

A Changing Climate: The Fossil Fuel Debate

We believe that climate change is taking the world into uncharted territory, introducing unprecedented challenges while presenting opportunities for investors to reduce potential risk and invest in solutions. Viewed mainly as an environmental issue in the past, mainstream companies and investors are increasingly recognizing climate change and its economic and financial implications.

Climate change will have a marked effect across the global economy. Policy pressure to reduce global carbon emissions is accelerating, as evidenced by the international agreement reached at the 2015 UN Climate Conference in Paris. This brings both potential risks and opportunities for investors. With combustion of fossil fuels, the single largest generator of global greenhouse gas (GHG) emissions, the energy sector is a key focus area for many policymakers, corporate leaders and investors alike.

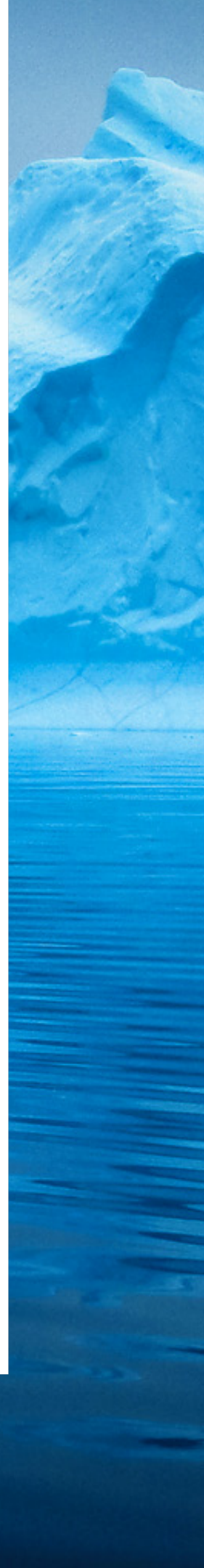
THIS ISSUE BRIEF DESCRIBES IN DETAIL HOW BUSINESS, INVESTOR AND ECONOMIC TRENDS POINT TO A SIGNIFICANT SHIFT TOWARD A LOWER-CARBON ENERGY SECTOR:

- Leading companies are actively working to reduce GHG emissions, investing in low-carbon and renewable energy sources
- Business is expanding environmental risk disclosure across operations and value chains, providing investors with greater insight into risks and opportunities
- Investors are increasingly integrating climate change into investment decision-making processes
- Energy sector economics are shifting away from fossil fuel dominance

In mid-December 2015, the United Nations Climate Conference in Paris resulted in an historic global agreement that provides the foundation for national policies to curb global greenhouse gas emissions.

The pact is significant because it establishes a first-ever unanimous agreement to limit climate change to less than 2° C above preindustrial levels, the maximum average temperature change that scientists believe will minimize the consequences of climate change. This sends a strong signal to investors that the trend in emissions is downward and that a transition in energy sources away from fossil fuels is underway. The agreement comes into force in 2020, but many investors are not waiting to take action. Through our review of this topic, we have found that many believe the outcomes of the climate conference have set the stage for notable changes in the global energy sector over the next five years and beyond. This is leading investors to consider climate change, and the fossil fuels that contribute to it, as part of their portfolio considerations. To be sure, at this early stage, it is still unclear what specific policies will result from the agreement at the individual country level, but investors with long-term investment horizons are increasingly considering potential risks and opportunities in their investments.

IN OUR VIEW, INVESTORS WHO ARE INTERESTED IN CONSIDERING THE POTENTIAL IMPACTS OF FOSSIL FUELS ON THEIR INVESTMENTS CAN EMPLOY A RANGE OF STRATEGIES, SUITED TO A VARIETY OF NEEDS. These options range from active engagement in the transition to lower-carbon energy sources, to investments in environmental leaders and reduced fossil fuel portfolio exposure to help mitigate future investment risks. These strategies are explored more fully at the end of this issue brief.



A Changing Investment Landscape: Climate-Related Risks and Opportunities

In our view, climate change is increasingly recognized as a material investment consideration that investors cannot ignore. Our analysis shows that its impact is real and growing. Seen mainly as an environmental matter in the past, we believe the economic and financial implications of a warming world are now growing concerns for mainstream businesses and investors. With the United Nations projecting global population to reach 9.7 billion by 2050,¹ and human activity related to energy generation and transportation as one of the primary drivers of climate change emissions, even small, single-digit changes to global mean temperatures result in high risks to sensitive earth systems needed to sustain life and economic activity (see Figure 1).

COMPANIES AND INVESTORS MAY FACE GROWING CLIMATE RISK. Global insurance companies are leading the charge to manage climate risk, driven by an upward trend in natural disasters since 1980 (see Figure 2) that threatens to undercut their industry.² In the United States, Hurricanes Sandy and Katrina alone triggered \$179.4 billion in damages,³ and in Asia, Thailand's extreme flooding in 2011 caused \$43 billion in damage and loss of human life.⁴ In a late 2015 speech to insurance industry peers, French insurer AXA S.A. CEO Henri de Castries noted that if climate change drives global temperatures to 4° C above preindustrial levels—the current projection if business as usual continues—most assets would become uninsurable.⁵ The Sustainable Accounting Standards Board (SASB) estimates that 93% of capital markets are exposed to climate change risk, with some industries more exposed than others. Continued climate impacts will likely drive shifts in business and investment decisions across energy, agriculture, real estate and infrastructure.⁶

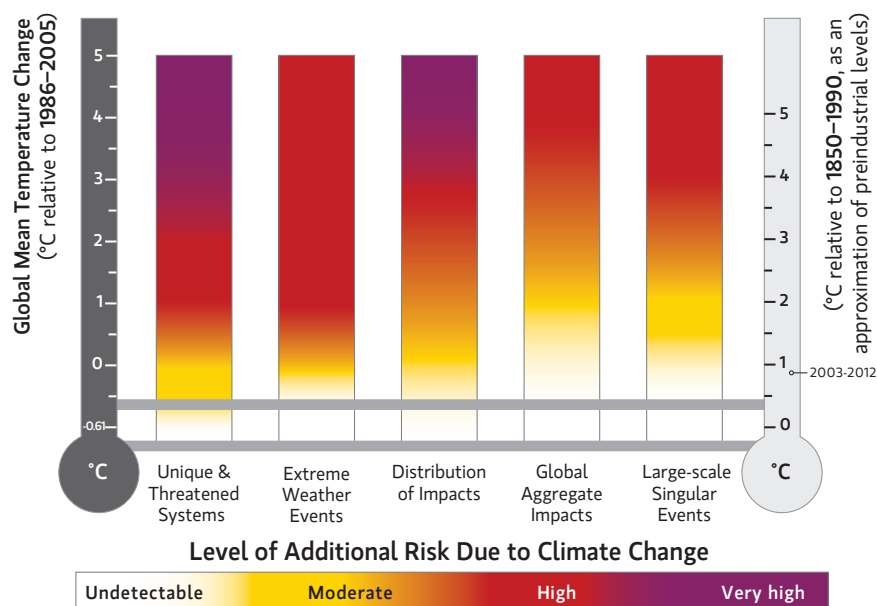
Momentum among investors is also growing to reduce climate risk across their portfolios, especially in the energy sector. Large institutional investors such as Rockefeller Brothers Fund⁷ and Dutch pension fund ABP have taken steps to reduce exposure to fossil

fuel investments.⁸ In late 2015, the state of California passed legislation mandating that its two largest pension funds, the California State Teachers Retirement System (CalSTRS) and the California Public Employees Retirement

System (CalPERS), sell their stakes in companies that earn a majority of their revenue from coal mining by July 2017.⁹ We believe that drivers for this investment activity include the prospect of carbon regulation and

Figure 1: Investors Should Be Aware That Societal and Economic Risks Resulting From Changes in Global Mean Temperature Increase Significantly as Temperature Rises

According to the Intergovernmental Panel on Climate Change, recent years' temperatures have not yet posed notable risks. However, in scenarios within which the global mean temperature changes, even by a few degrees relative to recent history, risks increase markedly.

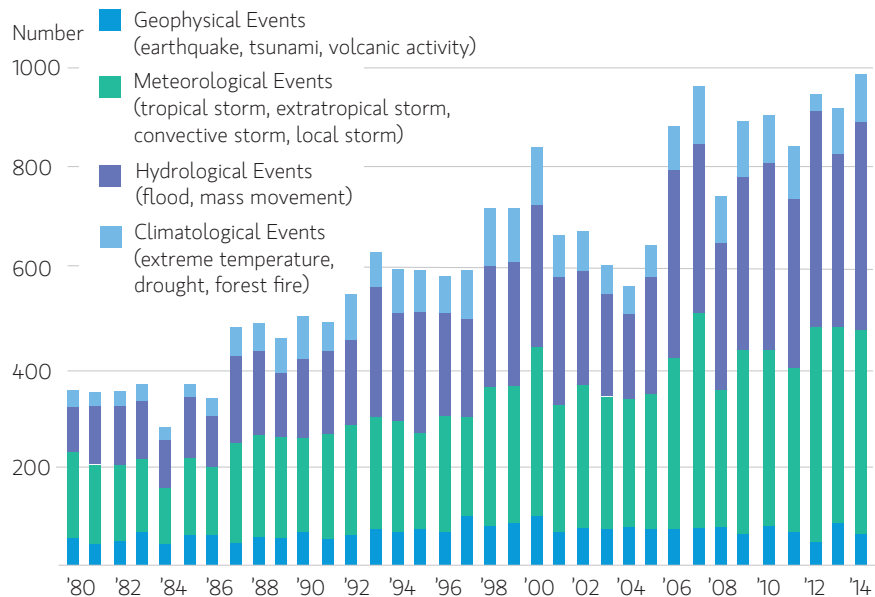


Source: UN IPCC, 2014: Summary for policymakers. Adapted from Assessment Box SPM.1, Figure 1 (right panel)

the intensifying fossil fuel divestment movement. Long-term asset owners also fear the potential for “stranded” assets—up to \$300 billion of future investment in fossil fuels that may be lost by 2035—if stronger climate policy reduces the economic viability of fossil fuels and prevents further extraction and use of these reserves.¹⁰ In a recent move on climate change, President Obama’s administration announced in early 2016 that it would place a moratorium on new coal mining leases on public land, leading to possible increases in costs and a slowdown in production for mining companies (see box on stranded assets).¹¹

We see mounting evidence that market sentiment about climate change can impact future performance. A November 2015 study by the University of Cambridge found through a portfolio stress-test analysis that short-term shifts in market sentiment induced by awareness of climate risks could lead to losses of up to 45% in an equity investment portfolio’s value and 23% for a fixed income portfolio. The study also found that only about 53% of this decline could be addressed by shifting specific positions within portfolios. The remaining 47% of potential decline could only be mitigated by systemic changes like major policy shifts on climate change, reflecting that broader, global macroeconomic risks may result from climate change regardless of one’s individual portfolio exposures. On the upside, the study also found that long-term economic growth is highest if society begins to systemically and successfully deal with climate change.¹² In our view, this reality presents a case for applying a range of investment approaches, from screening to targeted impact investments, to shareholder engagement with companies and policymakers to help address both portfolio implications and larger systemic risk related to climate change.

Figure 2: The Frequency of Climate Change-Related Natural Disasters Has Increased Considerably in the Last Three Decades



Source: Munich RE, Nat Cat Research, 2014

OUR ANALYSIS SHOWS THAT POLICY SHIFTS COULD ACCELERATE MEDIUM-TO LONG-TERM CHANGES IN THE ENERGY SECTOR. To attempt to limit the negative effects of climate change, many of the world’s biggest economies, including the United States, European Union, China, India, Brazil, Russia and Japan, have voluntarily pledged to reduce absolute GHG emissions or emissions intensity by varying levels going forward. Leaders from 195 countries gathered at the UN Climate Conference in Paris (COP21) in December 2015, ending decades of failed climate change negotiations. This landmark event culminated with a first-ever unanimous agreement to limit climate change to less than 2° C above preindustrial levels—the threshold at which scientists say the worst effects of climate change can be avoided.¹⁵ Planned country-level changes are to take effect in 2020 and ratchet up in intensity every five years after that. The focus of the final agreement is on holding climate change to even less than the recommended limit,

at 1.5° C above preindustrial levels—an unprecedented outcome.¹⁶ While there remains notable uncertainty about how this will translate into major policy development at individual country levels, we believe the agreement itself could be a strong sign of accelerating emissions regulations.

The energy sector is at the frontline of this regulatory pressure. Nearly 69% of global GHG emissions result from energy use, primarily from fossil fuels used in transportation, electricity and heating (see Figure 3).¹⁷ In 2013, 81% of the global energy supply was derived from fossil fuels.¹⁸ Increased regulation by the world’s largest emitters, including China, the United States and India could dramatically impair the profitability of higher-carbon energy sources on a sliding scale of impact from coal to natural gas while accelerating the adoption of clean energy sources, such as wind and solar. With economic growth projected to potentially increase energy demand by 32%¹⁹ over the next two and a half decades, this signals a major opportunity for low-carbon and

CLIMATE RISKS AND STRANDED ASSETS

Environmental risk factors could strand assets in a range of sectors, resulting in unanticipated or premature write-downs, devaluations or conversion to liabilities. According to the Stranded Assets Programme at the University of Oxford, these risk factors include:¹³



Environmental challenges related to climate change and natural capital degradation



Changing resource landscapes, such as shale gas abundance



New government regulations, such as carbon pricing



Falling clean technology costs, for example, for solar photovoltaics (PV), onshore wind and electric vehicles



Evolving social norms, such as the fossil fuel divestment campaign



Litigation, such as carbon liability



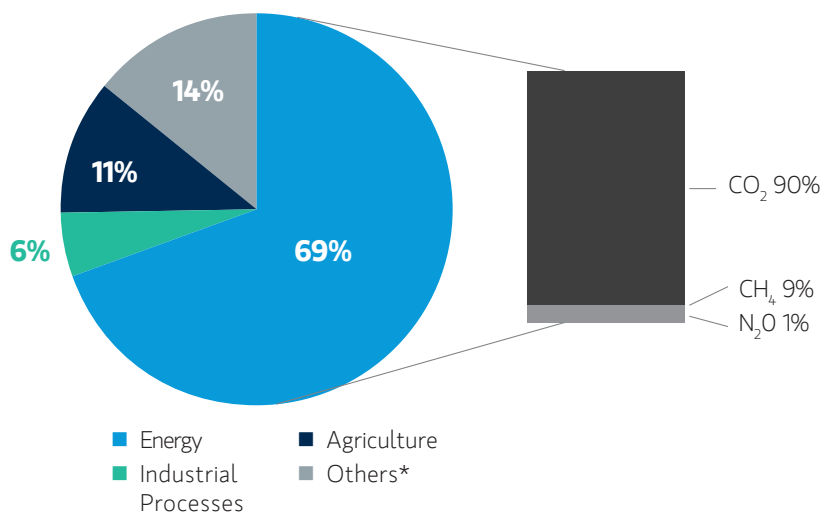
The extent to which fossil fuels assets become stranded will depend on policy and regulatory decisions. Scientists estimate the world has a maximum global “carbon emissions budget” of 1000 Gt (gigatonnes) that will limit the increase in global average temperature to 2° C (3.6° F) over preindustrial levels. This carbon budget is needed to help contain the damage from climate change and is the limit that governments have agreed to in the recent Paris negotiations. According to current projections, the world would need to avoid burning up to 80% of known fossil fuel reserves in order to live up to those binding commitments.¹⁴ Fossil fuel companies and their investors would face the loss of some or all of these reserves’ economic value.

renewable energy companies as well as investors. At the same time, we view the changing regulatory landscape as offering opportunities for energy companies and utilities to focus on best practices from a climate change perspective and to both enhance efficiency as well as change their fuel mix to favor low-carbon solutions.

REGARDLESS OF POLICY UNCERTAINTY, WE VIEW BUSINESS, INVESTMENT AND ECONOMIC TRENDS AS THE PRIMARY DRIVERS OF NEAR- TO LONG-TERM ENERGY SECTOR SHIFTS RELATED TO CLIMATE CHANGE.

Both the growing risks associated with fossil fuel-heavy portfolios and the investment opportunities presented by lower-carbon alternatives are bringing climate change considerations from the investment margins to the mainstream. In the following sections, these trends are explored further before providing investors with a range of strategies to apply this knowledge to their current portfolios.

Figure 3: Shares of Global GHG Emissions, 2010



*Others include large-scale biomass burning, postburn decay, peat decay, indirect N₂O emissions from nonagricultural emissions of NO_x and NH₃, Waste and Solvent Use.

Source: IEA estimates for CO₂ from fuel combustion and EDGAR 4.2 FT2010 estimates for all other sources.

Business, Investor and Economic Trends Point to a Potentially Significant Shift Toward Low-Carbon Energy

As described above, emerging climate and energy policy will likely accelerate both risks and opportunities for the energy sector and its investors. But many in the private sector, in our view, are not waiting for regulatory drivers to reduce climate exposure and take advantage of clean energy opportunities. Rather, business, investor and economic trends provide clear pointers toward a changing energy sector balance—away from fossil fuels and toward a low-carbon economy.

This section outlines four broad trends that point in this direction, with the potential for marked implications for the energy investment landscape.

TREND 1: IN OUR VIEW, MANY BUSINESS LEADERS ARE NOT WAITING FOR POLICY TO CHANGE. THEY ARE VOLUNTARILY ADDRESSING CLIMATE CHANGE AND INCREASING ACTION IN THEIR OPERATIONS AND ACROSS THEIR VALUE CHAIN.

Many forward-thinking companies have set targets to reduce emissions and are making significant investments toward resiliency in a changing climate. According to the CDP (Carbon Disclosure Project), 59% of the more than 2,300 companies reporting in 2014 reduced GHG emissions through operational changes and investments.²⁰ This activity not only cuts carbon emissions, but often drives return potential on these investments.

Our analysis revealed that some companies, including many of the world's largest and well-known brands, are factoring carbon into the way they price their internal cost of capital, affecting the way they allocate capital resources and make business decisions.²¹ Drivers cited included incentives for clean energy and emissions reductions and mitigating risks from future regulation and global carbon pricing frameworks.

COMPANIES' ACTION ON CLIMATE CHANGE CAN HELP PRODUCE SAVINGS, NEW BUSINESS VALUE AND HELP REAL RETURN POTENTIAL ON INVESTMENTS.

Companies are taking action to reduce their climate risks through business and operational improvements and efficiencies. Many companies are seeing payoffs from these efforts. According to the We Mean Business coalition, a collaborative effort of several business-focused think tanks, 85 of 100 companies researched by the group achieved an average internal rate of return of 27% on the aggregate \$8.2 billion invested to meet their public climate change targets.²² These investments include building and operational energy efficiency, direct operational emissions reductions, low-carbon energy purchases, transport fleet emissions reductions, behavioral change and more.²³ Still other companies are finding value in business-aligned investments that focus on lowering carbon emissions. A major U.S. technology company committed \$2.5 billion in financial investments in renewable energy in ways that are aligned with its business.²⁴

BUSINESSES ARE INCREASINGLY LOOKING BEYOND DIRECT OPERATIONAL ACTION INTO THEIR VALUE CHAINS.

Many large companies are also acting in growing numbers to limit climate risk in their supply chains in advance of emissions regulations. Among global

companies reporting to CDP's annual climate program, 435 stated that they were pricing carbon in their internal accounting—almost triple the number (150) in 2014.²⁵ Taking another tack, some global companies are actively creating demand for low-carbon energy sources. RE100, for example, is a consortium of corporations aiming to source 100% of their energy from renewable sources from a range of near-to medium-term deadlines. Launched in late 2014, RE100 has already signed 40 global companies that represent some of the world's most recognized brands, with some already meeting their 100% renewable sourcing goals.²⁶

Action on climate change can increase exponentially when supply chains are included, and the benefits of supply chain action on climate change are many. Suppliers who address carbon emissions often do so by reducing energy costs through increased efficiency and demonstrate to their customers that they are well-managed, long-term partners. The CDP supply chain program, launched in 2008, has accelerated emissions transparency by collecting information on climate risks, opportunities, emissions and reduction plans from the global supplier networks of some of the world's biggest companies. CDP's Supply Chain Report 2014-15

involved 66 global corporations with \$1.3 trillion in procurement spend.²⁷ The report generated the largest-ever set of such data, from 3,396 supplier companies worldwide, up from 2,868 in 2013. This represents a fivefold increase over the CDP's first supply chain report, in 2009, which involved only 34 customer companies and 634 of their suppliers.²⁸

As businesses focus more on company and value chain climate-related risks, activities and opportunities, investors are increasingly factoring this information into their portfolio decision-making.

TREND 2: ALONGSIDE ACTION, COMPANIES ARE VOLUNTARILY INCREASING RELATED CLIMATE CHANGE DISCLOSURE TO INVESTORS. In an era where news and information are constantly available through digital media accountability and transparency are growing trends in the business sector as well. In our view, the rapid availability of news and information is driving investor demand for a better understanding of environmental, social and governance (ESG) risks and opportunities and affecting how investors react to news about their investments—not just in individual companies, but in how they view the interconnectedness of the business value chain. With more data and information in investors' hands, climate change and sustainability are increasingly important drivers of investment decisions.

BUSINESS LEADERS ARE INCREASING DISCLOSURE ACROSS VALUE CHAINS. ESG factors are a growing source of companies' potential physical, reputational and regulatory risk and related disclosure. At present, climate change and sustainability disclosure in the U.S. is voluntary and the data can be challenging to compare across companies and sectors. Reporting initiatives including CDP, SASB, the Global Reporting Initiative (GRI) and the International Integrated Reporting Council (IIRC) all focus on driving greater transparency on material ESG issues to investors and improved consistency of data.²⁹ The proliferation of these voluntary standards and the increasing focus on

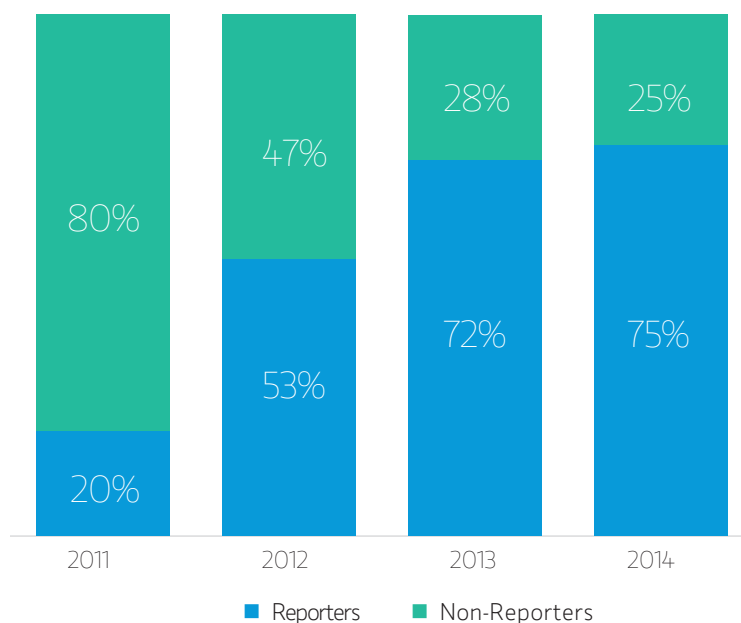
third-party auditing of ESG disclosures could help drive toward standardization of such disclosures.

Disclosures related to regulatory, physical and market risks due to climate change are a key element of these reporting frameworks. In 2014, 75% of companies included in the S&P 500 Index—a key barometer of the U.S. economy—published a sustainability or corporate responsibility report, up from only 20% in 2011 (see Figure 4).³⁰ Trends in reporting show both increasing accountability and increasing action on climate change. Among S&P 500 companies, board-level responsibility for oversight of climate change risk and opportunity jumped from 67% in 2010 to 95% in 2015.³¹ Between 2010 and 2015, the share of S&P 500 companies actively working to reduce GHG emissions increased from 52% to 96%.³² Internationally, the pattern is similar, with active climate change engagement increasingly becoming standard corporate practice. A comparison

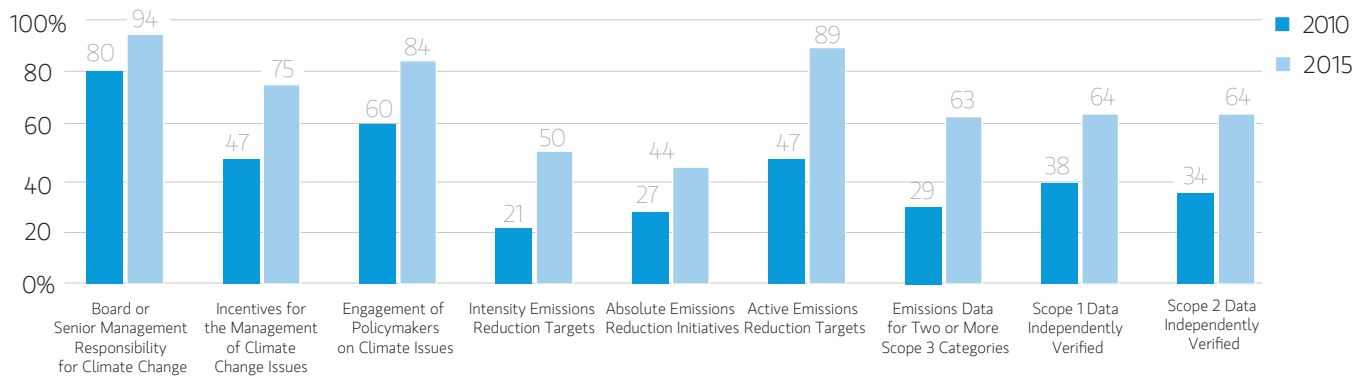
of corporate climate action in 2010 and 2015 by CDP shows just how far companies have come in five years. It is based on responses from 1,997 companies in 51 countries (see Figure 5). Selected from regional stock indexes and listings, these businesses represent 55% of the market capitalization of listed companies globally.^{33,34} From 2010 to 2015, disclosure on climate change in each aspect assessed by the CDP increased significantly, showing a steady upward trend in corporate climate change transparency and action.

Greater disclosure of information can enable investors to have a better base by which to make decisions. To be sure, much of this voluntary disclosure is unaudited and at times inconsistent across companies. This can present challenges for investors to compare companies' performance on climate change. The next section describes how many investors are already incorporating climate change into their investment decisions despite these

Figure 4: S&P 500® Companies Sustainability Reporting



Source: Governance & Accountability Institute, Inc., 2015

Figure 5: Improving Climate Disclosure in Global Companies

Source: CDP Global Climate Change Report, 2015

challenges, by focusing on environmental data and information that is deemed to be the most relevant and material.

TREND 3: MANY INVESTORS ARE STARTING TO INTEGRATE CLIMATE CHANGE INTO THEIR MAINSTREAM DECISION-MAKING.

Investors are increasingly acting on, and helping to drive, business response to climate change. As influential, large investors explore how to account for and address climate change in their portfolios, shifts in investment will likely soon follow. In just one example, Microsoft founder Bill Gates unveiled his “Breakthrough Energy Coalition” in late 2015. The coalition includes 28 of the world’s wealthiest private investors and business leaders, whose collective assets total some \$350 billion. The coalition is committed to investing significant capital in bringing the latest energy technology to market with a focus on zero-emission energy innovation.³⁵ While many factors, including technology innovation and regulation, will ultimately determine the world’s dominant energy source in 2030 and beyond, significant change in the sector will occur over the next five to 10 years.

ESG FACTORS ARE INCREASINGLY VIEWED AS FUNDAMENTAL INVESTMENT FACTORS. In recent years, we have seen a notable growth in the number

of investors that integrate ESG factors into their strategies and analysis. By the end of 2014, sustainable investing represented more than \$1 out of every \$6 of professionally managed assets in the United States, totaling \$6.57 trillion, a nearly 55% increase from \$1 out of every \$9 under management and a total of \$3.74 trillion just two years prior, in 2012.³⁶

Many investors have also seen ESG factors contribute to performance. A 2014 Harvard study showed that \$1 in 1993 invested in a portfolio of firms with high performance on material sustainability issues would have earned \$28.36 by 2013 versus \$14.46 earned by competitor firms with low performance on material sustainability issues.⁴⁰ Morgan Stanley Equity Research analysts have also incorporated this issue when analyzing their covered companies. The team has identified material ESG factors for 29 sectors and is incorporating this analysis into its fundamental coverage. The goal is to provide investors insight into the direct, meaningful and sometimes immediate near- and long-term financial impact these issues have on companies. In 2015, the Morgan Stanley research team revised some investment recommendations by increasing price targets on some ESG outperforming companies in the footwear industry based on this analysis.⁴¹

CLIMATE CHANGE ENGAGEMENT IS INFLUENCING INVESTMENT STRATEGY.

In our view, within the broad set of ESG issues, climate change is now seen by many of the world’s largest investors as a critical investment issue. By December 2015, nearly 120 investors representing \$10 trillion in assets had signed the Montreal Carbon Pledge, mobilizing these investors to measure, disclose and reduce the carbon footprint of their portfolios.⁴² Some investors have chosen to divest from fossil fuel equities to reduce climate change risks (see box on Page 8). Others have focused on more nuanced strategies, choosing to strategically reduce portfolio carbon risk while also using their position as investors to engage directly on climate change with corporate leaders and policymakers. For example, in 2014, Blackrock, PIMCO and 350 of the world’s largest institutional investors representing \$24 trillion in assets, called for a price on carbon emissions.⁴³

MANY INVESTORS ARE SEEKING INCREASED CORPORATE CLIMATE RISK MANAGEMENT, DISCLOSURE AND GOVERNMENT ACTION. Since 2009, the UN Sustainable Stock Exchanges (SSE) initiative has led 36 stock exchanges, including major exchanges like the New York Stock Exchange, Nasdaq and the London Stock Exchange, to advocate for disclosure of ESG data. This in turn has allowed some

investors to better account for the real risks and opportunities that such data presents.⁴⁴ In 2015, the Investor Platform for Climate Actions was formed, representing a coalition of 400 investors with a combined \$25 trillion in assets under management. The platform serves as an umbrella for 17 investor-focused initiatives promoting increased climate change disclosure from investors and companies, and engagement efforts with business and governments.⁴⁵ Climate change also accounted for the highest proportion of environmental issues covered by shareholder resolutions filed with U.S. companies in 2014.⁴⁶ In 2015, of 433 resolutions filed in the U.S., climate change and environmental issues comprised 27% of that total, the highest proportion of proposals filed on a single issue—highlighting its current importance to investors.⁴⁷ This level of engagement and advocacy can only be effective when investors are directly holding positions in the companies in which they seek to influence, making divestment a contradictory approach to influencing traditional companies on environmental improvements.

As investors increasingly focus on climate change as a portfolio issue, the underlying economics of energy are also changing rapidly, highlighting key investment risks and opportunities.

TREND 4: ENERGY SECTOR ECONOMICS ARE LIKELY SHIFTING AWAY FROM FOSSIL FUEL DOMINANCE. Multiple economic trends are contributing to fundamental changes within today's energy sector. Business and investor action is both a driver and a response. This section presents our view on key investment themes for both short- and long-term consideration.

Many energy producers are tapping costlier and riskier sources of energy.⁴⁸ Already, approximately 60% of U.S. oil and gas extraction is derived from less conventional sources such as tar sands, shale and offshore operations.⁴⁹ As climate policy comes to force in the lead-up to 2020, the true costs of traditional fossil fuels may increase, and investors could consider how these policies will affect their investments in fossil fuel-heavy industries over this time frame.

Fossil Fuel Divestment: Symbolic Act or Sound Investment Strategy?

Divesting from fossil fuels is at one end of a range of strategies open to investors. While not viewed as a practical approach to many investors, it has recently received much media and public attention due to activist advocacy by environmental groups such as 350.org and university groups.



The fossil-free movement aims to mobilize institutional and individual investors to divest from stocks, bonds or investments in fossil fuel companies. Proponents argue that fossil fuel assets are environmentally unsound and a poor economic bet, both risky and losing value. Currently, owners of \$3.4 trillion worth of assets have publicly committed to a divestment approach.³⁷

Though divestment has a mixed track record as an investment strategy, it often leads to increasing public pressure to take regulatory action on the underlying issues. In the 1980s and early 1990s, health issues caused by

tobacco use led global public health organizations, followed by universities and pension funds, to divest from tobacco companies, which subsequently became highly regulated.³⁸ Campus protests by American students similarly fueled the growth of the anti-apartheid movement through divestment from South African firms. By 1988, 155 institutions drove a net capital outflow of \$23.9 billion, bolstering U.S. sanctions.³⁹ But perhaps most notable about the divestment movement is that it has sparked a robust debate among investors about how to address fossil fuel risk in their portfolios.

The International Energy Agency's 2015 World Energy Outlook (IEA) projects a series of scenarios in which fossil fuels' global market share decreases by as much as 18% during the period from 2013 to 2040. To illustrate the specific short- and long-term risks and opportunities for investors, we examine two key scenarios:

- **New Policies Scenario.** This first scenario takes account of broad policy commitments and plans announced by countries prior to COP21 in 2015, including national pledges to reduce GHG emissions and plans to phase out fossil-energy subsidies, even if the measures to implement these policies have not been identified.
- **450 Scenario.** This second scenario sets out an energy future that is generally aligned with the outcomes of COP21—where more aggressive policies contain the global increase in temperature to 2° C by limiting the concentration of

atmospheric GHG to around 450 parts per million of CO₂.⁵⁰

The implications for the global energy mix in these IEA scenarios are illustrated in figures 6 and 7. Based on actual energy mix data from 2013 (the latest available at the time of their assessment), both scenarios focus on total energy demand and overall fuel mix in two key time horizons: 2020 (when COP21 commitments come to force) and 2040. Also over those time frames, the agency projects that by 2040 energy demand will increase by 32% over 2013 levels in the New Policies Scenario and 12% in the 450 Scenario, given assumptions for industrial and population growth.⁵¹ Regardless of the scenario, in our view, investors should consider how the fossil fuel mix is projected to decline and demand for renewables increases over time.

Although there will certainly still be a role for fossil fuels until 2040 and beyond, the share of the total fossil fuel-based

energy mix is expected to decline in both scenarios. Many investors may face important considerations if investing in fossil fuel markets and may find increasing opportunities to invest in a growing low-carbon sector.

In the more conservative New Policies Scenario, fossil fuels' (coal, oil and natural gas) global market share is projected to decrease by a total of 4% (from 79% of market share in 2020 to 75% by 2040). The more aggressive 450 Scenario projects that fossil fuels will decline 18% (from 78% share in 2020 to 60% share in 2040). As a result, these decreases—whether 4% or 18%—reveal a notable decline in fossil fuel use in the coming decades and could be an important trend for investors to watch. Also notable are significant shifts in the fuel mix that will occur even in the shorter term, by 2020—the same year in which the initial policy commitments from COP21 come into force. Beyond 2020, as more robust emissions reduction is driven by national and international policy enforcement, the

decline in fossil fuels is even more striking and growth in renewables presents a significant potential opportunity for investors.

ELECTRICITY AND HEATING. Together, fossil fuels accounted for nearly 67% of capacity of all electricity and heating used globally in 2013. In our view, a number of underlying trends are driving changes to energy demand that could create a range of investment risks and opportunities.

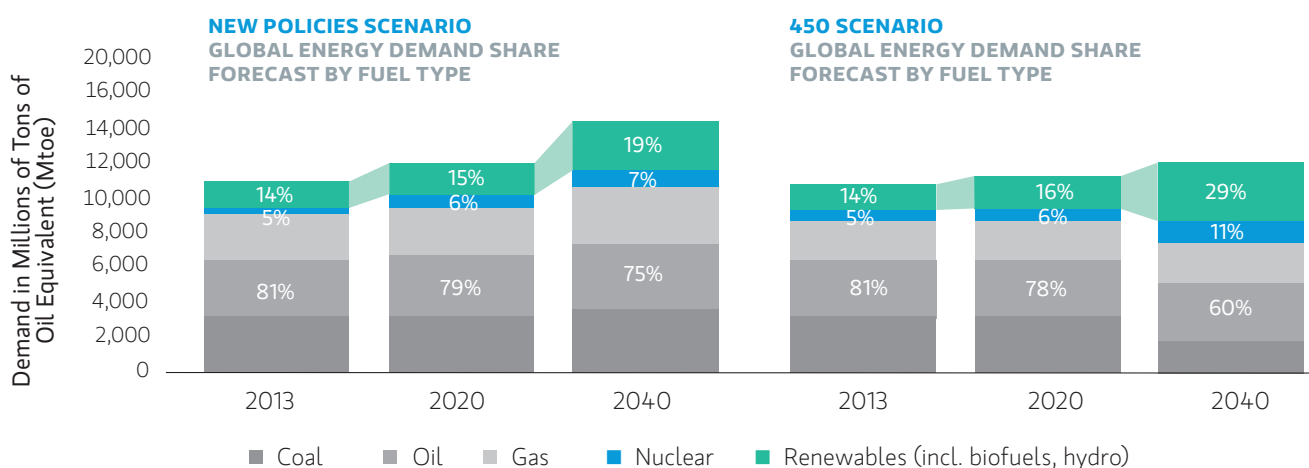
- **Competing cost curves favor renewables in the long term.** Technologies such as wind and solar are likely to have a distinct long-term cost advantage over extractive commodities, such as fossil fuels. As technologies scale, costs typically plummet.⁵² As of 2014, nearly three-quarters of global renewables-based generation was competitive with electricity from other types of power plants without subsidies, with large hydropower accounting for most of the total.⁵³ In the last five years alone, solar panel prices fell by 80%.⁵⁴ In

contrast, commodities such as oil and gas face long-term cost pressures despite current record low prices (see Transport below). For electricity and heating, utility scale use of alternative energy will likely continue to grow over time. To be sure, in a time of low fossil fuel energy prices, the cost competitiveness of renewables is uncertain, but over time, present low fossil fuel prices are likely to change and long-term investors should watch this trend against their time horizons.

- **New generating capacity favors cost-competitive, lower emission fuels and renewable energy sources.** Renewables accounted for 85% of all new generating capacity in 2014.⁵⁵ Natural gas also continues to replace coal as a base load fuel due to two advantages: it is cheaper and cleaner. While natural gas shows promise as a transitional fossil fuel, new proposed U.S. GHG regulations on methane, and on extraction practices such as hydraulic fracturing, could temper

Figure 6: Global Energy Demand by Fuel Type (IEA)

Two key scenarios by the IEA. The New Policies Scenario on the left is reflective of the climate change commitments made by countries prior to COP21. The 450 Scenario on the right is reflective of more aggressive emissions reductions commitments to hold climate change to less than 2 degrees above preindustrial levels and is therefore more reflective of the actual agreement made by nations at the COP21 summit. In both cases, investors should note the potential for growth in renewables. Perhaps most notable for investors in the 450 Scenario is the marked decline in fossil fuels by 2040, in addition to growth in renewables.



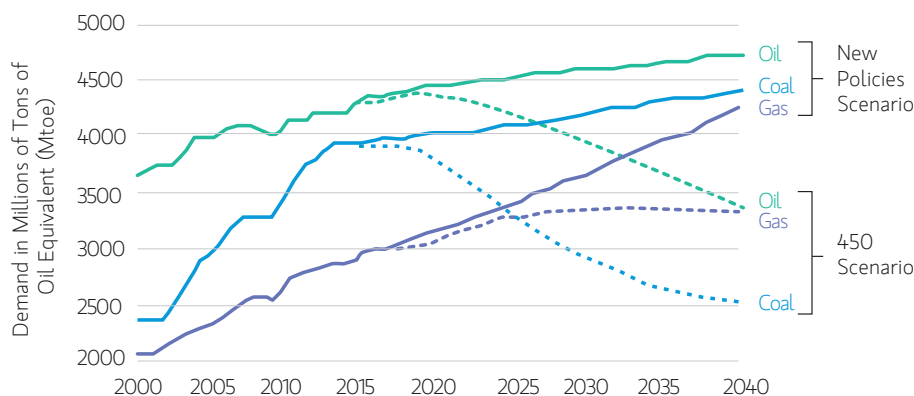
Source: International Energy Agency, 2015

its growth. The largest capacity additions going forward will take place in developing countries, such as India and China.⁵⁶ In the New Policies Scenario, renewable energy must account for 60% of China's capacity additions through 2040.⁵⁷ Long-term investors should consider monitoring developing countries' growth as they increasingly favor renewable energy.

- Coal faces growing risk of losses in market value.** Coal is the currently lowest cost fuel available in many global regions. The Stowe Coal index of global stocks lost 71% of its value between 2010 and 2015, while the S&P 500 rose 76% over the same period.⁵⁸ Of all fossil fuels, coal also has the highest carbon intensity—making it the key target of emissions reductions efforts.⁵⁹ In addition, reductions in global demand by large countries and shifts to natural gas and alternative energy have led to significant recent losses in coal equities.⁶⁰ If utilities continue to favor natural gas and alternatives ahead of coal, in our view, it could result in long-term risks to investments in coal.
- Improving battery technology could be an opportunity for climate-aware investment.** One disadvantage of renewable energy is intermittency, and batteries are the solution. If the sun is not shining or air currents are weak, solar and wind will not generate enough electricity. Efficient, cost-competitive energy storage technology would help drive wind and solar power to scale by allowing energy to be stored for later use. Battery technology appropriate for storing intermittent energy from renewables is expected to drop 70-85% in price by 2035.⁶¹ If this occurs, some IEA forecasts predict renewables could replace fossil fuels as the dominant base load energy source around or after 2030.⁶²

Figure 7: Fossil Fuel Demand by Scenario in Millions of Tons of Oil Equivalent (Mtoe)

Overall demand for fossil fuels in the two IEA scenarios show a marked decline after 2020 in the 450 Scenario, as compared to the New Policies Scenario.



Source: International Energy Agency, 2015

- Changing electricity distribution, especially in developing markets, could present opportunities to invest in distributed energy.** Electricity demand is expected to increase by 70% from 2013 to 2040 in the base case, with non-OECD countries responsible for nearly 88% of increased demand.⁶³ Today, many developing countries struggle with nonexistent or unreliable electric grids and increasingly are the focus of bottom-up electrification approaches.⁶⁴ Working grids are critical for centralized, commercial delivery of electrical power by fuel-based energy sources, such as coal, oil and gas. However, growing use of distributed (on-site) power generation reduces the role of utilities in electricity distribution. As a result, many developing countries lacking in grid infrastructure could skip it entirely and use remote, small-scale or on-site renewables to capture a large share of new generating capacity.
- Energy efficiency investments could potentially save trillions in energy costs while significantly reducing demand and GHG emissions.** Hardware and software that help optimize energy use, new materials, new construction methods and building management practices can significantly reduce energy consumption and cut costs—and present opportunities for investors. In the New Policies Scenario, energy efficiency mandates, coupled with technological advancement, could help reduce global energy demand by 6% by 2040, as compared to projections based on 2013 policies.⁶⁵ In the United States alone, LED lighting is projected to comprise 84% of sales, saving over \$26 billion in energy costs, by 2030.⁶⁶ Increasingly, commercial real estate tenants are seeking energy-efficient properties, and efficient buildings are seen as differentiators in the real estate development market. Energy efficiency investments from 1990 to

2015 avoided \$5.7 trillion of energy expenditure.⁶⁷ Looking ahead, up to 40% of the emissions reductions needed to cap warming at 2° C (3.6° F) above preindustrial levels could come from energy efficiency, according to the IEA, making energy efficiency a compelling option for investors to consider.⁶⁸

TRANSPORT. In our view, transportation presents a significant area of opportunity and risk for investors as GHG emissions regulations come to force in 2020 and beyond. Figure 8 illustrates that fossil fuels account for nearly 97% of road transport fuel use globally,⁶⁹ and as policy, technology and pressure to reduce costs drive energy efficiency, demand for oil and gas across modes of transport could decrease. If fuel efficiency mandates prove too stringent to achieve, alternative transport fuels, such as natural gas or renewables, could become an increasingly promising investment opportunity. The rapid growth of biofuels and electric vehicles may also present investment opportunities that reduce fossil fuel dependency for both consumer and commercial transport.

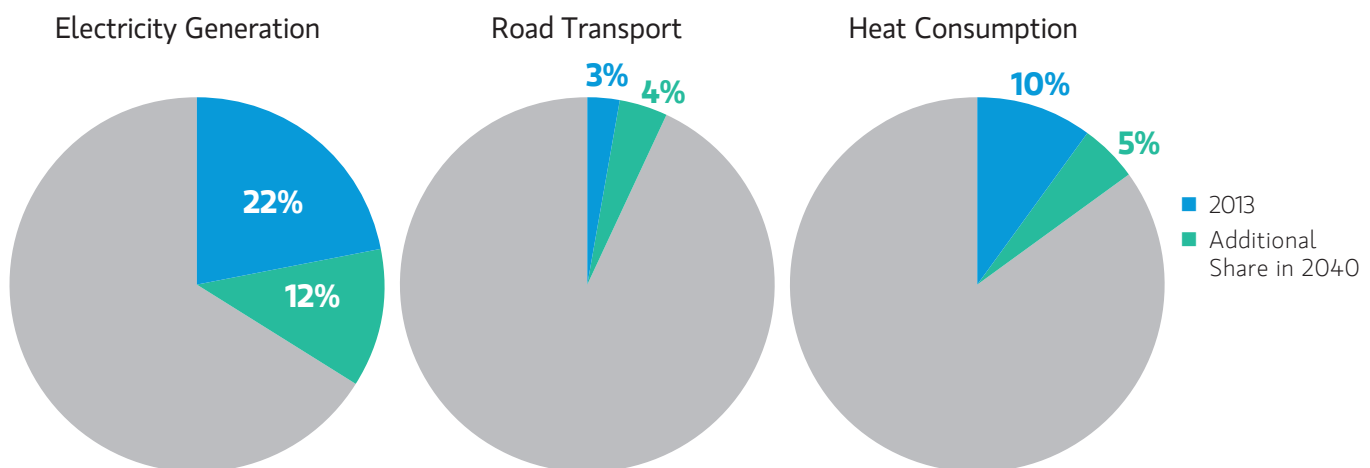
Electric vehicles (EV), just one example of low-carbon transport, have lower tailpipe emissions and are a growing business. To be sure, EVs are currently charged using grid-generated electricity, and in the U.S., 35% to 40% of that power comes from coal, making electric vehicles today only marginally better from an emissions standpoint than gas-powered vehicles. Based on anticipated changes in electricity generation to favor renewables, this could likely change over time.

- **Plug-in Hybrid (PHEV) and Electric vehicles (EV) may soon experience increasing growth.** Investments in technological improvements for EVs, including improved battery costs as described above, could bring them into contention as scalable lower-carbon alternatives to conventional vehicles. In our view, economics, not emissions, are even more central to the growth of EVs. Currently, PHEV and EVs represent only 0.08% of passenger cars.⁷⁰ Yet, global sales grew 70% and 53% in 2013 and 2014, respectively.⁷¹ Past growth was slow due to a shortage of charging

infrastructure and limited driving ranges. For example, current EVs have driving ranges between about 60 and 300 miles.⁷² Longer-range vehicles are significantly more expensive, however. In addition, charging times vary from 20 minutes to seven or more hours, creating current barriers to scale.⁷³ The IEA predicts that EVs would reach cost parity with gas-powered internal combustion vehicles once battery prices hit \$300 per kWh (kilowatt-hour) of storage capacity.⁷⁴ This could be a tipping point in the mass market adoption of EVs and PHEVs. Some studies suggest battery prices could hit this point within 2 to 3 years.⁷⁵

- **Commercial road transport is potentially the largest growth opportunity area for alternatives; however, investment opportunities currently lie in many substitutes rather than one clear winner.** The use of PHEVs or EVs for commercial transport is very early in its development, and could become an opportunity for

Figure 8: Global Share of Renewables by Sector in 2013 and 2040 (IEA)

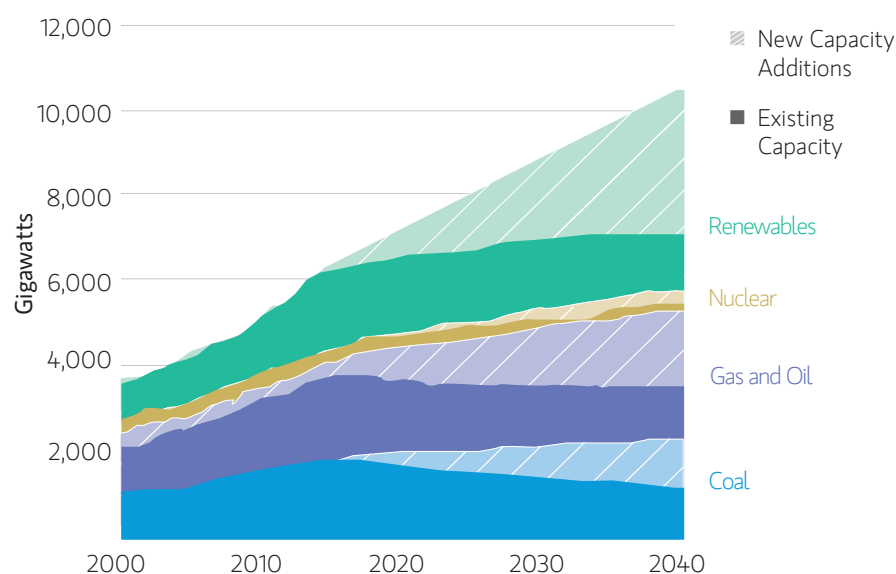


Source: International Energy Agency, 2015

investors with the advancements in technology described above. Natural gas, already used in 112,000 vehicles in the US and 14.8 million vehicles worldwide,⁷⁶ continues to be an investment opportunity as a “transition fuel” to renewables, given its competitive costs, lower emissions profile and use for both energy generation and transport. Investors should watch new policies to regulate emissions in extraction processes that could slow the growth of natural gas. Biofuels are also increasingly an opportunity for investors to consider in the road transport energy mix. Blended with fossil fuels to meet mandates that are in place in over 60 countries,⁷⁷ they reduce emissions and enhance vehicle performance. Biofuels have grown in the last decade from 1.2% of total transport market share to 3.3% in 2013.⁷⁸ In the New Policies Scenario, biofuels are projected to grow to over 8% market share by 2040.⁷⁹ Tightening of mandates and increased investment and reductions in price could result in biofuels becoming an even larger part of the energy mix than predicted. On the other hand, continued low oil prices could slow the growth of transition to any substitute energy sources—though this trend may not hold long-term.

- **Aviation and maritime transport are potentially long-term opportunities for improved fuel use and emissions reductions.** Though estimates vary, aviation and maritime transport together are currently responsible for about 5% to 6% of CO₂ emissions globally, but are growing quickly.^{80,81} Given the relatively

Figure 9: Forecast of New Capacity Additions (IEA)



Source: International Energy Agency, 2015

small share of today's emissions, however, fuel efficiency standards that are increasingly prevalent in road transport are still nascent in aviation and maritime transport, and long-term changes in the energy mix in these sectors are harder to predict. The New Policies Scenario estimates that steady growth in travel demand will increase consumer travel demand by 3.9% per year while commercial travel is expected to increase 4.2%.⁸² By 2040, fossil fuel demand in aviation may become 15% of total transport demand, up from 11% in 2013.⁸³ As a result, aviation could potentially drive demand for oil despite overall decline in fossil fuel demand for the broader transport sector. On the other hand, the reduction of oil use in the aviation sector could get

renewed attention if oil prices rise. Today, fuel represents nearly 30% of airline expenses between 2012 and 2015.⁸⁴

TRENDS IN SUMMARY

We believe many investors are already taking steps to engage on climate change policy and action, reduce their own climate exposure and invest in potential opportunities arising from these shifting market dynamics. These trends show that the energy sector is in a period of flux, challenging the long-term dominance by fossil fuels which began with the Industrial Revolution. In the next section, we explore potential strategies that allow investors to navigate this changing landscape and factor climate change appropriately into their energy investments.

To Counter Risk and Maximize Opportunity, Investors Can Employ a Range of Fossil Fuel-Aware Investment Strategies

In our view, the direction on climate change that business, investors and policymakers are taking is evident, and regardless of climate change policy, many leading companies and investors are increasingly betting on a lower-carbon future. While some investors are watching and waiting, others have been taking action. Their actions are both responding to and reinforcing market shifts in favor of clean energy sources and technologies. The confluence of these trends could reach a tipping point in the coming years. To be sure, investors focused on short-term trading goals may find opportunity for potential gains in fossil fuel plays. But what does this mean for investors with long-term investment horizons? What strategies could they employ, particularly in relation to the still dominant fossil fuel industry?

WHY NOW? THE PROS AND CONS OF ACTIVE FOSSIL FUEL-AWARE STRATEGIES

Climate change-related risks and opportunities provide the rationale for proactive investors to explore and consider implementing climate-aware energy investment strategies. Fossil fuel-related risks and opportunities in a portfolio can be addressed by a range of potential approaches from screening to broader corporate or policy engagement on systemic climate change-related issues, as illustrated earlier by the outcomes of the University of Cambridge study.

In our view, divesting from fossil fuels, a growing trend, has had a mixed track record. When oil prices are high, and oil and gas are more profitable, divestment can be a losing strategy. Recently, record low oil prices are creating a more positive track record for divestment, at least short term. For example, a 2013 study found that a low-carbon portfolio excluding coal, oil and natural gas produced a return penalty differential of less than 0.005% compared to a strategy that excluded the energy sector entirely.⁸⁵ Both portfolios tracked the Russell 3000 index, which represents the 3,000 largest companies in the United States.

In some cases, other lower-carbon approaches have had limited downside performance impact. In 2013, financial research firm MSCI compared the five-year performance of an index that excluded 247 of the largest fuel reserve-owning companies to the MSCI ACWI Investable Market Index. Overall performance was nearly identical. Another MSCI study for the California State Teachers Retirement System (CalSTRS), using 10 years of data, also found “ex-carbon” portfolio approaches to have minimal negative long-term performance impact. The tracking error, a measure of how closely a portfolio follows the index to which it is benchmarked, was 0.99% over the entire time series.⁸⁶

Ongoing review of climate change exposure in one’s investment portfolio can create a virtuous circle of investor and corporate interaction. Given that the future of the energy sector is expected to be very different than the past, forward-looking investment analysis helps position investors for the changes ahead. In addition, while an understanding of performance is still evolving, there are many signs that an ongoing, forward-looking fossil fuel aware investment lens can help reduce

risk and potentially enhance long-term performance.

Investor attention to climate issues has also led to direct engagement with companies which can result in improved performance on GHG reductions. Data on U.S. shareholder resolutions from the sustainability advocacy group Ceres found that nearly 50% of the 230 sustainability-focused resolutions filed by investors in their network between 2001 and 2010 were positively addressed, demonstrating that companies take action when investors engage them on the issue.⁸⁷

Given the dynamic nature of the evolving energy sector, reviewing investors’ climate-aware strategies on an ongoing basis could also enable them to be more responsive to changes that could have material short- and long-term investment impact.

This does not mean that there is no risk or potential downside to fossil fuel-aware strategies. Investors should keep in mind that the potential impact on the return or risk profile of fossil fuel-aware investing can vary significantly by investment vehicle, strategy, portfolio manager, geography, sector and more.

WHAT NOW? A RANGE OF FOSSIL FUEL-AWARE INVESTMENT STRATEGIES

Investors seeking to integrate climate change considerations into their portfolios can employ a range of strategies to help mitigate risk and leverage opportunities related to fossil fuels. There is no one-size-fits-all approach, and investors should carefully consider what approach to take given their unique goals, investment context and risk tolerance levels. Investors should revisit their analysis of portfolio risks and opportunities on a periodic basis as the political and economic landscape related to climate change evolves. At a high level, this approach involves the following steps:

- **Assessing** the investment objectives alongside portfolio exposure to climate change opportunities and risks
- **Developing** a strategy by matching available options to the investment objectives
- **Implementing** the strategy while monitoring performance and making changes over time

The graphic below summarizes the range of approaches available to investors, including reducing exposure to fossil fuels, investing in environmentally conscious low-carbon fuel practices and identifying thematic opportunities related to climate change. We also briefly describe the investment objectives available, along with related strategies, asset classes and examples of investments.

FOSSIL FUEL-AWARE: REDUCE NEGATIVE EXPOSURE TO FOSSIL FUEL-RELATED RISKS

Fossil fuel-aware strategies focus on partial or complete divestment from companies producing coal, oil and gas, as well as from companies that own significant fossil fuel reserves. Examples of investment vehicles and activity include mutual funds, separately managed accounts (SMAs) or exchange-traded funds (ETFs) with restricted exposure to publicly traded companies with the largest fossil fuel reserves. An optimized index strategy that limits exposure to fossil fuels is another approach.

ENVIRONMENTAL LEADERS: REDUCE EXPOSURE TO FOSSIL FUEL-RELATED RISKS WHILE INCREASING POSITIVE EXPOSURE TO ENVIRONMENTAL OUTPERFORMERS

Employing this strategy, investors can maintain select exposure to the energy sector by investing in companies that reflect industry-leading environmental practices compared with their peers. This approach includes energy names for diversification, but seeks to reduce risk by investing in companies that are leaders in the industry when it comes to environmental practices. Strategies invest in companies that apply best practices on climate change, such as companies in traditional sectors that are transitioning to cleaner energy investments, or those that are publicly committed to using only renewables in the near to long term. Examples of investment vehicles also include mutual funds, with a portfolio emphasis on companies pursuing low-carbon and energy efficiency solutions.

A Range of Fossil Fuel-Aware Strategies

There are a variety of options already available to investors that aim to align their investment with a climate-aware strategy. These options can be incorporated individually or in a combination, depending on the investor's individual objectives, needs and risk tolerance. Shareholder engagement is a strategy that can be used on its own or in conjunction with the other strategies.

OBJECTIVE

REDUCE CLIMATE RISK

INCREASE CLIMATE OPPORTUNITY

STRATEGIES

Fossil Fuel-Aware
Negative Screening



Environmental Leaders
Positive Screening



Thematic Opportunities
Proactive Solutions

Shareholder Engagement

THEMATIC OPPORTUNITIES: INCREASE POSITIVE EXPOSURE TO LOW-CARBON OPPORTUNITIES AND ACHIEVE TARGETED, ISSUE-AREA IMPACTS

This approach pursues a focus on thematic investment opportunities in energy that are driving the transition to a lower-carbon economy and climate-resilient society. Active or passive investment strategies focus on companies and technologies which provide low-carbon energy solutions, such as renewables, battery storage and energy efficient building infrastructure and management.

SHAREHOLDER ENGAGEMENT: ACHIEVE TARGETED IMPACTS THROUGH DIRECT INVESTOR-LED ENGAGEMENT ON ISSUES RELATED TO FOSSIL FUELS AND CLIMATE CHANGE

Advancing positive environmental change through shareholder engagement and active dialogue with portfolio companies drives this investor strategy. An option available across the range of approaches, engagement employing shareholder advocacy, proxy voting and shareholder resolutions around key climate and fossil fuel-related issues.

Conclusion

We see a future where the energy sector of tomorrow is likely to be very different from the past, primarily because of the macro and microeconomic trends underway, as well as changing views on climate change in the business and investment community. Investors have a vital role to play in this evolution.

Whether they pursue divestment strategies, full-on engagement with the transition to a lower-carbon economy, or an approach somewhere in between, their response can help to mitigate risk and take hold of opportunities. The investment options allow for a range of objectives and enables investors to use a combination of tactics to address the fundamental shifts in energy investments that are underway already. As our trends analysis reveals, this space is changing quickly—with significant evolution likely in the next five to 10 years. Investors should revisit their analysis of portfolio risks and opportunities on a periodic basis as the political and economic landscape related to climate change evolves.

For more information about the Morgan Stanley Institute for Sustainable Investing, visit <http://www.morganstanley.com/sustainableinvesting>. The Institute authors would like to thank the following Morgan Stanley colleagues for their insightful input into this issue brief: Eva Zlotnicka, Devin McDermott, Stephen Byrd, Elizabeth Volynsky and Stefan Revielle.

Index Definitions

MSCI ACWI Investable Market Index—The MSCI ACWI Investable Market Index (IMI) captures large-, mid- and small-cap representation across 23 Developed Markets (DM). With 8603 constituents, the index is comprehensive, covering approximately 99% of the global equity investment opportunity set.

Russell 3000 Index—Russell 3000 Index measures the performance of the 3,000 largest U.S. companies based on total market capitalization, which represents approximately 98% of the investable U.S. equity market. As of the latest reconstitution, the average market capitalization was approximately \$86.4 billion; the median market capitalization was approximately \$923 million. The index had a total market capitalization range of approximately \$540 billion to \$101 million.

S&P 500—The Standard and Poor's 500 tracks the performance of 500 widely held large-cap U.S. stocks in the industrial, transportation, utility and financial sectors.

Stowe Global Coal Index—The Stowe Global Coal IndexSM (COAL) is a composite equity index designed to serve as an equity benchmark for globally traded stocks, which are principally engaged in the coal industry. COAL predominantly comprises public companies engaged in Coal Mining and Production. In addition, a limited number of companies engaged in Coal Mining Equipment Manufacturing, Coal Transportation, and Coal Technology (e.g., Coal-to-Liquid) are also included.

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Diversification does not assure a profit or protect against loss in a declining market. Past performance is no guarantee of future results.

Because of their narrow focus, sector investments tend to be more volatile than investments that diversify across many sectors and companies.

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The indexes are unmanaged. An investor cannot invest directly in an index.

Investors should carefully consider the investment objectives and risks as well as charges and expenses of a mutual fund/exchange-traded fund before investing. To obtain a prospectus, contact your Financial Advisor or visit the fund company's website. The prospectus contains this and other information about the mutual fund/exchange-traded fund. Read the prospectus carefully before investing.