

# RENEWABLE ENERGY COMMITMENTS VERSUS GREENWASHING: BOARD RESPONSIBILITIES

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## Abstract

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Since many companies are making renewable energy commitments, boards of directors have responsibilities to monitor such commitments for enhanced corporate governance. This paper develops such board corporate social responsibilities for renewable energy commitments, especially in response to activist investors. In the existing literature, there are no research papers that addressed the major research question, and corresponding relevance, of this paper. What are the boards of directors' responsibilities for monitoring their companies' commitments to renewable energy and are they making significant efforts, or just greenwashing, i.e., just making commitments or pledges without any substantial subsequent performance? The shifting energy landscape to renewables, especially for carbon-free electricity, and the affordability and reliability of renewables are developed. Global corporations committed to 100% renewable electricity are cited for boards to monitor. Following guidelines from activist investors, boards of directors can assess whether their companies are reporting in alignment with the Task Force on Climate-related Financial Disclosures or other reporting systems. Boards can monitor how their companies' business plans are compatible with transitioning to a net-zero economy and how such plans are incorporated into long-term strategies. They can monitor if sustainability connections to stakeholders are driving long-term durable profits and delivering value to shareholders, customers, employees, and communities. Future research could investigate these board responsibilities with case studies or empirical studies, especially to see if greenwashing exists.

**Keywords:** Renewable Energy, Greenwashing, Boards of Directors, Corporate Governance

**Authors' individual contribution:** Conceptualization — H.G.; Methodology — H.G.; Resources — M.C.; Writing — Original Draft — H.G.; Writing — Review & Editing — M.C.; Visualization — H.G.; Funding Acquisition — M.C.

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## 1. INTRODUCTION

This paper develops board corporate social responsibilities for renewable energy commitments, especially in response to activist investors. Since

many companies are making renewable energy commitments, boards of directors have responsibilities to monitor such commitments for enhanced corporate governance. In the existing literature, there are no research papers that

addressed these responsibilities. Thus, this paper theoretically extends corporate governance concepts by exploring such board responsibilities from the practical perspective of current developments of renewable energy.

The major research question of this paper is: *What are the boards of directors' responsibilities for monitoring their companies' commitments to renewable energy, and are they making significant efforts, or just greenwashing, i.e., just making commitments or pledges without any substantial subsequent performance?*

The remainder of this paper is organised as follows. The activist investor guidelines are presented in Section 2. The literature review is outlined in Section 3. The shifting energy landscape is in Section 4. Renewables affordability is presented in Section 5, while renewables reliability in Section 6. Then, the global corporations committed to 100% renewable electricity are reviewed in Section 7. Section 8 presents renewables opportunities with energy industry examples and Section 9 concludes the paper.

## 2. ACTIVIST INVESTOR GUIDELINES

Laurence Fink is CEO of BlackRock, which has nearly \$9 trillion of assets under management, 70 offices in 30 countries, and clients in over 100 countries, making it far and away the largest such firm and arguably the world's most powerful investor. Fink sent his annual letter to all major public company CEOs on January 21, 2021. He asked these companies "to disclose a plan for how their business model will be compatible with a net-zero economy" which he defines as limiting global warming to 2 degrees Celsius above pre-industrial average and eliminating net greenhouse gas emissions by 2050. Also, he wrote: "We expect you to disclose how this plan is incorporated into your long-term strategy and reviewed by your board of directors" (Fink, 2021).

When Mr. Fink makes what sounds like a request, in truth it is much more than that as BlackRock's huge size gives it enormous influence. For example, last year BlackRock voted against 69 companies and 64 directors for climate-related reasons, and it put 191 companies "on climate watch". In summary, Fink's annual CEO letters have consistently helped change the topic of conversation in corporate boardrooms. Also, in the past year, the European Union, China, Japan, and South Korea all have made commitments to a net-zero future (Sorkin, 2021c).

Emphasizing such corporate boardroom discussions and opportunities, Fink "seeks to highlight issues that are pivotal to creating durable values, such as capital management, long-term strategy, purpose and climate change. We have long believed that our clients, as shareholders in your company, will benefit if you can create enduring, sustainable value for all of your stakeholders". Here are the major highlighted, sequential points in his CEO letter that boards of directors can use as a guideline to help their companies achieve net zero with their renewable energy commitments (Fink, 2021; Net Zero column in the Bloomberg Green Daily newsletter):

- I believe that the pandemic has presented such an existential crisis — such a stark reminder of our fragility — that it has driven us to confront the global threat of climate change more forcefully and to consider how, like the pandemic, it will alter our lives.

- When the pandemic took hold, conventional wisdom was the crisis would divert attention from climate. But just the opposite took place, and the reallocation of capital accelerated even faster than I anticipated.

- In 2020, investors in mutual funds and ETFs invested \$288 billion globally in sustainable assets, a 96% increase over 2019. I believe that this is the beginning of a long but rapidly accelerating transition to one that will unfold over many years and reshape asset prices of every type. We know that climate risk is investment risk. But we also believe the climate transition presents a historic investment opportunity.

- There is no company whose business model will not be profoundly affected by the transition to a net zero economy. As the transition accelerates, companies with a well-articulated long-term strategy, and a clear path to address the transition to net zero, will distinguish themselves with their stakeholders — with customers, policymakers, employees, and shareholders — by inspiring confidence that they can navigate this global transformation.

- Last year, we asked all companies to report in alignment with the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD) or the Sustainability Accounting Standards Board (SASB) which covers a broader set of material sustainability factors. Over the past year there has been a 363% increase in SASB disclosures and more than 1,700 organizations expressing support for the TCFD. Given how central the energy transition will be to every company's growth prospects, we are asking companies to disclose how this plan is incorporated into your long-term strategy and reviewed by your board of directors. We strongly support moving to a single global standard, which will enable investors to make more informed decisions about how to achieve enduring long-term returns. We support the TCFD approach.

- The world is moving to net zero, and BlackRock believes that our clients are best served by being at the forefront of that transition. We are carbon neutral today in our own operations and are committed to supporting the goal of net zero greenhouse gas emissions (GHG) by 2050 or sooner.

- Sustainability and deeper connections to stakeholders drives better returns. The more your company can show its purpose in delivering value to its customers, its employees, and its communities, the better able you will be to compete and deliver long-term durable profits for shareholders. As you issue sustainability reports, we ask that your disclosures on talent fully reflect your long-term plans to improve diversity, equity, and inclusion, as appropriate by region. We hold ourselves to this standard.

- We expect directors to have sufficient fluency in climate risk and the energy transition to enable the whole board — rather than a single director who is a "climate expert" — to provide appropriate oversight of the company's plan and targets.

We could vote against directors if a company has not provided a credible plan to transition its business model to a low-carbon economy.

- Studies have shown that investors lack consistent climate data to make decisions on their portfolios. We stress that companies need to improve disclosures of emissions and set rigorous short, medium, and long-term targets to reduce them. We could vote against company directors that fail to provide credible climate plans.

Erik Thedeen is the chairman of the Sustainable Finance Task Force of the International Organization of Securities Commissions (IOSCO), whose members regulate more than 95% of the world's securities markets. He said: "In the absence of global standards, an alphabet soup of standards or semi-standards has emerged that is not good enough. If we get reliable, comparable information with one set of standards, rather than different ones with different definitions, that will decrease the risk of greenwashing" (Schwartzkopff, 2021). According to IOSCO, companies eager to demonstrate responsible environmental and social behavior have been able to cherry-pick reporting methods and certifications that put them in a better light. IOSCO is working with other organizations, including the International Financial Reporting Standards Foundation, to present a preliminary proposal that would form the basis of national requirements at the United Nations climate change conference in Fall 2021 (Schwartzkopff, 2021).

Emphasizing climate concerns, Norway's sovereign wealth fund, which is the world's largest with \$1.3 trillion in assets, including 1.4% of all global stocks, sold its entire \$6 billion portfolios of companies focused on oil exploration and production in 2020. It also had a \$10 billion loss on all its oil and gas holdings in 2020 which had been valued at over \$40 billion at the start of 2020. Similarly, the New York City pension fund said that it would divest \$4 billion in fossil fuel-linked assets from its portfolios in 2021 (Taraldsen, 2021).

KKR is a leading global investment firm that manages \$235 billion of multiple alternative asset classes, including private equity, credit, and real assets. It has offices in 20 cities across four continents and 753,000 people employed worldwide by its portfolio companies. Also emphasizing the importance of climate change, in an October 2020 interview, Henry Kravis, co-founder, co-chairman, and co-CEO, said that whenever KKR investigates a possible company acquisition, it analyzes environmental, social, and governmental (ESG) issues to make sure the company is well-positioned, especially on climate change and government issues (Kravis, 2020).

An October 2020 McKinsey & Company report addressed the importance of corporate governance in these times of the coronavirus pandemic, resulting economic impacts, and climate change. Even before the spread of the coronavirus, investors and other stakeholders were calling on senior management and corporate boards to focus on ESG concerns. They were prompting companies to pay more attention to the impact of their actions on the environment. This report concluded that, in the wake of the global pandemic, economic disruptions, and ongoing climate change problems, boards of directors play a key role in guiding their organizations into the next new normal and stated

that 70% of all activist and institutional investors' demands over the past decade have focused on governance (Birshan, Goerg, Moore, & Parekh, 2020).

Similarly, Fink wrote in his January 2020 annual letter to all major global public company CEOs that BlackRock would make investment decisions with environmental sustainability as a core goal and that BlackRock would begin to exit certain investments that present a high sustainability-related risk, such as those in coal producers. His intent was to encourage every company, not just energy firms, to rethink their carbon footprints. He wrote: "Awareness is rapidly changing, and I believe we are on the edge of a fundamental reshaping of finance. The evidence on climate risk is compelling investors to reassess core assumptions about modern finance. As I have written in past letters, a company cannot achieve long-term profits without embracing purpose and considering the needs of a broad range of stakeholders. Ultimately, the purpose is the engine of long-term profitability. We believe that when a company is not effectively addressing a material issue, its directors should be held accountable" (Fink, 2020).

More specific disclosures of climate change risks and opportunities will help meet the information needs of investors and stakeholders (Grove, Clouse, & Xu, 2021; Grove & Clouse, 2021). Companies are encouraged to develop more wisdom in dealing with the risks and opportunities of climate change to benefit their investors and other interested parties (Grove & Lockhart, 2019). In developing such wisdom, Jamie Dimon, JPMorgan Chase CEO, observed: "It is long-term thinking, real policy with real facts and analysis, not guessing and not looking year-over-year. The year-over-year stuff has just become a waste of time and caused us to make really dumb decisions" (Smith, 2020).

Several high-profile Business Roundtable (BR) non-financial companies, such as Amazon, Apple, Facebook, Google, Microsoft, and Walmart, have pledged to be carbon neutral by 2030 (Mandel, 2020). Several high-profile BR banks, such as JPMorgan Chase, Morgan Stanley, Citigroup, and Bank of America, have agreed to tally GHG emissions by companies or clients in their lending portfolios. For example, JPMorgan Chase and Morgan Stanley are urging their clients to reduce their global net emissions to zero by 2050, a key target in the Paris Climate Agreement. Also, 55 global banks, insurance companies, and financial firms, such as HSBC Holdings Plc, Societe Generale SA, BNP Paribas SA, ING Group NV, Credit Agricole SA, and MetLife Inc., have committed to setting climate goals for mortgages, bonds, and other asset classes in their portfolios, in order to align with the Paris Climate Agreement (Chen, 2020).

### 3. LITERATURE REVIEW

In the following literature review, there were no research papers that addressed the major research question of this paper: *What are board of directors' responsibilities for monitoring their companies' commitments to renewable energy as corporate social responsibilities, especially in response to activist investors?* Several papers did discuss environmental issues, such as the emerging area of green banking practices, corporate social responsibility reporting,

and related impacts on financial performance and one study did investigate the impact of climate change on food production and corporate governance responsibilities, as subsequently discussed here.

CDP, a non-profit global organization based in the UK, issued its 2019 Global Climate Change report which surveyed 6,937 companies, identified by region and industry. The largest region responders were Europe (1,813 companies), the United States of America (1,784 companies), China (750 companies), and India (710 companies). Of the 14 industries, the largest ones were manufacturing (2,312 companies), services (1,193 companies), materials (760 companies), and food, beverage and agriculture (689 companies). These companies reported general climate risks linked to increasing policy, particularly GHG pricing. However, they did not report many significant risks related to a transition to low carbon. Instead, they viewed it as an opportunity, even though it could result in reduced demand for their products from market changes or consumer preferences, such as the switch towards electric vehicles, increasing reputational risks, as well as potential shifts in their costs of capital (CDP, 2019). While energy transition may take decades to complete, energy markets and prices are impacted on a much shorter time scale, due to increasing uncertainties, changing risk preferences of fossil fuel investors, and changes in the economy of energy markets (Grove & Clouse, 2020).

Investors, stakeholders, and boards of directors should be investigating such climate challenge risks for companies in all these industries. For example, there may be increasing operating costs, such as higher compliance costs or increased insurance premiums, due to the physical impacts of climate change and increasing water scarcity and reputational risks. However, there may also be climate opportunities, particularly focused on consumers, linked to increased revenue through demand for low carbon products, services, and a better competitive position to reflect shifting consumer preferences. There may be opportunities linked to operations focused on reduced operating costs with efficiency gains (Grove & Clouse, 2020).

Integrated reporting and environmental disclosures were investigated for the impact on natural capital where we have entered a new geological era, the Anthropocene, or the Age of Humans. This study analyzes the extent and type of information that can be provided on natural capital with integrated reporting and its efficacy to really enhance sustainability practices (Gelmini & Vola, 2021). A research paper examined the impact of corporate governance (CG) on corporate social responsibility (CSR). The results showed that a lack of CG in monitoring and supervisory mechanisms, as well as a high concentration of managerial ownership, can significantly contribute to low levels of CSR (Lahjie, Natoli, & Zuhair, 2021).

A research paper investigated how corporate governance influences firm performance with a meta-analysis of 251 studies covering almost 25,000 businesses in 37 published papers. It found statistical evidence that better corporate governance and more board independence significantly enhanced firm performance (Dao & Nguyen Tra, 2020). Another research paper investigated if the detriment to environmental disclosures because

of CEO power is different for outcome versus intention-oriented disclosure characteristics in a sample of 2,200 U.S. publicly traded companies. It found that powerful CEOs' suppression of the most comparable outcome-based environmental disclosures (effectiveness) is greater than the suppression of other environmental disclosures (Wukich, 2020).

A research paper aimed to explain whether the declaration of sustainability ratings contributes to the stock market reaction in emerging markets. This study showed that the announcement of sustainability ratings was not regarded by investors with a great deal of interest and there is inherent indifference to such news in these emerging stock markets (Malik & Yadav, 2020). Another study assessed sustainability at different levels of environmental, economic, and socio-institutional detail, using the triple bottom line approach. A Sustainable Irrigation Index was built to monitor and assess the sustainability of irrigation activities and policies and it was applied successfully in a case study (Longo & Tenuta, 2020).

A research paper showed a crucial role of CSR promotional activities as an anti-crisis solution during the recent COVID-19 pandemic., based on a sample of 208 respondents. Corporate reputation and image were enhanced (Rainero & Modarelli 2020). Green information technology (GIT) practices were analyzed in Sri Lanka banks, looking at the relationships among GIT practices, environmental performances of banks (EPB), and employees' attitudes on GIT (EAG). Results found that GIT practices had a positive relationship to and significant impact on EPB and a mediating partial role of EAG (Malsha, Arulrajah, & Senthilnathan, 2020). Another Sri Lankan bank study found a partial mediation role of employee green behavior (EGB) in the relationship between green banking practices (GBP) and sustainability performance of banks (SPB) (Malsha et al., 2020).

A research study found that CSR reporting was used in correcting negative perceptions and stakeholder skepticism. However, there was very little information on the existence of mechanisms that promote the implementation of stakeholder management policies at the firm level (Bonuedi, Ofori, & Simpson, 2020). Another study found that environmental responsibility and social responsibility disclosures were negatively associated with tax aggressiveness. However, corporate governance failed to strengthen these negative influences (Firmansyah & Estutik, 2020). Another study addressed how climate change impacts food production and the corporate governance challenges associated with managing such impacts. The study concluded that specific aspects of the prevailing climate change governance regime require major reforms, particularly the role of the state, corporations, and civil society, while other climate governance mechanisms need to be completely overhauled, such as through the establishment of a new World Environment Organization (Ddamulira, 2019).

A review of empirical studies found that both board independence and gender diversity were positively linked with CSR reporting which was differentiated between internal CSR reporting measures and external CSR disclosure ratings

(Velte, 2019). Another study found a positive and significant effect of CSR on firm performance profitability and that larger and older firms had a positive effect on such financial performance (Basuony, Elseidi, & Mohamed, 2014).

The year 2011 was the first that a majority of S&P 500 companies publicly disclosed their sustainability performance per the Governance & Accountability Institute. These companies had higher financial returns than their non-reporting competitors (Stevens, 2012). Another study found that companies that disclose social investment information had superior financial performance when compared with companies that did not disclose such information (Emmanuel, Carvalhal da Silva, & Avila, 2012). The connection between sustainability performance and financial performance has been clearly shown by more recent academic research and is becoming more established in mainstream financial analysis and reporting (Pilot, 2017).

A meta-analysis of 135 CSR studies over the last 25 years found a strong correlation between CSR that goes beyond just storytelling and financial performance (Braendle & Mozghovi, 2013). With different standards of CSR, such as company, industry, multi-stakeholder, and independence, a study categorized and evaluated those CSR standards and suggested a combination of different standards, replenished with firm-specific codes of conduct (Stiglbauer & Eulerich, 2012). One recent study did find that good corporate governance, specifically board independence, board diversity, CEO characteristics, remuneration, and oversight, led to better firm performance (Khan, Nijhof, Diepeveen, & Melis, 2018). Another recent study found that social and environmental improvements made by companies contributed to corporate financial performance, and good corporate governance contributed to such financial performance and reduced risk (Haryono, Iskandar, Paminto, & Ulfah, 2016).

#### 4. SHIFTING ENERGY LANDSCAPE

For the first time ever, solar and wind made up the majority of the world's new power generation, marking a seismic shift in how nations get their electricity. Solar additions in 2019 totaled 119 gigawatts (GW), representing 45% of all new capacity, as countries move to slash carbon emissions and as technology costs fall. In terms of total power produced, renewables technologies including hydro accounted for 27% in 2019, up from 20% in 2010. Still, the world added 39 GW of net new coal capacity and coal still represents 29% of installed capacity globally. However, power purchase agreements for corporate clean energy rose more than 40% in 2019, smashing a record set in 2018, and 2020 is expected to set another record. Those agreements represented more than 10% of all renewable energy capacity added globally in 2019 (Eckhouse, 2020).

Ember, a low-power chip technology company, analyzed power generation in 48 countries that represent 83% of global electricity usage. Wind and solar power increased 14% in the first half of 2020 while global demand fell 3%, due to the impact of the coronavirus. In western European countries,

coal has been all but eliminated from electricity generation. As this switch to renewables and gas has dramatically reduced coal generation in Europe and the U.S., China is left with the growing share of fossil fuel, making up 54% of the world's coal power generation, up from 44% in 2015 (Mathis, 2020).

The International Energy Agency (IEA) is comprised of energy ministers from many countries and is within the Organization for Economic Cooperation and Development. The IEA issued a 2020 global report that expects solar and wind to dethrone gas and coal and become the "New King of Electricity". Solar and wind capacity is set to double between 2020 and 2025 with a projected 1,123 GW increase that means these power sources will overtake gas capacity in 2023 and coal in 2024. These renewables, plus hydro and bioenergy, will displace coal as the largest source of the world's power by 2025. The IEA has solar, wind, hydro, and other renewable sources accounting for 95% of the increase in the world's electricity generating capacity over the next five years. Solar capacity, offering the "cheapest electricity in history", will be the main driver of this trend, adding 130 GW each year between 2023-2025 and accounting for nearly 60% of the total renewable expansion across this period. Wind is also expected to expand considerably but its contribution will be smaller than solar. Renewables will meet 99% of the increase in global electricity demand over the next five years (Gabbatiss, 2020).

This IEA report also predicted that the era of global oil demand growth will come to an end in the next decade. There will be an increased demand, growing by 80% in the next decade, for new transmission lines to carry electricity from sun-soaked and windy locales to densely populated areas. This steady deployment of renewables will need to be coupled with the increased use of battery storage, low-carbon hydrogen fuels, carbon capture technology, and advanced nuclear reactors (Kaufman, 2020).

Europe has developed some of the best transmission infrastructures in the world, successfully connecting grids in different countries to provide energy security and boost renewable power use. For example, spare wind power from Denmark feeds into Sweden and excess nuclear power from Belgium goes to the U.K. A University of California study found that reaching 90% carbon-free electricity by 2035 could be economically feasible by significantly increasing solar, wind, and battery storage. For example, Xcel Energy, which provides energy across eight U.S. states, said that it cut company-wide carbon emissions by 12% last year from 2019 levels (Eckhouse, 2020). A study by Bill Gates' Breakthrough Energy Sciences organization recommended that a strengthened U.S. power grid would help connect the far-flung U.S. renewable resources to the people that need them. A massive scale-up of wind and solar farms is needed along with enhanced power transmission lines to reach net-zero emissions by 2050 in the U.S. It is cheaper to put wind farms and solar parks in the places with the best renewable resources and then transport this power to population centers (Rathi, 2021c).

The International Renewable Energy Agency (IRENA) has been analyzing data on 17,000 renewable power projects and more than 10,000 power deals

signed in 2019. It found that half of new solar and wind installations undercut fossil fuels in 2019. Since 2010, the cost of new solar photovoltaic projects (the direct conversion of light into electricity using semiconducting materials) has fallen by 82%. Over the same period, the cost of the other main type of solar, concentrating power which uses mirrors or lenses to create power through heat, fell by 47%. Decreases in wind power costs are also significant: 39% for onshore wind and 29% for offshore wind. The costs have fallen for a combination of reasons, including better technologies and production at scale, and more experienced renewable developers. Thus, many renewable energy projects are now cheaper than even the cheapest coal-fired power plants. Around the world, nations are being urged to consider “green growth” as a way of stimulating locked-down economies by many observers, including the Prince of Wales, who support renewable energy projects (Kretchmer, 2020).

## 5. RENEWABLES AFFORDABILITY

Bill Gates’ top priority is to lower Green Premiums, the difference in cost between a product that involves emitting carbon and an alternative that doesn’t (Gates, 2021a). For example, the average price of jet fuel is \$2.22 per gallon versus \$5.35 per gallon for a zero-carbon advanced biofuel. The difference is the Green Premium for jet fuel. Green Premiums indicate which zero-carbon solutions should be deployed now, like solar and wind power. He argues that addressing them is the single most important thing that can be done to avoid a climate disaster and also advocates government-sponsored research into clean energy which will feed innovative work in private companies (Gates, 2021a).

For example, Gates has helped fund an Icelandic startup, Carbfix, which captures and dissolves carbon dioxide in water, then injects it into the ground where it turns into stone in less than two years. “This technology can be scaled, and it is cheap and economic and environmentally friendly” (Sigurdardottir & Rathi, 2021), said Carbfix CEO, Edda Sif Pind Aradottir. This technology relies on basalt rocks, where the carbonated water reacts with elements such as calcium, magnesium, and iron, forming carbonates that fill up empty spaces in these rocks underground. Carbfix is working to make this technology applicable to other rock types (Sigurdardottir & Rathi, 2021).

Lazard, a global financial advisory and asset management firm, issued in 2020 a Levelized Cost of Energy (LCOE) analysis which showed U.S. renewable energy prices fell below the cost of coal in 2018 and continued falling fast in 2019 with solar and wind hitting new lows. Over the last decade, solar photovoltaics energy prices have fallen 89% and wind energy prices have fallen 70%. Over the last decade, utility-scale solar capacity grew by a factor of more than 30 and reached more than 60 GW, and wind power capacity more than doubled just in 2018. Utility-scale renewable energy prices are now significantly below those for coal and gas generation and less than half the cost of nuclear. These latest numbers confirm that building new clean energy generation is cheaper than running

existing coal plants. The LCOE total cost of building and operating a power facility over its lifetime showed that renewables beat fossil fuels by ever-larger margins even without subsidies, and that trend is forecast to continue for decades to come. It is now cheaper to save the climate than to destroy it (Marcacci, 2020).

The LCOE of unsubsidized utility-scale solar and wind power came in at lower price ranges than coal, gas, and nuclear resources. Also, the marginal costs to run existing coal and nuclear power plants showed that building renewable energy plants remains competitive with running existing power generation. The LCOE of solar and wind technologies are predicted to decline by 74% and 64%, respectively, by 2050. Thirty-seven U.S. states have renewable portfolio standards or goals that diversify their electricity supply, and eleven states have committed to 100% clean electricity (Marcacci, 2020).

The LCOE bottom line is that renewables are now cheaper than the average cost to either operate coal power plants or to build new natural gas power plants. Due to research and development and the economic learning curve concept with more technology being deployed, renewables become cheaper and more efficient. The relative price decline associated with each doubling of experience is the learning rate of a technology that is incredibly strong for solar technology. While the installed capacity increased exponentially, the price of solar modules declined, due to economies of scale. For more than four decades, each doubling of global cumulative solar capacity was associated with the same relative decline in prices (Roser, 2020).

Economists have argued that market competition ensures that profits are low and capital costs for production decline. The other side of this argument is that regulation by the government could have an impact on market competition, especially if subsidies are given. The price of solar modules has declined from \$106 to \$0.38 per watt, a decline of 99.6%. This learning curve relationship also holds for the price of solar and wind-powered electricity, as solar became 89% cheaper and wind 70% cheaper. However, the global price of electricity from coal declined just from \$111 to \$109, or only 2%, for two reasons: 1) there is little room for substantially improving the efficiency of coal power plants and 2) the price of electricity from all fossil fuel is not only determined by the technology but to a significant extent by the cost of the fuel itself. Since the cost of coal that a power plant burns makes up about 40% of its total costs, there is a hard lower bound to how much that electricity cost can decline. Also, the price of gas for power plant usage is today higher than in the past two decades, even with the current benefits of fracking (Roser, 2020).

In a Global Climate Change report, the world’s 500 largest companies reported \$252 billion of potential losses from stranded assets. To avoid such risks of expensive stranded assets and also higher consumer electricity prices, utilities could replace fossil fuel plants with renewables. Their equity earnings would increase by moving the capital from uneconomic fossil power plants, which rely on significant fuel expenditures, to renewable power plants which run on free solar and wind power which comes to them, as opposed to paying for fossil fuels dug out of the ground. The operating

cost savings of this approach can be substantial, turning unproductive capital into productive, clean energy generating assets (CDP, 2019).

Government policymakers should consider forward-looking utility and power market regulations to reach their decarbonization goals while helping utilities capitalize on a transition to clean energy. For example, in Colorado, effective utility regulation has driven a surge of low-cost bids for solar and wind projects, and in Hawaii, the legal separation of revenue from capital expenditures is an example of performance-based regulation that will help the state achieve its 100% renewable energy target (Marcacci, 2020). For a federal regulation example, after the financial crisis of 2008, the government of Iceland eliminated its use of fossil fuels for its utility systems which became 100% dependent on steam for electricity and underground hot water for all its water needs.

For another federal and state regulation example, the U.S. government recently approved plans for the first major offshore wind farm in federal waters. This authorization will pave the way for the construction of the 800-megawatt Vineyard Wind LLC project, a joint venture by Avangrid and Copenhagen Infrastructure Partners, near the coast of the state of Massachusetts which also has a clean-energy mandate. This project will encompass no more than 84 wind turbines, each separated by at least one nautical mile, and will begin supplying electricity to 400,000 U.S. East Coast homes late in 2021. Currently, there are only two wind farms along the East Coast today which provide fewer than 50 megawatts of generation capacity. The U.S. has lagged Northern European nations in deploying offshore wind projects where subsidiaries and clean energy mandates encouraged such ventures (Dlouhy, 2021).

Globally, fossil fuels still account for 79% of the world's energy production (coal 37%, gas 24%, other 18%) and 87% of the world's carbon dioxide (CO<sub>2</sub>) emissions. Air pollution from burning fossil fuels kills 3.6 million people globally every year which is six times the annual combined death toll of all murders, war deaths, and terrorist attacks. Global warming is a warning that a world run on fossil fuel is not sustainable (Roser, 2020).

However, one of the downsides of renewable sources is their intermittent supply cycle since the sun does not always shine and the wind does not always blow. Technologies, especially for batteries that store electric power, are key to balance the changing supply from renewables with the inflexible demand for electricity. Fortunately, electricity storage technologies are also among the few technologies that are following steeply declining learning curves. In summary, renewables do not have fuel costs and have comparatively small operating and maintenance costs. Renewables follow steep learning curves and fossil fuels do not. Each doubling of the installed capacity of solar, wind, and batteries leads to the same decline of their costs and cheaper energy. It is rare to have a policy option that leads to more jobs, cheaper prices for consumers, and a greener, safer planet. As renewables technology continues to be developed, it can help everywhere, especially in low-income countries (Roser, 2020).

Renewable energy is now the cheapest type of new electricity in countries that make up three-quarters of the world GDP. It is also more efficient. Coal power generation is only 35% efficient, meaning that 65% is wasted in production and transport as well as emitting lots of greenhouse gas (GHG). In comparison, electricity powered by renewable resources is virtually 100% efficient and GHG-free and can be produced and managed locally (Lagarigue, 2021).

## 6. RENEWABLES RELIABILITY

The transition to renewable energy systems not only slows the progression of climate destruction driven by fossil fuels but also has often proven more reliable during climate disasters than either fossil fuels or nuclear power infrastructures. Power plants, particularly in coastal areas, are affected by hurricanes, storms, and rising sea levels. Wildfires, like those regularly ripping through the western U.S. and Australia, are already causing blackouts that endanger communities. Solar panels and wind turbines are effectively mini power plants or microgrids, distributed across the landscape, and able to be disconnected from the central grid, meaning they can continue to operate even when the main power supply goes down. With the help of battery storage, such mini power plants can provide a life-saving source of power during critical outages (Yeo, 2020).

Concerning the impact of climate change, the Earth's poles are warming faster than anywhere on the planet. The North Pole has been heating up about twice as fast as the rest of the Earth for the last 30 years. In the Northern Hemisphere's summer, this has led to a decrease in the contrast between the heat of the equator and the cold of the North Pole. The strength of the jet stream, a river of wind that propels weather systems around the globe, depends on extreme temperature differences between these two regions. As the planet warms and this contrast diminishes, the jet stream weakens and can no longer push large weather patterns out of the way. In January 2021, the air in the stratosphere above the Arctic warmed suddenly. This set up a slow-moving atmospheric chain reaction that weakened the polar vortex, the girdle of winds that keeps frigid air corralled at the North Pole, allowing it to spill out into the temperate regions of North America, Europe, and Asia. Once the cold starts rolling south, every little can stop it (Sullivan & Roston, 2021).

Unfortunately, the state of Texas's power grid was unprepared for Arctic weather which plunged temperatures down to near zero the week of February 13-19, 2021, and left over 4 million people without power and millions more without drinking water for almost the whole week and 80 deaths. Although solar and wind renewable energy can contribute up to 20% of the Texas power grid, in the winter they only account for about 10% of the grid while about 90% comes from natural gas, coal, and nuclear power. While some of the wind turbines in Texas froze, half kept turning and by the middle of the week, both solar and wind power were helping to get the power going again. The state's widespread electricity failure was largely caused by freezing natural gas pipelines that were

not properly weatherized to withstand extreme cold. After a less severe cold front or snap in 2011, power companies were supposed to better winterize their plants but ten years later, they had not done so, even with emerging climate change threats. Also, the planning processes of these companies did not represent how resources perform under extreme climate scenarios. Leah Stokes, a political science professor, who has studied the energy policy process, summarized: "Our infrastructure cannot handle extreme weather events, which these fossil fuels are ironically causing" (Searcey, 2021) (Parker, 2021; Carroll, Chapa, Saul, & Chediak, 2021).

For investigating extreme weather events, Sweden has an Artic Circle test site for keeping wind turbines going. Its turbines can work in temperatures as low as -30 degrees Celsius (-22 degrees Fahrenheit). The problem with sub-zero temperatures and humid air is that ice will form on the wind turbines and the wings catch less and less wind until they do not catch any wind at all. By adding a thin layer of carbon fiber to the wings that can be automatically heated, the formation of ice can be halted all together but costs about 5% more. Most turbine makers, like Vestas Wind Systems and General Electric, now offer versions that come armed with ice mitigation systems and heating for some of the equipment. Unfortunately, the average age of the Texas wind turbines was more than eight years old, meaning they were built before such technologies were widely available (Starn & Chia, 2021).

Bill Gates summarized this Texas catastrophe: "Relying entirely on wind and solar power remains problematic and a state like Texas needed three things in its power grid, especially as climate change ushers in more extreme weather in the future. One is more transmission. If Texas had slightly more of a connection for renewables, they would not have had a problem. The second is energy storage. It's still hard to store these amounts of energy. The third is sources of energy that are not weather dependent but greener, like nuclear" (Blum, 2021).

Timothy Fraser, a Northeastern University researcher, spent time with Japanese communities in 2016, tracking the transition to renewable energy in the wake of the 2011 Fukushima Daiichi nuclear power plant tsunami disaster which killed 20,000 people. He said: "If a community can just make it through the first three days, having power for vital facilities like hospitals and public shelters, by the end of that period, in most cases, disaster rescue operations can get there and give support. A lot of these communities have invested in public solar initiatives because they saw how vital it was to make it through the first 72 hours after a disaster" (Yeo, 2020). The Aizu Electric Power Company was formed in 2013 and has already installed solar panels at 80 sites around this region. In November 2020, Japan committed to becoming carbon-neutral by 2050 (Yeo, 2020).

For dealing with the almost annual California wildfires, caused mainly by climate changes, the Blue Lake Rancheria tribe, a Native American tribe located in Humboldt, California, set up its own microgrid including 1,500 solar panels in 2015. This microgrid operates independently, effectively turning the reservation into a small energy island. When wildfires swept through Humboldt County in 2019,

causing widespread power outages, this microgrid was able to supply its own power. Thousands of people from the surrounding area flocked to the tribe's buildings. Several rooms of the tribally owned hotel were given over to eight critically ill patients who relied on this power to supply them with constant oxygen. Humboldt County's Department of Health and Human Services credited the tribe with saving these eight patients' lives (Yeo, 2020). This microgrid strategy is equally as important today with the ongoing pandemic and the need for respirators.

Similar energy islands or microgrids are being established in Baltimore, Maryland. Founded in 2015, the Power52 organization trains people to install solar panels and battery storage in local communities. It established a microgrid at an East Baltimore community center in 2018, one of the city's most disadvantaged neighborhoods. This microgrid provides 72 hours of electricity, food, and water to help people ride out a power crisis (Yeo, 2020). In January 2021, President Joe Biden pledged to make the U.S. carbon-neutral by 2050.

Another interesting microgrid example is in Australia where one in four houses has a solar power system. For example, on October 11, 2020, South Australia microgrids generated more solar power than the grid's total electricity demand. For that afternoon, it was entirely solar powered from a microgrid total capacity of 1.7 gigawatts, serving 1.8 million people. However, natural gas-fired generators also ran all that day while solar was at its peak. This excess power was transferred to the neighboring state of Victoria. Along with battery storage, this example showed another way to use excess solar electricity and provide stability to electric power grids. In the last quarter of 2020 in South Australia, three-quarters of the solar power generated was from rooftop microgrid systems, and the climate action plan of the South Australian government wants renewable energy generation to reach 500% (not a typo) of the current grid demand by mid-century (Bullard, 2021). Energy Australia is accelerating the closure of a 100-year-old coal-fired plant and installing a giant storage battery to accelerate a faster transition to clean power. It is a four-hour, 350-megawatt utility-scale storage battery, larger than anything currently in operation globally (Stringer, 2021). Western Power in Australia uses artificial intelligence software to leverage customers' rooftop solar panels and batteries, which has the potential to contribute 45% of the power systems needs at certain times of the day and lowers costs for customers (Lagarrigue, 2021).

Thus, renewables reliability exists on local, state, national, and international levels. On the local and state levels, the Native American tribe in California and a Baltimore neighborhood project in Maryland both provided microgrids of electric power during climate and economic crises. The Texas energy catastrophe was reduced by both wind and solar systems getting back online before gas and coal systems for the electric grids. After its nuclear power plant disaster, Japan has installed solar panels or microgrids at 80 sites in the impacted region. Australia has microgrids from solar panels in many individual houses and backup battery storage facilities. Sweden has installed wind turbines and even has one test site in the Artic Circle.



## 7. GLOBAL CORPORATIONS COMMITTED TO 100% RENEWABLE ELECTRICITY

RE100 is a global initiative bringing together the world's most influential businesses to drive a transition to 100% renewable electricity. In partnership with the Carbon Disclosure Project (CDP), RE100's mission is to accelerate change towards zero carbon grids at scale. Companies in the commercial and industrial sector account for around half of the world's end-of-use of electricity. RE100 is attempting to switch this demand to renewable electricity and helps member companies progress toward their goals (RE100, 2020).

By the end of 2019, RE100 had surpassed 200 members, corporations that have committed themselves to go 100% renewable for electricity by a certain year. Together, the electricity needs of these RE100 members are greater than the electricity needs of all but 20 countries. The average target year for going to 100% renewable power is 2028 and about half of these corporations are already above 75% renewables. They are using their influence with stakeholders, such as policy makers and utilities, to push for a faster transition to renewables. 80% of these members have committed to 100% renewable electricity to save money. They are doing a laudable endeavor that helps the world, is popular among their customers, and saves them money (Shahan, 2020). Boards have the responsibility to monitor such commitments.

Recent RE100 member accomplishments included 5th 3rd Bank achieving 100% renewables three years early in 2019 and Estee Lauder Companies reaching its target of 100% renewable electricity ahead of schedule. Well-known members include 3M, American Express, Apple, Bank of America, Bloomberg LP, Coca-Cola European Partners, Credit Suisse, Dell Technologies, Facebook, General Mills, General Motors, Goldman Sachs, Google, HP, Intel, Johnson & Johnson, JPMorgan Chase, Kellogg, Mastercard, McKinsey & Company, Morgan Stanley, Nestle, NIKE, Proctor & Gamble, Panasonic, Pepsi Co., PwC, Ralph Lauren, Salesforce, SAP, Sony, Starbucks, Swiss Post, T-Mobile Target, UBS, Unilever, Vail Resorts, Vestas, Visa, Wells Fargo, and Zurich Insurance Group (Shahan, 2020).

General Motors, a RE100 member, announced on January 28, 2021, that it would phase out petroleum-powered cars and trucks and sell only vehicles that have zero tailpipe emissions by 2035 and said this decision was part of a broader plan to become carbon neutral by 2040. It plans to spend \$27 billion over the next five years to introduce 30 electric vehicles. The Biden administration is expected to announce that it will introduce rules requiring cars to reach an average of 51 miles per gallon by 2026. Daimler which makes Mercedes-Benz cars, said it would have an electric or hybrid version by 2022 and Volkswagen promised an electric version for each of its models by 2030 and began selling an electric S.U.V. in the U.S. in 2021. Volvo plans to convert its entire lineup to battery power by 2030, no longer selling cars with internal combustion engines. Ford Europe and Jaguar both plan to have 100% of their passenger vehicles be all-electric by 2030. Ferdinand Dudenhoffer, a veteran industry analyst, said that there is a consensus by European carmakers that electric cars would dominate within 10 or 15 years (Boudette & Davenport, 2021; Ewing, 2021).

Tesla's official mission is to "accelerate the world's transition to sustainable energy" (Hull & Malik, 2021). In addition to its electric cars, Tesla is developing and installing utility-scale batteries that are needed to store the electricity produced by wind and solar. It installed a 20-megawatt system in Southern California in 2016, a 100-megawatt system in Australia in 2017, a 182.5-megawatt system in Northern California in 2021, and a 100-megawatt system in Texas in 2021. Such systems can also become lucrative opportunities. By storing excess electricity when demand is low, battery owners can sell it back to the grid when prices are high (Hull & Malik, 2021).

IBM has committed to reach net zero emissions by 2030. It is focused on actual reductions in emissions and increasing clean energy use in more than 175 countries where it operates. It has pledged to get to net zero without relying on the purchase of unrelated, unbundled renewable energy certificates and will set interim deadlines to force accountability (Sorkin, 2021a).

One way to track a commitment to a net-zero economy is with shareholder capitalism metrics. The World Economic Forum, in collaboration with Bank of America, Deloitte, EY, KPMG, and PwC, and the support of over 140 stakeholders, established a set of 21 core and 34 expanded metrics in 2020. These shareholder capitalism metrics include non-financial disclosures, centered around four pillars: people, planet, prosperity, and principles of governance. Intentionally built on existing standards, these pillars include metrics such as greenhouse gas emissions, pay equality, and board diversity, for reporting on sustainability performance (World Economic Forum, 2021). Larry Fink reported that sustainability-oriented funds outperformed market benchmarks in 2020, even during the worst of the pandemic downturn, and he wrote in his 2021 CEO letter: "The more your firms are seen to embrace the climate transition and the opportunities it brings, the more the market will reward your firms with higher valuations" (Fink, 2021).

Such a climate-focused strategy might help U.S. zombies, a term used by the Bank for International Settlements for companies that, over the previous three years, had not even earned enough profit to make interest payments on their debt. In the 1980s, only two percent of publicly traded companies in the U.S. were considered zombies. This zombie minority started to grow rapidly in the early 2000s and by the 2020 pandemic, accounted for 19 percent of U.S. listed companies. Zombies are also occurring in Europe, China, and Japan (Friedman, 2021).

The annual Davos conference sponsored by the World Economic Forum was held virtually in January 2021. Climate change is a perennial conversation topic at Davos, but this year businesses are taking more concrete action to address it. Sixty-one (61) corporate chiefs committed to the World Economic Forum's shareholder capitalism metrics include climate change metrics (Sorkin, 2021d). These metrics focus on all the relevant greenhouse gas (GHG) emissions (e.g., carbon dioxide, methane, nitrous oxide F-gasses, etc. and require the reporting of the metric tons of carbon dioxide equivalent (tCO<sub>2</sub>e) GHG Protocol Scope 1 and Scope 2 emissions. Also, estimates and reports of material upstream and downstream GHG Protocol 3 emissions

are desired. There are also land use and ecological sensitivity for key biodiversity areas, water consumption, and withdrawal in water-stressed areas (World Economic Forum, 2021). These 61 companies agreeing to implement reporting on the stakeholder capitalism metrics include Accenture, Bank of America, BP, Credit Suisse, Dell Technologies, Deloitte, Dow, EY, HP, IBM, KPMG, Mastercard, McKinsey & Company, Nestle, PayPal, PwC, Royal Dutch Shell, Salesforce, Sony, Total, UBS, Unilever, and Zurich Insurance Group (World Economic Forum, 2021).

Science Based Targets initiative (SBTi) is a non-profit organization that helps companies translate the Paris Climate Agreement goal of keeping global warming under 1.5 degrees Celsius into concrete measures. SBTi analyzed 338 companies that had set targets guided by science, which requires goals not just decades out but also measurable emission cuts in the short term. These companies are in a broad range of industries, such as software, pharma, mobile networks, and utilities. The 2021 report concluded that between 2015 and 2019, these companies reduced Scope 1 and 2 emissions, generated by their own assets and in purchased electricity, by 25%, even as global emissions rose by 3.4% during that period. The avoided emissions added up to 302 million metric tons of carbon dioxide, equivalent to what Poland emits annually. More than 1,000 companies are now working with SBTi to set climate targets. Science-based goal setting is creating a strong framework for these companies to cut emissions and for the public to hold these companies accountable (Rathi, 2021b).

The boards of directors of these global corporations that have committed to 100% renewable energy have responsibilities to monitor and report to senior management on these commitments. Boards need to be aware of and check for the possibility of such renewable energy commitments leading to greenwashing. The same problems and challenges for boards arise when companies go further and establish zero net emissions goals, motivated by the Paris Agreement on Climate Change. Such board responsibilities strengthen corporate governance for these companies.

## 8. RENEWABLES OPPORTUNITIES WITH ENERGY INDUSTRY EXAMPLES

Bill Gates has a game plan of four ways that the U.S. can reassert leadership on climate change: 1) increase the supply of innovation, 2) increase the demand for innovation, 3) work globally, and 4) prepare for a warming world. He argues that a fivefold increase in federal spending on clean-energy development would put it on an equal footing with health research and a new National Institutes of Energy Innovation should be created and modeled on the very successful National Institutes of Health. Such federal spending would be a key first step in creating more than 370,000 renewables-related jobs (Gates, 2021).

Jerome Pecresse, the President and CEO of GE Renewable Energy, has elaborated how the energy industry can play a leading role in developing renewable energy and having energy workers fill many of these predicted new 370,000 energy-related jobs. He observed that oil and gas are never going to

disappear, but renewable energy is now mainstream and has achieved grid parity. He predicts that between 50% and 67% of new gigawatt energy will come from renewables which will become the baseload over the next 10 to 20 years (Pecresse, 2018).

Oil and gas companies are beginning to diversify their portfolios with renewables to support future sustainability and revenue growth goals. Sharing of technologies and best practices between these two industries can be very useful. Oil and gas companies have relevant expertise as renewables move into more challenging environments, like offshore wind and power grid linkages. Offshore oil and gas vessels and platforms can serve dual purposes, driving more energy infrastructure efficiency. Cables carrying electrical power from offshore wind farms to shore need protection from stresses, like weather conditions, wave heights, and tidal currents, which the energy industry has dealt with for years. Many oil and gas companies have large global presences and strong local government relationships which can help mentor the renewables industry introducing its new products and services (Pecresse, 2018).

The European oil industry is slowly transitioning to a future dominated by cleaner energy. All of Europe's large oil companies have now set targets to reduce the carbon emissions that contribute to climate change and most have set a "net zero" goal by 2050. BP, Royal Dutch Shell, Total, and Eni are investing considerable resources in offshore wind and solar energy while cutting back on oil. Bernard Looney, the BP CEO, said: "What the world wants from energy is changing, and so we need to change, quite frankly, what we offer the world" (Krauss, 2021). BP is investing \$5 billion a year over the next decade in renewable energy, such as offshore wind farms and hydrogen production, while cutting back oil and gas production by 40 percent. Royal Dutch Shell is building a vast wind farm off the coast of the Netherlands. Total owns a battery maker and is making several large investments in solar power in Spain and a wind farm off Scotland. Eni has converted refineries in Venice and Sicily to make lower-carbon fuel from plant matter. Also, these companies are expanding their electric vehicle charging business. American oil giants, like Exxon Mobil, Chevron, and Conoco Phillips, have been slower than their European counterparts to commit to climate-related goals and action (Krauss, 2021; Reed, 2020).

Investments in low-carbon energy by these large European oil companies have risen to as much as 15 percent of their capital spending on average for 2020, for 2021 plans, and up to 50 percent if natural gas is included. Oswald Clint, a Bernstein investment firm oil analyst, forecast that the large oil companies would expand their renewable energy business, primarily wind, solar, and hydrogen, by around 25 percent or more each year over the next decade. Daniel Yergin, an energy historian, said: "These companies are really good at big, complex engineering management that will be required for a renewables transition of that scale" (Reed, 2020). These large oil companies can take advantage of the thousands of engineers on their payrolls to manage the construction of new types of energy plants; their vast networks of retail stations to provide services

like charging electric vehicles; and their trading desks, which typically buy and hedge a wide variety of energy futures, to arrange low-carbon energy supplies for cities and large companies (Krauss, 2021; Reed, 2020).

Large global oil and gas companies have developed and upgraded their information technology systems, providing data to manage their massive global operations. As Jessica Mathews, CEO of Uncharted Power, commented: "We believe in God. All others must bring data!" (The New York Times Virtual Event, 2021). For example, the U.S. solar industry employed nearly 250,000 workers in 2019, an increase of 169% from the 93,000 jobs in 2010. Nearly two-thirds of these jobs were in installation and project development which is another area of expertise in the oil and gas industry. In the five-year period between 2014 and 2019, solar employment grew 44%, five times faster than job growth in the overall U.S. economy. Solar jobs also increased in 31 states in 2019, with the most jobs added by Florida, followed by Georgia, Utah, New York, Texas, Illinois, and Virginia. California still has by far the most solar jobs nationwide at over 74,000 (The Solar Foundation, 2020). Thus, there is good potential for oil and gas people to help fill the predicted new 370,000 renewables jobs although they may need some retraining for specific renewables industry jobs.

There may be related opportunities for global mining companies (Grove & Clouse, 2020). Demand for cobalt is surging, due to the increasing battery demands for electric cars and storage units for renewable solar and wind electric power. In the fast-growing battery industry, demand, especially from electric carmakers, has pushed up the price of cobalt by 30% in 2020, and already another 30% in 2021, to over \$40,000 per metric ton. The rally is being driven by China which is a leader in electric car development. Tesla and other electric car companies are facing battery shortages and are having to slow down production. Most of the cobalt supply comes from the Democratic Republic of Congo, where children working in "artisanal" mines dig tunnels with hand shovels, risking life and limb for about \$2 a day. Artisanal miners are not officially employed by a mining company but work independently, using their own resources, usually hand tools in manually intensive methods. The mining group Glencore announced in February 2021 that it would supply "ethically sourced" cobalt to a Norwegian battery producer, FREYR. Thus, there may be opportunities for global mining companies to use their expertise and resources to help develop such "ethically sourced" cobalt. For example, Glencore and Tesla are both part of a recently formed Fair Cobalt Alliance whose members pledge to support responsible artisanal mining (Sorkin, 2021b).

A new self-driving electric car competitor to Tesla will be Apple, which is negotiating a deal with Hyundai-Kia to manufacture an Apple-branded, fully autonomous electric vehicle, called the "Apple Car". It is initially focused on the "last mile," i.e., for package food delivery operations and firms incorporating robo-taxis. Apple will control the software and hardware that will go into the vehicle. It is tentatively scheduled to go into production in 2024 and will be manufactured at the Kia assembly plant, which opened on February 26,

2010, in West Point, Georgia. For Apple, the decision to build a car opens the potential to tap a global auto and mobility market valued at \$10 trillion. Katie Huberty, a Morgan Stanley analyst, explained in a January 2021 research note: "Smartphones are a \$500 billion market. Apple has about one-third of this market. The mobility market is \$10 trillion. So, Apple would only need a 2% share of this market to be the size of its iPhone business" (LeBeau & Reeder, 2021).

Avoiding artisanal mining, Vulcan Energy Resources Ltd., an Australian global mining company, is hoping to benefit from rising demand for lithium, a key ingredient for electric car batteries. It is attempting to build up a European battery manufacturing industry to reduce dependency on Asian suppliers and Australia which has the world's biggest lithium mine. The company's pre-feasibility study, scheduled to be done by 2022, values its lithium resources near Offenburg, Germany at \$3.4 billion. Developing a "green" lithium play, it is attempting to produce battery-grade lithium without emitting carbon dioxide by extracting lithium, using a geothermal power plant in southern Germany, like Berkshire Hathaway's "green" lithium research in the Salton Sea, California (Thornhill, 2021). Another Australian mining company, Fortescue Metals Group, maintains that the country's abundant renewable power sources should be used to make zero-emissions hydrogen, which can then be used to make zero-emissions iron and steel (Bullard, 2021).

Similarly, the boards of directors of these global oil and gas companies that have committed to goals for renewable energy and zero net emissions have responsibilities to monitor and report to senior management on these commitments. Mining company boards also need to review their companies' mining practices for cobalt and lithium used in batteries, especially to check for artisanal mining practices. These boards also need to check for the possibility of such commitments and practices leading to greenwashing. Again, these board responsibilities strengthen corporate governance for these energy companies.

## 9. CONCLUSION

The major research question of this paper is what are the boards of directors' responsibilities for monitoring their companies' commitments to renewable energy, and are they making significant efforts, or just greenwashing, i.e., just making commitments or pledges without any substantial subsequent performance? This paper has analyzed such board corporate social responsibilities for renewable energy commitments, especially in response to activist investors, like BlackRock. This paper has developed such boards of directors' responsibilities for assessing renewable energy commitments and for monitoring any greenwashing by their companies. A limitation of this study is that it is ongoing and evolving as more companies make renewable energy commitments. Then, more in-depth studies of how boards are monitoring and reporting such commitments can be made. Such studies can analyze the evolving nature of corporate governance for renewable energy and zero net emissions commitments.

Jana Ganion, the Blue Lake Rancheria tribe's director of sustainability and government affairs, observed: "We have spent more than enough time admiring the climate problem. The evidence is clear, the jury is in, the predicted climate crisis is upon us. It is time to fight. The solutions are right in front of us, and the transition is underway, but we must accelerate, starting today" (Yeo, 2020). This paper embellishes these observations. Activist investor guidelines were summarized. The shifting energy landscape and transition to affordable and reliable renewables, especially for carbon-free electricity and "the greening of the grid" were developed. Global corporations committed to 100% renewable electricity were cited for their boards to monitor such commitments. Renewables opportunities were explored with energy industry examples.

Concerning effective corporate governance, boards of directors have the responsibility to monitor their companies' renewables pledges. As Larry Fink wrote in his 2021 CEO letter to all public company CEOs: "We expect you to disclose how your business model will be compatible with a net-zero economy and how this plan is incorporated into your long-term strategy and reviewed by your board of directors" (Fink, 2021). An excellent starting point for such reviews by boards of directors would be to use the key points in Fink's letter, summarized here as a checklist for monitoring renewable energy commitments:

- Report in alignment with the recommendations of the TCFD. Set rigorous short, medium, and long-term targets to reduce emissions.
- Disclose how your business plan is compatible with transitioning to a net-zero economy and how it is incorporated into your long-term strategy and reviewed by your board of directors.
- Monitor if sustainability and deeper connections to stakeholders are driving better returns. Monitor if your company is showing its purpose in delivering value to its stakeholders: customers, employees, and communities. Monitor how successfully your company is competing and delivering long-term durable profits for shareholders.
- We expect directors to have sufficient fluency in climate risk and the energy transition to enable the whole board — rather than a single director who is a "climate expert" — to provide appropriate oversight of the company's plan and targets.

Examples in this paper of high visibility companies that have pledged corporate social responsibilities, concerning renewables commitments for boards of directors to monitor include: Apple, Bank of America, BP, Credit Suisse, Daimler, Dell Technologies, Eni, Facebook, Ford, General Motors, Goldman Sachs, Google, HP, IBM, JPMorgan Chase, Mastercard, Nestle, NIKE, Panasonic, Royal Dutch Shell, SAP, Sony, Starbucks, Swiss Post, Tesla, Total, UBS, Unilever, Visa, Volkswagen, and Volvo.

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Boards of directors' responsibilities extend to ensuring that their companies are not merely greenwashing. Discussing zero net commitments by companies, Alberto Carillo Pineda is a founder of SBTi, widely regarded as the gold standard for climate plans. He said: "When you look at what is behind it, you will see there is not a lot of substance behind those commitments, or the commitments are not comprehensive enough" (Sorkin, 2021a). Similarly, the Sierra Club's Ben Cushing said: "A destination without a complete road map is not going to cut it" (Sorkin, 2021a).

A related pitfall for boards monitoring responsibility is "avoided emissions" in which a company takes credit for refraining from high-polluting action to reach net zero. For example, an investment in wind turbines might be claimed as avoiding investment in the same amount of energy produced by coal. SBTi does not count avoided emissions, as Alberto Pineda said: "Using these avoided emissions to meet net zero claims is not credible" (Eavis & Krauss, 2021). Ben Caldecott, director of the University of Oxford's Sustainable Finance Program, said that avoided emissions are not credible and represent greenwashing (Eavis & Krauss, 2021; Bloomberg Green, 2021). Amy West is the managing director, global head of sustainability, at TD Securities, a Canadian investment bank and financial services provider with offices in 18 cities worldwide, 4,000 employees, and \$4 billion in revenues. She commented: "Transparency and consistency of reporting are the key for investors, especially how scope 1, 2, and 3 emissions are calculated, to identify outperformers and underperformers" (Bloomberg Live, 2021).

Last year, Larry Fink asked all public companies to report in alignment with the recommendations of the TCFD or the SASB which covers a broader set of material sustainability factors. This year, he said he prefers the TCFD approach. The World Economic Forum has recently developed shareholder capitalism metrics which include climate change metrics. The IOSCO, whose members regulate more than 95% of the world's securities markets, is creating a preliminary proposal that would form the basis of national reporting requirements to present at the United Nations climate change conference in Fall 2021. For monitoring their companies' net zero or renewable energy commitments, boards might wait to see if they could use the IOSCO reporting requirements as a comparable and consistent reporting system. Future research could investigate these challenges and responsibilities with case studies or empirical studies, especially looking out for any "greenwashing" related to net zero or neutral carbon commitments by companies.

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