Research Note

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Material World

The materiality of CO_2 emissions is debatable – energy isn't.

- It is now widely accepted that "climate-related risks and opportunities" are financially material for public companies. Disclosing greenhouse gas (GHG) emissions is encouraged by the world's biggest asset managers, and, increasingly, mandated by regulators.

- For many issuers and investors, "transition risk" starts and ends with emissions. The underlying idea seems to be that governments around the world will gradually adopt policies in line with their commitment to keeping global warming below the Paris Agreement threshold of 2° C – including large and increasing carbon taxes.

- Companies representing **71 percent** of the S&P 500 by market capitalization **and 87 percent** of the index's direct emissions have set voluntary net zero goals. Activist groups continue to use shareholder voting to push companies to adopt stricter targets. But investors have balked over the last two annual general meeting (AGM) cycles. There is no consensus on how strict a company's targets should be.

- We think a reset – **from a sole focus on emissions to a broader focus on energy efficiency** – can help break through this impasse.

- Consensus envisions a future of cheap, abundant, but (paradoxically) sparingly used energy. **We are not so sure**. Decarbonization may require **higher real energy prices** in order for the trillions of dollars in requisite storage, transmission, and low-carbon generation capex to earn a return on investment.

- Energy costs are a bigger financial driver for more individual companies, and more dollars of market cap, than direct emissions over any plausible range of energy and carbon prices.

- With proxy season imminent, we think investors should pay close attention to shareholder proposals targeting companies falling behind on **energy efficiency** (and locking in long-term, low-cost sources of clean energy). **In a follow-up memo, we will highlight select case studies.**

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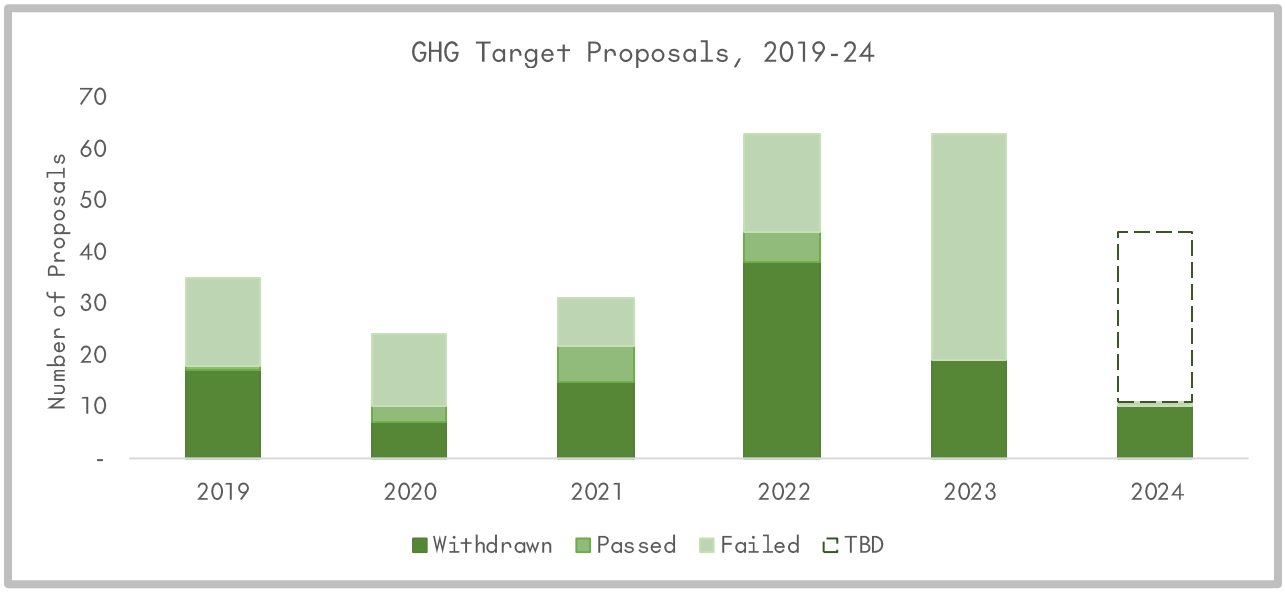
I. Table stakes

Reporting on emissions, energy use, and more granular "[climate-related] risks and opportunities" is now **table stakes** for public companies. It is encouraged by investors, adopted by many companies, and, often, mandated by regulators. BlackRock, Vanguard, and State Street are all on the record supporting the Task Force on Climate-Related Financial Disclosures (TCFD) recommendations on climate reporting, including the disclosure of material GHG emissions. Scope 1 (direct) and Scope 2 (purchased electricity) emissions disclosures are required for public companies listed in Canada, the EU, Hong Kong, Japan, New Zealand, and the UK. These listing venues are home to **32.3 percent of global equity market capitalization.** If the SEC's climate disclosure rule is upheld in court, it would add the US to this list, meaning that **77 percent of equity market cap globally** would be covered by a climate disclosure rule.

Activist groups have used shareholder meetings as a forum to push for corporate action on environmental, social, and political (ESP) issues for decades. Filing formal proposals ("14a-8 proposals" in the US) calling for companies to make new climate-related disclosures – and, increasingly, set emissions targets – has been a major focus for these groups in recent years. From roughly 2018 to 2021, they caught lightning in a bottle. New norms on climate-related reporting were still spreading through corporate America and the asset management industry. Proposals calling out companies that were slow in adopting the recommendations of the TCFD were increasingly successful. Across CAS's covered proposal universe, success rates reached a high of 40 percent (of proposals making it to a vote) in 2021, thanks to support from mainstream investors. The subset of proposals focused on GHG targets did even better, with 71 percent of resolutions that made it to a vote passing.

Fig. 1: *CAS-flagged climate proposals by outcome. We consider both proposals that have been voluntarily withdrawn by their proponents and proposals that make it to a vote and win majority support to have "succeeded."*



(CAS analysis)

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II. The ESG impasse

Relative to 2021, investor support for proposals calling for companies to set stricter GHG targets continues to fall. Projects like the Science-Based Targets Initiative (SBTi) are trying to align industry, investors, and NGOs on criteria for high-integrity targets, but they have been a non-starter with US-based asset managers. The share of CAS-flagged climate proposals that passed (excluding withdrawn and omitted proposals) fell from 40 percent in 2021 to 15 percent in 2022 and just 2 percent in 2023.

Our view is that shareholder proposals on ESP issues work best when they are focused on getting companies to make **specific new disclosures** that plausibly map onto investor decision-making. In recent years, proponents of climate-related shareholder proposals have had a hard time countering the argument that it doesn't make sense for companies to voluntarily act as thought the world is on a net zero pathway, when it in fact isn't:

> *For background, our most recent resiliency modeling, which was subject to a quality-assurance audit by an independent third-party, describes our approach to scenario analysis and the robustness of our business and assets through an aggressive energy transition scenario. As requested by the prior proposal, it was conducted using the assumptions provided by the IEA NZE scenario. It is important to note that the IEA acknowledges that society is not on an IEA NZE pathway, and that the IEA NZE scenario assumes unprecedented energy efficiency gains, innovation and technology transfer, lower-emission investments, and globally coordinated greenhouse gas reduction policy by governments. Further, under that scenario, oil and natural gas remain an important part of the supply mix at least through 2050.*

(ExxonMobil response to a shareholder proposal calling for disclosure of downstream asset retirement obligations under the NZE scenario, 2023 proxy statement)

We think **a reset from solely focusing on emissions targets, to a broader view of *energy intensity* and energy costs**, could help companies, investors, and activists get out of this impasse. We would also note that this is very much in the spirit of the TCFD's recommendations.

The TCFD framework does acknowledge the importance of **policy-related risk –** essentially, the notion that as global climate policy converges on the goal of reaching net zero, penalties for fossil fuel users will ramp up, hurting investors in carbon-intensive assets. But it also includes a broader spectrum of technology- and energy-related issues. Our view is that many players in the ecosystem are overestimating the materiality of **direct emissions** (Scope 1 and Scope 2) and underestimating the materiality of **energy source and resource efficiency** issues.

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Fig. 2: *The spirit of the TCFD's recommendations covers a broader range of energy- and resource-related issues. Headline emissions continue to get more attention, however, because comparable data is widely available, and, CAS would argue, because they allow companies to report gradual progress without resolving deeper technology and business model challenges (e.g., Scope 2 emissions intensity can be expected to decline over time because of the impact of renewable portfolio standards, not proactive risk management by issuers).*

Table 2

Examples of Climate-Related Opportunities and Potential Financial Impacts

Type	Climate-Related Opportunities[33]	Potential Financial Impacts
Resource Efficiency	– Use of more efficient modes of transport – Use of more efficient production and distribution processes – Use of recycling – Move to more efficient buildings – Reduced water usage and consumption	– Reduced operating costs (e.g., through efficiency gains and cost reductions) – Increased production capacity, resulting in increased revenues – Increased value of fixed assets (e.g., highly rated energy-efficient buildings) – Benefits to workforce management and planning (e.g., improved health and safety, employee satisfaction) resulting in lower costs
Energy Source	– Use of lower-emission sources of energy – Use of supportive policy incentives – Use of new technologies – Participation in carbon market – Shift toward decentralized energy generation	– Reduced operational costs (e.g., through use of lowest cost abatement) – Reduced exposure to future fossil fuel price increases – Reduced exposure to GHG emissions and therefore less sensitivity to changes in cost of carbon – Returns on investment in low-emission technology – Increased capital availability (e.g., as more investors favor lower-emissions producers) – Reputational benefits resulting in increased demand for goods/services

(TCFD)

III. Abundance and scarcity

The consensus view, as represented by the latest edition of the International Energy Agency (IEA) *World Energy Outlook* ("WEO 2023"), is that in 2050, energy will be cheaper, cleaner, and, paradoxically, more sparingly used. Across the IEA's three scenarios, which range from the realistic "Stated Policies Scenario" (SPS) to the intermediate "Announced Pledges Scenario" (APS) and idealized "Net Zero Emissions" (NZE), the primary energy intensity of global GDP continues its linear march downward. The cost of key fossil fuels falls as higher-cost producers of coal, oil, and gas leave the market. And the levelized cost of electricity (LCOE) in key regions appears to fall dramatically.

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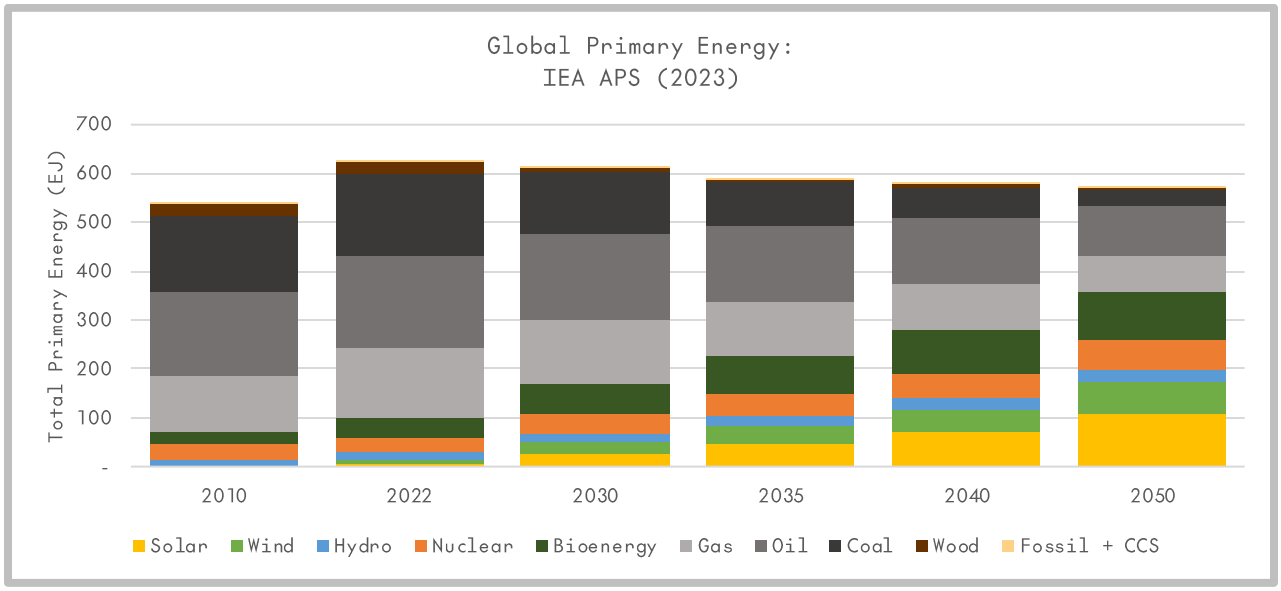
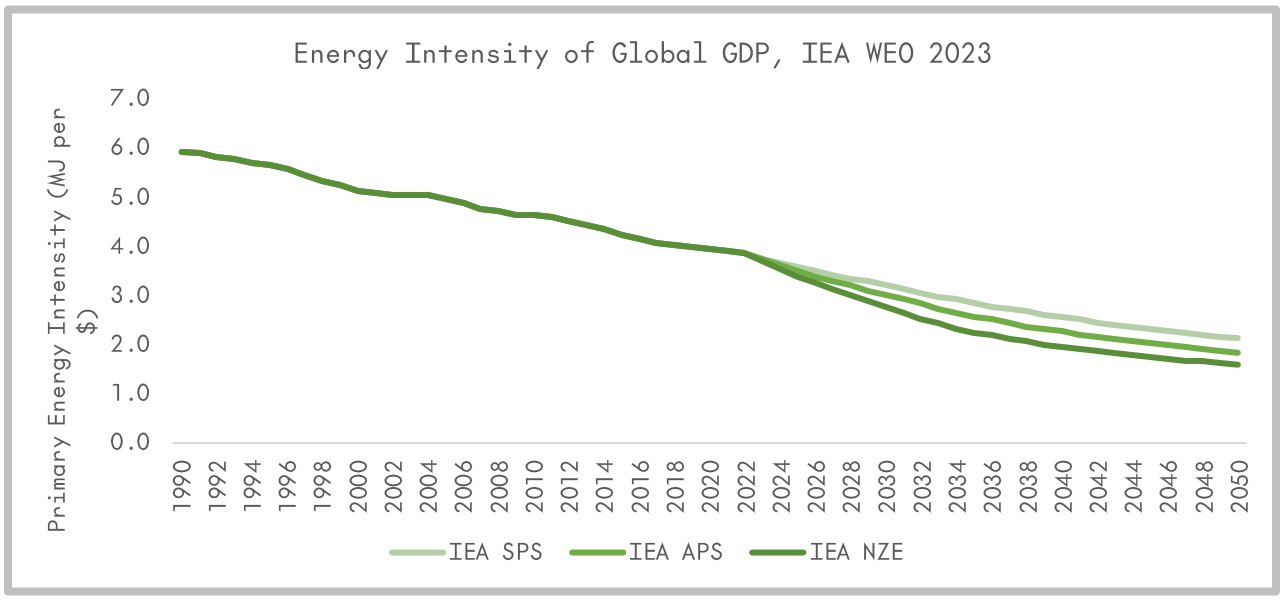
Figs. 3-4: *The IEA's APS and NZE scenarios assume an unprecedented acceleration in the long-term rate of decline in the energy intensity of the world economy.*





(Statistical Review of World Energy, IEA WEO 2023)

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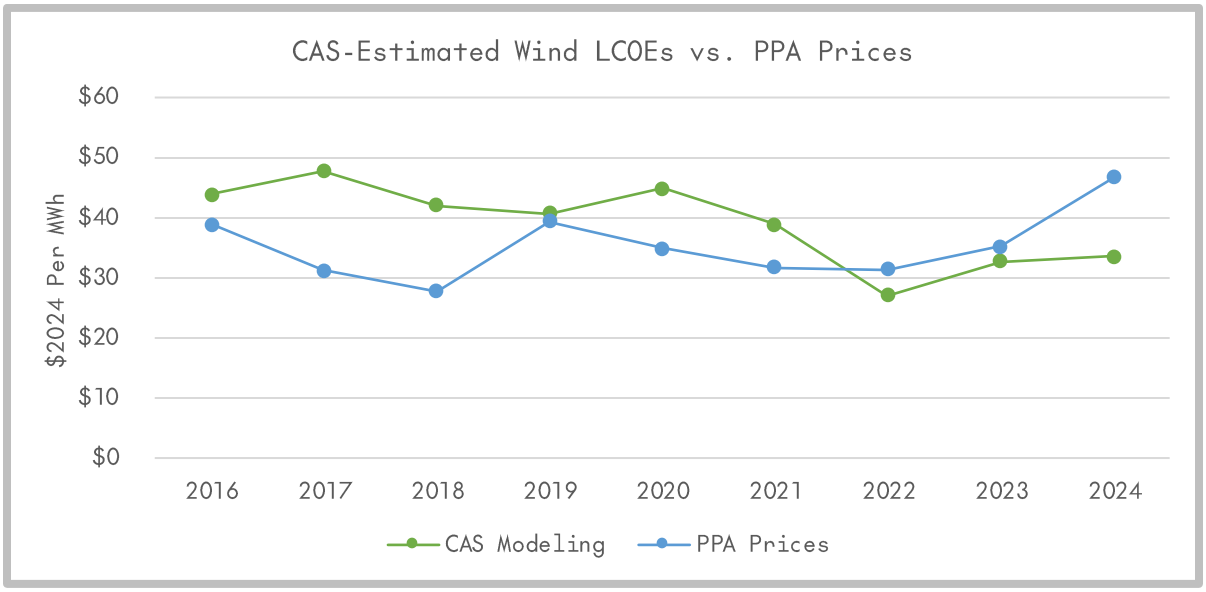
We are not prognosticators. But a few points are worth noting to complicate this view.

Wind and solar power purchase agreement (PPA) prices in the US continue to rise faster than our LCOE modeling would suggest.[1] Data from PPA consultancy Level10 suggests that, in the US, solar PPA prices have increased by around two-thirds since 2020, while wind PPA prices have more than doubled. Higher equity hurdle rates can only explain part of the uptick in PPA costs, which means the rest of the increase is attributable to higher construction and operating ("O&M") costs.

Fig. 5: *CAS-modeled levelized cost of energy (LCOE) for US onshore wind compared to average power purchase agreement (PPA) prices as reported in the US Department of Energy's Land-Based Wind Market Report.*



(CAS analysis; US Department of Energy)

The exact level of storage, transmission, and low-carbon capacity investment required for grid resilience in a net zero world is notoriously uncertain. But our hunch is that substantial levels of firm, low-carbon generation capacity will be needed in much of the world, especially given low solar and wind resource potential in many regions. Our modeling suggests that existing firm, low-carbon options are at least two to three times more expensive than the (widely-quoted) best-case costs of solar and wind.

Finally, Scope 1 emissions are highly concentrated in "hard to decarbonize" industries, where fossil fuels are required for process heat. Lower-carbon production pathways in refining, chemicals, steel, aluminum and other heavy industries are

[1] Modeling assumes a 35 percent capacity factor; construction and O&M costs based on the DOE *Land-Based Wind Market Report* series and Vestas reports; prevailing production tax credit levels; a 60 percent debt-to-total capital ratio; BBB interest rates; and an equity hurdle rate equal to 800 bps over 10 year treasuries.

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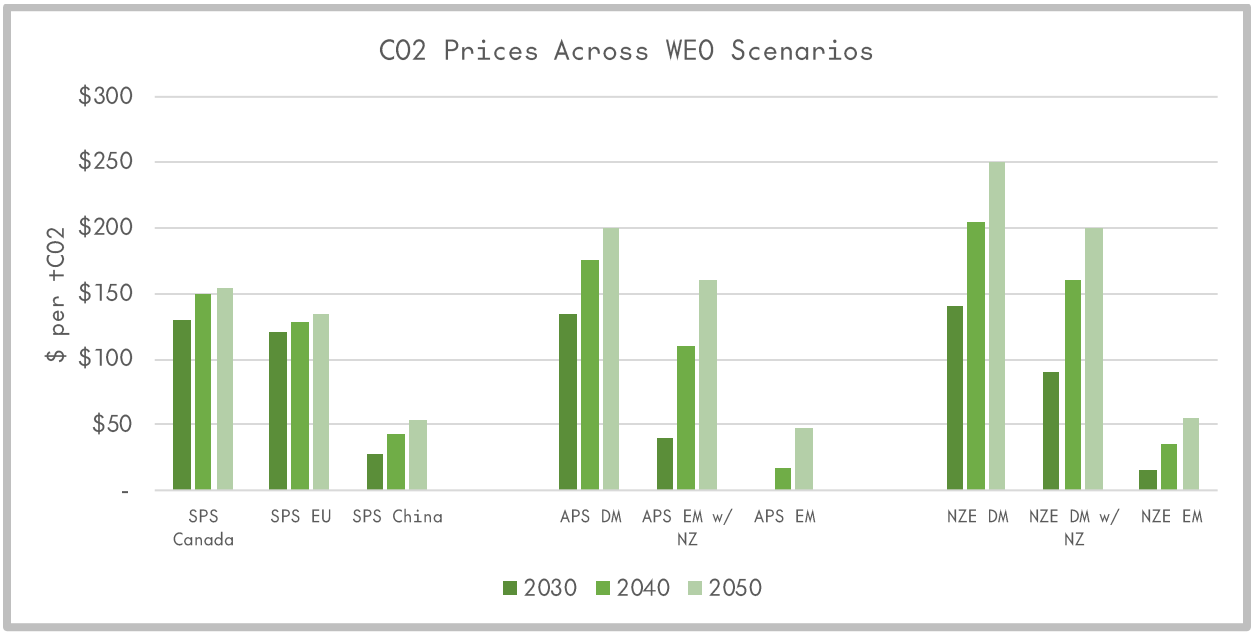
always going to be more expensive than higher-carbon pathways, since they layer on the cost of additional capital equipment (e.g. electrical generators and "industrial heat pumps").

IV. Material world

The IEA's WEO 2023 scenarios contemplate carbon prices in developed countries with net zero targets reaching anywhere from below $100 per tonne of CO_2 (SPS) to $250 (NZE).

Fig. 6: *CO_2 prices vary widely across the IEA's three WEO scenarios, and, within each scenario, between developed and emerging markets. The "where" of carbon emissions matters a great deal for financial materiality.*



(IEA WEO 2023)

Even **at the highest end of this range**, carbon costs would only total over 5 percent of sales for 78 companies in the S&P 500, representing 9 percent of the index by market cap (but 79 percent of the index's Scope 1 and Scope 2 emissions). Excluding utilities, these totals fall to 53 companies, 7 percent of the index by market cap, and 66 percent of the index's emissions. If we lowered the materiality threshold to carbon costs of just **0.6 percent** of sales[2], carbon costs would still only be material for **188**

[2] We use sales as a denominator for materiality mainly to avoid issues that arise from (i) the treatment of unprofitable companies and (ii) commodity-sensitive companies with widely varying margins. Excluding unprofitable companies, the modal S&P 500 constituent had a 16 to 18 percent GAAP operating margin in 2022. The 10th to 90th percentile range of profitability is 6.6 to 37.9 percent, while the 25th to 75th percentile range is from 11.5 to 27.1 percent. GAAP materiality is generally defined in terms of the "5 percent rule" (really a rule of thumb), i.e. items that affect greater than 5 percent of assets or net income are generally considered material. 0.6 percent of **sales** is used as an illustrative threshold

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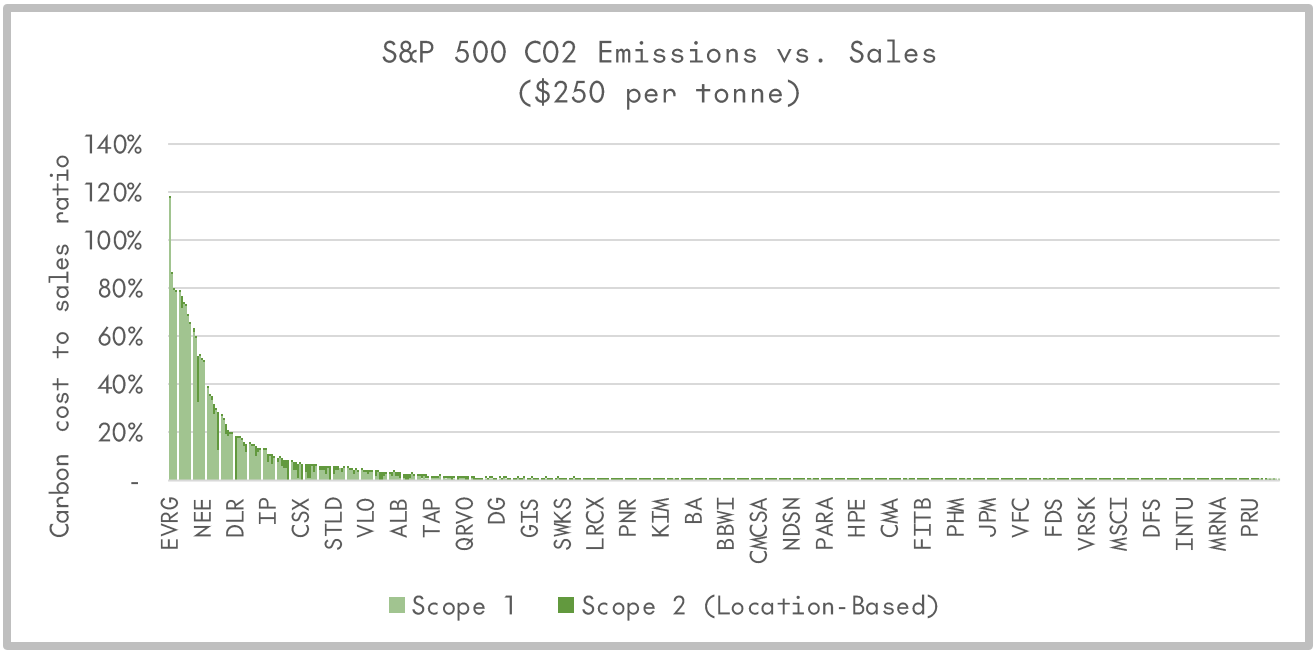
index constituents (again excluding utilities[3], totaling **40 percent** of the S&P 500 by market cap and generating **94 percent** of its Scope 1 and Scope 2 emissions.

Fig. 6: *Even in a punitive carbon price scenario, material emissions are heavily concentrated in a small number of companies. Excluding utilities, which are expected to decarbonize faster than the economy at large in the prevailing "electrify everything" paradigm, and the list shrinks further.*



(Bloomberg)

But even in the IEA's NZE scenario, these calculations would be too punitive. S&P 500 constituents generate emissions all over the world (a little under a third of the index's revenue comes from overseas, as a rough proxy for emissions-generating activities). And, in the NZE scenario, carbon taxes only rise to $250 per tonne by 2050 in "advanced economies with net zero emissions pledges." In "selected emerging markets and developing economies (without net zero emissions pledges)" they only reach $180 per tonne. In "other emerging market and developing economies" they total just $55 per tonne.

here because it represents 5 percent of **GAAP operating income** for companies at the 25th percentile of S&P 500 margins.

[3] Utilities are excluded here, despite the very large share of public company emissions they represent, because their generation fleets are expected to have **much** lower carbon intensity in the future, and because a rate-regulated monopoly can (to a first approximation) pass these costs on to customers.

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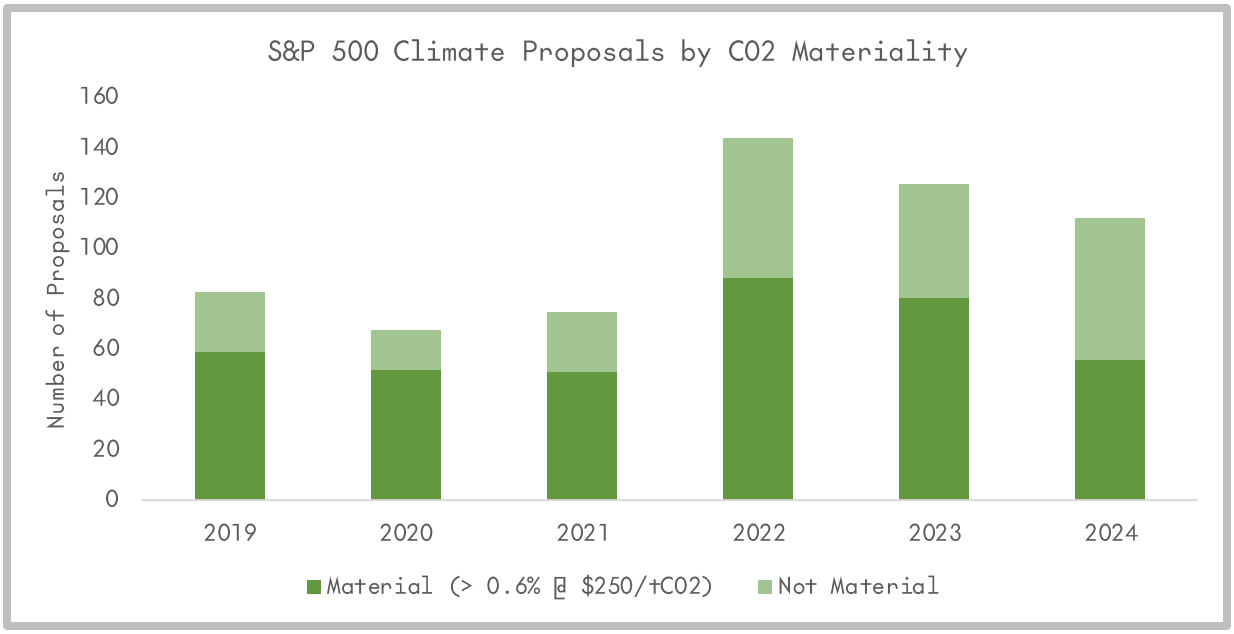
It is therefore somewhat striking that even using this exacting threshold, **only half of climate-related proposals targeting S&P 500 constituents in this year's proxy season are aimed at companies with financially material Scope 1 and Scope 2 emissions.** In 2020, 76 percent of climate proposals within the S&P 500 were aimed at companies with material emissions.

Fig. 7: *In recent proxy voting cycles, climate-related shareholder proposals have increasingly been directed at companies that do not have financially material Scope 1 and Scope 2 emissions.*



(CAS analysis)

But, again, this analysis is anchored on a **very high** cost of emissions – one that is unlikely to be implemented in practice (and certainly not without lots of opportunities for geographic arbitrage, and, for companies with pricing power, passing on higher CO_2 costs to customers, which would dampen the earnings impact of high CO_2 prices or taxes considerably). Across all carbon tax and price schemes globally, the 75th percentile of carbon prices is currently **just $43 per tonne,** according to World Bank data.

Further, the two highest prices in the World Bank database are not very representative - $156 per tonne in Uruguay (only levied on gasoline) and $131 per tonne in Switzerland (where 91 percent of power comes from nuclear and hydroelectricity).

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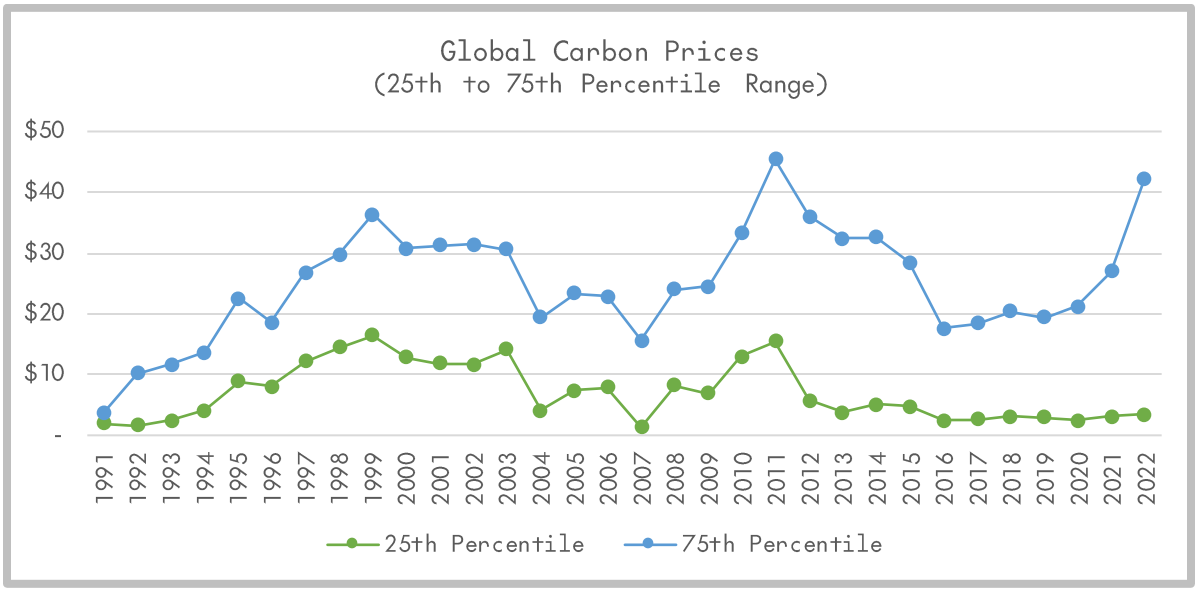
Fig. 8: *Existing carbon prices, taxes, and trading schemes use prices much lower than the levels contemplated in the IEA's APS and NZE scenarios.*



(World Bank)

At the 90th percentile of **actually existing global carbon prices,** approximately $51 per tonne, **just 76 companies in the S&P 500** (ex utilities), **representing only 9 percent of the index by market cap** (excluding utilities)**, have financially material Scope 1 and Scope 2 emissions** (again using the 0.6 percent of sales threshold).

To underscore the relative financial materiality of energy and emissions, CAS investigated a subset of 100 companies with the highest absolute Scope 1 and Scope 2 emissions in the S&P 500, excluding utilities. Collectively, these companies generate 913 million tonnes of CO_2 emissions annually – a little over half of the index's total Scope 1 and Scope 2 emissions (83 percent excluding utilities) and about 36 percent of its market cap.

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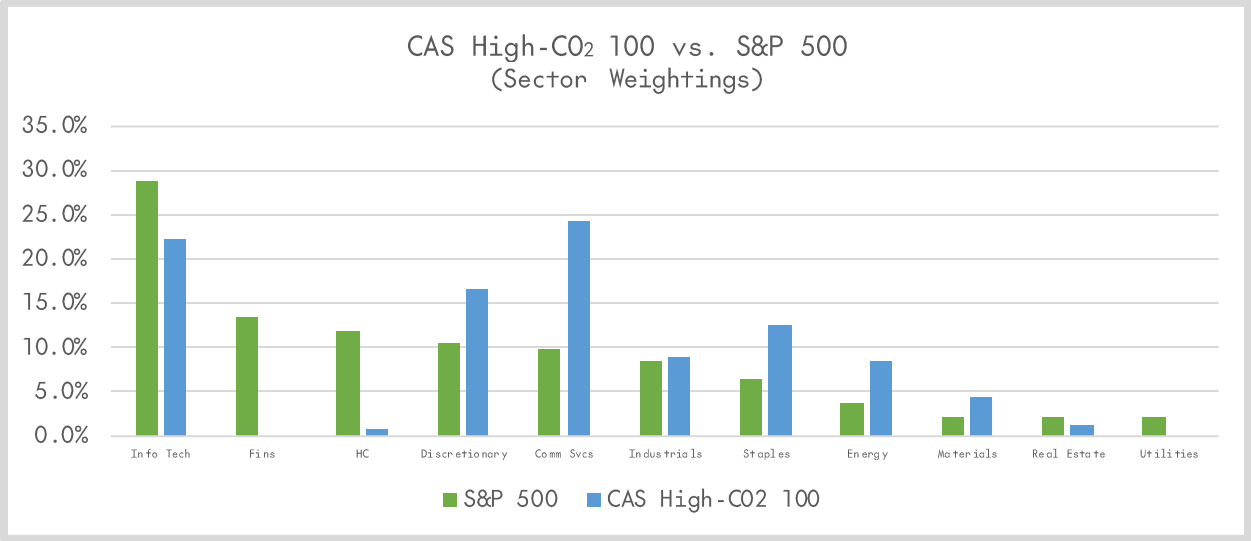
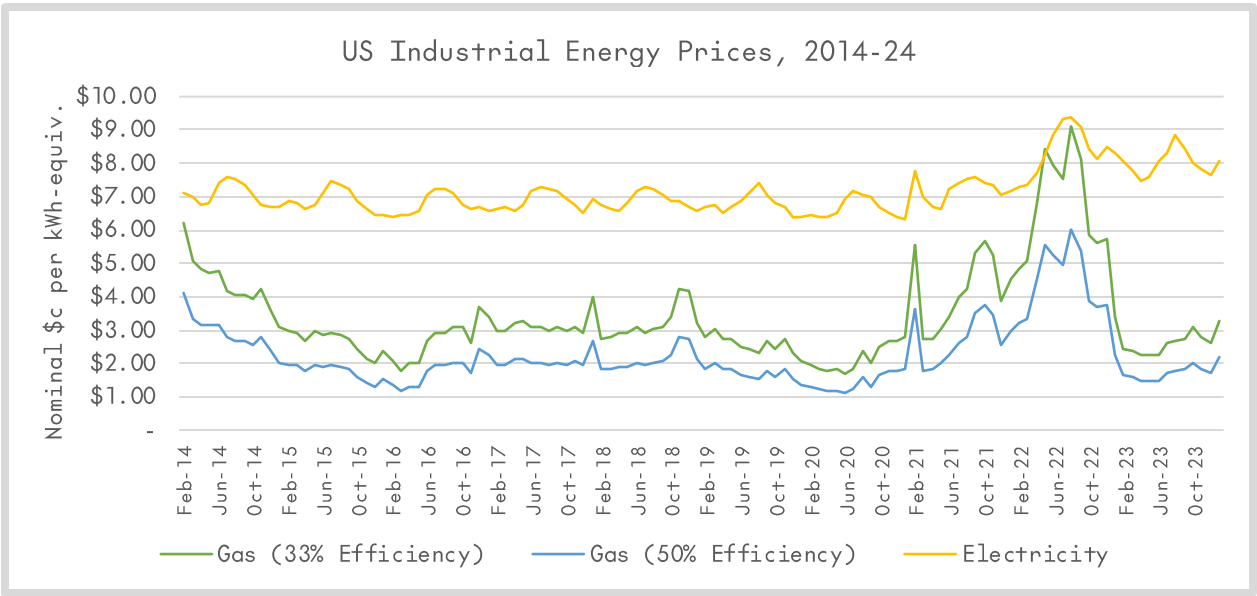
Fig. 9: *The discussion below drills down into a universe of the 100 companies in the S&P 500 with the highest Scope 1 and location-based Scope 2 emissions. The resulting sector weightings are notably different than for the index as a whole.*



(Bloomberg)

Fig. 10: *US industrial electricity prices ranged from $0.08 to $0.10 per kWh from 2014-2, while gas prices have been meaningfully lower, even after adjusting for conversion losses.*



(US Energy Information Administration)

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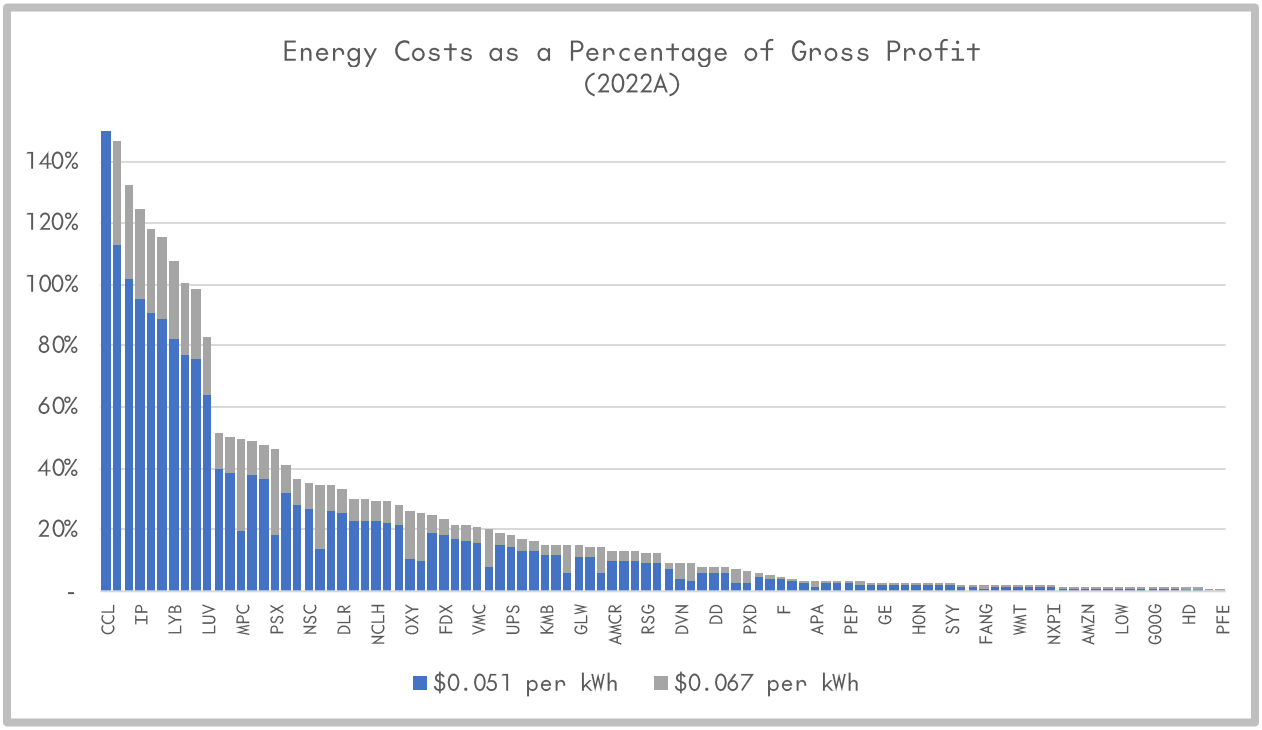
Conversely, at the 50th percentile of natural gas prices for industrial customers (from 2014-24), energy costs are greater than 2 percent of gross profit for 72 companies in our "Carbon-Intensive 100." At the 50th percentile of **electricity costs** they are greater than 2 percent of gross profit for 78 companies (85 percent of the carbon-intensive 100 by market cap).

Figs. 11-12: *Energy costs are a material financial driver (as proxied by the ratio of energy costs to gross profit) for the vast majority of companies in our "carbon-intensive 100." Note that some companies appearing on the far left end of the chart may have been cyclically under-earning in 2022. For companies that do not regularly report "gross profit" as a metric (airlines, rails, and REITs) we use EBITDA, or in the case of airlines, EBITDA excluding plane leasing and fixed costs.*



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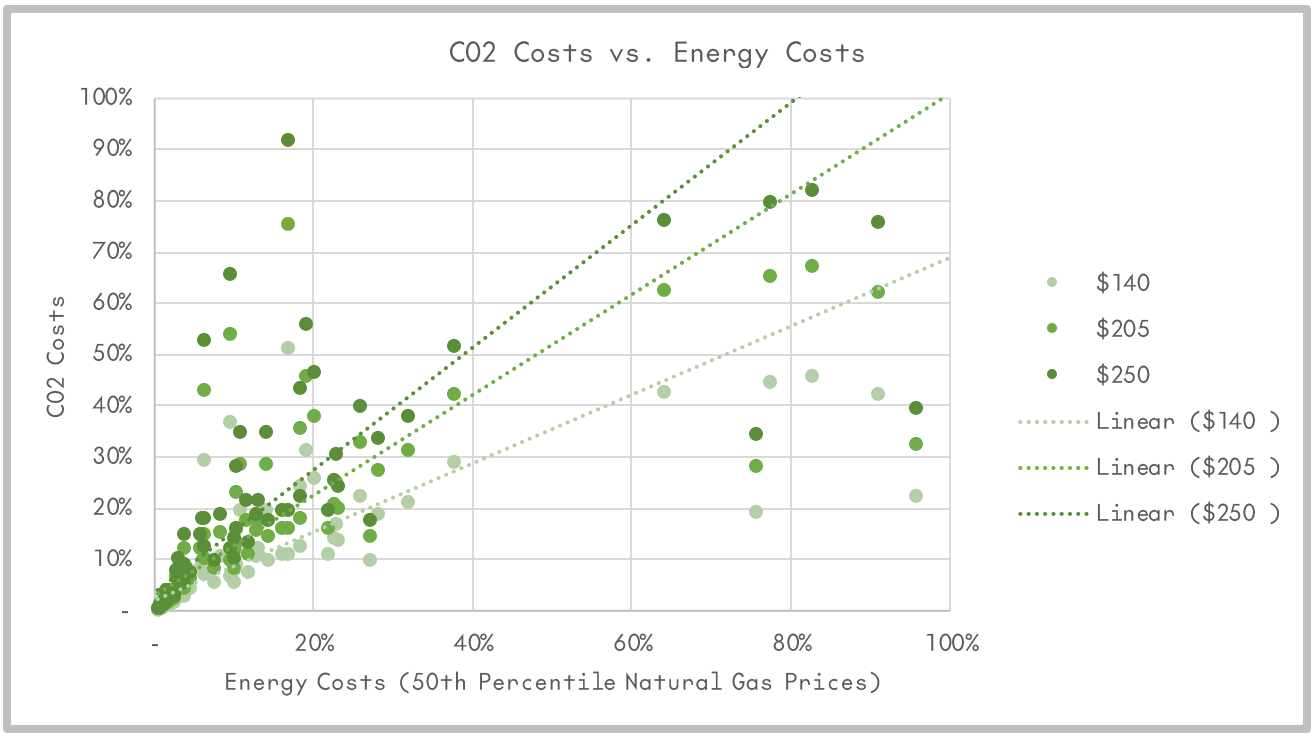

(Bloomberg)

Comparing <u>current</u> energy costs (based on the 50th percentile of *US domestic natural gas prices for industry from 2014-24*) to the cost of CO_2 under the IEA NZE speaks for itself. At $140 per tonne, CO_2 costs scale at two-thirds the rate of energy intensity. At $205 per tonne, they are roughly proportional. At $250 per tonne, CO_2 costs scale 20 percent faster than energy costs. **But this is comparing one of the lowest imaginable benchmarks for energy costs to one of the highest imaginable benchmarks for CO_2 costs.**

Over any realistic range of energy and CO_2 price assumptions, energy costs can be expected to be the more financially material of the two. At, say the 50th percentile of US industrial electricity prices, and the 90th percentile of currently implemented carbon prices, **energy costs are about five times potential CO_2 costs, even for our high-carbon subset of the S&P 500.**

Focusing on energy costs rather than alignment with specific long-term energy scenarios can help activists, investors, and companies break out of the current impasse. An "energy-first" rather than "emissions-only" framing can open up the black box of how much decarbonization will cost.

Whether they track it or not, all public companies have a unique **emissions abatement cost curve,** based on rank ordering emissions reduction opportunities from the lowest to highest effective cost per tonne of CO_2-equivalent. Sizing and pricing each of these opportunities with publicly available information, in a way that investors can maintain and update over time, is extremely difficult, leaving market participants dependent on periodic and selective disclosures by companies. **Grounding**

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company engagements in *energy* allows activists and investors to leverage a much broader universe of white papers, academic research, and government data sets in order to evaluate a company's energy efficiency options.

Moreover, **energy costs are material over a wide range of future energy cost and climate policy scenarios,** whereas policy-related risks from carbon emissions are dependent on political decisions that are inherently hard to forecast. It's easy for companies to dismiss activists' concerns if those concerns are grounded in a future energy scenario that is currently unlikely. But energy costs are a material financial issue for many S&P 500 constituents in the here and now.

Engagements between investors and issuers on energy and climate issues do not need to be premised on the endlessly debatable outputs of long-term energy outlooks. Haggling over the nuances of the BNEF, IEA, and OPEC outlooks for the global energy market in 2040 or 2050 is an interesting intellectual exercise, but often beside the point. What we know for sure is that **energy costs are financially material for the most carbon-intensive companies and industry over nearly any plausible state of the world.** Shareholder engagement and voting strategies on climate can get back on track if they can internalize this basic fact.

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