is all the electric load, the pedals are the turbines, the Caroni river as the legs powering it, and the chain connecting the whole system are those 765 kV lines. On March 7th, that chain broke.

“The engineers suspect that the overheat alarm was triggered by a forest fire. It is mandatory to keep vegetation trimmed under and around power lines, to avoid the risk of this kind of events. Anyone that has driven by the countryside and under these large power lines would see there's a corridor under the lines. These corridors haven't been maintained in years and there is a very hot summer going on. In a tropical country, this means the bushes can cover a line very fast.”

**Subsequent information details that there were four attempts to restart El Guri's turbines, but each attempt failed**

Subsequent information details that there were four attempts to restart El Guri's turbines, but each attempt failed. As of early last week, there was no time set for restarting the turbines. According to former power company employees, besides the lack of proper maintenance under the power lines, there is a lack of quality spare parts. In the past, most spare parts came from power

**There were seven states without electricity (black), six with partial service (light gray) and 11 with precarious service (dark gray)**

equipment manufacturers in Europe, but now they come from China and are supposedly of poor quality that results in their failure. One *New York Times* reporter wrote about traveling to the El Guri substation, which was eerily quiet, with no signs of activity.

On March 11<sup>th</sup>, Juan Guaidó, the interim president of Venezuela and the leader of the political opposition to the Maduro government, tweeted out a copy of the map of the country with the status of electricity in each state as of 11:30 am. There were seven states without electricity (black), six with partial service (light gray) and 11 with precarious service (dark gray). We are not sure the exact standards for precarious and partial, but we assume the former indicates much less and highly unstable power, while suggesting the latter term means power is only available in certain geographic locations. Regardless of the definitions, the fact was that nowhere in Venezuela had unrestricted power five days after the blackout occurred. This raises a serious question about the future for the country's economy and its people.

**Exhibit 10. Venezuela Electricity Status March 11**

**Reporte de Suministro Eléctrico**

11/03 Hora: 11:30 am



Source: *Tweeter*

**The fossil fuel plants were reportedly only operating at 20% of utilization due to a lack of fuel**

Early last week, there were reports that the Maduro government was producing power from fossil fuel plants and substations associated with smaller dams. The fossil fuel plants were reportedly only operating at 20% of utilization due to a lack of fuel. The power being generated was being selectively directed to areas of Caracas, and, importantly, to the pumps to produce oil for export to keep the government running.

On Tuesday of last week, in an interview on *CNBC*, the head of OPEC would not directly answer the question of whether

**The mass firings and replacement with Chavez loyalists set in motion the slow destruction of the technical skills for operating the national oil company**

**This move proved highly successful as OPEC member countries began to adhere to production quotas that limited oil supplies and lifted prices above \$27 per barrel, the highest since the mid-1980s oil price crash**

**The government began to syphon off more funds for these social programs increasing operational pressure on PDVSA that was struggling to sustain oil output**

Venezuela's oil production had fallen below one million barrels a day. We know the lack of power has created a significant obstacle for Venezuelans seeking to fuel their vehicles, not only because of the lack of available fuel, but also because of a lack of power at gasoline stations to pump the gasoline.

The deteriorating economic situation in Venezuela has been underway for years and is taking a toll on the country's oil industry. Looking at the history of Venezuela's crude oil production and its exports shows how the deterioration has accelerated recently. Following the oil price collapse in 1986, Venezuelan oil production grew steadily throughout the 1990s and peaked in 1998. From that point through 2006, Venezuelan oil production stayed within 10% of its peak output with the exception of the period impacted by the oil industry strike of 2002. That strike led to the firing of 19,000 PDVSA employees. The mass firings and replacement with Chavez loyalists set in motion the slow destruction of the technical skills for operating the national oil company.

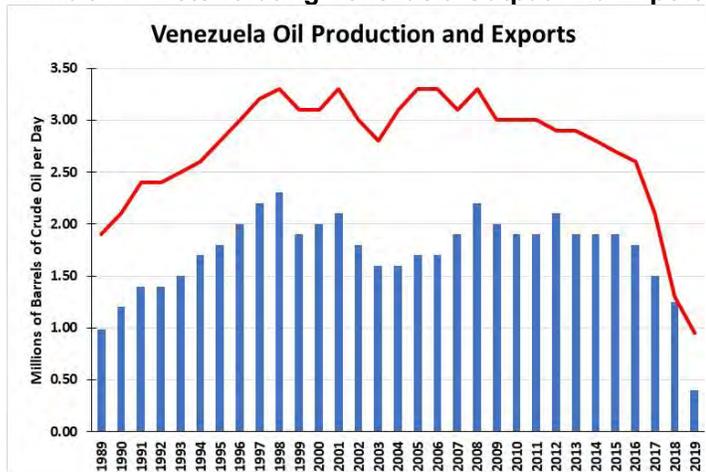
The period between 1998 and the 2002 strike represented significant period in the history of the global oil industry. OPEC was formed in 1960 due to the driving influence of Venezuela. The cartel's revival during 1999 -2002 was also due to Venezuelan influence. Following President Hugo Chavez's first election in December 1999, he installed Alí Rodríguez as Venezuela's oil minister. Mr. Rodríguez was subsequently elected to head OPEC in 2000, culminating an extensive lobbying effort by Mr. Chavez with the aim of restoring the power of OPEC. This move proved highly successful as OPEC member countries began to adhere to production quotas that limited oil supplies and lifted prices above \$27 per barrel, the highest since the mid-1980s oil price crash.

This move to restore OPEC's power clashed with the actions of PDVSA's executives who had been operating with the goal of increasing production without concern about OPEC quotas. Now forced to live within quota constraints and under the leadership of Mr. Rodríguez, who had been installed as the CEO of PDVSA following his term heading OPEC, the tension between PDVSA executives and the Chavez government eventually led to the general strike of 2002-2003 and the mass oil industry firings.

During the period up to the strike, PDVSA had been good at finding and bringing into production new fields. There are studies that now question whether the company was as efficient in this effort as it had been in earlier years, but the combination of high oil prices in the early 2000s and high output produced substantial funds for the Chavez government to boost its social spending and to fund oil output. The government began to syphon off more funds for these social programs increasing operational pressure on PDVSA that was struggling to sustain oil output. Production began to slowly decline.

The slow decline was due to the strong revenue flow the oil company was receiving and its operational strengths, which had only begun to erode.

#### Exhibit 11. Deteriorating Venezuela Output And Exports

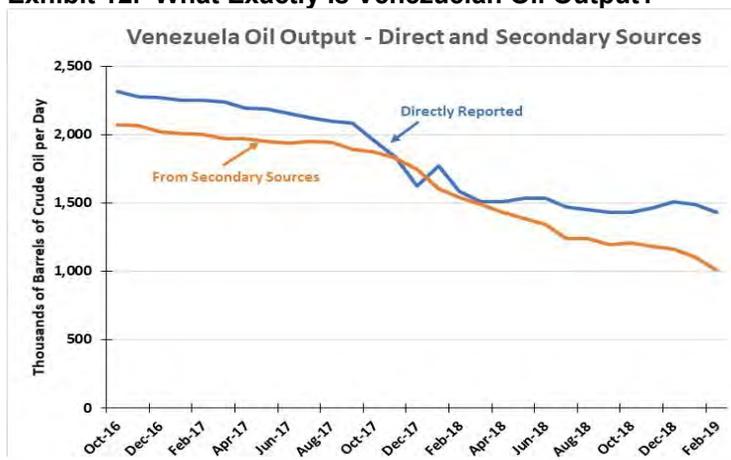


Source: IEA, OPEC, EIA, PPHB

**Based on current projections, 2019 oil production will average below one million barrels per day and exports are likely to only average slightly above 400,000 barrels per day**

The first problems arose when global oil prices collapsed during the Financial Crisis and Great Recession of 2008-2009. Oil prices quickly rebounded easing the problems PDVSA faced. But, as the government continued to drain funds from PDVSA, and coupled with the loss of its technical expertise, the nation's output slipped further. The 2014 oil price collapse, and subsequent three years of low oil prices, has resulted in a more rapid fall in oil output. Based on current projections, 2019 oil production will average below one million barrels per day and exports are likely to only average slightly above 400,000 barrels per day.

One of the historical problems for OPEC, and global oil analysts, has been determining exactly what is Venezuela's oil production. If one reads OPEC's Monthly Oil Report, there are two tables listing the monthly oil output for the various OPEC members. One report is based on direct data reports from the member oil ministries. The second report of monthly oil production is based on data gathered from secondary reporting sources. Interestingly, the secondary-source table is presented first in the report. We have gone back to late 2016 and compared the monthly data from the two tables for Venezuela. There was a notable difference. A number of years ago, we were on a panel in Norway with an OPEC official involved in compiling the organization's oil reports who spoke about his frustration over the quality of the production data received from the various member countries, including Venezuela. This was about the time OPEC began reporting production data in the two different tables.

**Exhibit 12. What Exactly Is Venezuelan Oil Output?**

Source: OPEC, PPHB

**In October through December 2018, Venezuela reported rising output, while secondary reports suggested it was falling**

The most interesting point about Exhibit 12 is at the end of 2017 and early 2018 when the two monthly reports were fairly close. We don't know the explanation for that closeness other than Venezuela became more honest in reporting its production, which, as can be seen, was falling sharply. Since last Spring, Venezuela has again reported production greater than the data coming from secondary sources. In October through December 2018, Venezuela reported rising output, while secondary reports suggested it was falling. The respective declines in output for January and February 2019 show further questionable "official" output figures.

**Both companies are working to return the oil, but reportedly without any success**

Venezuelan oil output has reportedly fallen below one million barrels per day, and given the March power failure, it will be sharply lower for the month. The big question is how much oil the country can export to earn income. The U.S. sanctions on PDVSA's oil is creating serious challenges for the country to sell its output to generate income. There are reports that Chevron Corp. (CVX-NYSE) and Valero Energy Corp. (VLO-NYSE) purchased oil just as the U.S. financial sanctions on Venezuela were put in place. Both companies are working to return the oil, but reportedly without any success. The payments for the oil should have been moved into a special account, which is available to the newly recognized interim government and not the government of President Maduro.

**The IEA has cut its expected Venezuelan oil production to only 750,000 barrels per day for the balance of the year, well below prior expectations of 1.2 million barrels per day**

A series of challenges are confronting PDVSA. First is the power situation, which continues to linger in Venezuela. Exactly how much it is impacting the oil producing and refining operations of PDVSA remains unclear at the present time. The International Energy Agency (IEA) has cut its expected Venezuelan oil production to only 750,000 barrels per day for the balance of the year, well below prior expectations of 1.2 million barrels per day. The big question for Venezuela is how much of that production can be exported to generate revenue for the government?

**There are reports that the German shipping company that was operating the Venezuelan oil tanker fleet has parked those ships and removed its crews for lack of payment by PDVSA**

The issue of PDVSA's ability to export oil is uncertain. While initially the sanctions were not strictly enforced, that has changed as the U.S. government has begun enforcing much more stringent rules against dealings with PDVSA. This has forced India's Reliance Group, which has purchased crude oil from Venezuela and was supplying diluent to dilute the heavy Orinoco oil, to now declare it will no longer engage in either business. Russia continues to support the Venezuelan oil industry, but it is beginning to pull back politically due to the growing humanitarian crisis. Russian oil companies have been buying oil, which they usually sell into European markets, as well as supplying diluent. China, who has supported the Maduro regime with sizable loans and investments, continues to take oil, but as a credit against outstanding loans. In other words, China is not providing cash to Venezuela. There are reports that the German shipping company that was operating the Venezuelan oil tanker fleet has parked those ships and removed its crews for lack of payment by PDVSA. That means even if PDVSA could get oil into ships, they are unable to go anywhere.

**That would be the first oil exported from Venezuela, a week after the nation's power supply crashed**

According to the latest report (last Wednesday), two oil storage tanks containing diluent exploded at the heavy-oil upgrading project Petro San Felix in eastern Venezuela. Pictures reportedly showed the two tanks ablaze with heavy black smoke spiraling into the sky. The president of PDVSA tweeted that the tanks were attacked by terrorists supporting opposition leader Mr. Guaido. The report also said that at Jose, the country's main oil exporting port, one ship had been loaded to transport oil domestically between ports. A tanker chartered to Petrochina completed loading and was preparing to sail to China. That would be the first oil exported from Venezuela, a week after the nation's power supply crashed.

**The SPE official questioned how long before a refinery operated by untrained military personnel experiences an accident?**

With respect to daily operations, a senior Society of Petroleum Engineers (SPE) official told us that PDVSA has taken all its skilled workers from its refinery operations and shipped them out to the company's drilling rigs scattered across the country, as the company needs new producing wells to sustain its production. Those workers were replaced by military personnel. We suspect the PDVSA employees are not happy about being transferred from running the refinery to the more strenuous work of operating drilling rigs. The SPE official questioned how long before a refinery operated by untrained military personnel experiences an accident? Given PDVSA's financial condition, the refineries are known to have experienced operating problems due to a lack of spare parts and adequate maintenance, increasing the chance of a catastrophic refinery accident given the lack of skilled labor running them.

As the struggles between the Maduro regime and the interim government continue, the headquarters of PDVSA was moved to Moscow by Maduro. This move was intended to keep PDVSA, and whatever income it can generate, beyond the reach of the interim government and outside of U.S. sanctions. We have already seen

**Citgo has relied on Venezuelan oil for about a quarter of its refinery input, but this volume is easily replaced from other sources**

that the members of the new PDVSA board of directors, appointed by the interim government, have been declared criminals and subject to arrest by the Maduro regime. What has been successfully accomplished by the interim government is the appointment of a new board of directors for PDVSA's Citgo unit. As a U.S. incorporated company, its officials are beyond the reach of the Maduro government. Citgo operates three refineries in the United States (Texas, Louisiana and Illinois), along with a network of company-owned gasoline stations. The company's new CEO, Luisa Palacios, recently told the CeraWEEK gathering in Houston that Citgo has relied on Venezuelan oil for about a quarter of its refinery input, but this volume is easily replaced from other sources. She said that last year, the refineries had processed 60 different crude oils from 38 suppliers in 19 countries. Based on EIA data, Citgo used 56 million barrels of Venezuelan oil during the first 10 months of 2018. That averages to about 185,000 barrels per day of imported Venezuelan crude oil. The U.S. Gulf Coast refinery industry has been a major consumer of Venezuelan heavy, sour crude oil. The refineries are scrambling to establish new oil supply sources, but that is more a logistical and cost issue than a physical shortage situation. As a last resort for the domestic refining industry to offset the loss of Venezuelan oil, slightly over 60% of the 649.1 million barrels of oil in the U.S. Strategic Petroleum Reserve is heavy, sour oil of the type the refineries are seeking to replace. There are no indications that the U.S. government is contemplating a sale of any oil from the SPR.

**For example, the claim of a cyberattack on the power substation at El Guri by the Maduro government is difficult to reconcile against plant workers who explain that the plant computers are not linked to the Internet**

Venezuela's economy and society are struggling to deal with the growing humanitarian crisis that is claiming lives and forcing mass migration. The latter is taking a substantial amount of skilled and educated labor out of the country, which is pointed to as a problem when events such as the massive power failure occur. It is fascinating to read the media coverage of events from inside Venezuela compared to the "official" versions reported by the Maduro regime and its supporters. For example, the claim of a cyberattack on the power substation at El Guri by the Maduro government is difficult to reconcile against plant workers who explain that the plant computers are not linked to the Internet. Sorting out what is true about current economic and oil industry conditions is just as much of a challenge. We believe it will be extremely difficult for Venezuela to remain a major oil market player in 2019 as long as the government leadership battle continues.

**The loss of even all of Venezuelan current oil production and exports should not be a serious issue for the market**

The loss of even all of Venezuelan current oil production and exports should not be a serious issue for the market, as the global oil market is being balanced by a cut of nearly 1.4 million barrels of output by OPEC, Russia and Canada, and there exists other surplus production capacity. How long the global market could operate without Venezuelan oil is another question. But, the most important questions are what will it take to restore Venezuela's oil industry to a healthy and reliable condition, and, importantly, how long might it

take to achieve that status once political and economic stability is achieved? With the world's largest oil reserves, albeit much of it is extremely heavy bitumen, the country needs a viable oil industry to support its economic and humanitarian recovery.

## The Future For EVs And Transportation Oil Demand

### **The key for eliminating petroleum is to electrify our transportation system**

The goal of the climate change movement is to move the world off using petroleum and coal – one fuel primarily associated with transportation and the other with power generation. The key for eliminating petroleum is to electrify our transportation system, even though there are no commercially viable or even technically capable solutions for airplanes or ships. Therefore, the focus has been on eliminating internal combustion engine (ICE) vehicles, and replacing them with electrically-powered ones.

The push by governments around the world to ban ICE vehicles in the future, especially in Europe following the diesel emissions cheating scandal caused by Volkswagen in 2015, has forced every car manufacturer to embrace electric vehicles (EV). The slowing, and potential decline, of automobile sales in the developed economies of the world, and the rapid growth in vehicle sales in developing economies is further forcing global auto manufacturers to reassess their production plans and models, and geographical operating locations.

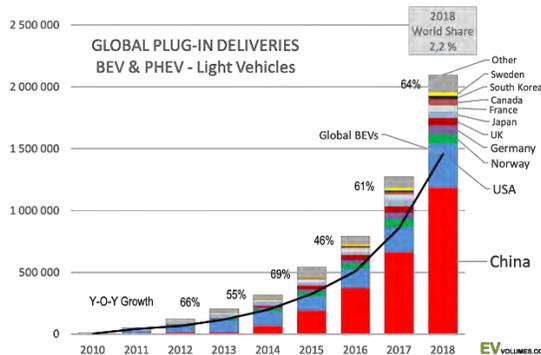
### **The country's rules also require carmakers to sell more alternative-fuel cars if they want to continue to sell ICE cars**

The world's largest car market is China with sales of about 2 million units per year. China, which is the world's largest market for EVs has decreed it wants one in every five cars sold to run on an alternative fuel by 2025. The country's rules also require carmakers to sell more alternative-fuel cars if they want to continue to sell ICE cars. Given these mandates, global car companies are increasingly basing their future vehicle production plans around satisfying the demands of China.

### **Although the pace of EV sales BEV and PHEV has been slightly faster than previously forecasted, they still represent a small fraction of global new light vehicle sales, averaging only 2.2% for 2018**

The impact of EVs on the oil market has become a battle ground for forecasters. Will EVs be embraced at the speed with which the world sucked up cell phones? Or, will we see EV fleets grow more slowly, like how the telephone or washing machine was embraced? Basing EV forecasts off the cell phone uptake pace results in them accounting for a third to half of new car sales by 2035-2040 from a current low single-digit rate. On the other hand, although the pace of EV sales (battery electric (BEV) and plug-in hybrid vehicles (PHEV)) has been slightly faster than previously forecasted, they still represent a small fraction of global new light vehicle sales, averaging only 2.2% for 2018. Sales did grow rapidly during the year, reaching a 3.8% rate in December, according to *EVvolumes.com*.

**Exhibit 13. Growth Of Worldwide EV Fleet**



Source: *EVvolumes.com*

**Global plug-in vehicle sales represented 2.1 million units during 2018**

Global plug-in vehicle sales represented 2.1 million units during 2018, 64 % greater than for 2017. The universe of EVs counted included all BEV and PHEV passenger cars sales, light duty trucks in the U.S. and Canada, as well as light commercial vehicles in Europe and China.

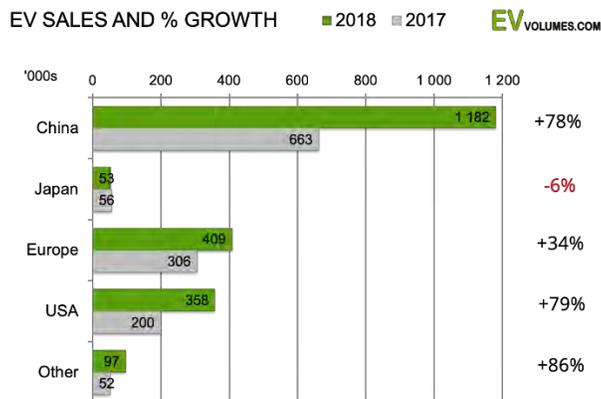
**At year-end 2018, the EV fleet totaled 5.4 million units**

At year-end 2018, the EV fleet totaled 5.4 million units. Medium and heavy commercial vehicles, 80% of which were electric buses, add another 600,000 units to the global EV fleet total. This component of the global EV fleet grew by 120,000 units in 2018, of which 98% were built in China.

**For 2019, EVvolumes.com expects EV sales to reach 3.2 million units, with an additional 140,000 heavy duty vehicles**

For 2019, *EVvolumes.com* expects EV sales to reach 3.2 million units, with an additional 140,000 heavy duty vehicles. There are expectations this forecast may prove low, as EV sales are growing very rapidly in China. Exhibit 14 shows how significant the Chinese EV market is, and why auto manufacturers are targeting it so aggressively.

**Exhibit 14. EV Sales Growth By Area**



Source: *EVvolumes.com*

**Comparing estimates, in the 2019 Outlook, EV market share increased to 9.5% from 6% of the fleet for 2035, a 50% increase in two years**

To appreciate how quickly the EV market is changing, with a commensurate impact on oil demand, one needs only to read the three most recent issues of the “BP Energy Outlook.” Although the terminal date of the BP forecasts moved from 2035 to 2040, we were still able to track BP plc’s (BP-NYSE) higher EV estimates. In 2017, BP projected EVs increasing from 1.2 million cars in 2015 to 100 million in 2035, representing 6% of the global fleet. The 2018 Outlook forecasted that there would be 300 million EVs by 2040. That estimate rose to 350 million EVs in the company’s recently released 2019 Outlook. BP suggests its EV estimate will equate to 15% of all cars and 12% of all light-duty vehicles in 2040. Comparing estimates, in the 2019 Outlook, EV market share increased to 9.5% from 6% of the fleet for 2035, a 50% increase in two years.

**Regardless, oil will remain an important fuel for the remaining 85% of the global car fleet and 75% of miles driven, suggesting that the oil industry still has a long future ahead**

The key point BP made about the growth of EVs and their impact on the oil market, is that although EVs represent 15% of all cars in 2040, they will account for 25% of all passenger vehicle miles driven. This reflects EVs becoming dominant in urban and suburban areas, and for short trips. Regardless, oil will remain an important fuel for the remaining 85% of the global car fleet and 75% of miles driven, suggesting that the oil industry still has a long future ahead. At issue will be the growth rate for the petroleum business, as electrification of the fleet erodes transportation fuel demand. There are various cross-currents impacting the transportation fuel market that require further examination in order to more fully appreciate the potential timing for a peak in transportation fuel consumption.

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