

ESG Industry Report Card: Oil And Gas

June 3, 2019

(Editor's Note: Our ESG Industry Report Cards include an analysis of ESG factors for a selection of companies. We intend to expand our ESG Industry Report cards to include more companies throughout the year.)

Key Takeaways

- As fossil fuel producers, oil and gas companies are among the most exposed to the energy transition. This could weigh on long-term average oil prices and refining margins.
- The speed of the transition away from carbon-based fuels is uncertain, but is beginning to accelerate and will be influenced by external factors such as government environmental policies and regulations on greenhouse gases, plastics, and vehicle electrification.
- Over the next decade, we see average oil demand growth remaining positive. Hence, we do not anticipate sectorwide material rating actions over the next five years directly triggered by environmental challenges faced by the industry.
- Pollution, safety and community impacts are other important ESG-related factors that can influence individual company ratings. These include risks related to the use of chemicals (in fracking) as well as high impact, low probability events such as severe oil spills and refinery accidents. Related sectors that have a higher exposure to such risks are oil sands, shale, and offshore.

The ESG Risk Atlas

To calibrate the relative ranking of sectors, we use our environmental, social, and governance (ESG) Risk Atlas (see "The ESG Risk Atlas: Sector And Regional Rationales And Scores," published May 13, 2019). The Risk Atlas provides a relative ranking of industries in terms of exposure to environmental and social risks (and opportunities). The sector risk atlas charts (shown below) combine each sector's exposure to environmental and social risks, scoring it on a scale of 1 to 6. A score closer to 1 represents a relatively low exposure, while 6 indicates a high sectorwide exposure to environmental and social risk factors (for details see the Appendix). This report card expands further on the Risk Atlas sector analysis by focusing on the credit-specific impacts, which in turn forms the basis for analyzing the exposures and opportunities of individual companies in the sector.

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Exploration And Production

Environmental exposure (Risk Atlas: 6)

We divide environment risks in the oil and gas sector into two types, as noted in our Key Credit Factors criteria for the industry. The first type of risk stems from inherent material exposure to greenhouse gas emissions. The second type concerns lower probability but potentially high impact risks on individual companies from pollution because of well head and transport spills and leaks, and increasingly water use and contamination risks. The most significant risk is the pace of the energy transition away from carbon-based fuels; this could result in stronger deviations from the industry demand forecasts outlined below. It is likely to be strongly influenced by long-term government policies for renewable energy as well as the pace of electric vehicle penetration growth. "Risk of secular change and substitution by products, services, and technologies" is clearly articulated as a risk in the Key Credit Factors criteria for oil and gas in the industry risk assessment section.

The combustion of carbon-based fuels, specifically oil-derived products and natural gas, results in carbon dioxide. Natural gas, largely methane, is another greenhouse gas itself (when released) and has 25 times the impact of carbon dioxide. Production activities can also be a direct source of greenhouse gases, through methane leaks, gas flaring or extraction methods.

Oil production (and prices) are more exposed over the longer term. According to many market projections, we are likely over the next two decades to reach a point known as peak oil, in which aggregate demand for oil will peak and then start to decline. However, demand will likely continue to increase significantly before that happens. This change would also affect demand for oil field services, result in stranded reserves, and likely weigh on prices, depending on the extent and timing of supply corrections, including the typical onshore conventional oil field decline rate of 4%-6% per annum. These demand factors could therefore impact ratings over the long term. These risks could also impact the sector through limits on funding availability. Funding constraints for banks and other investors are presently more common for coal producers, but may well increasingly affect other fossil fuel producers and the sector as a whole.

Also, the risk of pollution is material for companies producing and transporting hydrocarbons and may result in material financial and reputational damage. While infrequent and unpredictable, the occurrence of disasters with the magnitude of the Deepwater Horizon oil spill in the Macondo Prospect, can severely impact issuer credit quality due to the significant liabilities incurred from environmental remediation, government fines, and lawsuits from industries and consumers affected by the occurrence. Such liabilities totalled more than \$60 billion in the case of Macondo. Oil tanker spills, even if vessels may not be operated by an oil company itself, equally can be a source of material litigation. Finally, the increased frequency of extreme weather events (such as hurricanes) have increased operational risk.

The environmental impact of plastic waste is another topic of consumer focus. Such plastics are largely derived from petrochemicals, which altogether account for about 14% of crude oil demand. Nonetheless, to the extent that plastics are used in construction, their carbon content is effectively sequestered. Water use and the risk of contamination of land and aquifers is particularly relevant for shale oil and gas producers, as a result of hydraulic fracturing activities. Many countries have stringent development, operating, and decommissioning requirements and potential penalties for companies that extract hydrocarbons. Moreover, many exploration and production companies, such as those operating in the Gulf of Mexico and North Sea, incur meaningful asset retirement obligations that we include as debt in our credit ratios.

Although a fossil fuel, we consider natural gas to be somewhat less exposed to environmental risk. This is because, when burnt for power generation, gas is significantly less polluting than coal. Hence, gas is seen as a vital bridge fuel in the energy transition to systemic decarbonization, which should support demand over the next two decades, even under a two degrees warming scenario. Comparing between gas producers and value chains, we note the higher total emissions arising from the liquefaction and delivery of liquefied natural gas (LNG) versus piped gas.

Social exposure (Risk Atlas: 5)

The key social risks in the oil and gas sector are based on its exposure to safety management, social cohesion, and ultimately consumer behaviour risks, which may lead to substitution of products. Our Key Credit Factors criteria for oil and gas also flags these factors that can influence producers' profitability, as well as substitution risks ultimately driven by consumer choices. Safety management is a key risk given drilling activities and sometimes harsh environmental conditions, especially offshore. Companies in the sector typically track and manage to incidents and have specific programs in place to educate workforces. The costs to ensure adequate safety and compliance with local regulations can be material, for example, in instances where crew time offshore is limited.

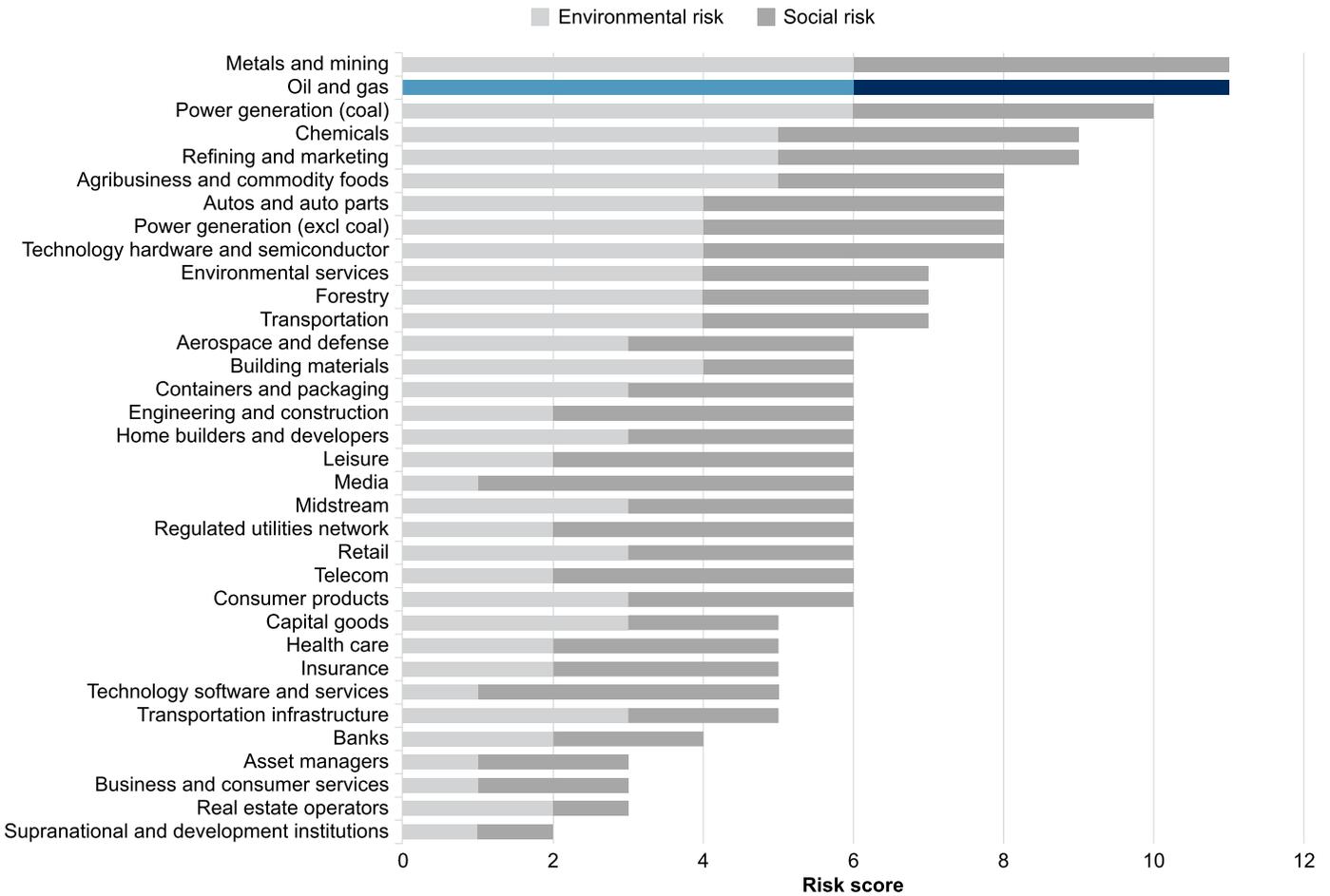
Social cohesion is another key risk, specifically in terms of licenses to operate, given land use and disruptions that drilling and production sites can typically create for local communities. Access to market can also be contentious, as shown by the Trans Mountain and Keystone XL pipelines in North America. Relationships to communities and governments are important in that a lack of shared benefits to them could create opposition. This can delay or raise costs for companies' reserve developments or even render them unviable, constraining growth and returns on capital. Our competitive position assessments capture both these qualitative aspects in competitive advantage and quantitative measures such as cash costs and full-cycle costs in operating efficiency.

Long-term consumer behaviour is likely to be increasingly influential in the energy transition away from carbon fuels and in reduced use of disposable plastics or those which are uneconomical to recycle. Low carbon transport is exemplified by the adoption of electric cars, albeit this is unlikely to have a material impact on oil demand in the next decade. Current long-term industry projections nevertheless still show fossil based fuels to account for the lion share (75% of more) of global primary energy demand in 2035 (potentially 30% for oil and 25% for gas), but substitution risk is real and could become more material in our view, depending on future government policies and competitiveness of batteries and renewable energy. Ultimately, the sustainability of oil and gas companies' business models depends on factors including the balance of supply and demand for oil and gas, and the all-in costs and funding to continue producing and delivering it to users.

Governance

While governance is best measured at the company level, we see the oil and gas exploration and production sector as having above-average exposure. This results from the strong compliance and oversight needed because of the sensitivities around bidding for and corruption relating to natural resources, particularly in emerging markets. Government ownership can exacerbate the sector's lack of transparency. Furthermore, the high severity of safety incidents also means board oversight and understanding of risk management and company culture have high importance.

ESG Sector Risk Atlas



Source: S&P Global Ratings.
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Oil Field Services And Drilling

For decades, oil and gas producers have outsourced most of the activities associated with the life cycle of an oil or gas field to oil field service companies. We see these companies that provide drilling, and construction and supply services as exposed to many of the same environment and social risks and requirements as the producers. Ultimate responsibility for control, safety, behavior, and incidents in a license area typically lies with the operator (the producer). However, operational or product shortcomings, as well as safety breaches, can result in the incurrence of significant liabilities, as for Transocean Ltd. after Macondo, as well as reputational risk. Strong safety cultures and safety records are a credit strength. Similarly, experienced crews on proven offshore rigs and drillships are often preferred to cheaper, untested providers. Leading operators, such as the supermajors and many national oil companies, will typically have stringent qualifying requirements, in part to manage reputational risks. We can assess positively the competitive positions of those service or drilling companies that routinely meet these conditions.

Finding, training, and retaining employees of a sufficient caliber at the right time can be

problematic. In this context, so-called local content requirements for fields and contracts in some countries can have unintended consequences and present risks to performance, safety, and profitability. For example, some of the recent problems in the Brazilian vessel supply and offshore industry can be attributed to local content requirements in the context of the rapid, huge developments of the pre-salt reserves. These challenges also highlighted risks relating to procurement and tendering. Tendering can expose companies to significant risks, including bribery, especially for high value contracts. (Also see "ESG Industry Report Card: Building Materials And Engineering And Construction," published June 3, 2019.)

Refining And Marketing

Environmental exposure (Risk Atlas: 5)

Environment risks in the refining and marketing sector are based on the sector's inherent material exposure to greenhouse gas emissions, pollution, transport spills, and contamination risks, as well as exposure to severe weather. The refining process itself creates carbon dioxide emissions and produces carbon-based fuels and products.

The risk of pollution and accidents is significant for companies refining and distributing hydrocarbons and may result in material financial and reputational damage. The risk of land contamination during operations and the cost of clean-up before property can be turned over for alternative use are also significant, especially at refineries. Therefore, asset retirement obligations that we include in adjusted debt can be material. Hydrocarbon fuels are flammable and frequently produced near and distributed through populated areas. Therefore, most countries have stringent operating and safety requirements for refiners and marketers of oil products. The costs of remaining compliant with these requirements can be material and may be one differentiator between companies' competitive positions and profitability in different countries and regions. Difficulties purchasing insurance cover, for example for weather events, can be factored into our views on operating efficiency.

Social exposure (Risk Atlas: 4)

Social risks in the refining and marketing sector are weighted toward exposure to safety, social, and, ultimately, consumer behaviour risks.

Safety management is critical and generally routine given the combustible and polluting nature of oil products. With the large scale of some refinery complexes, accidents can be major events involving fatalities. Companies in the sector typically track and manage incidents and have specific programs in place to educate workforces. The severity of incidents was demonstrated by the March 2005 catastrophic fire and explosions at BP PLC's America Refinery in Texas City during the restarting of a hydrocarbon isomerization unit. Fifteen workers were killed and 180 others were injured. At the PDVSA Amuay plant in August 2012, an explosion killed 47 after a gas leak and operations were severely impacted. We view other accidents, which are typically less severe, as weighing on the refiners' operating efficiency: Refiners with a history of accidents or poor safety records tend to have weaker business risk assessments when compared with peers.

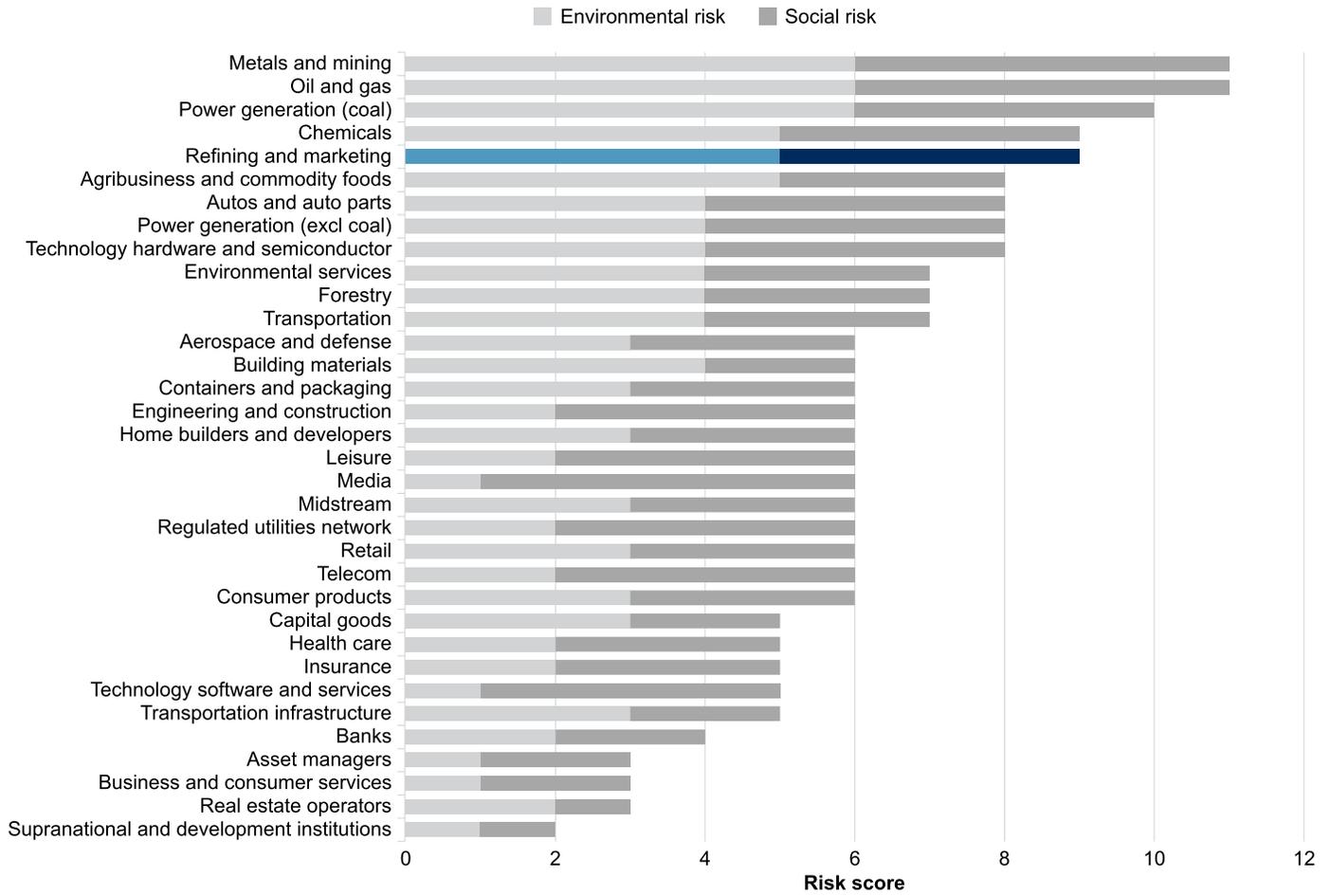
We believe consumer behaviour is likely to be increasingly influential in the energy transition away from carbon fuels. Longer-term risk could stem from supply-demand imbalances, which could be prolonged and heavily weigh on refining margins.

With an increase in concerns about global warming, fuel retailers, as the local face of the oil

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industry, might face more protests and disruptions. Poor management of social and particularly safety factors typically leads to reputational issues, with differing impacts on companies and their creditworthiness.

ESG Sector Risk Atlas



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ESG Risks In Exploration And Production And Integrated Companies

Company/Rating/Comments

Analyst

Anadarko Petroleum Corp. (BBB/Watch Pos/A-2)

Christine Besset

We view Anadarko's exposure to environmental and social risks as moderate compared to peers in the oil and gas sector. This assessment reflects Anadarko's relatively broad geographic diversification, which mitigates individual regulatory and environmental risks, and an asset portfolio with a majority of short-cycle investments, which allow for more rapid adaptation to changing regulation and policies than do long-term projects. These factors are partially offset by the company's significant exposure to Colorado (39% of production in the fourth quarter of 2018) and the U.S. Gulf of Mexico (20% of production). In Colorado, we view the environmental and regulatory environment as unsupportive of oil and gas drilling activities and we believe there is a high risk of heightened regulations that may slow production growth or increase operating costs. Nevertheless, we believe Anadarko has mitigated potential regulatory risks by taking proactive steps to limit the environmental footprint of its operations and by engaging with the communities where it operates. In the U.S. Gulf of Mexico, operations are susceptible to interruption and damage from hurricanes and the potential damage from oil spills is significant. While the company has insurance, it may be affected by larger-than-anticipated financial obligations or high deductibles. Asset retirement obligations for offshore operations are also typically higher than for onshore operations. By contrast, we view onshore Texas (18% of production and growing), as having a supportive regulatory environment and political climate for oil and gas producers. We view Anadarko's management and governance as satisfactory, reflecting management's expertise and experience in the oil and gas sector, its transparency with stakeholders, and its independent board of directors. Anadarko incorporates external regulations, policy and initiatives, including the Paris Accord, in its enterprise risk management process and considers climate risk in its long-term strategic planning and decision making.

Apache Corp. (BBB/Stable/A-2)

Ben B Tsocanos

We assess Apache's exposure to environmental risks as relatively moderate due its concentration in Texas, which we view as a generally favorable regulatory and political climate for exploration and production companies. We note, however, that deepwater activities such as the company's North Sea operations have heightened risk of a catastrophic event. The company has a solid recent safety record, with low recorded incidents. We believe material environmental risks are relatively moderate from a credit quality perspective. Apache has taken steps to limit the adverse social effects of operations in areas such as west Texas. Measures taken include improving water infrastructure and recycling, and minimizing truck traffic to reduce wear on local roads. We view Apache's management and governance as satisfactory, reflecting, in part, management's experience and expertise, and favorable planning processes.

BP PLC (A-/Stable/A-2)

Alexander Griaznov

Environmental factors are material to our credit analysis of BP, social and governance factors less so. The Macondo incident in the Gulf of Mexico has demonstrated how big financial losses can become in the event of an oil spill. We believe this incident was a wake-up call for BP and the entire industry. Since then, all large oil and gas companies have been increasingly focusing on the safety of operations. This is also one of the reasons why we believe digitalization and robotization in the sector will be only gradual, since the companies are still learning how to operate fully unmanned platforms with minimal environmental risks. BP is also one of the leaders in the global energy transition and is committed to reducing carbon emissions in line with the Paris Climate Agreement, as its CEO has recently reiterated. This is reflected in BP's higher share of natural gas in its portfolio than the other majors. BP is also investing in renewables, similar to its peers, but so far these investments have not exceeded 5% of total capital spending. From a governance standpoint, BP is fully in line with best practices, similar to other large international companies. The company has not been subject to any material investigations on bribery or corruption, which happens often in emerging markets, where BP has a smaller presence than Total or Eni.

Chesapeake Energy Corp. (B+/Stable/--)

Paul B Harvey

We view Chesapeake's exposure to environmental and social risks as moderate relative to peers in the oil and gas sector because of its relatively broad geographic and product diversification. It operates primarily in Texas, Louisiana, Appalachia, and Wyoming. The company is subject to new regulations that could restrict production or increase the cost of producing oil and gas. We view Texas and Louisiana as having a generally favorable regulatory and political climate for exploration and production companies. The permitting process for new wells and infrastructure is relatively streamlined and faces infrequent opposition, in part because of the industry's importance to Texas' economy. Appalachia, on the other hand, is generally less favorable and we believe susceptible to higher regulations and up until recently, significant transportation constraints due in part to greater regulatory hurdles. We view Chesapeake's management and governance as fair, reflecting, in part, its management's experience and expertise, favorable planning processes, and ability execute on its strategies.

Chevron Corp. (AA/Stable/A-1+)

Paul B Harvey

We believe Chevron has a material exposure to environmental factors, similar to peers, notably through its large offshore operations as well as hydrofracking used in its sizeable U.S. onshore shale assets. We believe each area represents an above-average risk for the industry. That said, given the typically large scale and diversity of its operations as well as strong safety record, we believe at this time, Chevron has the ability to manage its exposure. Chevron has significant offshore operations. In particular, about 7.5% of total production is in the U.S. Gulf of Mexico, which we see as a risky area of operations (given the precedent on Macondo), mitigated by the company's extensive operational experience, size and overall diversification. The oil major also has a significant footprint in shale development, with a particular focus in its rapidly growing Permian Basin assets of West Texas and New Mexico (forecast to account for 20%-25% of total

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production by 2023). We view the regulatory and political environment there for shale as generally favorable. We are not aware of any major controversies or incidents reported against Chevron related to fracking activities. We view Chevron's management and governance as satisfactory. A specific area of risk relates to its oversight of operations in emerging markets, including in countries such as Angola and Kazakhstan (about 20% of total production including that of equity share affiliates as of Dec. 31, 2018), even if the company has a long history of operations in these countries without any noteworthy controversies.

China National Offshore Oil Corp. (A+/Stable/--)

Danny Huang

We consider environmental factors to be key for CNOOC as an oil and gas company. As one of the three national oil companies of China, CNOOC has to meet environmental protection targets set by the government. CNOOC considers ESG to be high priority for its operations. All new projects have to go through environmental and social impact assessments. The company invested 350 million renminbi (RMB) (about US\$52 million) in emissions reduction projects in 2017. Emissions of major pollutants all fell in 2017 from a year earlier. CNOOC has experienced no major environmental issues in the last five years. The last major oil spill happened at its Penglai 19-3 oilfield in Bohai Bay in June 2011. ConocoPhillips (COP) was the operator of the field, and the reason for the oil spill was COP violated the overall development plan. However, CNOOC paid RMB480 million (about US\$74 million) for the protection of Bohai Bay. CNOOC is also involved in the offshore wind power industry. It began work on a project in Jiangsu Province in January 2019. However, we believe this initiative is still in the early stages and its impact on the company's creditworthiness will be limited in the next three to five years.

China National Petroleum Corp. (A+/Stable/--)

Danny Huang

CNPC places a high priority on ESG in its operations. As one of the three national oil companies of China, CNPC has to meet environmental protection targets set by the government. CNPC is the only Chinese member of the Oil And Gas Climate Initiative (OGCI), which focuses on reducing energy value chain carbon footprints, accelerating low-carbon solutions, and enabling a circular carbon model. The other 10 members of the OGCI are among the largest oil companies globally. CNPC published its Low Carbon Development Roadmap in 2017. This document outlines targets for reducing carbon dioxide per industrial value add by 25% by 2020 from 2015 level, and domestic natural gas production accounting for 55% of total domestic oil and gas production by 2030 to reduce China's carbon intensity. CNPC has experienced no major environmental issues in the last five years. Its chemical oxygen demand, emissions of sulfur dioxide, ammonia nitrogen, and nitrogen oxides declined year on year by 0.76%, 3.03%, 5.42% and 9.57%, respectively, in 2017.

Canadian Natural Resources Ltd. (BBB+/Stable/A-2)

Michelle S Dathorne

Increasing public attention on greenhouse gas emissions, water management, and other environmental issues heightens the significance of environmental factors in our assessment of Canadian Natural Resources' (CNRL) ESG factors. . . Based on the company's record, and our expectation of its continued compliance with regional and federal greenhouse gas and water treatment requirements, we do not believe these factors are likely to drive us to change our credit rating on the company. About 95% of the company's operations are in Canada, with the remaining 5% of current production coming from operations in the U.K. (3%) and Ivory Coast (2%). CNRL must comply with regulations in all these regions. Because of well-established environmental laws in Canada and the U.K., CNRL faces heightened public scrutiny of its adherence to evolving emissions management standards. Environmental regulations in the Ivory Coast are evolving, but not yet well established. The country is working to develop and implement a carbon tax system in late 2019. There are no significant operational safety issues associated with CNRL's oil and gas production and the company's senior management team is experienced. We therefore believe the company's social and governance practices conform to general industry standards.

ConocoPhillips (A/Stable/A-1)

Paul B Harvey

ConocoPhillips' risks related to EG are moderated by its significant regional and product diversification. Significant U.S. and domestic environmental regulations, as well as harsh political environments, can create risks for oil and gas exploration and development activities vital to sustaining production and reserve replacement. Lower 48 U.S. operations in areas favourable to industry, such as the Eagle Ford Shale and Permian Basin of Texas, help offset exposure to more sensitive operations in the Williston Basin and Alaska, where it has a long record of successful operations. Additionally, international operations are diversified between the Asia-Pacific, Middle East, and Canada among other regions, helping to balance the potential regulatory or political impact from any one region. We view ConocoPhillips' management and governance as satisfactory, reflecting in part management's ability to plan and execute very large projects, its experience and expertise, and its strong talent pool. Additionally we note that its accrued environmental costs of \$178 million and indemnifications of \$90 million as of Dec. 31, 2018, are modest relative to its 2018 net income of \$6.3 billion.

Continental Resources Inc. (BBB-/Stable/--)

Carin Dehne-Kiley,
CFA

We view Continental's exposure to environmental and social risks as moderate to high because of the concentration of its operations in North Dakota, Montana, and Oklahoma. Regional concentration exposes the company to the risk of severe weather events, accessibility to markets, and potential regulatory changes that could negatively affect production levels or realized prices. The rapid growth of oil production (and associated natural gas) in North Dakota since 2008 has overwhelmed existing natural gas transportation infrastructure, leading to a significant increase in the flaring of natural gas (itself a greenhouse gas). State regulations now require operators to capture 88% of the associated natural gas produced from oil wells, increasing to 91% on Nov. 1, 2020. In 2017, Continental captured about 90% of its associated gas, slightly above the industry average of 88%. Natural gas flaring is not an issue in Oklahoma because there is already significant infrastructure in place. However, the potential for seismic events to occur from the use of underground saltwater injection wells has led to community concerns and could lead to additional regulation of such wells. Overall though, the company has a decent safety record and no history of significant environmental accidents. On the social side, although all three states have governments and regulatory environments that have been generally supportive of oil and gas drilling, given its importance to the local economies, there has been strong community opposition to new pipelines in North Dakota, such as the Dakota Access Pipeline (DAPL). Although DAPL was eventually built,

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this opposition heightens the risk of industry's ability to move additional oil out of the region without having to use more costly rail or trucking options. We view Continental's management and governance as fair, reflecting, in part, its control by a single shareholder. Harold Hamm, founder, CEO and chairman, owns 75% of the company. However, as an offset, the company's six-member board includes five independent directors.

Cenovus Energy Inc. (BBB/Stable/--)

Michelle S Dathorne

Inherent industry environmental and social factors are incorporated in our rating on Cenovus Energy. As the company is an oil sands-focused exploration and production company, its approach to emissions management and reduction is under heightened scrutiny from stakeholders and subject to increasing Canadian regulations. Cenovus has been able to reduce its greenhouse gas emissions by one-third since 2004. Moreover, the company's safety and environmental record since its inception in 2009 (following its spin-off from Encana Corp.) indicates an appropriate emphasis on safety. The Canadian federal government's environmental policies provide provinces with the latitude to implement either a carbon tax or cap and trade system. Both aim to reduce carbon emissions. Although many of these established standards are being contested, Canadian companies, particularly those operating in the oil and gas industry, are actively working to reduce carbon emissions, and the costs associated with emissions reduction are reflected in reported operating and finding and development (or full-cycle) costs. Although, full-cycle costs are increasing as a result of these environmental initiatives; they have not adversely affected Cenovus' profitability and rating. Although neutral to the rating, we view Cenovus' management and governance practices as strong, reflecting our assessment of the company's strategic positioning in the Canadian oil and gas industry. Specifically, we believe Cenovus' operational expertise enables it to consistently achieve its strategic objectives, and generate strong profitability, particularly when regional prices are weak. Furthermore, we believe there is more than sufficient depth in its management ranks to ensure succession with no disruption in operational efficiency.

Devon Energy Corp. (BBB/Negative/A-2)

Carin Dehne-Kiley,
CFA

We view Devon's exposure to environmental and social risks as moderate relative to peers in the oil and gas sector because of its relatively broad geographic diversification in Texas, Oklahoma, the Rockies, and Canada. We view Texas as having a generally favorable regulatory and political climate for exploration and production companies. The permitting process for new wells and infrastructure is relatively streamlined and faces infrequent opposition in part because of the industry's importance to the state economy. Although Oklahoma has a similarly favorable climate for exploration and production companies, recent earthquakes have prompted community concerns about the use of underground saltwater injection wells, which could lead to additional regulation of such wells. In Canada, greenhouse gas emissions are being addressed at both the federal and provincial level, and it is likely Devon's oil sands operations will be subject to increased greenhouse gas regulation and carbon costs in the next one to two years, although the company has recently announced its intention to sell its Canadian operations over the next 12 months. We view Devon's management and governance as satisfactory, reflecting management's expertise and experience in the oil and gas sector, its transparency with stakeholders, and its independent board of directors.

Ecopetrol (BBB-/Stable/--)

Fabiola Ortiz

Environmental factors are material to our credit analysis of Ecopetrol. In Colombia, oil and gas companies need to obtain an environmental license for the use of natural renewable resources (water, soil, and air), a filing of an environmental impact study, and a plan to prevent, mitigate, correct, and compensate for any activity that may be harmful to the environment. As a result, Ecopetrol has established a three-year plan to take into consideration the environmental significance of the hydrocarbon value chain, recognizing water and energy flows as the main resources used in production processes. The plan includes three action lines: comprehensive management of water resources, climate change and biodiversity, and sustainable production. We believe Ecopetrol is taking adequate implementation measures to mitigate potential environmental risks. In terms of social impact, Ecopetrol has developed several programs to contribute with social infrastructure projects such as schools, hospitals, and toll roads, which improve the standard of living of communities where the company is highly influential. The company expects to invest approximately US\$700 million billion in socio-environmental projects between 2019 and 2021. Moreover, the company is engaged in incorporating a health and safety management approach into its operations. We consider Ecopetrol's management and governance to be satisfactory, reflecting management's experience and expertise focused to strengthen the company's corporate governance.

Encana Corp. (BBB/Stable/A-2)

Michelle S Dathorne

Although environmental factors have the potential to materially affect an oil and gas company's credit profile, in part given the increasing public scrutiny on emissions and water usage in the industry, we do not assess Encana's environmental profile as worse than industry peers. Encana has operations in Canada and four U.S. states. In the U.S., environmental policies in Texas, Oklahoma, and North Dakota are not as strict as those in Canada. In contrast, there is greater uniformity in Canada's environmental regulations. Canadian companies, particularly those operating in the oil and gas industry, are actively working to reduce carbon emissions, and the costs associated with emissions reduction are reflected in reported operating and finding and development (or full-cycle) costs. To date, costs associated with meeting environmental standards in both countries, which are included in Encana's reported operating and full-cycle costs, are nominal and broadly in line with peers. Although we expect these costs to continue increasing, we expect Encana's profitability should remain in the top quartile of the global exploration and production peer group ranking. Based on Encana's operating record, we do not expect safety issues will be a material consideration in the company's credit profile. Furthermore, its management and governance practices are aligned with industry standards in both Canada and the U.S., so we view them as neutral to the company's credit profile and rating.

Eni SpA (A-/Stable/A-2)

Edouard Okasmaa

With a large share of its operations in upstream, and in non-Organization for Economic Cooperation and Development countries, Eni is

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exposed to significant environmental and social risks that could hamper its ability to generate operating cash flow. The company aims to increase its share of natural gas production to 60% by and having a net zero carbon footprint for direct emissions of equity upstream activities by 2030 (scope 1). To achieve this, by 2025 Eni aims to eliminate gas process flaring and reduce fugitive methane emissions by 80% versus 2014) while also offsetting through forestry projects. We view these types of objectives as aligned with increasingly stringent environmental laws and regulations, which could heighten risks for financial compensation or fines. Eni logged environment expenditure and investments of €915 million in 2018, although about 40% was spent on remediation and reclamation activities. Downstream, the company has transformed two of its loss-making refineries into biofuel refineries, improving profitability and the company's impact on the environment. The company's decarbonization strategy includes €3 billion (9% of group 2019-2022 capex), of which about €950 million is for circular economy projects and €1.4 billion renewable projects, for a total installed capacity of 1.6 GW by 2022. We believe the Italian government's combined 30.1% direct and indirect stake and its presence on the board are currently neutral for the ratings. Government ownership could constrain or cap our rating on Eni if we believed government actions or statements could adversely affect Eni.

EOG Resources Inc. (A-/Stable/A-2)

Carin Dehne-Kiley,
CFA

We view EOG's exposure to environmental and social risks as moderate relative to peers in the oil and gas sector. This is because of the company's relatively broad geographic diversification, primarily in Texas, New Mexico, North Dakota, Wyoming, and Utah, as well as Trinidad. We view Texas as having a generally favorable regulatory and political climate for exploration and production companies. The permitting process for new wells and infrastructure is relatively streamlined and faces infrequent opposition in part because of the industry's importance to the state economy. In North Dakota, exploration and production companies face stricter restrictions on natural gas flaring and some community opposition to new pipelines that could limit EOG's ability to grow and market oil production from the region over the medium term. Companywide, EOG installed over 1,500 kilometers of gas gathering pipelines between 2013 and 2017 to capture gas and minimize flaring. The company also implemented a leak detection and repair program which reduced fugitive emissions by more than 90% in 2017. We view EOG's management and governance as strong, reflecting management's operational effectiveness, industry expertise, experience, and long history of achieving its financial and operational goals.

Exxon Mobil Corp. (AA+/Negative/A-1+)

Carin Dehne-Kiley,
CFA

We believe ExxonMobil has a material exposure to environmental factors, similar to peers, notably through its large offshore operations (Guyana, Brazil, Gulf of Mexico), oil sands projects in Canada, as well as hydrofracking used in its sizeable U.S. onshore shale assets (Permian Basin and Bakken shale) and its large refining and chemicals businesses. For ExxonMobil, with the exception of a truly catastrophic event (similar to the Valdez oil spill in 1989, for which the company ultimately paid \$4.3 billion in cleanup costs, settlements and fines), the financial impact of a localized environmental incident, tighter regulation or community opposition is somewhat limited, due to the company's massive scale, scope, and diversification, and its ability to reallocate capital. The company has spent \$9 billion since 2000 and estimates it will spend approximately \$5.7 billion in 2019 and 2020 (just under 10% of its total capex) on efforts to prevent and minimize the impact of its operations on the environment, including projects to manufacture clean fuels, reduce greenhouse gas emissions, and fund asset retirement obligations. We view ExxonMobil's management and governance as strong, reflecting, in part, its exceptional operational performance, management expertise, and the implementation of a consistent business strategy.

Gazprom PJSC (BBB-/Stable/A-3)

Elena Anankina, CFA

Environmental factors are material to our assessment of Gazprom's business. Given European Union policies aimed at increasing the share of intermittent renewable generation, natural gas is an attractive and more environmentally friendly option for power generation. Still, Gazprom's export business is exposed to social sensitivities and also political concerns about European dependency on Russian gas (37% of Europe's gas in 2018, and well over 50% in some Eastern European countries). China's focus on transitioning from coal to cleaner gas fuel creates future export opportunities for Gazprom, subject to a multibillion-dollar Power of Siberia pipeline construction. We believe Gazprom to be fully compliant with applicable environmental regulations for exploration, production, refining, and transport activity. Gazprom's social mandates weigh on our business risk assessment on the company. However, they also create incentives for the Russian government to protect and support the company. For example, Gazprom has to sell gas at low regulated prices (in 2018, Gazprom sold 43% of its gas domestically at a price 3.7x below export levels), or invest in regional gasification. Gazprom's role as a large employer and big customer for certain local industries and the high strategic importance for the government of certain capex projects it has undertaken might reduce its flexibility in operating expenditure and capex.

Korea National Oil Corp. (AA/Stable/--)

Shawn Park

We believe that significant new environmental regulations would make it difficult to conduct activities that are vital to KNOC's sustaining production, replacing reserves, and increasing stockpiling activities. More broadly, we believe changing attitudes toward fossil fuels could increase regulatory compliance requirements or lead to litigation. Given South Korea's high dependency on oil imports, KNOC plays a key role in securing and mitigating potential risks related to disruptions in nation's oil supply. For KNOC in particular, tighter regulation or social opposition is somewhat limited due to its status as one of South Korea's key government related entities. In terms of environmental factors, the company does not have a negative record. In addition, KNOC has International Organization for Standardization certification for its environmental management standards. Governance factors are neutral for KNOC; its public disclosures are consistent and comprehensive. The company publicly discloses its mid- to long-term financial and operational plans, which are applied with government guidance to encourage KNOC to build healthier financials, and specific targets to increase oil stockpiling reserves.

ONGC Ltd. (BBB-/Stable/--)

Vishal Kulkarni, CFA

ONGC's large upstream and refining operations and the role it plays as a state owned enterprise means environmental and governance

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factors play an important role in our credit assessment. Given its exposure in emerging markets such as India, climate change risks relating to the production and usage of fossil fuels are less important in our analysis compared with its peers. Similar to its peers, ONGC has inland and offshore environmental exposure. It has in the past experienced minor incidents. In 2011 and 2018 ruptures to company pipelines led to oil spills, one off the coast of Mumbai and the other involving an onshore pipeline in the Southern Indian state of Tamilnadu. ONGC refineries in the past have reported occasional fires and fatalities. However, we do not consider the incidents to constitute a pattern that indicates institutional environmental noncompliance or insufficient risk controls. We believe ONGC's industrial labor relations, and health and safety standards are in line with the industry. Its majority government owned and important oil and gas state-owned enterprise status means ONGC gets strong oversight from government agencies; this benefits ONGC's governance. While there are minor cases of alleged fraud or bribery; they do not indicate systemic governance failure to us. ONGC's investments and acquisition strategies are largely driven by government directives, such as ones to improve hydrocarbon energy security for India and build a major Indian oil and gas state-owned enterprise. At times, financial return objectives may be superseded by the government's social and fiscal goals.

Occidental Petroleum Corp. (OXY) (A/Watch Neg/A-1)

Ben B Tsocanos

The company's U.S. operations are located in Texas, which is in general an accommodating regulatory and political context for oil and gas-related activities. Restrictions on drilling and pipeline construction are limited obstacles to development relative to other states. The company is improving its water handling and recycling in the Permian in order to reduce costs and friction with local communities. The countries in which OXY operates outside of the U.S. also have relatively favorable operating environments for exploration and production operations, though security conditions in Colombia have at times led to disruptions to the company's operations. OXY is preparing for potential future carbon constraints, including by minimizing gas flaring and exploring the potential commerciality of carbon capture related to its enhanced oil recovery operations. This could reduce the negative effects of regulation on financial performance to a limited extent. The company has a strong recent safety record, with a very low number of recorded incidents. We assess OXY's governance as satisfactory, reflecting, in part, its strong organizational performance, strategy execution, and depth of leadership resources.

Petroleo Brasileiro S.A. - Petrobras (BB-/Stable/B)

Luisa Vilhena

Governance factors have been a critical factor in determining Petrobras' credit quality. We view the company's management and governance as fair. However, we had assessed it as weak following corruption investigations. The company has taken steps to improve its internal controls, supplier relations, decision-making process and governance, but it is too early to say if those changes will be sustainable. Petrobras is exposed to Brazilian regulations and government mandates that have historically impacted its profitability and cash flow generation. Up until 2014, the Brazilian government attempted to contain inflation by constraining the fuel prices Petrobras could charge. With the improved governance framework and prices now following international parity, we believe Petrobras will be able to benefit from price peaks in line with global peers. Petrobras' core strategy for the next five to 10 years is likely to remain focused on offshore production. However, the company has committed to zero growth of absolute operating emissions through planned investments in natural gas and renewable energy. The commitment to those businesses to date (about 6.5% of total capex) do not represent a challenge to the company maintaining its leverage or profitability. Safety and labor relations are not a major credit concern at this point. The company's recordable accident rate is comparable to those of peers.

Petroleos Mexicanos (PEMEX) (BBB+/Negative)

Luis Manuel Martinez

Environmental risks are key in the oil and gas industry and may be increasingly important for PEMEX. For instance, a new environmental regulation that will limit the sulfur content of bunker fuel could weigh on the profitability of heavy oil producers, if the international price of heavy crude comes under pressure. PEMEX has specific environmental policies, and adheres to multilateral actions to mitigate climate change and reduce gas emissions. The company has also halted the use of fracking activities to prevent ecological damage. PEMEX has plans to develop a new refinery in the State of Tabasco, which in our opinion could pose environmental threats to its mangrove and other aspects of the ecosystem in the area. For many years, PEMEX has coped with social risks related to fuel theft in Mexico. In December 2018, the company engaged in a joint plan with the federal government to deter this illegal activity. According to PEMEX, the plan has been successful thus far, yielding a 95% reduction in fuel theft. In early 2019, an illegal breach of PEMEX's gasoline transportation pipeline caused a major fuel leakage and an explosion followed, causing the death of more than a 120 people. This prompted the company to take actions to support the affected community. PEMEX has an established governance framework, although full ownership and control from the federal government exposes the company's business strategy to policy risks. Continuous political involvement in PEMEX's decision-making has led to changes in the company's medium and long-term business objectives, which in part explains the trajectory of its stand-alone credit profile over the past several years

Petroleum Nasional Bhd. (A-/Stable/--)

Bertrand P Jabouley,
CFA

Petronas, like other oil and gas operators, faces significant risks from environmental factors. However, we do not expect these factors to move our rating on the company in the next two years. Petronas' strong balance sheet, with a net cash position of US\$24.2 billion equivalent on Dec. 31, 2018, would enable the company to address the financial consequences of liabilities stemming from a low-probability, high-impact event such as a large oil spill. An event with large-scale consequences could also happen in case of a major disorder in the downstream business, because of the operation's concentration on a few large assets, such as the US\$27-billion Pengerang Integrated Complex (PIC) in Johor, Malaysia. We view Petronas' social and governance practices as in line with peers and likely to help retain our rating on the company over the next two years. It is one of the most scrutinized state-owned enterprises in a country with a wealth of local sensitivities. And with about 50,000 staff worldwide, predominantly in Malaysia, the company is also a large local employer. Accordingly, Petronas pursues active dialogues and engagements with its various constituents. We believe that the company has been working on decisively reinforcing its safety policies after some setbacks in the past, such as the Sabah-Sarawak gas pipeline

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explosion in 2014 and the condensate tank fire at Kertih in 2017.

PT Medco Energi Internasional Tbk. (B/Positive/--)

Vishal Kulkarni, CFA

Medco's mid-size, upstream exploration and production operations and its family-controlled ownership means environmental and governance factors play an important role in our assessment of the company, especially in the presence of meaningful minority public ownership. The family plays a decisive role when it comes to key investments and merger and acquisition activity. The family has been aggressive in its pursuit of business growth. In the past two or three years, Medco has invested in businesses outside of oil and gas, such as geothermal power and base metal mining. This is not necessarily a negative from governance perspective, but it keeps leverage high. The owners have shown a willingness to inject equity as necessary, take minimal dividends, and support Medco's fund raising and strategic deleveraging. Medco has experienced environmental incidents in the past, but they have been limited in scale and haven't had a major effect on the company's financial health or reputation. We consider the company to have a reasonable operational record from an environmental perspective. Medco aims to have all its assets evaluated as "green" within four years under Indonesia's Evaluation Program for Corporate Efforts in Environmental Management. Such an evaluation would indicate compliance above the required standards for pollution control, use of clean technology, and energy efficiency. Medco has a fair record in terms of labor relations and social welfare.

PT Pertamina (Persero) (BBB/Stable/--)

Vishal Kulkarni, CFA

Pertamina's large upstream and refining operations and the fact that it is owned by the government mean environmental, social and governance factors carry a meaningful weight in our opinion of its creditworthiness. Climate change risks are a factor but we typically see risks as less severe for national oil companies in emerging markets such as Indonesia. Pertamina experienced operating and environmental incidents in upstream and downstream operations--an oil spill due to pipeline rupture near Balikpapan, Borneo, in 2018 and fires at its refinery operations there, which led to fatalities. The financial impact of the incident to date has been modest. Nevertheless, we do not believe the incidence of such incidents is materially higher than industry average. In terms of social factors, Pertamina plays a very important role as a retail distributor of fuel that sells at government determined prices. In the past, Pertamina has received negative publicity for not being able to ensure the availability of subsidized fuels in remote locations. Pertamina's governance practices are broadly in line with other large state-owned enterprises and have been improving over last two to three years, since the company began reporting quarterly financials. However, we note bribery cases at the board of director level. Moreover, management changes have been more frequent than we see at peers, which could disrupt long-term strategy implementation and investment decision-making.

PTT Exploration and Production Public Co. Ltd. (BBB+/Stable/--)

Vishal Kulkarni, CFA

There are intrinsic environmental risks to PTT's upstream operations, because the group is vertically integrated into refined petroleum products and chemicals. We believe its substantial liquidity and conservative funding policy would allow PTT to absorb a material, one-off environmental event. PTT has a long-term target for 2030 to reduce its greenhouse gas emissions by 20% from 2012 estimated business-as-usual levels. This is broadly consistent with Thailand's commitment to reduce greenhouse gas emissions by 20% in 2030 from 2005 estimated business-as-usual levels. Some subsidiaries of PTT's have experienced environmental incidents in the past few years. In particular, the Indonesian government sued PTTEP in 2016 after a major deepwater oil spill from its Montara well, off the coast of Australia, in 2009. However, the Indonesian government eventually withdrew its US\$2 billion claim against the company. The group has refocused its efforts away from technically challenging deepwater drilling to shallow water. Despite the allegation of employee bribery in relation to a supply contract with Rolls Royce PLC in 2017, we believe PTT's governance practices are broadly in line with those of other large international companies. Furthermore, the growing level of government and public scrutiny of PTT--which is the country's largest company (with an EBITDA close to US\$10 billion)--acts as a structural motivation for the company to increase transparency and maintain a good governance framework.

Repsol S.A. (BBB/Positive/A-2)

Edouard Okasmaa

We believe Repsol, in comparison to its peers, has a stronger focus on environmental initiatives given 17% of its capital expenditure is geared toward renewables and low-carbon businesses. We believe the ratings can accommodate the €2.5 billion of capital expenditure in 2018-2020. Repsol has for many years had an upstream portfolio weighted towards more environmentally friendly natural gas, which also brings synergies and efficiencies with the new business. We note that Repsol's safety record has improved since 2013 (its total recordable incident rate has decreased to 1.59 from 2.95 since then), and despite being satisfactory in a global comparison, remains higher than that of close peers. Repsol continues to face major challenges related to risks inherent to oil and gas operations in unstable political environments. It faces such risks in Venezuela and Libya currently. In relation to its peers, Repsol has a higher exposure to emerging markets requiring strong governance in all operations

Royal Dutch Shell PLC (AA-/Stable/A-1+)

Alexander Griaznov

We believe Shell's massive scale should enable the company to avoid rating changes from most one-off ESG events. Shell is articulating and starting to enact its strategic responses to climate change. Shell has linked nearer-term net carbon footprint targets to executive remuneration. Shell has not experienced a disaster or consequences on the scale of BP PLC's Macondo blowout. Shell has, however, had explosions and fires in its refineries and chemical operations globally over the past decade. Shell's total recordable case frequency is slightly below 1, which is in line with peers, but big incidents can also occur in the supply chain. The explosion of a tanker truck in Pakistan killed more than 200 people. Shell did not accept liability as the tanker was owned by a contractor, but paid the government and families of the injured and provided additional support to affected communities. Shell targets greenhouse gas reductions from its energy products sold--a carbon intensity measure that takes into account their full life-cycle emissions, including customers' emissions when they use these products--of half by 2050 and around 20% by 2035. The drivers are the shift to natural gas and biofuels use, new energy sources development, and expansion of electric mobility. Shell's leading position in LNG supports this goal. The company plans to invest \$1

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billion-\$2 billion a year until 2020 in its New Energies division (about 5% of total capex). This is below the 10% share for Equinor and Repsol, but in line with Total and BP. As a large listed company Shell has appropriate governance practices at a corporate level. Operations in emerging markets nonetheless expose Shell to allegations of corruption and bribery. The Dutch Public Prosecutor's Office (DPP) is prosecuting the company regarding a \$1.3 billion Nigerian exploration license settlement in 2017. Such situations somewhat weigh on our ESG assessment for Shell and peers such as Total and Eni, even if from a financial perspective the penalties are manageable.

Santos Ltd. (BBB-/Stable/A-3)

Minh Hoang

Santos faces increasing public scrutiny to reduce carbon emissions, which is an area of heightened focus in the oil and gas industry in Australia. Indeed, Western Australia's Environmental Protection Authority's proposed zero-carbon guideline, although later withdrawn, threatened the compliance of future and existing projects. Santos has long-term targets of achieving net-zero emissions from its operations by 2050 and has set medium-term targets, which include reducing emissions by more than 5% across existing operations in Cooper Basin and Queensland by 2025. Santos has had a dedicated carbon team since the early 2000s, to support integration of greenhouse gas emissions management and climate change within its strategy. Historically, Santos has only had to address minor infringements for environmental violations. We view Santos' management and governance as satisfactory.

Suncor Energy Inc. (A-/Stable/A-2)

Michelle S Dathorne

With 93% of its 2018 production tied to Canada, Suncor is highly exposed to stringent environmental regulations, conflicting provincial regulations, and indigenous activism. Protracted delays in constructing pipelines have led to massive hydrocarbon differentials for the industry. Nevertheless, Suncor's upgrading and refining capacity effectively insulates its production from the prevailing volatile price discounts for Canadian heavy oil. Furthermore, we believe Suncor has sound emissions management practices, and remediation efforts at its oil sands mining tailing ponds. In addition to Canada's clearly defined emissions reduction policies, environmental regulations in the North Sea, U.K., are also well defined, covering abandonment and reclamation (asset retirement obligations), oil spills, and emissions, among other items. Suncor has negligible exposure to Libya and changes to the environmental regulatory framework would not have a meaningful impact on the company.

China Petrochemical Corp. and China Petroleum & Chemical Corp. (collectively known as Sinopec) (A+/Stable/--)

Danny Huang

As one of the three national oil companies of China, Sinopec is responsible for achieving environmental protection targets set by the Chinese government. Sinopec announced its Green Corporate Action Plan in April 2018, with the aim of making Sinopec a "clean, efficient, low-carbon, and recycling" green corporation by 2023. Specific targets include energy conservation of 6 million tons of standard coal and an 18% reduction in sulfur dioxide. Sinopec has not experienced very severe environmental issues since an oil pipeline explosion in Shandong Province because of a leak in late 2013. There have been incidents involving fires at refineries, but the financial impact of them has been insignificant. The company spent RMB7.9 billion (about US\$1.2 billion) in environmental protection in 2017. The company also supplied the Chinese domestic market with national standard (NS) V (equivalent to Euro V) gasoline and diesel in 2017 and NS VI in 28 cities in northern China from September 2017 as required by the government. Sinopec is also promoting and developing bio jet fuel and bio diesel in China. Sinopec's bio jet fuel was put into commercial use in 2017 and its B5 bio diesel was launched in Shanghai in October 2017.

Total S.A. (A+/Positive/A-1)

Edouard Okasmaa

We see Total as one of the more proactive large oil companies given its investments in solar, electricity retail, and battery storage, as part of its redirected strategy which recognizes the energy transition and UN Sustainable Development Goals. Between 2015 and 2030, Total aims to reduce the energy intensity of its products by 15%, notably by a greater shift to gas and LNG. Shell has a carbon footprint reduction target of 20% by 2035. Total's annual capital investment on low carbon electricity is \$1.5 billion-\$2 billion per year compared with guidance for total capital investment of \$15 billion-\$16 billion in 2019 and \$15 billion-\$17 billion in 2020. A particular environmental exposure stems from Total's large offshore operations, including off the coasts of the U.K. and Norway, but excluding the Gulf of Mexico. We note that Total's strong cultural focus on safety and its record has improved over the past decade in terms of both downstream fires and fatalities (the last major incident dating back to 2001 when its former French AZF chemical plant exploded killing 29 people, wounding 2,500, and costing the company over \$1 billion). From a social point of view, Total was able to restructure its French downstream operations within the constraints of union and employment requirements. Total has transparent governance practices, which we assess as satisfactory. Having a greater presence than peers in the emerging markets, especially Sub-Saharan Africa (43% of upstream net income), can however lead to greater exposure to corruption or bribery. The group's, culture, controls, and social engagement have mitigated these risks with no material controversies reported in the last decade. From a credit perspective, the potential liabilities are typically manageable for groups of Total's scale and diversity across many countries.

Woodside Petroleum Ltd. (BBB+/Stable/--)

Minh Hoang

Woodside faces increasing public scrutiny to reduce carbon emissions and is an area of heightened focus in the oil and gas industry in Australia. Western Australia's Environmental Protection Authority's proposed a zero-carbon guideline. Although the guideline was later withdrawn, it threatened the compliance of future and existing LNG projects. Woodside currently targets a 5% improvement in energy efficiency by 2020 that includes both sustainable emissions reductions and energy efficiency improvements. Woodside's global operations expose the business to a wide range of risks, including natural disasters, political factors, and changes in the regulatory environment, as well as bribery, fraud, and corruption. Woodside recently fired 11 people for behavioral breaches, three of which involved fraudulent activities. We view governance factors to be neutral to our ESG risks assessment for Woodside, reflected in our satisfactory assessment for management and governance.

All ratings are as of May 31, 2019.

ESG Risks In Oilfield Services

Company/Rating/Comments

Analyst

Baker Hughes A GE Company (A-/Stable/--)

Paul B Harvey

ESG factors are material to our credit analysis of Baker Hughes A GE Co. (BHGE). Significant international and domestic environmental regulations, as well as political environments, can create risks for oilfield services companies. Environmental liabilities were not material as of Dec 31, 2018, amounting to only \$84 million. The majority of BHGE's operations are outside the U.S., about 76% of BHGE's gross trade receivables were tied to international markets as of Dec 31, 2018, making it less exposed than most peers to potential environmental restrictions on U.S. drilling and completion activities. Internationally, the oilfield services industry's operations are subject to the Foreign Corrupt Practices Act (FCPA), the U.K. Bribery Act, and other anticorruption laws, which have seen violations across the industry, as companies conduct business in emerging markets through third party or other local contacts. Although no current violations exist, in 2007, predecessor Baker Hughes Inc. was found in violation of FCPA rules and fined \$44 million, a record at the time. Overall, we view BHGE's management and governance as satisfactory, and that BHGE has put in place adequate policies and controls to help prevent both environmental and regulatory violations and is prepared to effectively address any that might occur. Additionally, we expect GE Co. to become a minority owner over the next 12 months and that BHGE has policies, procedures and controls in place to manage itself independently.

Halliburton Co. (A-/Negative/A-2)

Paul B Harvey

Significant multinational environmental regulations, as well as political environments, can create risks for oilfield services companies. In particular, as the leading hydraulic fracturing company in North America, Halliburton faces many environmental regulations and has incurred nonmaterial accruals related to ground water and site remediation costs among other factors. Additionally, the oilfield services industry's international operations are subject to the Foreign Corrupt Practices Act (FCPA), which has seen violations across the industry as companies enter emerging markets through third party or other local contacts. In particular, during 2017 Halliburton paid \$29.2 million to settle an SEC investigation into its use of a local content provider in Angola and violations of the books and records and internal controls provisions of the FCPA. We view Halliburton's management and governance as satisfactory. We believe the company has adequate policies and controls in place to help prevent both environmental and regulatory violations and is prepared to effectively address any that might occur. Additionally, we believe Halliburton benefits from management's experience and expertise, which have allowed it to successfully pursue large-scale projects and quickly adjust to fluctuating market conditions.

Schlumberger Ltd. (A+/Negative/A-1)

**Carin
Dehne-Kiley,
CFA**

Given its broad global base of operations (just 30% of its revenue is tied to the U.S.), the company has a diverse and complex range of multinational, environmental, regulatory, and social issues to manage compared with peers. In 2015, a non-U.S. subsidiary of Schlumberger paid approximately \$233 million related to violations of U.S. sanctions against Sudan and Iran (and has since ceased operations in both countries). In 2019, the company dropped its bid to acquire Russian driller Eurasia Drilling Co., a decision we believe was influenced in part by potential further tightening of U.S. sanctions against Russia, although the company has ongoing operations there that are exempt from current sanctions. Internationally, the oilfield services industry's operations are potentially subject to the Foreign Corrupt Practices Act (FCPA), the U.K. Bribery Act, and other anti-corruption laws, which have seen violations across the industry as companies conduct business in emerging markets through third party or other local contacts. We view Schlumberger's management and governance as strong, based on its history of favorably managing the business through commodity cycles, and its organizational depth and breadth.

All ratings are as of May 31, 2019.

ESG Risks In Refining

Company/Rating/Comments

Analyst

CITGO Holding Inc. (B-/Watch Dev/--)

Steve Goltz

Refiners incur substantial capital expenditures and operating costs as a result of compliance with environmental laws related to greenhouse gas emissions, by-products related to the refining of crude oil into finished refined products, including, renewable fuels. However, the configuration and complexity of the company's refineries allow it to blend various slates of crude and respond to stricter global regulations and changes such as IMO 2020 with respect to bunker fuel. Renewable Identification Number costs have not impacted the company's refining margins in a material way. CITGO has a good safety record and we view the company's ongoing investment in their refining assets to address changing environment as neutral. U.S. sanctions on Venezuela are a moderate risk for CITGO. The sanctions have curtailed the company's ability to import Venezuelan crude. However, this has not done material harm to our ratings on the company at this time. Although the company's governance is exposed to political risk through the company's ownership by PDVSA, the recent changes to the board have not resulted in any disruption to the company's operations. Overall, we have

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not identified governance shortfalls that harm the credit.

Empresa Nacional del Petroleo (BBB-/Stable/--)

Juan
Barbosa

We see social factors as a key driver for our rating on ENAP. It is Chile's sole refinery operator and is responsible for 60% of national fuel supply. This is one of the pillars of our view of a very high likelihood of extraordinary government support, which in turns uplifts its rating by 5 notches from its stand-alone credit profile of 'b'. Environmental factors are also important for our rating. In 2017, ENAP was sentenced to pay around \$1 million for moral and environmental damages as a result of an oil spill occurred in Chile in 2007. As a countermeasure, it established an environmental management plan under which the company performs an annual emergency check to monitor the performance of drills, prevent further oil leaks and to monitor environmental legal compliance. Greenhouse gas emissions are monitored by environmental agencies in Chile, although there are no specific regulations on refinery emissions. We consider the company's governance to be comparable to those of its global industry peers. The board is composed by seven members, two appointed directly by the president of Chile, four from proposals of the High Public Management System, and the last one appointed by the company.

GS Caltex Corp. (BBB+/Stable/A-2)

Shawn Park

We consider environmental and social risks as important factors in our credit analysis of oil refining companies. However, we view GS Caltex as being in no worse a position than its global peers in terms of these factors. The energy sector's exposure to greenhouse gas emissions, pollution, and increasing water usage, have led GS Caltex to take measures to improve the energy efficiency of its manufacturing processes and to reduce pollution by recycling heat and waste material. As a result, GS Caltex has been reducing energy consumption by around 2,000 terajoules annually over the past three years. Its recycling rate for waste materials was 76% in 2017. Employee safety is a key social factor for the sector: Any negligence could result in legal fines and reputational damage for companies. GS Caltex has worked to improve safety measures for employees and partners. The company reduced the number of industrial accident cases in 2017. However, the total recordable incident rate slightly increased to 0.09 in 2017, up from 0.05 in 2015. We do not consider there to be any material deficiency in GS Caltex's corporate governance.

Marathon Petroleum Corp. (BBB/Stable/A-2)

Mike Llanos

Like its peers, MPC's refining and logistics operations face increased regulations related to climate-change policies such as renewable fuel standards. In maintaining compliance with renewable fuels standards, MPC purchased Renewable Identification Numbers totaling approximately \$320 million in 2018, down from approximately \$460 million in 2017. With its recent acquisition of Andeavor, it now has two refineries located in California, which tends to have stricter environmental requirements than other states and consequently higher operating costs. We therefore consider refineries in California as having higher risk than those in other parts of the U.S. MPC has taken initiatives to minimize its environmental impact and reduce its carbon footprint, replacing less efficient assets to reduce greenhouse gas emissions. Its 2018 environmental capital expenditures total approximately \$950 million and 2019 estimates are approximately \$420 million. In our view, these costs are manageable given the approximate \$2.8 billion in total capital expenditure costs for 2019 for MPC (not including its MLPs). The company has a solid safety record, with very low recorded incidents. We assess MPC's governance as satisfactory, reflecting, in part, its strong organizational performance, strategy execution, and depth of leadership resources.

Petroleos del Peru Petroperu S.A. (BBB-/Stable/--)

Juan
Barbosa

We view social and environmental factors as more material than governance factors for Petroperu. It is a key infrastructure asset in Peru as the main fuel distributor in the country. Supplying about 50% of the domestic market's needs, it is important for the government's energy strategy. This is one of the pillars of our view of a very high likelihood of extraordinary support from the government that uplifts its rating by 4 notches from its stand-alone credit profile of 'b+'. In regard to environmental factors, the company aims to reduce air pollution by modernizing its Talara refinery. This project should reduce the amount of sulfur in fuels from 1,800 parts per million (ppm) to 50ppm, which will help reduce toxic emissions by 2021. It's also working to improve the degree of octane in naphthas and to decrease refinery waste. The company is investing \$5 billion in machinery optimization and in the modernization of the refinery, with operations expected to be ramped up in the first half of 2021. We view the company's governance structure as comparable to those of its regional industry peers, such as ENAP or ANCAP. Two of the board's six directors are senior government officials. The government is therefore highly involved in the company's decisions on investment and approval of additional debt incurrence.

Phillips 66 (BBB+/Stable/A-2)

Steve
Scovotti

Environmental factors are material in our rating analysis for Phillips 66, which has a portfolio of refining, midstream, and chemical assets. These sectors incur substantial capital expenditures and operating costs as a result of compliance with environmental laws which include emissions and the blending of renewable fuels. Phillips 66 budgets about \$1 billion annually for air emission reduction and clean fuels. Like its industry peers, Phillips' sustaining capital spending for its refineries is significant, averaging \$600 million-\$800 million annually. While we do not expect renewable Identification Number costs to impacted Phillips 66 refining margins in a material way in 2019, regulatory and environmental expenses can significantly impact profitability at times. The potential impact on the local economy and environment is an ongoing moderate risk for Phillips. However, this does not influence ratings at this stage. We view Phillips 66 as an efficient operator, which is reflected in its business risk profile and our rating on the company, which is higher than its industry peers. The company has a satisfactory safety record, and we believe the board is focused on setting a comprehensive ESG policy, which we reflect in its satisfactory management and governance score.

Reliance Industries Ltd. (BBB+/Stable/--)

Vishal
Kulkarni,
CFA

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Reliance's large presence in hydrocarbon value chain and family control means environmental and governance factors are relatively more important to our assessment of the credit rating. Climate change risks relating to the production of fossil fuels are a credit factor, although the risks are less severe for companies operating in emerging markets such as India, as Reliance does. Reliance's large, single-location refining base has operated for more than a decade without any significant environmental incidents. Its E&P business, small by global standards, hasn't faced any environmental incidents. Its other businesses--telecom and retail--do not have significant environmental exposures. Its industrial relations and health and safety norms are in line with peers. Reliance's governance structure and financial reporting is in line with practices followed by large international companies. We don't view its family control as a negative factor, though it invariably brings additional public and investor scrutiny. Management stability has been a supportive factor overall from governance and transparency. Reliance has had its share of tax and operational disputes with regulators, and competitors in the past. However, they have been largely resolved through arbitration, without material financial or reputational impairment for Reliance.

SK Innovation Co. Ltd. (BBB+/Negative/--)

Shawn Park

We consider environmental and social risks as important factors in our credit analysis of oil refining companies. The energy sector's exposure to greenhouse gas emissions, pollution, and increasing water use, have led SK Innovation (SKI) to take measures to reduce its harmful impact on the environment. SKI has made strides in improving greenhouse gas emission record. It reduced carbon emissions by 24,000 tons in 2017. Over the past decade, SKI has invested in technology related to batteries for electric vehicles. As a result, SKI holds the No. 2 global share in the market for one major component, wet-type battery separators. SKI has worked to improve safety measures for its employees. The company reduced its industrial accident rate to 0.04% in 2017, down from 0.08% in 2015. We believe SKI's corporate governance is in line with peers. The company has adequate internal controls in place and maintains the independence of its board. The company also remains focused on sustainable development, as evidenced by its setting up of a sustainable management committee on the board.

Valero Energy Corp. (BBB/Stable/--)

Michael Grande

Valero has a high exposure to potential environmental risks due to its refining operations, which have significant environmental and social costs. For example, in April 2018, an explosion at Valero's Texas City refinery injured about 28 workers. However, we generally view Valero to be a good operator, and infrequent incidents such as the one described above would generally not impact our view of a refining company's business risk profile or rating. Like all refineries, Valero spends significant regulatory and maintenance capital to maintain safe and efficient operations. The company has made major capital investments to its refineries to reduce carbon emissions while at the same time expanding refining capacity. Valero has also taken steps to minimize emissions by producing renewable diesel fuel and has invested in cogeneration systems that produce electricity and thermal energy. The company is among the largest ethanol producers in the U.S., with 14 plants in the Midwest. Ethanol production has helped partly offset the significant costs for renewable identification credits, which can impact profitability and a refiners' competitive position. Valero's renewable identification credit costs have significantly declined, to about \$400 million in 2018 from roughly \$950 million in 2017. Capital expenditures attributable to environmental laws and regulations were about \$270 million in 2018 and will be at least \$170 million in 2019. We assess Valero's governance as satisfactory, in part reflecting its organizational performance, strategy execution, and leadership.

All ratings are as of May 31, 2019.

Appendix: Components In The Sector ES Risk Atlas

Here is a list of examples of factors we consider in evaluating sector-specific environmental exposure. For example, we examine to what extent each sector is relatively exposed to:

Greenhouse gas emissions (GHG): actual or potential regulations such as carbon taxes, emissions trading schemes, and other direct or indirect costs. The GHG emissions under the Kyoto climate change agreement are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆).

Sensitivity to extreme weather events: incremental costs or the potential physical impact on assets associated with recurring (for example, hurricanes) or infrequent (droughts) severe weather events.

Sensitivity to water scarcity: potential costs related to the need for extracting or sourcing large quantities of water, or requiring on-site water treatment, in comparison to other water users of the same water basins or utilities.

Waste, pollution, and toxicity: potential fines or rising costs associated with prevention and treatment of waste and pollution, including hazardous waste and air pollution.

Land use and biodiversity: asset retirement obligations, developing natural land or potential operating constraints, or increased costs associated with protecting plant and animal life.

The following is a list of examples of factors we consider in evaluating sector-specific social exposure. For example, we analyze to what extent each sector is relatively exposed to:

Human capital management: a sector's capacity to develop a long-lasting productive workforce while reducing potential operational disruptions from workforce mismanagement; diversity and inclusion attributes; exposure to strikes and the sector's general exposure to dealing with emerging skills scarcity or surplus labor.

Changing consumer or user preferences: We recognize that changes in consumer behavior are often the result of complex dynamics, such as changes in technology or fashion or other disruptive business trends. Therefore, we treat a change in consumer preferences as a social factor related to sustainability, health, safety, the environment, privacy, financial mis-selling, or community and human rights, particularly when an entity has triggered the change.

Demographic changes: potential costs or opportunities related to population growth and composition, such as an aging population, urbanization, changing living standards, or a growing middle class

Safety management: potential direct or indirect costs resulting from problems related to the safety of a sector's production processes and final customer products.

Social cohesion: potential or actual costs in direct operations or in the supply chain resulting from geopolitical or community-related events such as conflicts, community unrest, and terror attacks.

This report does not constitute a rating action.

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