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Energy, the Environment and the Investment Process

THE NEUBERGER BERMAN SRI GROUP

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As the risks and consequences of climate change become more broadly understood, investors are increasingly considering how the companies in their portfolio may impact—and be impacted by—changes in the environment. Amid this trend, we see considerable debate regarding what to actually do with such information, whether it involves the exclusion of certain sectors or industries, or company-specific based analysis gauging risk/return benefits. As active fundamental investors, we have long considered Environmental, Social and Governance (ESG) issues in our analysis and portfolio decisions. In this paper, we seek to frame the ESG issues associated with energy-related investments—both in terms of their effect on underlying companies and their businesses, and their broader implications for the environment and economy.

OVERVIEW

Over its 20+ year history, the Neuberger Berman Socially Responsive Group has been a leader in contributing to the discussion, analysis and implementation of environmental, social and governance (ESG) criteria in the investment process. We believe that a thoughtful understanding of ESG factors, and the risks and opportunities they pose to a company's path to growth, is an essential part of the due diligence process.

The interaction of top-down issues like emissions control and climate change present business risks and investment opportunities that differ across industries. For the portfolio management team, these risks and opportunities need to be analyzed and understood as part of a thorough company-level investment due diligence process. For a plan fiduciary, understanding how these issues are analyzed and implemented in portfolio construction is essential, as it can impact both the prospective return profile and the adherence to the policy mandate of the investment product.

Our views on energy and the environment have been reflected in company engagement and advocacy on environmental issues, the mix of our energy exposure and in our approach to investing in energy efficiency across sectors.

DISCUSSION GOALS

In this paper, we outline our philosophy regarding energy investing and the environment in the broader context of our approach to integrating ESG criteria into the investment process. Key takeaways include:

1. **Statement on Climate Change –** formulated as part of our integrated approach to investment research, engagement, and advocacy
2. **Natural Gas –** lower aggregate emissions today and a bridge to a more sustainable future
3. **Fossil Fuel Divestment** – narrowly defines the CO_2 challenge while introducing potential tradeoffs that need to be analyzed and understood by investment plan fiduciaries

4. **Energy Efficiency – Finding Opportunity with Economic Solutions** – technologies in new growth markets that address clear unmet needs of cost avoidance and emission reduction

CLIMATE CHANGE AND THE INVESTMENT PROCESS

There is near unanimous consensus in the scientific community that humans have impacted climate change over the past century.[1] Many scientists agree that to reduce the probability of extreme events there is a need to prevent a 2º C rise in temperature by 2050. To accomplish this, they point out that the concentration of carbon dioxide (CO_2) in our atmosphere must be limited to 450 parts per million.[2]

The effects of rising CO_2 levels on our natural environment are significant. Temperatures and sea levels are allegedly rising. While the 0.8º C increase in surface temperature since 1900 may not sound alarming, consider that sea levels have risen 3.5 mm per year since 1993, twice the rate of the prior century (1.7 mm per year).[3] Glacier volumes are declining sharply at a rate of 0.58 meters water equivalent per year, more than twice the rate of previous decades.[4] Ocean acidification due to the absorption of CO_2 poses risks to marine ecosystems and species up and down the food chain.[5] Extreme weather events including hurricanes, drought, floods and wildfires have increased in frequency and severity.[6] Further, scientists have observed negative impacts on crop yields including corn, rice and wheat that have led to commodity price volatility.

Climate change, therefore, represents a significant threat to the stability of our natural environment and thereby the global economy. We assess the risks and opportunities presented by climate change at both the portfolio and security level, through our integrated research process.

Our Statement on Climate Change[7] was published in recognition that climate change is real and can have a material impact on businesses, communities and the environment. Understanding environmental impacts has always been an integral part of our fundamental due diligence process, which integrates financial and ESG criteria into company analysis. In this context, companies can impact climate change by contributing to it, mitigating it and by providing solutions.

NATURAL GAS: LOWERING AGGREGATE EMISSIONS TODAY WHILE PROVIDING A BRIDGE TO A MORE SUSTAINABLE FUTURE

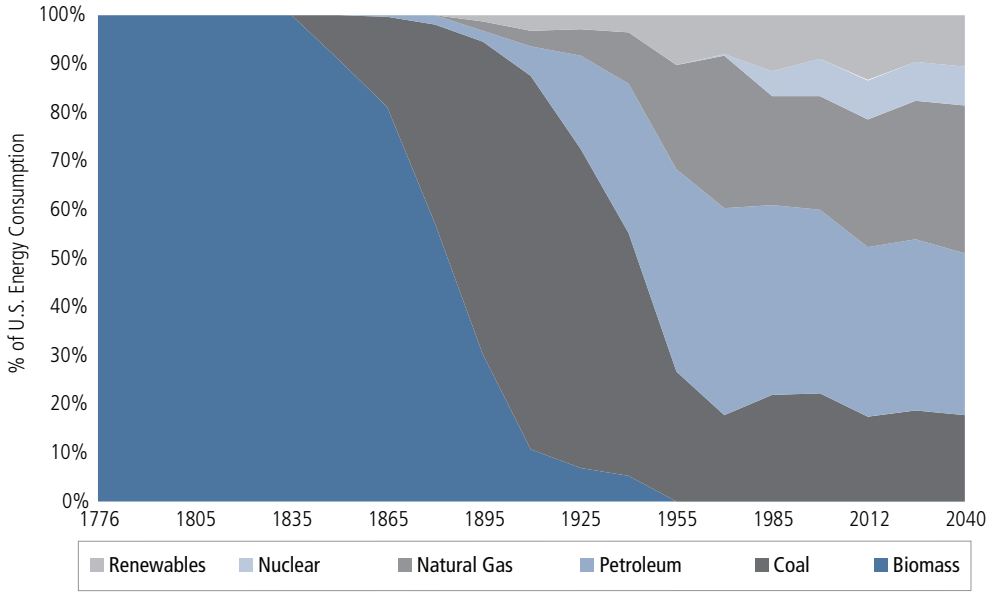
In our view, by displacing more carbon-rich fuel sources in power generation, natural gas continues to play an important near-term role in reducing CO_2 emissions, while serving as a bridge to a more sustainable energy future by enabling the use of green power technologies that today are limited by reliability of supply. With that said, growing production of natural gas from shale plays across the U.S. presents a new set of ESG issues that need to be analyzed and understood so that they can be integrated into the due diligence process.

[1] American Association for the Advancement of Science (AAAS), *What We Know: The Reality, Risks and Response To Climate Change* (March 2014). http://whatweknow.aaas.org/wp-content/uploads/2014/03/AAAS-What-We-Know.pdf
[2] Meinshausen, M., et al., "Greenhouse Gas Emission Targets for Limiting Global Warming to 2 °C", *Nature*, 458, 1158-1162 (April 2009). *OECD Environmental Outlook to 2050* (November 2011). http://www.oecd.org/env/cc/49082173.pdf
[3] NOAA, *Global Climate Change Indicators.* https://www.ncdc.noaa.gov/indicators/
[4] UNEP and World Glacier Monitoring Service, *Global Glacier Changes: facts and figures.* http://www.grid.unep.ch/glaciers/pdfs/glaciers.pdf
[5] IPCC, *Climate Change 2014: Impacts, Adaptation, and Vulnerability,* IPCC WGII AR5 Summary for Policymakers (April 2014).
[6] Ibid.
[7] Neuberger Berman, *Statement on Climate Change* (February 10, 2014) http://nb.com/pages/public/en-us/insights/sri-statement-on-climate-change.aspx

Historically, energy sources have shifted over time; from wood to coal to oil and, in the future, renewables, which are likely to constitute a significant part of global energy consumption. In the U.S., the first century of the nation was reliant on burning wood biomass as the primary source of energy. In the mid-19th century, the energy mix began to shift and coal grew to account for 75% of energy consumption by 1910.[8] The advent of oil drilling saw petroleum grow to 47% of the nation's energy consumption by the late 1970s.

The rapid growth of shale gas reserves over the past decade has driven a renaissance for domestic producers. Natural gas from low cost domestic sources now accounts for 26% of energy consumption versus coal at 20%. We believe that natural gas represents a bridge to a lower carbon future while renewables (solar, wind, hydro as well as nascent alternatives) could grow from their current small base.

FIGURE 1: NATURAL GAS – DISPLACING COAL IN POWER GERNERATION



Source: EIA.

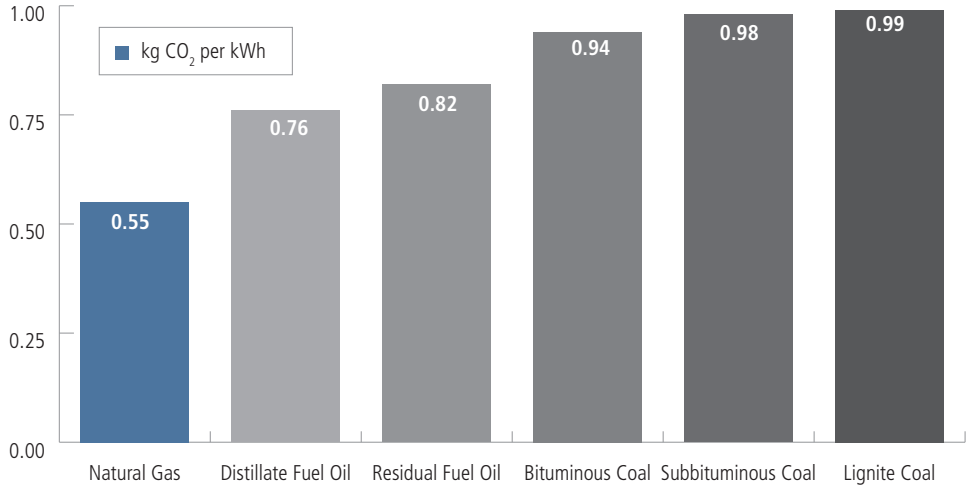
The growth of U.S. natural gas production presents both opportunities and challenges for the environment, the economy and ESG investors. On the positive side, relative to other fossil fuels such as coal and petroleum, natural gas combustion emits less carbon dioxide equivalents, negligible sulphur oxides (SOx), nitrogen oxides (NOx), and toxic mercury emissions.[9] Natural gas combustion has at least 45% lower emissions intensity at 0.55 kg CO_2 per kWh compared to coal (0.98).[10] In addition, natural gas enables on-demand peak generation capacity that is an essential requisite for renewable energy such as wind and solar that today cannot be relied on for base-load supply. These advantages and the growing low-cost availability of domestic gas across the U.S. also explain why natural gas has been capturing share as a supply source for power generation.

[8] US Energy Information Administration. Data adapted from Estimated Primary Energy Consumption in the United States, Selected Years, 1635-1945 (September 2012), Primary Energy Consumption by Source (January 2014) and Annual Energy Outlook 2014 Early Release (December 2013). Note: Biomass included within Renewables from 1955 onwards.

[9] EIA, EPA 2012 US Greenhouse Gas Inventory Report (PDF) downloaded from EPA Website. http://epa.gov/climatechange/emissions/usinventoryreport.html NaturalGas.org,"Natural Gas and the Environment." Website, http://www.eia.gov/tools/faqs/faq.cfm?id=74&t=11

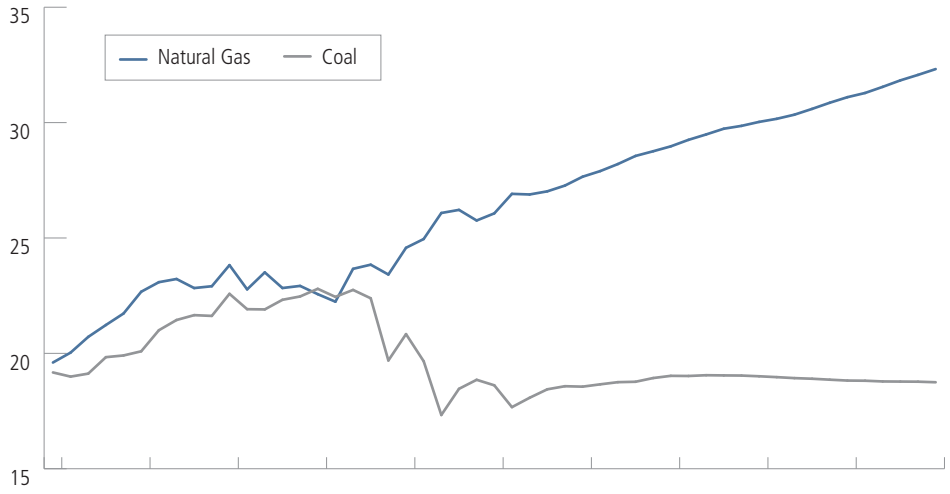
[10] Ibid.

FIGURE 2: NATURAL GAS IS MORE EFFICIENT AND EMITS LESS GHG EMISSIONS THAN COAL



Source: EIA.

FIGURE 3: % SHARE OF U.S. ENERGY CONSUMPTION 1990 – 2040 (ESTIMATED)



Source: EIA.

INTEGRATING ESG CRITERIA INTO NATURAL GAS DUE DILIGENCE

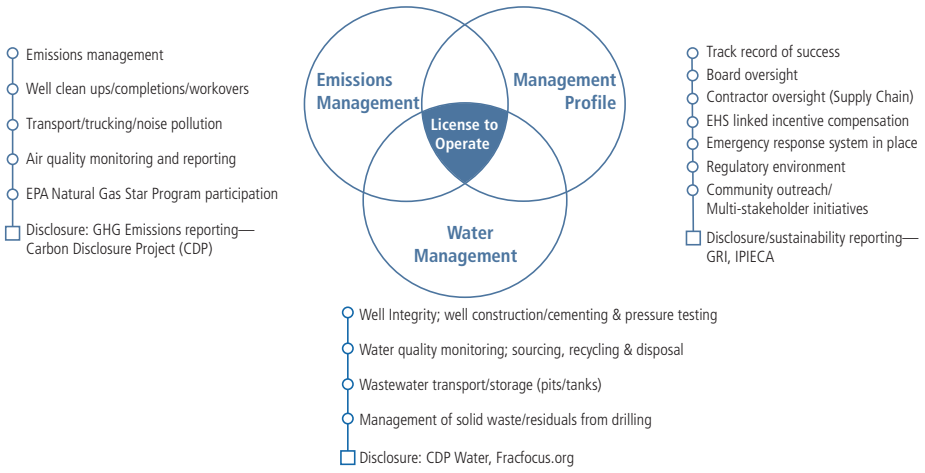
We also recognize the challenges presented by the growth of U.S. shale gas production. These include environmental questions regarding the impact of hydraulic fracturing, patchwork regulation and environmental standards by state, variation in company operating practices and publicized incidents involving several industry participants.

Our bottom-up approach to integrating ESG criteria as part of our due diligence process for natural gas investments is a threefold focus on understanding a company's management of emissions, water usage, and governance and reporting.

First, we assess natural gas producers based on corporate management of emissions, including air quality monitoring, reducing transport pollution, and disclosure of greenhouse gas emissions to the Carbon Disclosure Project (CDP). Second, we focus on water management policies including well integrity (construction and pressure testing as well as water quality

monitoring), sourcing, recycling and disposal. We actively encourage companies to disclose to CDP Water. Finally, we look for high quality management with a demonstrated track record of success, board oversight, compensation incentives linked to environment, health and safety, and transparent stakeholder reporting through industry standards such as International Petroleum Industry Environmental Conservation Association (IPIECA) and the Global Reporting Initiative (GRI). We believe that it is necessary for producers to be on the leading edge of industry best practices as failure to do so is likely to undermine their franchise value and could potentially lead to a loss of the license to operate.

FIGURE 4: NATURAL GAS PRODUCTION – ADDRESSING THE ISSUES



In contemplating environmental impacts, we conduct proprietary research on the full-cycle impact of shale gas versus other fuel sources. Ongoing dialogue with multi-stakeholder federal and local regulators including the Environmental Protection Agency and various environmental non-governmental organizations (NGOs) keeps us informed on emerging issues. Finally, we engage companies across the producing sector and our portfolio holdings on industry best practice in meetings with company management.

In addition, the Neuberger Berman SRI team is a signatory to the CDP Carbon Action program that targets companies in heavy-emitting industries to take action by setting targets and reducing emissions while generating positive returns on this investment. In 2013, companies reported global investments of $33 billion in 1,050 emissions-reduction activities expected to reduce emissions by 169 million metric tons CO2e while creating $15.1 billion in net present value.[11]

FOSSIL FUEL DIVESTMENT: NARROW SOLUTION WITH TRADE-OFFS FOR FIDUCIARIES

Supported by recent grass roots efforts, the call for fossil fuel divestment has growing share of voice in the climate change debate. While the end goals of these efforts, supported by individual investors and plan participants, are a reduction in CO_2 emissions contributing to global climate change, the practical implementation of a fossil fuel-free strategy presents new trade-offs for fiduciaries with oversight for plan investments.

[11] CDP, *Carbon Action: Lower emissions, higher ROI: the rewards of low carbon investment* (January 2014). https://www.cdp.net/CDPResults/Carbon-action-report-2013.pdf

By way of context, it has been estimated that if we are to reduce the probability of a 2°C rise (above pre-industrial levels) in global surface temperature, the world's carbon budget should be limited to burning another 565 Gt CO_2 between now and 2050.[12] The Carbon Tracker report *Unburnable Carbon*[13] suggested that coal, oil and gas reserves exceed the world's carbon budget of 565 Gt CO_2 by a factor of five (2,860 Gt CO_2). The report states that not all reserves can be burned if we are to stay within our carbon budget.

Proponents of fossil fuel divestment argue that investors must acknowledge the long-term implications and risks that a carbon budget creates for the producers in the energy and materials sectors. We share this view and believe that thorough analysis is required so that investors can understand all of the risks that may impact a company's long-term profitability and growth. Understanding how the asset value of an energy supplier's resource base may be impacted by changing end-market fundamentals is part of any robust due diligence process.

However, fiduciaries must evaluate plan investments on the basis of the risk-adjusted returns generated for investors. Before implementing a fossil fuel divestment strategy, plan administrators need to evaluate and consider how such a strategy will be consistently implemented and what its impact will be on portfolio returns. For instance, we believe the following factors need to considered:

1. Upon implementation, does the investment approach being considered promote a result consistent with the end goals of the organization (e.g., promoting CO_2 reductions)?
2. How is the investment manager integrating relevant ESG analysis into company due diligence?
3. How might changes in investment policy impact the return profile of the plan's investible assets?

Furthermore, we believe that a narrow strategy of excluding fossil fuel suppliers has the following limitations:

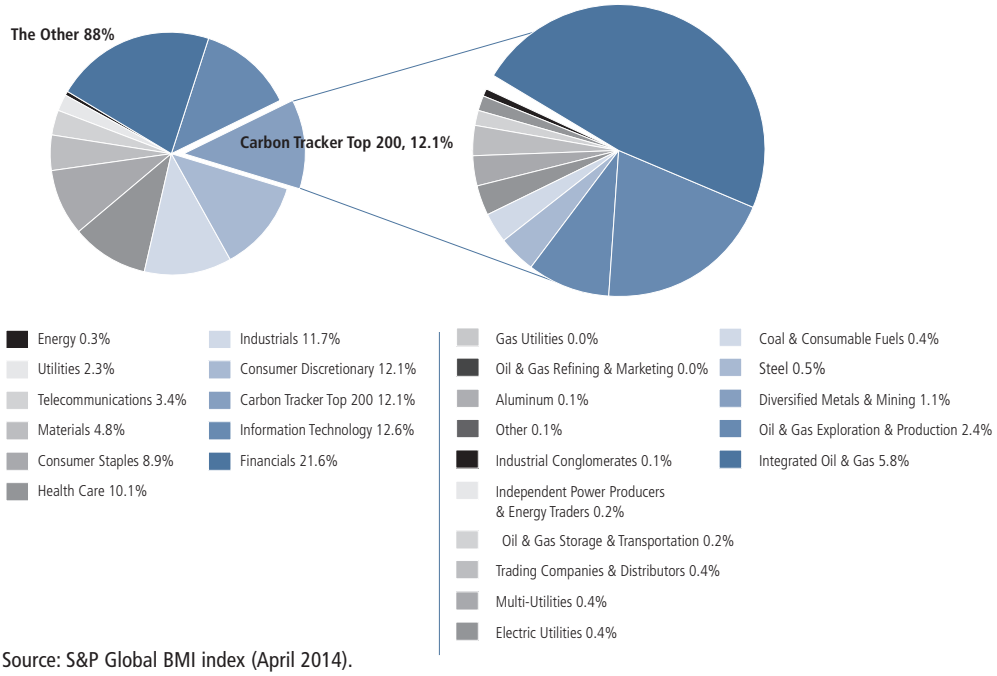
1. Does not address CO_2 emissions of energy consuming industries
2. Does not address the significant benefit in CO_2 reduction that can be gained by emission reduction efforts across industries
3. Has no impact on State-Owned Enterprises responsible for three-fourths of global oil and gas reserves
4. Does not recognize the near-term benefits in CO_2 reduction from fuel switching to natural gas
5. Does not contemplate alternative energy sources with other unique environmental challenges (i.e., nuclear and hydroelectric)
6. Does not acknowledge the benefits that derive from best practices and engagement efforts with producers and users

Fossil fuel companies targeted for divestment by Carbon Tracker represent 12% of the S&P Global Broad Market Index. The fossil fuel divestment campaign therefore omits companies representing approximately 88% of global equity market capitalization, including other energy-intensive industries. We believe that a more holistic approach is to

[12] Ibid.
[13] "Unburnable Carbon," Carbon Tracker, March 2012. http://www.carbontracker.org/wp-content/uploads/downloads/2011/07/Unburnable-Carbon-Full-rev2.pdf

consider the impacts of carbon emissions on businesses across all segments of the economy to evaluate risk and potential opportunities presented by the emissions challenge.

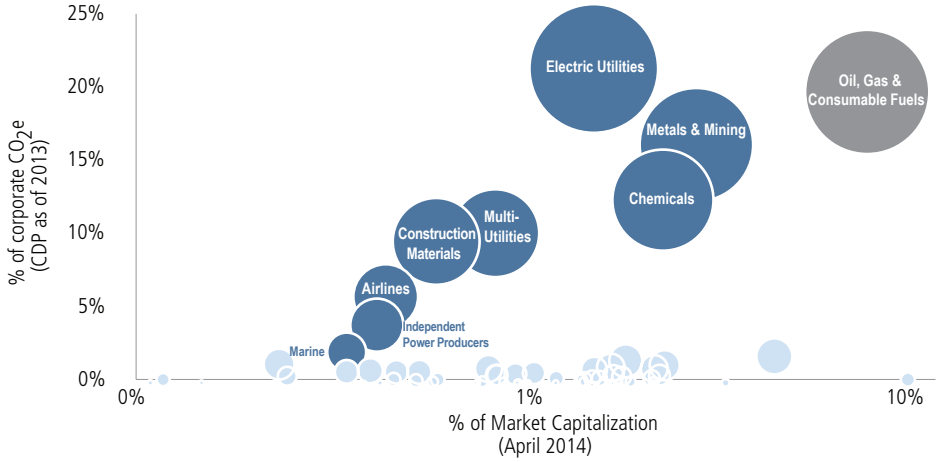
FIGURE 5: FOSSIL FUEL COMPANIES TARGETED FOR DIVESTMENT REPRESENT 12% OF GLOBAL EQUITIES



Source: S&P Global BMI index (April 2014).

In fact, many of these industries are energy-intensive and are significant sources of CO_2 emissions. For instance, more than 80% of emissions disclosed to CDP are from industries that operate outside of the coal, oil and natural gas-producing sectors.

FIGURE 6: ENERGY CONSUMING INDUSTRIES ARE SIGNIFICANT SOURCES OF C02 EMISSIONS



Source: CDP 2013.

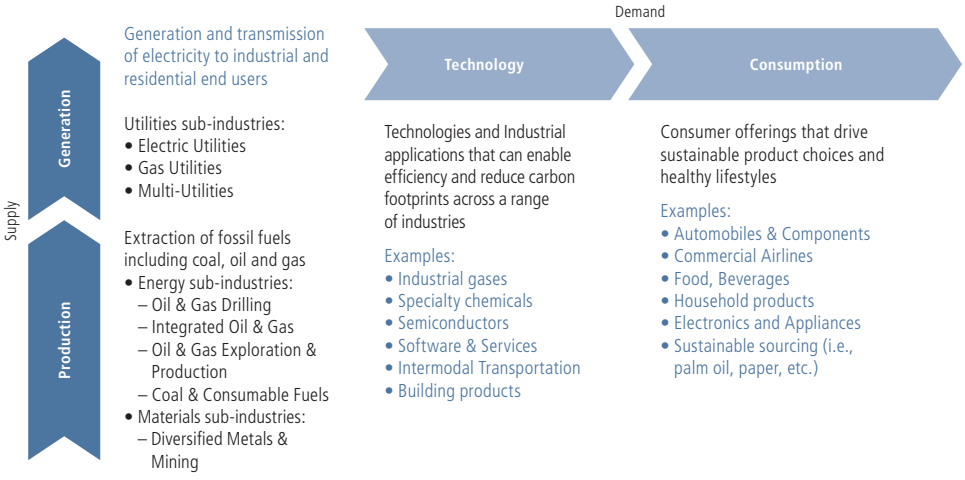
The proponents of fossil fuel divestment have done much to elevate the level of discussion on climate change and have raised important issues on the need to assess and value carbon-exposed businesses. We believe that, in implementation, a divestment strategy like excluding the top 200 carbon generators, while elegant in its simplicity, is a narrow solution that presents potential return considerations that need to be evaluated by prospective investors and plan fiduciaries.

ENERGY EFFICIENCY: FINDING OPPORTUNITY WITH ECONOMIC SOLUTIONS (THE OTHER 88%)

Reducing energy consumption is an important means of cost avoidance and emissions control for all companies, regardless of industry. The deployment of technologies that promote energy efficiency and emissions control can also be a key source of competitive advantage and product differentiation. We believe that innovative companies are creating new growth markets in energy efficient technologies. Furthermore, by shifting the demand curve for energy consumption in their deployment, these technologies can have a more immediate, positive impact on climate change without sacrificing economic growth.

Energy-efficiency programs can span manufacturing, transportation/distribution and supply chains. Opportunities also exist in integrating energy efficiency into product design, thereby increasing awareness of a product's value, creating overall cost savings and environmental benefits of products and services to the end consumer.

FIGURE 7: ENERGY EFFICIENCY: FINDING OPPORTUNITY WITH ECONOMIC SOLUTIONS (THE OTHER 88%)



By way of example, only about a third of electricity produced in the U.S. is actually delivered to end-users as power; the rest is lost through inefficiencies in the transmission process. This means that more than two-thirds of generated electricity represents an unnecessary cost and source of emissions that it may be possible to avoid. Looked at another way, approximately 20% of U.S. total GHG emissions—from unused power generation—are not for any useful purpose.[14]

[14] U.S. EPA estimates that GHG emissions from electricity amounts to 32% of total U.S. GHG emissions, and consumption from useful purpose amounts to 30%, resulting in approx. 20%.

Other examples of energy-efficient products and services include:

- Automobiles and components with next generation technologies such as turbo chargers, and thermal and emissions systems, can optimize fuel efficiency, reduce emissions and enhance performance. Transportation accounts for 28% of U.S. greenhouse gas emissions, the second largest contributor after the electricity sector.[15]
- Consumer products designed to minimize the environmental footprint of their supply chain can lead to sustainable cost advantage and important product differentiation that is increasingly being demanded by consumers. For example, sustainable palm oil and forestry practices can help minimize deforestation and forest degradation, which contributes up to 20% of global carbon emissions.[16] Reductions in packaging materials also limits landfill waste, the third largest source of methane emissions in the U.S.[17]
- Industrial gases such as oxygen fuel combustion technology provided to the steel, glass and cement industries can increase fuel and electric power efficiency while lowering emissions. Steel accounts 6.7% of global CO_2 emissions, with 1.8 tons of CO_2 being emitted for every ton of steel produced.[18]
- Semiconductors are components that enable next generation "smart" energy efficient products that can help reduce power and emissions from data centers, vehicles, appliances, electronics, industrial motors, smart grids and LED lighting. Technology-enabled solutions offer the potential to reduce annual emissions by an estimated 16.5% (9.1 Gt CO_2e) by 2020[19] spanning the power, transportation, agriculture, and manufacturing industries.
- Specialty chemicals like industrial enzymes can help reduce CO_2 emissions by offering alternatives to petrochemical inputs for products across a range of industries, from fertilizers to food and household products such as detergents, breads and cereals. As an additional environmental benefit, enzyme-based detergents have also been engineered to be effective with significantly smaller amounts of water.[20]

As these examples illustrate, opportunities driven by potential energy-efficiency gains, can be found across virtually all industries and sectors. Taken in aggregate, these types of innovative products and services could have a profound impact on the course of climate change.

By our math, for every 1% reduction of GHG emissions achieved through demand efficiency, we would need to remove approximately 3% – 4% of fuel supply to achieve the same emissions reduction. The International Energy Agency (IEA) has stated that global emissions could be halved by 2050 using existing and emerging technologies. The same report suggests that, by 2020, investment in these technologies could represent a $500 billion annual opportunity that could grow to $1 trillion by 2030.[21]

[15] EIA.
[16] World Wildlife Fund.
[17] EPA.
[18] International Energy Agency.
[19] GeSI Global e-sustainability Initiative, "GeSI SMARTer 2020: The Role of ICT in Driving a Sustainable Future", http://gesi.org/assets/js/lib/tinymce/jscripts/tiny_mce/plugins/ajaxfilemanager/uploaded/SMARTer%202020%20-%20The%20Role%20of%20ICT%20in%20Driving%20a%20Sustainable%20Future%20-%20December%202012._2.pdf.
[20] Novozymes Company reports.
[21] OECD/IEA Green Growth Studies: Energy ©OECD 2011. / IEA Energy Technology Perspectives 2012.

CONCLUSION

As active fundamentals-based investors, we seek to assess the potential bottom-up and top-down business risks that could undermine the growth of companies that we may consider for our portfolio. Our investment approach is comprehensive, incorporating fundamental and ESG related criteria into our due diligence process.

In considering our direct energy related investments, we have maintained a long-term bias towards natural gas as its lower full-cycle emissions profile contributes to global market share growth at the expense of other fossil fuels. Furthermore, the efficiency of natural gas in peak power generation is an enabler of alternative energy sources that today cannot be relied upon for base-load capacity.

Throughout our two-decade history, the Neuberger Berman SRI team has carefully considered the full life-cycle impact of emission profiles across sectors and companies. For instance, our bottom-up company analysis has led us to avoid direct investments in coal production. We have found that business and environmental risks associated with coal-related investments would lead to rising cost and share loss over the long term.

Outside the energy sector, we have pursued numerous businesses across sectors that derived their customer value proposition from the secularly growing markets for energy efficiency and emissions control.

In summarizing our view, we believe that there is a continuum of approaches for integrating energy and environment impact into the investment process.

FIGURE 8: CLIMATE CHANGE AND THE ESG PROCESS – IMPLEMENTATION STRATEGIES

Invest/ Divest Implementation		Traditional Strategy Broad Market Exposure	NB SRI Strategies		
			Selective Avoidance	Invest in Solutions	"Divest"
Potential Outcomes	Portfolio Characteristics	Conventional Approach	• Actively avoid environmentally and economically disadvantaged businesses • Ability to incorporate client driven criteria	• Actively seek investment opportunities in companies developing solutions • Best in class industry leaders	Avoids Top 200 Publicly traded producers based on coal, oil and gas reserves
	Performance	Competitive returns	Competitive returns	Competitive returns	Introduction of new risks for analysis
	Climate Change	No Impact	Considers relative emissions profiles across and within industries	• Acknowledge business risk and opportunities • Seek reductions in net emissions throughout value chain • Holistic view on ESG issues not limited to climate change (e.g., human rights, community relations)	• No solution for CO^2 emissions from energy consuming industries • Does not consider CO^2 gains from emission reduction efforts across industries • Has no impact on State-owned Enterprises • Does not address significant benefit from fuel source
	Climate Change Policy	None	Recognizes climate change	• Recognizes climate change • Company level engagement	• Recognizes climate change • Policy statement to divest top 200 publically traded coal, oil, and gas producers based on reserves • Does not acknowledge best practices and engagement efforts with producers

Our role as an ESG-focused manager is to engage our clients' objectives and priorities and to help them understand the potential return trade-offs that may result from how their priorities are implemented in portfolio design. Once this is established, we work with them to translate these priorities into an implementable set of ESG guidelines.

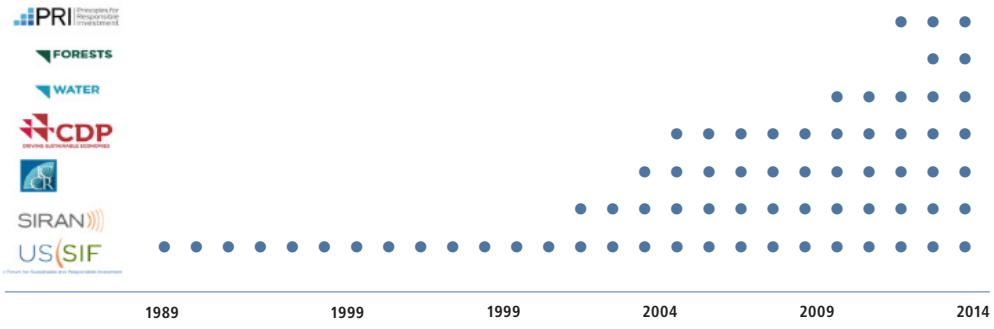
As analysts, we see ourselves as an active industry participant in these ongoing discussions. As an investment advisor, we want to facilitate our client's review and consideration of these issues. As investors, we are here to implement an actively managed equity portfolio consistent with the broader mission of each of our clients.

NEUBERGER BERMAN AND SRI

As an innovator in socially responsible investing (SRI), we believe responsibility is a hallmark of quality. We integrate ESG criteria into the investment process as we seek to identify best-in-class industry leaders that are positioned to gain profitable share in their served markets while generating positive externalities for their broader constituent base including shareholders, employees, the community, and the environment. Our in-house ESG research results in a single point of portfolio accountability through a consistently executed research and investment process. Our objective is to generate attractive risk-adjusted portfolio returns, while being consistent with our client's stated priorities.

The Neuberger Berman SRI team has been an active contributor to the broader discussion on the analysis of ESG factors and their significance to business performance and investment returns. We are a signatory member of initiatives that advance ESG integration within the investment process and have actively supported specific initiatives engaging policy makers on the environment, including the CDP, Interfaith Center on Corporate Responsibility (ICCR), Principles for Responsible Investment (PRI) and the Forum for Sustainable and Responsible Investment (U.S. SIF).

FIGURE 9: NB SRI – 20+ YEARS OF ADVOCACY AND PARTICIPATION



2014: Engage SEC to require disclosure of corporate resources for political activities 2013: Join coalition of investors to support Issues Statement on Bangladesh
2012: CDP Carbon Action request to implement emissions reductions
2011: Statement in Support of Responsible Lending Practices (CRL)
2010: Engage SEC to support DRC Conflict Mineral Disclosure in Dodd-Frank Act 2009: Signatory to statement on Conflict Minerals from Democratic Republic of Congo
2008: Signatory to the Emerging Markets Disclosure Project (EMDP)
2005: Engage EPA to not reverse Toxic Release Inventory Reporting

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