Comments submitted by the Competitive Enterprise Institute et al.
June 17, 2022
In the matter of the proposed rule
"The Enhancement and Standardization of Climate-Related Disclosures for Investors"
Securities and Exchange Commission
87 FR 21334; RIN 3235-AM87; File No: S7-10-22

Comments Prepared by Marlo Lewis, Kevin Dayaratna, and Patrick Michaels

Thank you for the opportunity to comment on the Security and Exchange Commission's proposal to require every registrant to provide more information about "climate-related risks" that are "reasonably likely to have a material impact" on the firm's business, operations, or financial condition.[1] Please address any inquiries about these comments to Marlo Lewis, Senior Fellow, Competitive Enterprise Institute (marlo.lewis@cei.org).

I. Introduction: Objective Quantification of Climate Risks Is Often Impossible

The SEC's proposed rule is the cutting edge of the environment, social, governance (ESG) movement's campaign to align private capital investment with an aggressive climate policy agenda—one that aims to cut greenhouse gas (GHG) emissions dramatically by 2030 and achieve a net-zero emission economy by 2050.[2]

The proposed rule would require registrants to report the magnitude and probability of the financial losses they could incur due to (1) the physical impacts of climate change and (2) the companies' "transition" and "liability" risks—the losses they may incur due to climate policies and litigation.

However, objective quantification and measurement of such risks is often impossible. Climate risk assessments depend on multiple assumptions fraught with uncertainties. Speculative risk guestimates are of little financial value to investors.

Boston University professor Madison Condon's "Market Myopia's Climate Bubble" (MMCB), an influential paper cited in the proposal,[3] describes some of the epistemological challenges:

> Evaluating climate risk involves forecasting macroeconomic energy demand, guessing on the success of carbon regulation and future technologies, modeling the relationship between atmospheric gas concentrations and global temperatures, predicting how temperature rise will change the earth's climate systems, and calculating how those changes impact physical economic assets. The task requires skills beyond that of a typical

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[1] Securities and Exchange Commission ("SEC," "Commission"), The Enhancement and Standardization of Climate-Related Disclosures for Investors, 87 FR 21334, April 11, 2022, https://www.govinfo.gov/content/pkg/FR-2022-04-11/pdf/2022-06342.pdf.

[2] The SEC explicitly mentions one or both targets at 87 FR 21336, 21337, 21341, 21349, 21345, 21360, 21376, and 21406, and mentions the 1.5°C warming limit, the ostensible goal of the NetZero target, at 87 FR 21336, 21337, 21356, 21357, 21358, 21423, 21449, 21466, and 21468.

[3] 87 FR 21361, fn. 291; 21368, fn. 361.

> financial analyst, colossal amounts of data, and models that have only begun to be built. Each step of estimation adds layers of uncertainty to risk projections. In some cases, particularly those longer-term and macroeconomic, the estimation of the economic impact of climate change may be dwarfed by this uncertainty.[4]

Additional uncertainty arises from the vagaries of politics and litigation: "No amount of regulatory or corporate governance intervention can give shareholders and managers the ability to foresee the future—the outcomes of national elections, for example, are both largely uncertain and hugely influential in determining the strength of future climate policy."[5]

MMCB therefore cautions against an "overemphasis on false precision provided by complicated models." The author prefers the use of "fine-grained asset-level" analysis focused "on climate risks at the scale of individual corporations and investors and their horizons." She suggests companies should at least be able to report on the "climate-related impacts we have already been experiencing."[6]

However, even when assessing current impacts, speculative modeling comes into play. Consider *Lights Out: Climate Change Risk to Internet Infrastructure*,[7] the featured study in MMCB's introduction. As summarized by MMCB, the study shows that on the U.S. East Coast, "thousands of miles of fiber optic cable, and more than a thousand nodes of key Internet infrastructure, could be underwater in the next 15 years."[8] Alluding to the study a few pages later, MMCB criticizes "the continued neglect of assessing companies' exposure to foreseeable climate risks," describing "global sea-level rise over the next 15 years" as a phenomenon that "can be predicted with some certainty."[9]

In fact, *Lights Out* is a cautionary tale of how dubious climate risk assessment can be. The study is based on a long-term (2018-2100) sea-level rise projection, which the authors call the "highest" and "most extreme" scenario. The scenario projects sea levels to rise 6 feet by 2100 and 1 foot by 2030:

Table 1: Timeline of projected Global Mean Sea Level Rise. Data is based off of "Highest" (*i.e.*, most extreme) projections.

Year	2030	2045	2060	2075	2090	2100
Projected rise (ft)	1	2	3	4	5	6

[4] Madison Condon, *Market Myopia's Climate Bubble*, SSRN, May 15, 2021, pp. 10-11, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3782675 (hereafter MMCB).
[5] MMCB, p. 7.
[6] MMCB, pp. 11, 16, 50.
[7] Ramakrishnan Durairajan, Carol Barford, Paul Barford. 2018. Lights Out: Climate Change Risk to Internet Infrastructure. Proceedings of the Applied Networking Research Workshop 9, https://ix.cs.uoregon.edu/~ram/papers/ANRW-2018.pdf.
[8] MMCB, p. 3.
[9] MMCB, p. 7.

Global mean sea-levels have risen 8-9 inches (21-24 centimeters) since 1880.[10] The Internet infrastructure risks forecast in *Lights Out* materialize only if sea levels increase by about 30 percent more during 2018-2030 than during the preceding 138 years. The current annual rate of global mean sea-level rise is 3.5 millimeters, according to the National Aeronautics and Space Administration (NASA).[11] *Lights Out* assumes a 2018-2030 rate of about 25.4 mm/year—more than seven times faster. In the National Oceanic and Atmospheric Administration's (NOAA) recent sea-level rise report, one foot (0.31 meters) of sea-level rise is the upper end of the projected range in 2050, not 2030, and only in the "very high" emission scenario (SSP5.8.5).[12]

The lesson here is how easily junk science can beguile those predisposed to believe climate change is 'worse than we thought.' *Lights Out* sources its "extreme" scenario to "a collection of projected sea-level rise scenarios, flood exposures, and affected coastal counties, and is amassed from a number of partner organizations." However, the accompanying footnote takes us not to sea-level rise scenarios, models, or data but to a list of the Web sites of 827 partner organizations.[13] The study is literally non-auditable.

Despite the plea for "granular" information,[14] climate risk disclosure advocates typically rely on overheated models run with inflated emission scenarios, producing scary but implausible warming forecasts.

In addition, the assessments often exaggerate the costs of climate change by depreciating mankind's remarkable capacity for adaptation. For example, neither the SEC nor any of the reports it cites mentions the dramatic long-term decline in both weather-related mortality and the relative economic impact of extreme weather events. None acknowledges fossil fuels' indispensable contributions to those improvements.

Because ESG advocates exaggerate the magnitude and certainty of climate change risks, they also exaggerate the political prospects of the NetZero agenda and, thus, the certainty (although not the magnitude) of the transition risks facing fossil-intensive companies. Contrary to what many ESG proponents claim, climate change is not a looming planetary disaster that precludes a future for the fossil-fuel industry. Moreover, in the United States, inflation, soaring energy prices, and energy security concerns have stalled the climate agenda on Capitol Hill.

On the other hand, the SEC ignores the risks ESG requirements and the NetZero agenda create for non-fossil-fuel-company shareholders and the economy. First, and most obviously, the pursuit of NetZero threatens to saddle America with high-cost unreliable energy, low economic growth,

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[10] Rebecca Lindsey, "Climate Change: Global Sea Level," NOAA Climate.Gov, January 21, 2021, https://www.climate.gov/news-features/understanding-climate/climate-change-global-sea-level.

[11] NASA Global Climate Change, Sea Level, Latest Measurement, accessed May 12, 2022, https://climate.nasa.gov/vital-signs/sea-level/. NASA reports there was 102.3 millimeters of sea-level rise from January 1993 to January 2022.

[12] NOAA et al. Global and Regional Sea Level Rise Scenarios for the United States, February 2022, https://aambpublicoceanservice.blob.core.windows.net/oceanserviceprod/hazards/sealevelrise/noaa-nos-techrpt01-global-regional-SLR-scenarios-US.pdf. See Figure 23, below.

[13] NOAA, Digital Coast, Contributing Partners, https://coast.noaa.gov/digitalcoast/contributing-partners/.

[14] 87 FR 21361.

and increasing dependence on OPEC for hydrocarbons and China for energy transition minerals. Such conditions would make building wealth more difficult for many Americans.

Second, requiring corporate leadership to prioritize climate metrics and objectives is bound to dilute fiduciaries' primary focus on financial metrics and objectives, which are what matter to most investors, as distinct from ideologically-motivated stakeholders.[15]

Third, the Commission cannot put its thumb on the scales without causing favored companies' stock prices to rise above their fundamental value. President Biden wants the SEC, Treasury, and other agencies to channel "the flow capital toward climate-aligned investments and away from high-carbon investments."[16] That is a recipe for creating a novel systemic risk for the financial industry—an ideologically-charged, mandate- and subsidy-fueled green investment bubble.

II. Overview

The SEC approvingly cites several reports and numerous comments by prominent ESG advocates.[17] However, the Commission seems unaware of the questionable premises on which much of that literature is based. We aim to remedy that oversight here. The studies informing and underpinning the SEC's proposal:

- Favor climate risk assessments based on warm-biased models run with warm-biased emission scenarios.
- Attribute to climate change damages that chiefly reflect societal factors such as increases in population and exposed wealth.
- Overlook the increasing sustainability of our chiefly fossil-fueled civilization.
- Assume away the power of adaptation to mitigate climate change damages.
- Underestimate the resilience of financial markets to climate-related risks.
- Exaggerate the political prospects of the NetZero agenda.
- Ignore the vast potential of climate policies to destroy jobs, growth, and, thus, shareholder value.
- Overlook the economic, environmental, and geopolitical risks of mandating a transition from a fuel-intensive to a material-intensive energy system.
- Downplay the regulatory impediments to building a "clean energy economy."
- Ignore the systemic risk their own advocacy efforts could create—an ideologically-charged, mandate- and subsidy-fueled "green" investment bubble.

[15] Commissioner Hester M. Peirce, "We Are Not the Securities and Environment Commission: At Least Not Yet," March 21, 2022, https://www.sec.gov/news/statement/peirce-climate-disclosure-20220321.

[16] The words quoted are from President Biden's Executive Order on Tackling the Climate Crisis at Home and Abroad, January 27, 2021, https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/.

[17] The comments cited were in response to Acting Chair Allison Herren Lee's request for information, "Public Input Welcome on Climate Risk Disclosures," March 15, 2021, https://www.sec.gov/news/public-statement/lee-climate-change-disclosures.

Those flawed analytic practices are prevalent in climate policy advocacy in general. The SEC's proposal would be unimaginable apart from those widespread assumptions and decisions. The SEC's (mostly) implicit reliance on egregiously biased methodologies renders the proposed rule vulnerable to challenge as arbitrary and capricious.

III. Methodological Biases in Climate Impact Assessments

The SEC rule is predicated on the assumption of an impending climate crisis. The alleged scientific verity of looming planetary disaster is the core justification for compelling publicly traded companies to prioritize "climate-related risks" not only in their SEC filings but also in their business models, planned expenditures, and corporate governance.

Unfortunately, the proposed rule overlooks the methodological flaws on which the climate crisis narrative is based. In Administrative Procedure Act (APA) terms, the rule ignores several "important aspect[s] of the problem."

In Sections IV, V, and VI, we outline the foundational role of hot models, inflated emission scenarios, and gloomy adaptation assumptions in official climate impact assessments such as the Intergovernmental Panel on Climate Change (IPCC) reports. In Section VII we document the same pattern in ESG advocacy, including reports or experts cited by the SEC.

IV. Malpractice #1: Hot Models

Official climate change risk assessments are based on General Circulation Models (GCMs) that project changes in average global temperature, Earth System Models (ESMs) that project other changes in weather and climate, and Integrated Assessment Models (IAMs) that project how the physical impacts of climate change will affect consumption and other economic values.

The probability and magnitude of climate change risks depend chiefly on three variables—GCM and ESM estimates of equilibrium climate sensitivity (ECS), the forcing trajectories (emissions scenarios) with which the models are run, and IAM assumptions about human adaptive capabilities.

ECS is typically defined as the rise in global mean annual temperature after the climate system fully adjusts to a doubling of atmospheric carbon dioxide-equivalent (CO_2e) GHG concentration. Radiative forcing is the difference, measured in watts per square meter (W/m^2), between the amount of incoming shortwave solar radiation and the amount of outgoing longwave infrared radiation.

In its Fifth Assessment Report (AR5), the IPCC used the Coupled Model Intercomparison Project Phase 5 (CMIP5) models to project future warming and the associated climate impacts.[18] Figure 1 below compares CMIP5 model projections and observed average tropospheric

[18] Program for Climate Model Diagnosis and Intercomparison, CMIP5 – Coupled Model Intercomparison Project Phase 5 – Overview, https://pcmdi.llnl.gov/mips/cmip5/.

temperature over the tropics.[19] The observations come from satellites, weather balloons, and reanalyses.[20]

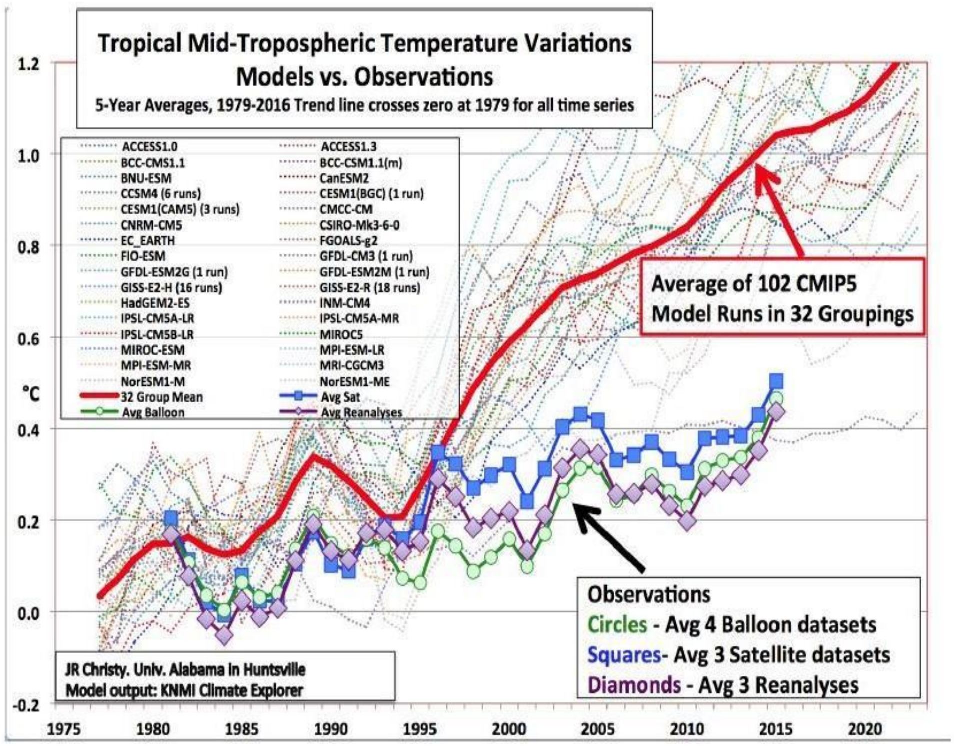

Figure 1. Solid red line—average of all the CMIP5 climate models; Thin colored lines—individual CMIP5 models; solid figures—weather balloon, satellite, and reanalysis data for the tropical troposphere.

The CMIP5 models used in AR5 hindcast a warming rate of 0.44°C per decade in the tropical mid-troposphere since 1979. The average observed warming rate is less than half the model average.[21]

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[19] Christy, J.R.: 2017, [in "State of the Climate in 2016"], *Bull. Amer. Meteor. Soc.* 98, (8), S16-S17, https://journals.ametsoc.org/view/journals/bams/98/8/2017bamsstateoftheclimate.1.xml. The CMIP5 predictions are available at https://climexp.knmi.nl/start.cgi.

[20] Climate reanalyses produce synthetic histories of recent climate and weather using all available observations, a consistent data assimilation system, and mathematical modeling to fill in data gaps. See National Center for Atmospheric Research, Atmospheric Reanalysis: Overview & Comparison, https://climatedataguide.ucar.edu/climate-data/atmospheric-reanalysis-overview-comparison-tables, and ECMWF, Climate Reanalysis, https://www.ecmwf.int/en/research/climate-reanalysis.

[21] John R. Christy, *The Tropical Skies: Falsifying Climate Alarm,* Global Warming Policy Foundation, GWPF Note 17, 2019, https://www.thegwpf.org/content/uploads/2021/02/Christy-2019A.pdf.

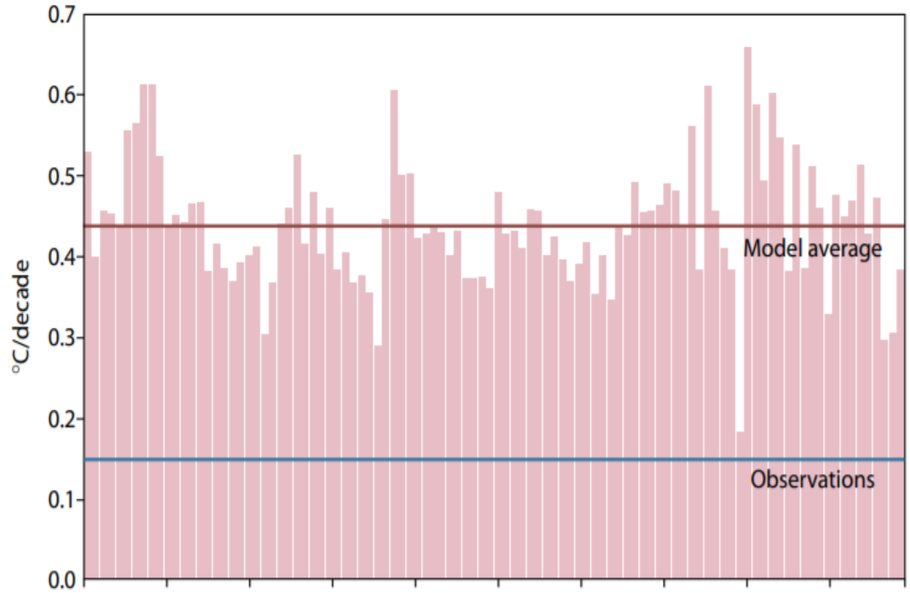

Figure 2. Tropical troposphere warming trends in 102 climate models. CMIP5 models, trends for 1979-2017, 20N-20S, 300-200hPa.

A careful look at Figure 1 reveals that only one of the 102 model runs correctly simulates what has been observed. That is the Russian climate model INM-CM4, which also has the least prospective warming of all of them, with an ECS of 2.05°C. The CMIP5 average ECS is 3.2°C.

Best scientific practice uses models that work and does not seriously consider those that do not. That is standard when formulating the daily weather forecast, and should be the standard in climate forecasts. Instead, the common practice is to base climate change impact assessments on the mean and spread of all model projections, regardless of how inaccurate the vast majority of models may be.

The IPCC's Sixth Assessment Report (AR6) uses a new suite of models, designated CMIP6. Is this generation of models more accurate?

No. As shown by McKitrick and Christy (2020), the CMIP6 models are even less accurate.[22] The CMIP6 mean warming rate again exceeds observations by more than two times at altitude in the tropics.

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[22] R. McKitrick and J. Christy. 2020. Pervasive Warming Bias in CMIP6 Tropospheric Layers. *Earth and Space Science* Volume 7, Issue 9, https://agupubs.onlinelibrary.wiley.com/doi/10.1029/2020EA001281.

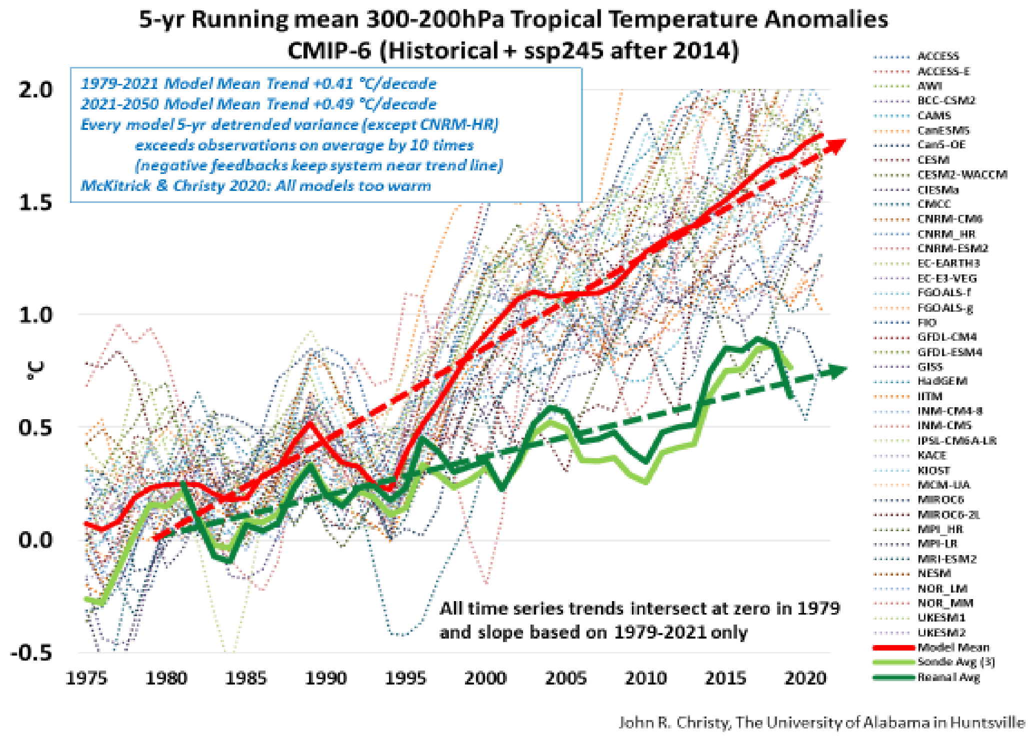

Figure 3. The CMIP6 model suite compared to observations.

Quoting from McKitrick and Christy's conclusion:

> The literature drawing attention to an upward bias in climate model warming responses in the tropical troposphere extends back at least 15 years now (Karl et al., 2006). Rather than being resolved, the problem has become worse, since now every member of the CMIP6 generation of climate models exhibits an upward bias in the entire global troposphere as well as in the tropics. The models with lower ECS values have warming rates somewhat closer to observed but are still significantly biased upward and do not overlap observations.

As of this writing, the collection of CMIP6 models is nearly complete. According to Zeke Hausfather of the Breakthrough Institute, CMIP6 has a larger range of ECS values compared to CMIP5, from 1.8°C (not surprisingly, generated by the updated Russian model INM-CM4.8), all the way up to 5.6°C, as shown in Figure 3. Hausfather demonstrates that the larger the ECS is in CMIP6 models, the more they overpredict warming in recent decades.[23] Again, best scientific practice would eliminate models with poor predictive ability and use the CMIP5 Russian model, INM-CM4, or possibly INM-CM4.8 and INM-CM5 from CMIP6.

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[23] Zeke Hausfather, "Cold Water on Hot Models," The Breakthrough Institute, February 11, 2020, https://thebreakthrough.org/issues/energy/cold-water-hot-models.

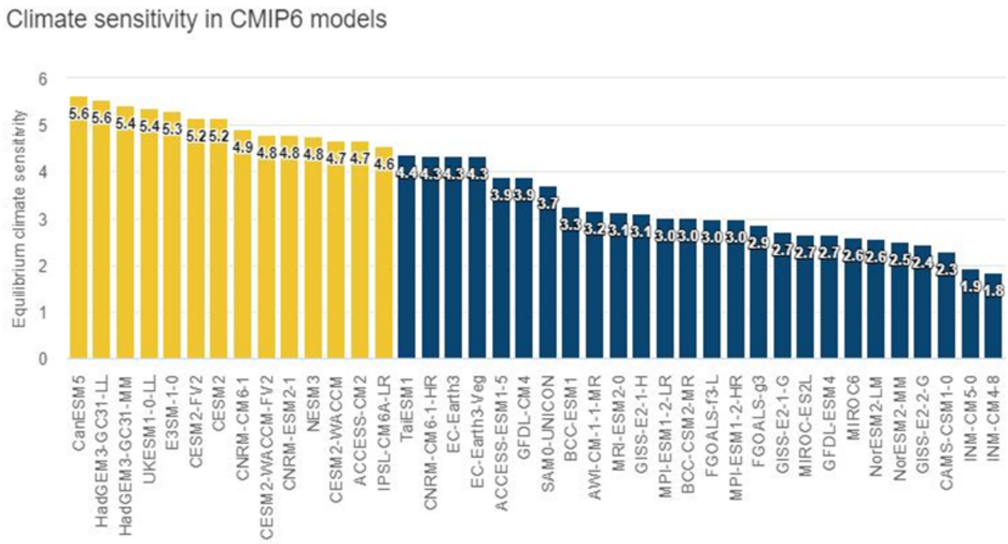

Figure 4. The CMIP6 model suite. Models warmer than the warmest CMIP5 versions are in yellow. The models with the lowest ECS are the Russian INM-CM4.8 (1.8°C) and INM-CM5.0 (1.9°C). In CMIP5, the INM-CM4 ECS was 2.05°C. Those three models conform to observed temperatures better than the others.

In a recent commentary article in *Nature*, Hausfather and four co-authors caution that "a subset of the newest generation of models are 'too hot' and project climate warming in response to carbon dioxide emissions that might be larger than that supported by other evidence."[24] In AR5 and previous IPCC reports, the IPCC "simply used the mean and spread of models to estimate impacts and their uncertainties"—a method dubbed "model democracy," as it assumes all models are created equal. The CMIP6 hot model problem ended that fiction.

For example, Zhu, Poulsen, and Otto-Bliesner (2020) ran the CESM2 model with an emission scenario in which CO_2 concentrations reach 855 parts per million (ppm) by 2100. The model produced a global mean temperature "5.5°C greater than the upper end of proxy temperature estimates for the Early Eocene Climate Optimum."[25] That was a period when CO_2 concentrations of about 1,000 ppm persisted for millions of years.[26] Moreover, the CESM2 tropical land temperature exceeds 55°C, "which is much higher than the temperature tolerance of plant photosynthesis and is inconsistent with fossil evidence of an Eocene Neotropical rainforest."[27]

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[24] Zeke Hausfather, Kate Marvel, Gavin A. Schmidt, John W. Nielsen-Gammon & Mark Zelinka, "Climate simulations: recognize the 'hot model' problem," *Nature* Vol. 605, May 5, 2022, https://media.nature.com/original/magazine-assets/d41586-022-01192-2/d41586-022-01192-2.pdf.

[25] Jiang Zhu, Christopher J. Poulsen & Bette L. Otto-Bliesner. 2020. High climate sensitivity in CMIP6 model not supported by paleoclimate. *Nature Climate Change* Vol. 10, pages 378–379, https://www.nature.com/articles/s41558-020-0764-6.

[26] NOAA National Centers for Environmental Information, Early Eocene Period, 54 to 48 Million Years Ago, https://www.ncdc.noaa.gov/global-warming/early-eocene-period.

[27] Zhu et al. (2020), Op. Cit.

To address the hot model problem, “AR6 authors decided to apply weights to each model before averaging them, to produce ‘assessed global warming’ projections,” Hausfather et al. explain.[28] In effect, IPCC scientists used their judgment to discount models originally built to guide their judgment.

While “weighting” may help the IPCC avoid reputational damage, it does not correct the basic methodological flaw—the reliance on errant models. All CMIP6 models, not just those with the yellow bars in Figure 3 above, overshoot observed temperatures. Even the two newer Russian models, INM-CM4.8 and INM-CM5, run hotter than the observations.

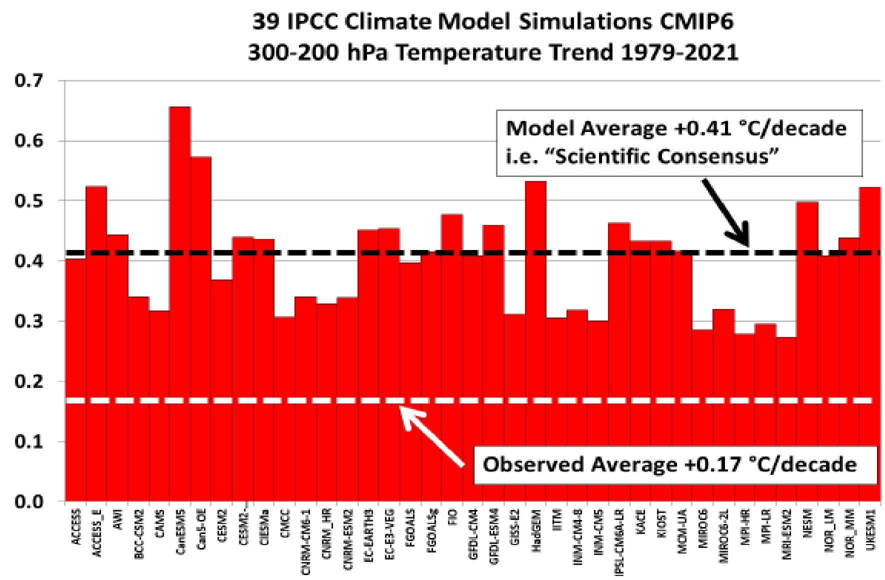

Figure 5. CMIP 6 models vs. observations. Source: John Christy.

The Commission may be wondering why Christy’s charts compare model simulations and observations in the tropical troposphere at altitude 300-200hPa. As explained in McKitrick and Christy (2018), that region of the atmosphere is best suited to test climate model warming predictions, because it satisfies four key conditions: measurability, specificity, independence, and uniqueness.

- Temperature changes in the tropical 300-200hPa layer have been “well measured” by multiple datasets since 1979.
- All the models specifically predict rapid warming in that region over the same timeframe as the observations.
- Model projections in the 300-200hPa layer have not been tuned to match historical observations, so the simulations are independent of the data used to test them.

[28] Hausfather et al. (2022), Op. Cit.

- The troposphere at altitude 300-200hPa is too high up to be influenced by urban heat islands or other land-use changes.[29]

By comparing climate model predictions to data, McKitrick and Christy applied the scientific method as described by the Supreme Court in *Daubert v. Merrell Dow Pharmaceuticals, Inc*. (1992): “Scientific methodology today is based on generating hypotheses and testing them to see if they can be falsified; indeed, this methodology is what distinguishes science from other fields of human inquiry.”[30]

Richard Feynman famously put it this way. Scientists begin with a hypothesis or “guess.” They “compute the consequences of the guess” to see what it would imply if it is right. They compare the computational results to experiment or experience. “If the results disagree with experiment, it’s wrong. In that simple statement is the key to science. It doesn’t make any difference how beautiful your guess is, doesn’t matter how smart you are, who made the guess, or what his name is … If it disagrees with experiment, it’s wrong. That’s all there is to it.”[31]

In a series of cases dealing with the Environmental Protection Agency’s (EPA) modeling of air pollutant risks, the D.C. Circuit Court of Appeals has repeatedly held that an agency’s use of a model is “arbitrary” if the model bears “no rational relationship to the reality it purports to represent.”[32]

The SEC and other ESG advocates rely, directly or indirectly, on the CMIP5 and CMIP6 model ensembles, which are off by more than 100 percent in the atmospheric layer best suited for measuring changes in the greenhouse effect. Errors of that magnitude earn failing grades in most academic disciplines. Much smaller errors can lead to disaster in other fields of applied mathematics such as civil and aerospace engineering. Financial advisors whose forecasting models chronically overpredict ROI by 100 percent might well be sued by investors and decertified by regulators.

These simple reflections suggest that regulatory policies based on the CMIP model ensembles are arbitrary and capricious. That includes the SEC proposal, which cites AR6 as a scientific basis for mandatory climate risk disclosure.[33]

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[29] Ross McKitrick and John Christy. 2018. A Test of the Tropical 200- to 300-hPa Warming Rate in Climate Models. *Earth and Space Science*, 5, 529–536, https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2018EA000401.

[30] *Daubert v. Merrell Dow Pharms., Inc.*, 509 U.S. 579, 593 (1993), https://supreme.justia.com/cases/federal/us/509/579/case.pdf.

[31] “Richard Feynman Teaches You the Scientific Method,” Cornell Lecture, 1964, https://fs.blog/mental-model-scientific-method/.

[32] *Chem. Mfrs. Ass’n v. EPA* 28 F.3d 1259, 1264 (D.C. Cir. 1994); *Am. Iron & Steel Inst. v. EPA*, 115 F.3d 979, 1004 (D.C. Cir. 1997); *Columbia Falls Aluminum Co. v. EPA*, 139 F.3d 914, 923 (D.C. Cir. 1998); *Sierra Club v. EPA*, 356 F.3d 296, 307 (D.C. Cir. 2004).

[33] 87 FR 21339, 21350, 21357.

A related problem, alluded to above, is the widespread practice of model "tuning." As explained in Hourdin *et al*. (2017),[34] a paper by 15 leaders in various climate modeling efforts, models have many knobs and dials that are adjusted so that simulations of previous decades match the historical climate, creating the appearance that the models are predictive. The authors call tuning "an unavoidable but dirty part" of climate modeling, seldom discussed partly because doing so "may strengthen the arguments of those who question the validity of climate change projections."

Tuning occurs in model estimates of the key variable: equilibrium climate sensitivity. Hourdin et al. explain: "One can imagine changing a parameter which is known to affect the sensitivity, keeping both this parameter and the ECS in the *anticipated acceptable range*" (emphasis added).

This suggests that top IPCC scientists predetermine an "acceptable [ECS] range" and parameterize the models accordingly. If so, the scientists, not the science, determine the sensitivity of the manifold climate models. That is not best scientific practice; nor, strictly speaking, is it science.

It is all the more noteworthy that, despite model tuning, the CMIP5 and CMIP6 ensembles overshoot observed warming by significant factors. A reasonable inference is that the models overestimate climate sensitivity and, consequently, project too much warming from whatever emission scenario is fed into them.

Figure 6 compares the sensitivity estimates of 24 empirically-constrained studies[35] to the CMIP5 mean climate sensitivity and the climate sensitivity probability distribution (Roe and Baker 2007) used by federal agencies to estimate the social cost of carbon.[36] The average sensitivity in the 24 studies (2°C) is 37.5 percent lower than the average in CMIP5 (3.2°C). Or, conversely, the CMIP5 mean sensitivity is 60 percent higher than the mean of the 24 studies.

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[34] Frédéric Hourdin et al. 2017. The Art and Science of Climate Model Tuning. *Bulletin of the American Meteorological Society* Vol. 98: Issue 3, https://journals.ametsoc.org/view/journals/bams/98/3/bams-d-15-00135.1.xml.

[35] Empirically-constrained studies use "long and detailed observational data sets" to estimate climate sensitivity with energy balance models. See Kevin Dayaratna, Ross McKitrick, and David Kreutzer. 2017. Empirically-Constrained Climate Sensitivity and the Social Cost of Carbon, *Climate Change Economics* Vol. 8, No. 2, https://www.worldscientific.com/doi/abs/10.1142/S2010007817500063.

[36] Interagency Working Group on the Social Cost of Carbon, *Technical Support Document: - Social Cost of Carbon for Regulatory Impact Analysis – Under Executive Order 12866*, February 2010, pp. 12-14, https://www.epa.gov/sites/production/files/2016-12/documents/scc_tsd_2010.pdf.

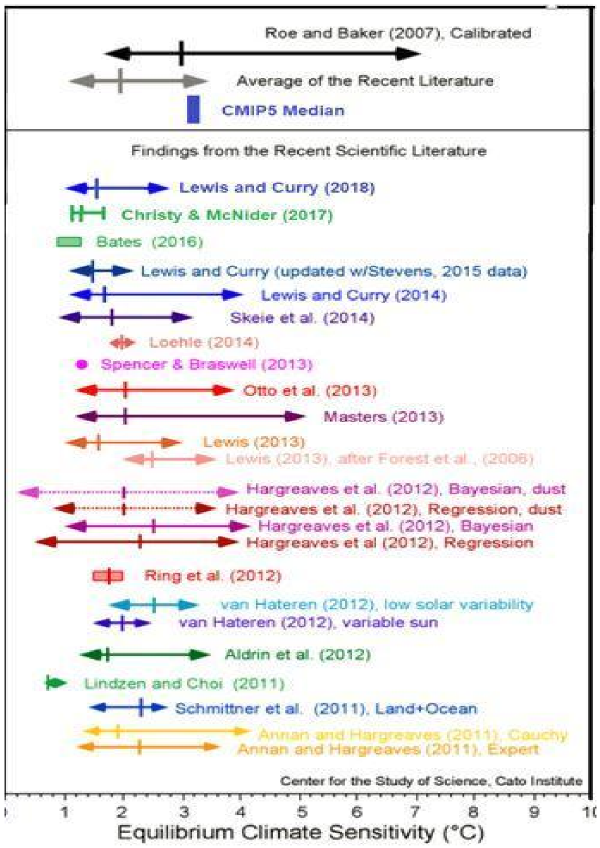

Figure 6. Climate sensitivity estimates in 24 empirically-constrained studies. Figure Source: Patrick Michaels and Ryan Maue.

The SEC's implicit reliance on models that produce significant forecasting errors and mis-specify climate sensitivity, despite being tuned to achieve predetermined results, is arbitrary and capricious. Consequently, the rule should not be implemented.

V. Malpractice #2: Inflated Emission Scenarios

In AR5, the IPCC ran the CMIP5 models with four representative concentration pathways (RCPs)—scenarios that plot changes in emissions, concentrations, and forcing from 2000 to 2100. RCPs are called "representative" because each forcing trajectory corresponds to at least some published socio-economic development scenarios. From coolest to hottest, the four pathways are RPC2.6, RPC4.5, RPC6.0, and RCP8.5, each numbered for the projected W/m^2 change in radiative forcing from 1750 to 2100.

In AR6, the IPCC ran the CMIP6 models with five socio-economic pathways (SSPs)—baseline worlds where factors such as population, technology, economic growth, and non-climate policies can lead to the same forcing scenarios as the RCPs—2.6, 4.5, 6.0, and 8.5—plus new forcing scenarios of 1.9, 3.4 and 7.0.[37] SSPs are intended to complement RCPs by helping analysts estimate how different development paths constrain or facilitate mitigation and adaptation.

Although often described as "business-as-usual" scenarios, RCP8.5 and SSP5-8.5 are actually worst-case emission scenarios.[38] For RCP8.5 to be a realistic projection of future CO_2 emissions and concentrations, coal consumption would have to increase almost tenfold during 2000-2100,[39] achieving market shares not seen since the 1940s.[40] There is no evidence the world is on the verge of a "return to coal."[41]

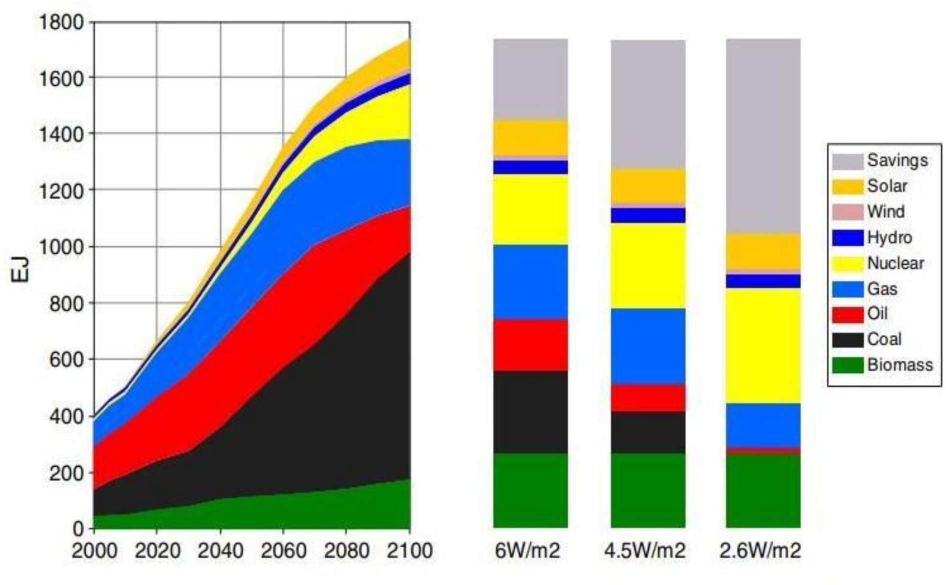

Figure 7. Development of global primary energy supply in RCP8.5 (left-handed panel) and global primary energy supply in 2100 in the associated mitigation cases stabilizing radiative forcing of 6, 4.5, and 2.6 W/m2 (right hand bars). Riahi et al. (2011).

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[37] Zeke Hausfather, *Explainer: The high-emissions 'RCP8.5' global warming scenario*, CarbonBrief, August 21, 2019, https://www.carbonbrief.org/explainer-the-high-emissions-rcp8-5-global-warming-scenario/.

[38] Roger Pielke, Jr. and Justin Ritchie, "How Climate Scenarios Lost Touch with Reality," Issues in Science and Technology, Summer 2021, https://issues.org/wp-content/uploads/2021/07/74-83-Pielke-Ritchie-How-Climate-Scenarios-Lost-Touch-With-Reality-Summer-2021-ISSUES.pdf; Hausfather, *Explainer*, Op. Cit. (noting RCP 8.5 "is more properly considered to be one of the worst case emissions outcomes, as according to van Vuuren and colleagues, more than 90 percent of the other no-policy baseline scenarios in the literature result in lower emissions").

[39] Keywan Riahi et al. 2011. RCP 8.5—A scenario of comparatively high greenhouse gas emissions. *Climatic Change* 109, article 33, https://link.springer.com/article/10.1007/s10584-011-0149-y.

[40] Our World in Data, "Global primary energy consumption by fuel source," https://ourworldindata.org/energy-production-consumption#how-much-energy-does-the-world-consume.

[41] Justin Ritchie and Hadi Dowlatabadi. 2017. Why do climate scenarios return to coal? *Energy* 140, 1276-1291, https://cedmcenter.org/wp-content/uploads/2017/08/Why-do-climate-change-scenarios-return-to-coal.pdf.

Tellingly, mid-century CO_2 emissions in SSP5-8.5 are more than double those projected by the International Energy Agency (IEA) in its baseline (current and pledged policies) emission scenarios.[42]

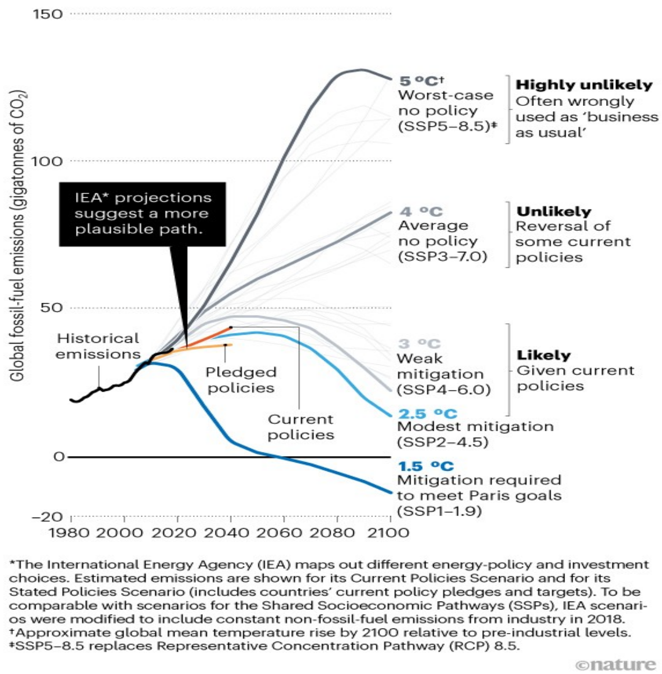

Figure 8. Hausfather and Peters (2020).

University of Colorado professor Roger Pielke, Jr. and Breakthrough Institute scholar Justin Ritchie also compare RCP8.5 and SSP5-8.5 to the IEA baseline scenarios.[43]

[42] Zeke Hausfather and Glenn P. Peters, "Emissions – the 'business as usual' story is misleading," *Nature*, January 29, 2020, https://www.nature.com/articles/d41586-020-00177-3.

[43] Pielke, Jr. and Ritchie (2021).

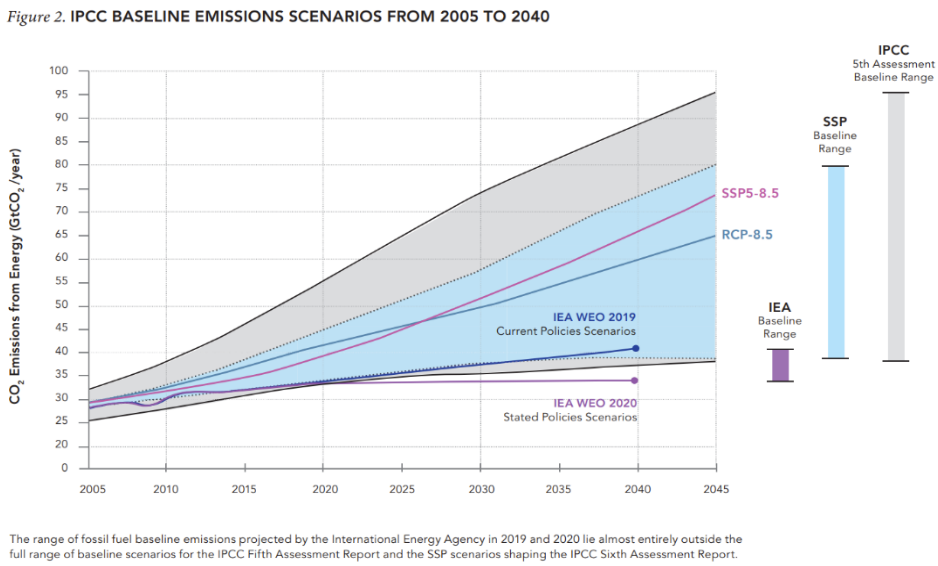

Figure 9. Pielke, Jr. and Ritchie (2021)

In no small part, the problem with RCP8.5 can be summed up in two words: natural gas. The four AR5 RCPs were developed in 2010. RCP8.5 derives from a revised version of the A2r emission scenario developed for the IPCC's 2007 Fourth Assessment Report (AR4).[44] U.S. commercial production of natural gas from shale increased more than fourfold during 2007 to 2010.[45] However, the reality of a shale revolution took several more years to sink in. When describing the "RCP8.5 energy system," Riahi et al. (2011), the authoritative account of the scenario's characteristics, does not mention shale gas, hydraulic fracturing, or directional drilling.

Inflated emission scenarios are not confined to official climate impact assessments such as the IPCC reports and the Fourth U.S. National Climate Assessment (NCA4); they also permeate the entire climate impacts literature. Pielke Jr. and Ritchie (2021) report:

> According to Google Scholar, from the beginning of 2020 until mid-June 2021, authors published more than 8,500 papers using the implausible baseline scenarios, of which almost 7,200 use RCP8.5 and nearly 1,500 use SSP5-8.5. Neither the IPCC nor the broader climate modeling community has sought to counter or reverse this proliferating source of error in projections of future climate change.[46]

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[44] Riahi et al. (2011).
[45] Energy Information Administration, Annual Shale Production, https://www.eia.gov/opendata/v1/qb.php?sdid=NG.RES_EPG0_R5302_NUS_BCF.A.
[46] Pielke, Jr. and Ritchie (2021).

Although AR5 does not call RCP8.5 a "business-as-usual" scenario, it fosters the impression that RCP8.5 is realistic enough to worry about, mentioning the scenario 821 times in the *Physical Science Basis* report and 294 times in the *Impacts, Adaption, and Vulnerabilitie*s report.

In AR6, the IPCC finally acknowledged that the likelihood of RCP8.5 and SSP5-8.5 "is considered low in light of recent developments in the energy sector," citing the IEA's "stated policy" scenario, which projects emissions "approximately in line with the medium RCP4.5, RCP6.0 and SSP2-4.5 scenarios."[47]

Yet the scientific malpractice continues. Pielke, Jr. observes: "Despite acknowledging the low likelihood of the most extreme scenarios RCP8.5 and SSP5-8.5, which were the dominant focus of the 2013 IPCC report, the extreme scenarios dominate the current report as well. This is obvious from the table below which shows the number of mentions of various scenarios in the new report."[48]

SCENARIO	MENTIONS	PCT of MENTIONS
SSP5-8.5 & RCP8.5	1359	41.5%
SSP1-2.6 & RCP2.6	733	22.4%
SSP2-4.5 & RCP4.5	571	17.4%
SSP3-7.0	378	11.5%
SSP1-1.9	200	6.1%
RCP6.0	32	1.0%

Figure 9. Scenario Mentions in AR6. Pielke, Jr. (April 2021)

He summarizes: "The extreme scenarios RCP8.5 and SSP5-8.5 account for more than 40 percent of all scenario mentions across the 3,000+ page report. Add in the extreme scenario SSP3-7.0 and the total gets to over 50 percent."

Recalling the aforementioned D.C. Circuit cases, since agency reliance on unrealistic models is arbitrary, the same should hold for agency reliance on unrealistic emission scenarios.

Although the SEC does not specifically cite such emission pathways in the proposed rule, RCP8.5 and SSP5-8.5 underpin all official worst-case impact assessments and the alleged urgency to achieve NetZero emissions by 2050. Those assessments, in turn, are the justification

[47] IPCC, Sixth Assessment Report, *Climate Change 2021: The Physical Science Basis*, Chapter 1, pp. 238-239, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Chapter01.pdf.
[48] Roger Pielke, Jr., "How to Understand the New IPCC Report: Part 1, Scenarios," The Honest Broker, Substack, August 10, 2021, https://rogerpielkejr.substack.com/p/how-to-understand-the-new-ipcc-report?s=r.

for the Biden administration's "whole-of-government process" of which the SEC proposal is a key component.[49]

In short, the "climate crisis" to which the SEC rule responds is based, in large part, on increasingly implausible emission scenarios. Consequently, the proposal is arbitrary and capricious, and should not be implemented.

VI. Malpractice #3: Ignoring Adaptation

Official and advocacy group climate impact assessments often ignore, assume away, or downplay mankind's remarkable capacity for adaptation.[50] That methodological bias further inflates estimates of climate change costs and risks. Prominent examples include:

- The EPA's 2015 *Benefits of Global Action* report. Using a forcing trajectory equivalent to RCP8.5, a climate forecasting model (MIROC 3.2) with a sensitivity of 3.6°C,[51] and an IAM calibrated to the CMIP5 ensemble,[52] the EPA projected 12,000 annual heat-stress deaths and 57,000 annual air pollution deaths in 49 U.S. cities in 2100.[53] As revealed in the fine print, the heat mortality estimate assumes no further progress in adaptation after 2015. As explained in a key underlying study,[54] the air pollution mortality estimate assumes no further reduction in air pollutant emissions after 2000. In fact, fine particle ($PM_{2.5}$) emissions and precursors in 2015 were already significantly lower than in 2000. As a result, U.S. average $PM_{2.5}$ concentrations declined from 12 percent above the annual National Ambient Air Quality Standard (NAAQS) in 2000 to 29 percent below the NAAQS in 2015.[55]

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[49] 87 FR 21349, fn. 176, citing The White House, FACT SHEET: President Biden Sets 2030 Greenhouse Gas Pollution Reduction Target Aimed at Creating Good-Paying Union Jobs and Securing U.S. Leadership on Clean Energy Technologies (Apr. 22, 2021), https://www.govinfo.gov/content/pkg/FR-2022-04-11/pdf/2022-06342.pdf.

[50] Oren Cass, *Overheated: How Flawed Analyses Overestimate the Costs of Climate Change*, Manhattan Institute, March 11, 2018, https://www.manhattan-institute.org/html/overheated-how-flawed-analyses-overestimate-costs-climate-change-10986.html.

[51] Masahiro Watanabe, et al. 2010. Improved Climate Simulation by MIROC5: Mean States, Variability, and Climate Sensitivity. *Journal of Climate*, Vol. 23, Issue 23, https://journals.ametsoc.org/view/journals/clim/23/23/2010jcli3679.1.xml.

[52] Monier, E., J.R. Scott, A.P. Sokolov, C.E. Forest and C.A. Schlosser. 2013. An integrated assessment modeling framework for uncertainty studies in global and regional climate change: the MIT IGSM-CAM (version 1.0). *Geoscientific Model Development*, 6: 2063–2085, https://globalchange.mit.edu/publication/15631.

[53] Environmental Protection Agency, *Climate Change in the United States: Benefits of Global Action*, June 2015, https://www.epa.gov/sites/production/files/2015-06/documents/cirareport.pdf.

[54] Fernando Garcia-Menendez, Rebecca Saari, Erwan Monier, Nicole E. Selin. 2015. U.S. Air Quality and Health Benefits from Avoided Climate Change under Greenhouse Gas Mitigation. *Environmental Science and Technology* 49, 7580-7588, https://www.researchgate.net/publication/277893514_US_Air_Quality_and_Health_Benefits_from_Avoided_Climate_Change_under_Greenhouse_Gas_Mitigation.

[55] EPA, Our Nation's Air, interactive chart on air pollution concentrations, https://gispub.epa.gov/air/trendsreport/2020/#home. A question for social scientists: What incentives created or augmented by the climate agenda would cause the EPA to conceal its own dramatic success in curbing air pollution?

- The 2018 *Fourth National Climate Assessment* (NCA4). Citing a study combining CMIP5 with RCP8.5, NCA4 warned that unchecked emissions could increase average U.S. temperatures by 8°C, cutting U.S. GDP by 10 percent in the 2090s.[56] NCA4 did not see fit to mention that a U.S. warming of 8°C occurred in only 1 percent of model simulations.[57] As revealed in the fine print, the 10-percent GDP loss estimate for the 2090s assumed no adaptive measures beyond those already deployed "in the historical period," i.e., during 1980-2010.[58] Similarly, NCA4's RCP8.5+CMIP5 estimate of climate damages costing $505 billion in 2090 assumed "limited or no adaptation."[59]

- The U.S. Interagency Work Group's 2010, 2013, 2016, and 2021 technical support documents (TSDs) on the social cost of carbon. The TSDs average the results of three IAMs. Two of the models (called DICE and PAGE) do not include the immense agricultural benefits of atmospheric CO_2 enrichment.[60] One model (PAGE) also assumes adaptation cannot mitigate the costs of climate change once increases in 21st century global average temperature and sea levels exceed 1°C and 10 inches, respectively.[61]

Such dismissive treatments of adaptation are unreasonable. Industrial civilization's virtuous circle of wealth creation and technological innovation endlessly updates mankind's adaptive capabilities—a process that has made Earth's naturally dangerous climate much more livable.[62] As global CO_2 emissions have increased, so have global average life expectancy, population growth, and per capita income—three critical metrics of human well-being.

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[56] Coral Davenport and Kendra Pierre-Luis, "U.S. Climate Report Warns of Damaged Environment and Shrinking Economy," *New York Times*, November 23, 2018, https://www.nytimes.com/2018/11/23/climate/us-climate-report.html.

[57] Solomon Hsiang et al. 2017. Estimating economic damage from climate change in the United States. *Science* 356, 1362–1369, Figure 1(A), https://www.science.org/doi/10.1126/science.aal4369.

[58] U.S. Global Change Research Program, *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*, Chapter 29, "Reducing Risks Through Emissions Mitigation," p. 1,360, https://nca2018.globalchange.gov/downloads/NCA4_Ch29_Mitigation_Full.pdf (hereafter USGCRP, NCA 2018).

[59] USGCRP, NCA 2018, p. 1,358.

[60] Kevin D. Dayaratna, Ross McKitrick, and Patrick J. Michaels. 2020. Climate sensitivity, agricultural productivity and the social cost of carbon in FUND. *Environmental Economics and Policy Studies*, 22:433–448, https://link.springer.com/content/pdf/10.1007/s10018-020-00263-w.pdf.

[61] Interagency Working Group, *Technical Support Document—Technical Update of the Social Cost of Carbon in Regulatory Impact Analysis—under Executive Order 12866*, August 2016, pp. 14-15, https://www.epa.gov/sites/default/files/2016-12/documents/sc_co2_tsd_august_2016.pdf.

[62] Indur Goklany, *Humanity Unbound: How Fossil Fuels Save Humanity from Nature and Nature from Humanity*. Policy Analysis No. 715, Cato Institute, December 20, 2012, https://www.cato.org/sites/cato.org/files/pubs/pdf/pa715.pdf; Alex Epstein, *Fossil Future: Why Global Human Flourishing Requires More Oil, Coal, and Natural Gas—Not Less* (New York: Penguin Books, 2022), Chapter 4.

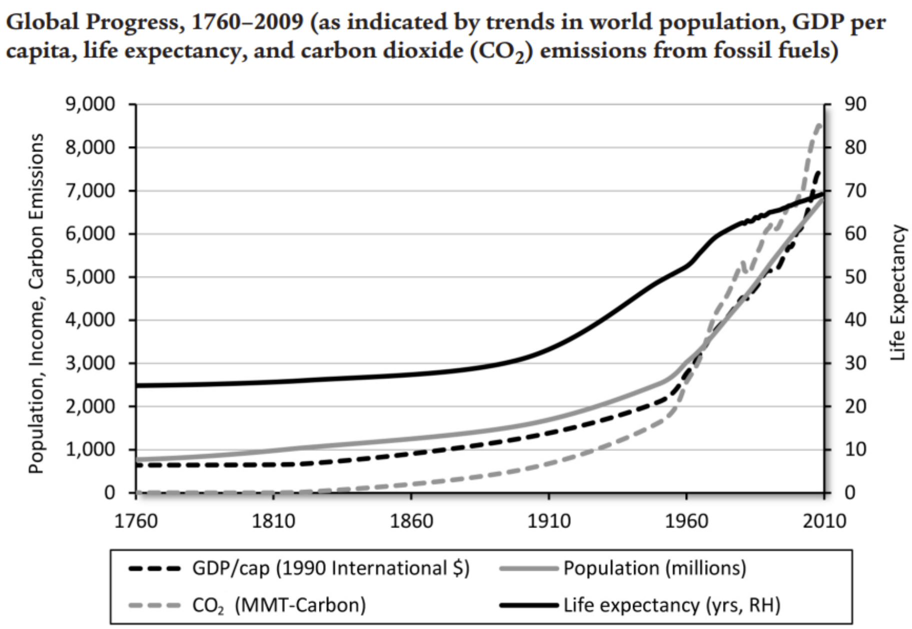

Figure 10. Goklany (2011)

The notion that the long-term increases in prosperity, health, and safety of our mostly fossil-fueled civilization mask a rapidly approaching climate catastrophe cannot be squared with the evidence. Since the 1920s, global CO_2 concentrations increased from about 305 parts per million to more than 415 ppm, and average global temperatures increased by about 1°C.[63] Yet, globally, the number of people dying from storms, floods, droughts, wildfires, and extreme temperatures decreased dramatically. Danish economist Bjorn Lomborg recently detailed the good news:

> Fewer and fewer people die from climate-related natural disasters. This is even true of 2021—despite breathless climate reporting, almost 99 percent fewer people died that year than a hundred years ago. Why is this consistently not reported?
>
> Over the past hundred years, annual climate-related deaths have declined by more than 96 percent. In the 1920s, the death count from climate-related disasters was 485,000 on average every year. In the last full decade, 2010-2019, the average was 18,362 dead per year, or 96.2 percent lower.
>
> In the first year of the new decade, 2020, the number of dead was even lower at 14,885—97 percent lower than the 1920s average. For 2021, which is now complete, we see an even lower total of 6,134 dead or a reduction since the 1920s of 98.7 percent.[64]

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[63] NASA, Global CO2 Mixing Ratios (ppm), https://data.giss.nasa.gov/modelforce/ghgases/Fig1A.ext.txt
[64] Bjorn Lomborg, Facebook, January 1, 2022, https://www.facebook.com/bjornlomborg/posts/475702943914714.

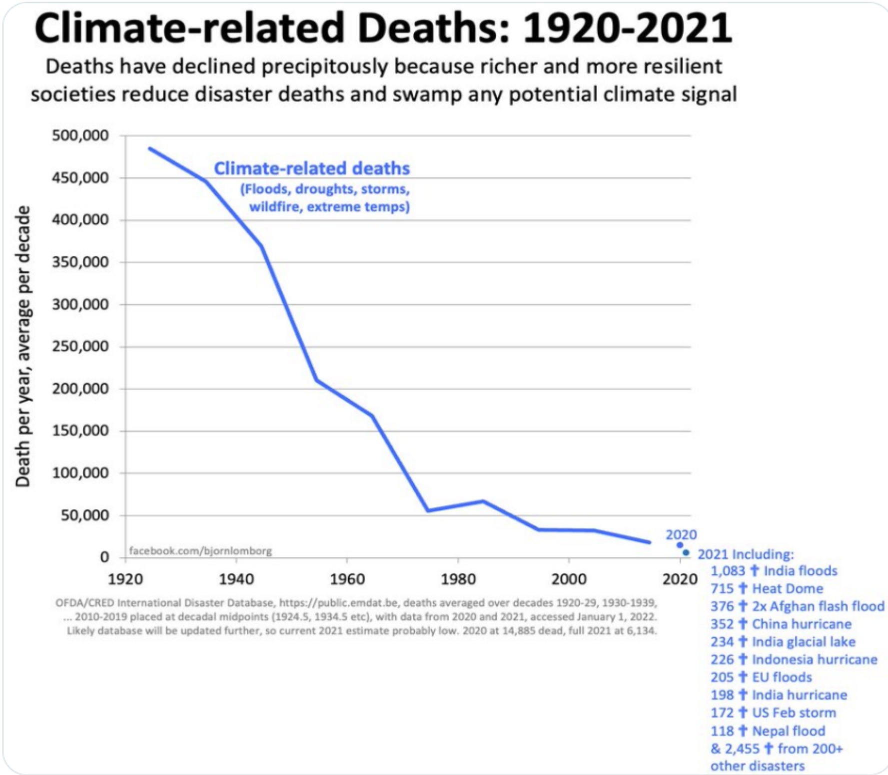

Figure 11. Lomborg (January 2022)

The almost 99 percent drop in aggregate weather-related mortality is all the more impressive given the quadrupling of global population since the 1920s.[65] Weather-related *mortality rates* have declined by more than 99 percent over the past 100 years.[66] A "climate crisis" cannot be discerned in that data.

Nor is a crisis discernible in other trends of fundamental relevance to human survival and flourishing. The past 70 years have been marked by unprecedented improvements in global life expectancy, per capita income, food security, and various health-related metrics. Yields of all major food crops keep increasing, and production is increasing exponentially.[67] Nearly 3 billion people gained access to improved water sources since 1990, and deaths from malaria (the most consequential climate-sensitive disease) declined by 52 percent during 2000-2015.[68]

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[65] Our World in Data, The size of the world population over the last 12,000 years, https://ourworldindata.org/world-population-growth.

[66] Lomborg, "We're Safer from Climate Disasters than Ever Before," *Wall Street Journal*, November 3, 2021, https://www.wsj.com/articles/climate-activists-disasters-fire-storms-deaths-change-cop26-glasgow-global-warming-11635973538.

[67] See Figure 22, below.

[68] Our World in Data, Life Expectancy, https://ourworldindata.org/grapher/life-expectancy; Economic Growth, https://ourworldindata.org/economic-growth; Food Supply, https://ourworldindata.org/food-supply; Burden of Disease, https://ourworldindata.org/health-meta#burden-of-disease; Crop Yields, https://ourworldindata.org/crop-yields; and Malaria, https://ourworldindata.org/malaria.

During the past three decades, mortality and economic loss data point to an increasingly sustainable civilization. Formetta and Feyen (2019) compare fatalities over exposed population and losses over exposed GDP, to climate-related hazards between 1980 and 2016. They find that climate-related hazards show a "clear decreasing trend in both human and economic vulnerability, with global average mortality and economic loss rates that have dropped by 6.5 and nearly 5 times, respectively, from 1980–1989 to 2007–2016."[69]

Recent insurance industry data indicate that climate-related damages as a share of global GDP declined during 1990-2020, with the trend line now below 0.2 percent.[70]

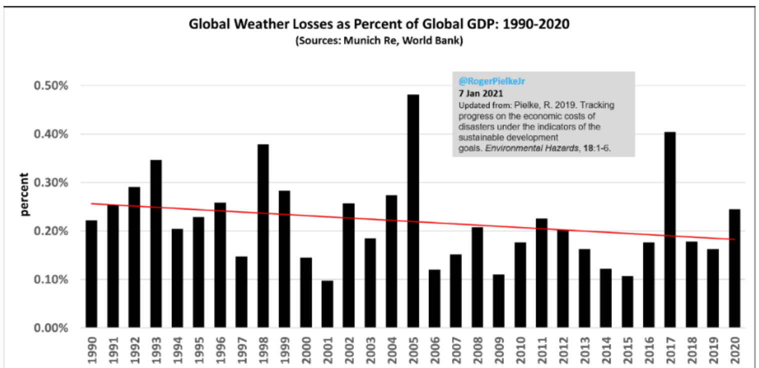

Figure 12. Pielke, Jr. (January 2021)

An important policy implication of those trends is often overlooked. Policies that help make the United States and other countries wealthier also make humanity better able to handle whatever climate-related hazards occur in the future. In contrast, policies favored by many ESG advocates, such as carbon taxes, cap-and-trade programs, renewable energy mandates, drilling bans, and "sustainability criteria" restricting fossil-fuel companies' access to capital and credit, are likely to make nations poorer, while providing negligible climate change mitigation.[71]

While elected officials are free to engage in one-sided advocacy, federal agencies are not. An agency action that "entirely ignores an important aspect of the problem" is arbitrary and capricious.[72] The SEC proposal ignores the mortality and economic loss data that undercut the climate crisis narrative, the case for prioritizing economic growth as the foundation of successful

[69] Giuseppe Formetta and Luc Feyen. 2019. Empirical Evidence of Declining Global Vulnerability to Climate-Related Hazards. *Global Environmental Change* 57, https://www.researchgate.net/publication/333507964_Empirical_evidence_of_declining_global_vulnerability_to_climate-related_hazards.

[70] Roger Pielke, Jr., "Global Disasters: A Remarkable Story of Science and Policy Success," The Honest Broker, January 14, 2021, https://rogerpielkejr.substack.com/p/global-disasters-a-remarkable-story?s=r.

[71] Kevin D. Dayaratna and Nick Loris, "Assessing the Costs and Benefits of the Green New Deal," Heritage Foundation Backgrounder No. 3427, July 24, 2019, https://www.heritage.org/energy-economics/report/assessing-the-costs-and-benefits-the-green-new-deals-energy-policies.

[72] *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983).

long-term adaptation, and the economic risks of imposing ESG-based restrictions on capital and credit markets. Because the rule fails to consider those important aspects of the problem, it is arbitrary and capricious, and should not be implemented.

VII. Methodological Biases in ESG Advocacy

Hot Models, Inflated Emission Baselines

In the voluminous ESG literature cited by the SEC, the IPCC is the chief source of "science-based" investment targets. Heavy hitters who reference the IPCC in their reports and policy statements include the Financial Stability Oversight Council (FSOC), Basel Committee on Banking Supervision, Science Based Targets Initiative, First Movers Coalition, McKinsey & Company, Vanguard Financial Advisors, S&P Dow Jones Indices, BlackRock, Task Force on Climate Related Risks Disclosures, Network for Greening of the Financial System, 2021 Global Investor Statement to Governments on the Climate Crisis, State Street Global Advisors, Climate Action+100, NetZero Asset Managers Coalition, and Glasgow Financial Alliance for NetZero. Many of those stakeholders manage assets totaling trillions of dollars.[73]

Some ESG proponents explicitly use CMIP5+RCP8.5, or similar models and scenarios, to build a case for mandatory climate-risk disclosure. A few examples must here suffice.

Citing a McKinsey report by Woetzel et al. (2020),[74] the SEC warns that by "damaging assets that serve as collateral for loans or that underpin other investments, reducing property values, increasing insurance premiums or decreasing insurance coverage, diminishing agricultural capacity, and causing labor forces to migrate, the physical consequences of climate change could have profound and long-term effects on financial markets more generally."[75]

Woetzel et al. ran RCP8.5 with the CMIP5 ensemble mean. CMIP5 is mentioned 59 times. RCP8.5 is mentioned 157 times. No other forcing trajectory is used. The authors explain: "We have chosen to focus on RCP8.5, because the higher-emission scenario it portrays enables us to assess physical risk in the absence of further decarbonization." They state that "for the next three decades, we consider RCP8.5 to be the best guide for understanding inherent risk."[76]

Those opinions are incorrect. RCP8.5 assumes a world in which coal is the increasingly affordable backstop energy for the global economy.[77] That is not happening. Coal prices in May

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[73] 87 FR 21337, fn. 23.
[74] Jonathan Woetzel et al. 2020. *Climate Risk and Response: Physical Hazards and Socioeconomic Impacts*, McKinsey Global Institute, https://www.mckinsey.com/business-functions/sustainability/our-insights/climate-risk-and-response-physical-hazards-and-socioeconomic-impacts.
[75] 87 FR 21446, fn. 979.
[76] Woetzel et al. 2020, pp. viii, 42.
[77] Justin Ritchie and Hadi Dowlatabadi. 2017. The 1,000 GtC coal question: are cases of vastly expanded future

2022 were more than six times higher than they were in May 2012.[78] As noted earlier, RCP8.5 is blind to the shale revolution and does not reflect the multitude of mitigation measures incorporated into the IEA's emission baselines.

BlackRock's influential April 2019 report, *Getting Physical: Scenario Analysis for Assessing Climate-Related Risk*, also pairs hot models with RCP8.5.[79] BlackRock's modeling was done by the Rhodium Group, who supplemented CMIP5 with "simple climate models" designed to capture "tail risk."[80] The effect is to increase the probability of warming projections beyond the CMIP5 "likely" range. Rhodium explains:

> The CMIP5 models substantially underestimate the 95th-percentile projections from the probabilistic methods. We find that by the end of the twenty-first century there is a 5 percent chance that annual CONUS temperature change could be as high as ~8°C over 1981–2010 levels—roughly 1°C warmer than the hottest CMIP5 model projection (RCP 8.5).[81]

The warming rate of the global lower troposphere over CONUS since January 1979 has been 0.18°C per decade.[82] That implies an additional 1.8°C rise in annual CONUS temperature by 2100—4.4 times less than Rhodium's 8°C scenario. Although the observed warming rate may increase, there has been no acceleration over the past four decades. Somehow that never factors into ESG advocacy.

The SEC cites Martinich and Crimmins (2019),[83] claiming the researchers found that if global temperatures rise 2.8°C from pre-industrial levels by 2100, climate change "could cost $396 billion each year," and if temperatures rise by 4.5°C, "the yearly costs would reach $520 billion."[84]

The $396 billion and $520 billion loss figures do not appear directly in the Martinich and Crimmins study. Rather, the $520 billion estimate seems to come from a press release posted on the Columbia University Web site—a source not cited in the SEC proposal. The press release implies that annual climate damages in 2100 associated with a 2.8°C warming are $296 billion,

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coal combustion still plausible? *Energy Economics*, vol. 65, issue C, 16-31, https://econpapers.repec.org/article/eeeeneeco/v_3a65_3ay_3a2017_3ai_3ac_3ap_3a16-31.htm.

[78] Trading Economics: Coal, https://tradingeconomics.com/commodity/coal (accessed May 30, 2022).

[79] BlackRock Investment Institute, *Getting Physical: Scenario Analysis for Assessing Climate-Related Risks*, April 4, 2019, https://www.blackrock.com/ch/individual/en/insights/physical-climate-risks.

[80] *Getting Physical*, p. 7.

[81] D.J. Rasmussen, Malte Meinhausen, Robert E. Copp. 2016. Probability-Weighted Ensembles of U.S. County-Level Climate Projections of Climate Risk Analysis. *Journal of Applied Climatology and Meteorology*, https://journals.ametsoc.org/view/journals/apme/55/10/jamc-d-15-0302.1.xml.

[82] UAH Version 6.0 temperature data, December 1978 – May 2022, USA48, USA49, https://www.nsstc.uah.edu/data/msu/v6.0/tlt/uahncdc_lt_6.0.txt.

[83] Jeremy Martinich and Allison Crimmins. 2019. Climate Damages and Adaptation Potential Across Diverse Sectors of the United States, *Nature Climate Change* 9, 397–404, https://www.nature.com/articles/s41558-019-0444-6.

[84] 87 FR 21424, fn. 790.

not $396 billion, as the SEC states.[85] Rather than rely on a non-referenced press release, the SEC should explain, or link to an explanation of, how the $520 billion loss figure was calculated.

Martinich and Crimmins used two forcing trajectories: RCP4.5 and RCP8.5. As noted, RCP8.5 is unrealistic and inconsistent with current market trends and political commitments. On that account alone, the SEC should be dubious about the study's high-end loss estimate.

The researchers ran the two scenarios with five CMIP5 climate models that have the same average sensitivity as the full ensemble: 3.2°C. As discussed above, the mean CMIP5 warming projection exceeds observations in the tropical troposphere by more than a factor of two.

Note also the lack of context in this study. Even assuming $520 billion in U.S. climate-related damages, that represents 2.3 percent of U.S. nominal GDP in 2021 ($22.996 trillion).[86] The Congressional Budget Office (CBO) projects 1.8 percent annual growth in real potential GDP during 2022-2030.[87] If the U.S. economy continues to grow at that rate over the next 78 years, U.S. GDP will be $92.465 trillion in 2100. In that case, $520 billion in annual climate-related damages would equal 0.5 percent of GDP. That is not trivial but neither is it a crisis. The typical investor in 2100 should be much wealthier than most investors today, because the economy would be four times larger.

If, as is more likely (RCP4.5 being a more realistic scenario than RCP8.5), warming reaches 2.8°C in 2100 and costs $296 billion, annual climate damages would equal 0.3 percent of a $92.465 trillion economy—only slightly more than the relative economic impact of climate-related damages today.

This missing context is another "important aspect of the problem" the SEC does not address. It is important for two reasons. First, relative economic impact matters more than total costs in determining climate-related risk. Second, economic growth shrinks relative impact. What investors need most is not a new set of complicated reporting requirements but a government-wide program to eliminate political impediments to economic activity. By imposing additional reporting burdens on firms, the SEC would impose new impediments to economic activity.

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[85] Renee Cho, "How Climate Change Impacts the Economy," Columbia Climate School, June 19, 2019, https://news.climate.columbia.edu/2019/06/20/climate-change-economy-impacts/

[86] U.S. Bureau of Economic Analysis, "Table 1.1.5, Gross Domestic Product," https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2#reqid=19&step=2&isuri=1&1921=survey (accessed 06/07/22).

[87] 1.8 percent is the annual growth in real potential GDP projected by the Congressional Budget Office for 2022-2030. CBO, *The Budget and Economic Outlook: 2022-2030*, May 2022, p. 42, https://www.cbo.gov/system/files/2022-05/57950-Outlook.pdf.

Swiss Re, in a report cited by the SEC, projects that unchecked climate change could cause 3.2°C of global warming by 2050, which in turn would reduce U.S. GDP by 9.5 percent.[88] The projection is based on the unrealistic RCP8.5 forcing trajectory. Indeed, Swiss Re calls RCP8.5 a scenario of "unmitigated climate change." The 3.2°C projection would be possible only if (a) the current lower atmosphere warming rate of 0.13°C per decade[89] quintuples over the next 30 years, and (b) the world's governments refuse to undertake any mitigation measures despite a fivefold increase in warming rates. Neither assumption is reasonable.

Even with RCP8.5, Swiss Re had to tweak the models to get 3.2°C of warming by 2050. Specifically, Swiss Re incorporated the higher sensitivities of "more recent models" (presumably CMIP6) and increased the weight given to "tail risks" ("tipping points") due to "unknown unknowns."[90] How Swiss Re *knows* that *unknown unknowns* will aggravate rather than moderate global warming is not explained.

The SEC cites Swiss Re's scary estimate that climate change could depress U.S. GDP 9.5 percent by 2050, but does not alert shareholders to the dodgy assumptions on which that estimate is based. That is not the careful vetting of advocacy group claims registrants are entitled to expect from the SEC. Once again, the rulemaking ignores "an important aspect of the problem," namely, the biased methodologies on which ESG advocates often rely. Again, the rulemaking is arbitrary and capricious, and should not be implemented.

The proposed rule would "require the disclosure of the location (via ZIP code) of firm assets or operations, which could allow investors to assess firms' exposures to physical risk at a more granular level."[91] To the extent that climate risks are both material and "granular," registrants do not need complicated new rules to report them. If an agribusiness is located in a drought- or flood-prone region, weather-related risks are likely already reported and priced into its stock values.

The same holds for fossil-fuel company stock values, which reflect both the risk of eventual bankruptcy from punitive regulation and the expectation of higher stock prices as climate policies boost commodity prices by decreasing supply relative to demand.[92]

Despite the plea for "granular" analysis, the SEC cites no examples from the peer-reviewed literature. "Lights Out" has already been discussed. Another such study, also cited in MMCB, is

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[88] 87 FR 21424. Swiss Re Institute, *The economics of climate change: No action not an option*, April 2021, https://www.swissre.com/dam/jcr:e73ee7c3-7f83-4c17-a2b8-8ef23a8d3312/swiss-re-institute-expertise-publication-economics-of-climate-change.pdf.

[89] Roy Spencer, "UAH Global Temperature Update for May, 2022: +0.17 deg. C," DrRoySpencer.Com, June 1, 2022, https://www.drroyspencer.com/2022/06/uah-global-temperature-update-for-may-2022-0-17-deg-c/.

[90] Swiss Re, Op. Cit., pp. 5, 9, 12, and 27.

[91] 87 FR 21448.

[92] Benjamin Zycher, "Does the Biden Administration Deserve Blame for Higher Gasoline Prices?" *National Review*, March 17, 2022, https://www.nationalreview.com/2022/03/does-the-biden-administration-deserve-blame-for-high-gasoline-prices/.

Palu and Mahmoud (2019).[93] The study purports to assess the impacts of thermal stress on the expansion joints of U.S. bridges under RCPs 2.6, 6.0, and 8.5 in 2040, 2060, 2080, and 2100. The authors claim their research can help decisionmakers "prioritize the allocation of funds for maintenance and replacement." MMCB believes the study is relevant to investors generally: "The businesses (and their shareholders) whose supply chains rely on these bridges are likely unaware of their heightened risk exposure."[94]

We recommend letting firms that do not build or repair bridges decide for themselves whether to report information on the condition of bridges within, say, a 100-mile radius of their facilities. What is most notable about this study is the climate model the authors selected out of the dozens available—the Geophysical Fluid Dynamics Laboratory's GFDL-CM3 model. Figure 13 shows the divergence of model projections and observations through the depth of the tropical atmosphere during 1979-2016. The GFDL-CM3 projection is the hottest—so hot it is literally off the chart.[95]

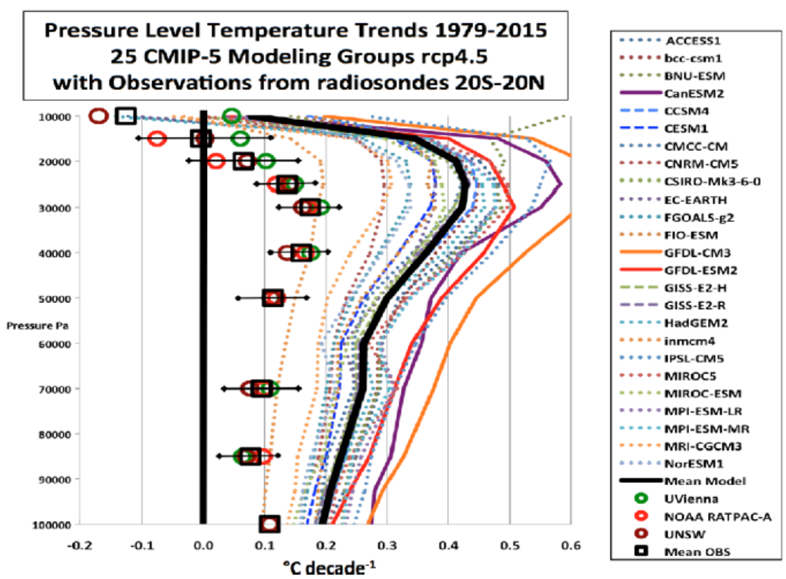

Figure 13. Pressure-level temperature trends (1979-2016) for the tropical atmosphere as measured by four radiosonde datasets (circles with square as average, UVienna is average of two datasets) and 25 modeling groups (dotted, dashed and solid lines, mean is black line) used in IPCC AR5.

To summarize, when a company's "granular" climate risks are material, they are likely already reported and baked into asset values. No additional rulemaking is needed. However, as the Lights

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[93] Susan Palu and Hassam Mahmoud. 2019. Impact of climate change on the integrity of the superstructure of deteriorated U.S. bridges. *PLoS|One*, 14(10), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0223307.

[94] MMCB, p. 21.

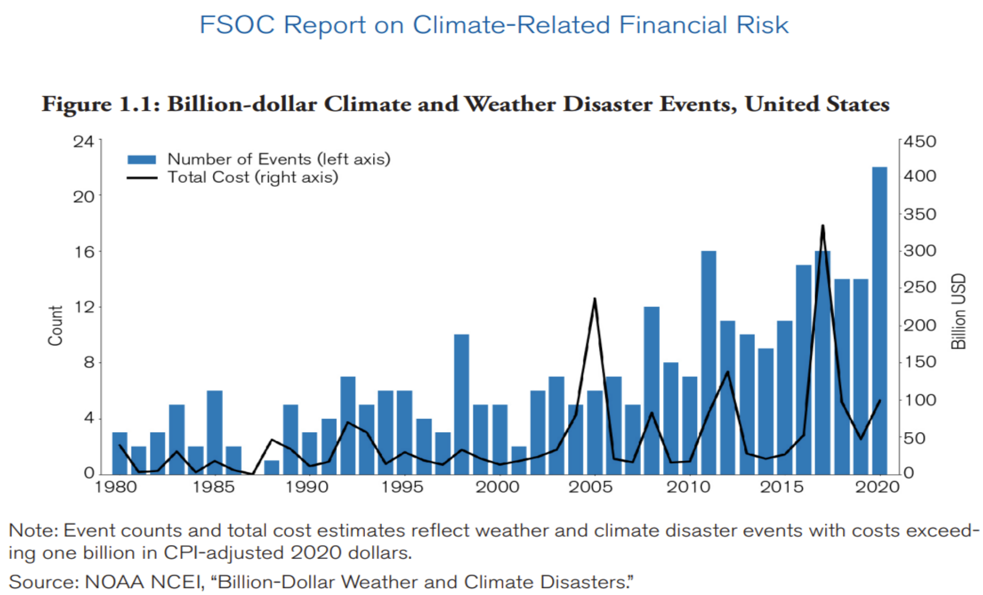
[95] John R. Christy and Richard T. McNider. 2017. Satellite Bulk Tropospheric Temperatures as a Metric for Climate Sensitivity. *Asia-Pac. J. Atmos. Sci.*, 53(4), 511-518, https://link.springer.com/article/10.1007/s13143-017-0070-z.

Out and bridge expansion-joint studies suggest, increasing the regulatory pressure for granular analysis is likely to promote the use of extreme scenarios.

Misattribution of Climate-Related Damages

The SEC states that "the impact of climate-related risks on both individual businesses and the financial system as a whole are well documented."[96] As evidence, the SEC cites NOAA's estimate that "In 2020 alone, a record 22 separate climate-related disasters with at least $1 billion in damages struck across the United States, surpassing the previous annual highs of 16 such events set in 2011 and 2017."[97]

A chart of NOAA's billion-dollar disaster data appears in the Financial Stability Oversight Council's (FSOC's) *Report on Climate Change Financial Risk 2021*,[98] which the SCC also



cites.[99]

Figure 14. Billion-Dollar Weather and Climate Disasters

Unwary readers may assume the frequency and intensity of bad weather is increasing dramatically, i.e., the world is in a "climate crisis." However, billion-dollar disaster counts are not evidence of climate chaos or even of climate change. To reiterate, the relative economic

[96] 87 FR 21336.
[97] NOAA, National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2022), https://www.ncei.noaa.gov/access/billions/.
[98] FSOC, *Report on Climate-Related Financial Risk 2021*, p. 12, https://home.treasury.gov/system/files/261/FSOC-Climate-Report.pdf.
[99] 87 FR 21336, fn. 11.

impact of climate-related losses is declining. Pielke, Jr. set the record straight back in November 2019.[100]

NOAA adjusted weather-related damages for inflation. However, to discern a climate signal, the data must also be adjusted ("normalized") for changes in population, wealth, and development patterns. More people and assets in harm's way produce bigger weather-related damages even if there is no overall trend in the weather.

Lomborg calls this phenomenon the "expanding bull's-eye effect." He explains:

> While the U.S. population since 1900 has more than quadrupled, coastal populations have increased far more. The population of all the coastal counties from Texas to Virginia on the Gulf of Mexico and Atlantic has increased sixteen-fold during the same period. The coastal population of Florida has increased a phenomenal sixty-seven times. There are now many more people living in Dade and Broward Counties in South Florida than lived along the entire coast from Texas to Virginia in 1940. For a hurricane in 1940 to hit the same number of people as a modern hurricane ripping through Dade and Broward today, it would have had to tear through *the entire Gulf of Mexico and Atlantic coastline*.[101]

NOAA's billion-dollar charts ignore the expanding bull's eye. Between 1980 and 2020, the U.S. population increased by 44.2 percent and U.S. GDP increased by 174 percent.[102] Moreover, substantial population growth and economic development occurred in coastal areas.[103] Since 1990, U.S. population has grown rapidly in the wildland-urban interface, which expands as people build houses in previously undeveloped areas.[104] This ongoing development pattern increases wildfire risk, especially where forest growth has been mismanaged or neglected. One hundred-year floodplains have also experienced slightly faster population growth than the surrounding areas.[105]

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[100] Roger Pielke, Jr., "Everything You Here about Billion Dollar Disasters Is Wrong," *Forbes*, November 7, 2019, https://www.forbes.com/sites/rogerpielke/2019/11/07/everything-you-hear-about-billion-dollar-disasters-is-wrong/?sh=57ee33352fea/.

[101] Bjorn Lomborg, *False Alarm: How Climate Change Panic Costs Us Trillions, Hurts the Poor, and Fails to Fix the Planet* (New York: Basic Books, 2020), pp. 70-71 (original emphasis).

[102] Macrotrends, U.S. Population 1950-2021, https://www.macrotrends.net/countries/USA/united-states/population; St. Louis Fed, FRED Economic Data, Real Gross Domestic Product, https://fred.stlouisfed.org/series/GDPC1.

[103] Steven G. Wilson and Thomas R. Fischetti, Coastline Population Trends in the United States: 1960-2008, U.S. Department of Commerce, 2010, https://www.census.gov/prod/2010pubs/p25-1139.pdf (reporting, e.g., that during 1980-2008, the coastal populations of North Carolina, Texas, and Florida increased by 53 percent, 69 percent, and 81 percent, respectively).

[104] Volker C. Radeloff et al. 2018. "Rapid growth of the US wildland-urban interface raises wildfire risk." *Proceedings of the National Academy of Sciences,* Vol. 115, 3314–3319, https://www.pnas.org/content/115/13/3314 (estimating that "one in three houses and one in ten hectares are now in the WUI").

[105] Mike Maciag, "Analysis: Areas of the U.S. with Most Floodplain Population Growth," *Governing*, July 31, 2018, https://www.governing.com/archive/flood-plains-zone-local-population-growth-data.html.

Normalizing the damages—estimating the direct economic losses from an historic extreme weather event if the same event were to occur under present societal conditions—creates a very different picture from those presented by the billion-dollar disaster charts. For example, there has been no trend in normalized U.S. hurricane damages since 1900. That result is consistent with meteorological data, which show no long-term trends in the frequency and strength of U.S. landfalling hurricanes.[106]

This is what hurricane damages look like if adjusted only for inflation:

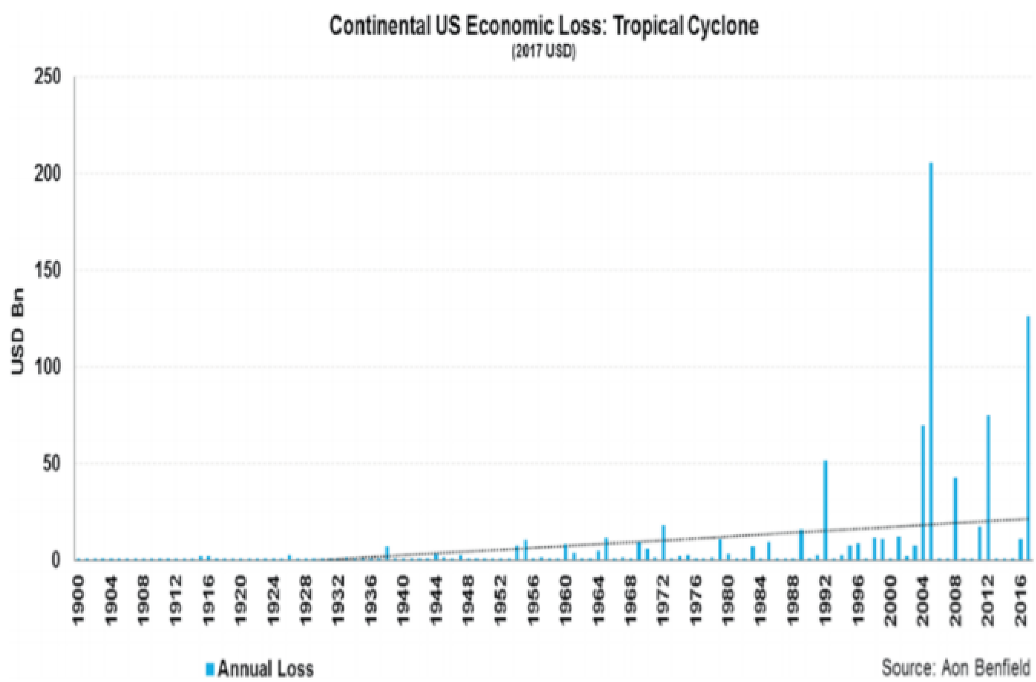

FIG. 1. CONUS total inflation-adjusted economic losses from TC landfalls (1900–2017). The dotted line represents the linear trend over the period. The *p* value for the linear trend is <0.01, indicating that the trend is significant.

Figure 15. U.S. tropical cyclone losses adjusted only for inflation.

Here are the same damages normalized for changes in population and exposed wealth:

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[106] Philip J. Klotzbach, Steven G. Bowen, Roger Pielke Jr., and Michael Bell. 2018. Continental U.S. Hurricane Landfall Frequency and Associated Damage: Observations and Future Risks. *Bulletin of the American Meteorological Society* Vol. 99, Issue 7, https://journals.ametsoc.org/view/journals/bams/99/7/bams-d-17-0184.1.xml?tab_body=pdf ("While neither U.S. landfalling hurricane frequency nor intensity shows a significant trend since 1900, growth in coastal population and wealth have led to increasing hurricane-related damage along the U.S. coastline").

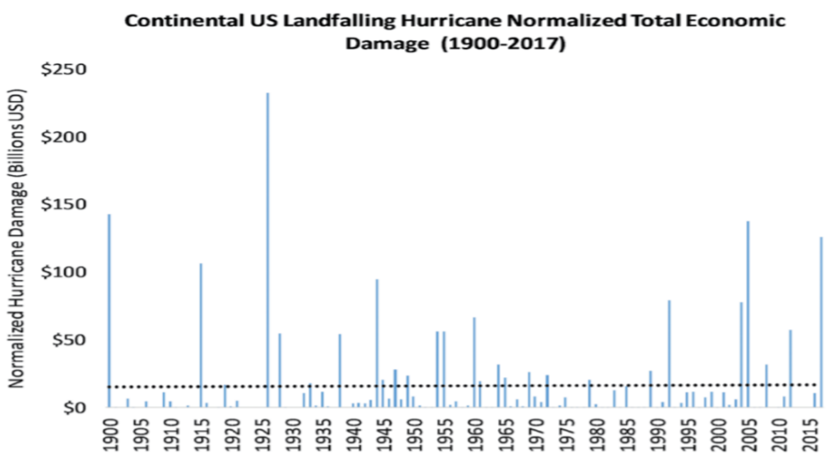

FIG. 3. Normalized CONUS landfalling hurricane damage from 1900 to 2017. The dotted line represents the linear trend in CONUS hurricane normalized damage during the period of record. The *p* value for the linear trend is 0.86, indicating that the trend is not significant.

Figure 16. U.S. tropical cyclone damages also adjusted for population and wealth

Below are plots of total and major (Category 3-5) U.S. landfalling hurricanes during 1900-2017. No long-term trend or "climate signal" is discernible in the data.

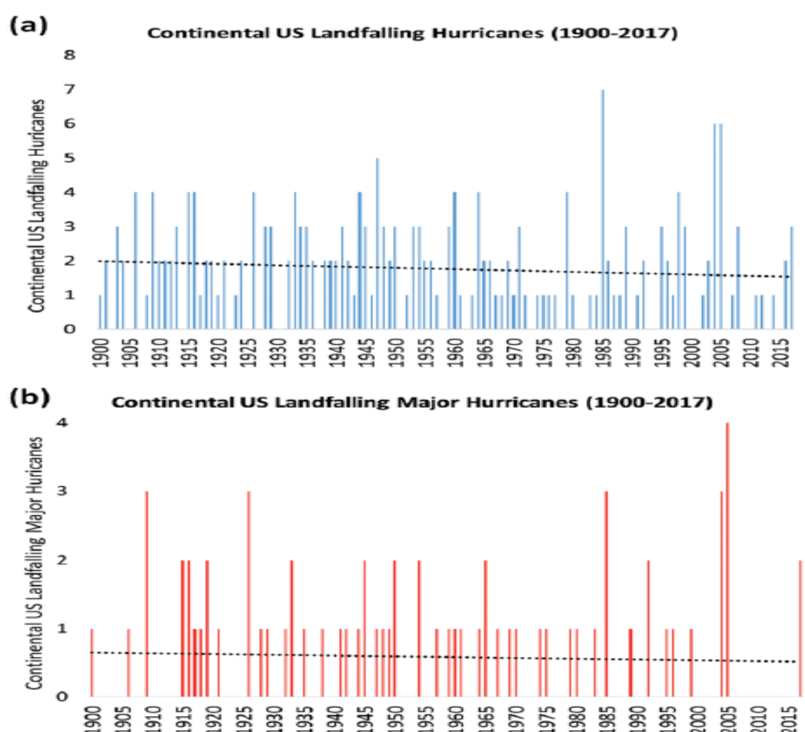

FIG. 2. (a) CONUS landfalling hurricanes by year from 1900 to 2017, and (b) CONUS landfalling major hurricanes by year from 1900 to 2017. The dotted lines represent linear trends over the period. The *p* values for the linear trends are 0.33 for landfalling hurricanes and 0.61 for landfalling major hurricanes, indicating that neither of these trends are significant.

Figure 17. Frequency of total and major U.S. landfalling hurricanes (1900-2017)

The SEC presents NOAA's billion-dollar damages study as Exhibit A for the claim that "the impact of climate-related risks on both individual businesses and the financial system as a whole are well documented."[107] However, NOAA's failure to normalize climate-related damages flouts best practices and misleads the public. The SEC proposal's uncritical promotion of that study is biased. Again, the proposal ignores an "important aspect of the problem," namely, the widespread misattribution to climate change of damage trends actually driven by socioeconomic factors. On both counts, the proposed rule is arbitrary and capricious, and should not be implemented.

Ignoring Adaptation

ESG advocacy literature, like climate advocacy literature in general, tends to underestimate human adaptive capabilities. Three examples must here suffice.

BlackRock's *Getting Physical* report warns that "many effects of climate change are non-linear," noting that corn yields "start to drop sharply when daily high temperatures exceed 84°F (29°C)."[108] It illustrates the point with the following chart:

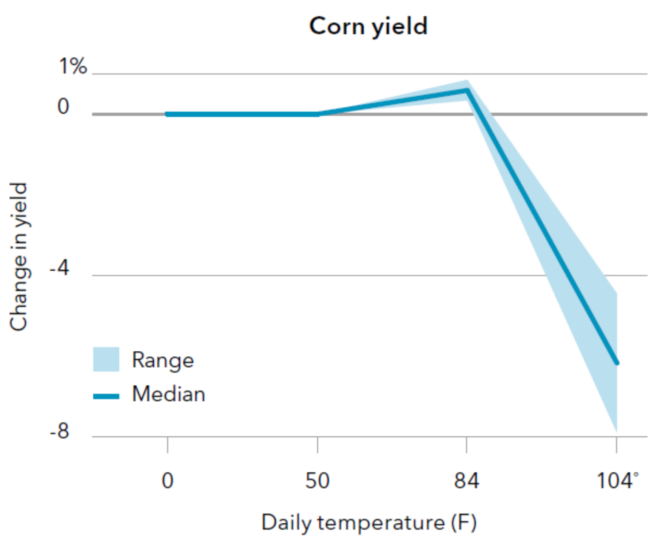

Figure 18. Corn Yield vs. Temperature

The imminent decline of corn yields has been predicted for some time.[109] A few quick points. First, combining RCP8.5 with the CMIP5 ensemble, as Blackrock does, projects about 4°C of warming by 2100. Running the most accurate CMIP5 model (the Russian INM-CM4) with a

[107] 87 FR 21336.
[108] *Getting Physical*, p. 6.
[109] Marlo Lewis, "House Energy and Commerce Climate Science Hearing: Is Corn Doomed?" GlobalWarming.Org, March 11, 2011, http://www.globalwarming.org/2011/03/11/house-energy-and-commerce-climate-science-hearing-is-u-s-corn-doomed/.

more realistic emission baseline (RCP4.5 or RCP6.0) would project significantly less warming.[110]

Second, in Iowa, the No. 1 corn producing state, maximum daily temperatures in July (the warmest month) often exceed 84°F. The same holds for No. 2 corn producer Illinois, and No. 3 producer Nebraska.[111] The United States remains by far the world's leading corn producer.[112]

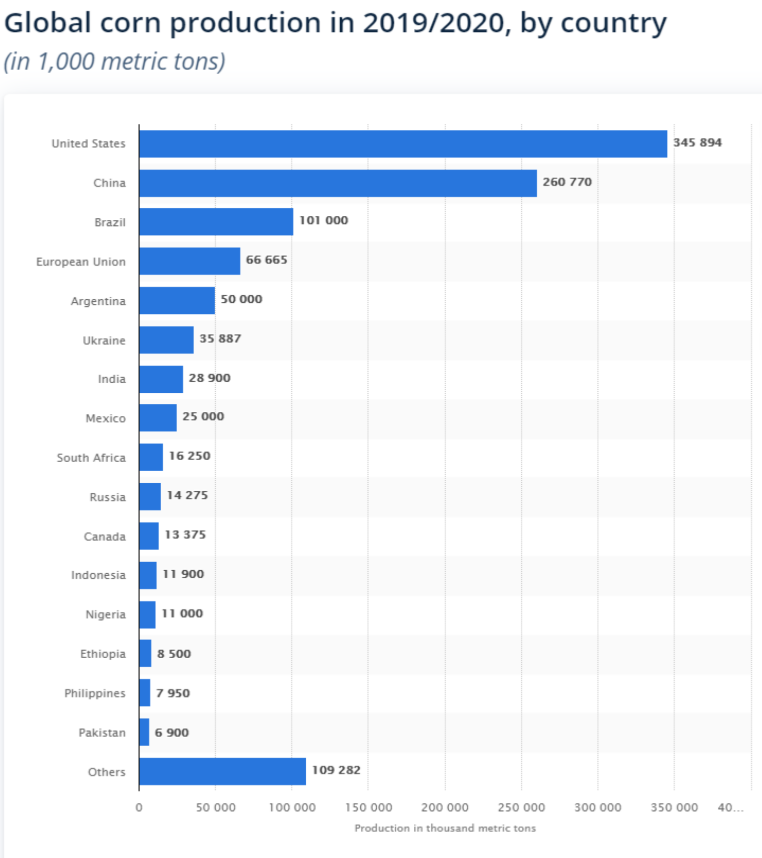

Figure 19. Corn Production by Country

Third, CO_2 emissions have positive as well as negative externalities. In 60 experiments, a 300 ppm increase in CO_2 concentration increased average corn plant dry weight (biomass) by 32.1 percent. In 28 experiments, a 300 ppm increase in CO_2 concentration increased average corn plant photosynthetic activity by 23.7 percent.[113]

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[110] Patrick J. Michaels, Comments on the Fourth U.S. National Climate Assessment, Cato Institute, February 1, 2018, https://www.cato.org/sites/cato.org/files/pubs/pdf/pat-michaels-national-climate-assessment.pdf.

[111] Weather Atlas, Monthly Weather Forecast and Climate in Iowa, https://www.weather-us.com/en/iowa-usa-climate#climate_text_11; Monthly Forecast and Climate in Illinois, https://www.weather-us.com/en/illinois-usa-climate; Monthly Forecast and Climate in Nebraska, https://www.weather-us.com/en/nebraska-usa-climate.

[112] Statista, Global corn production 2019/2020, by country, 2021, https://www.statista.com/statistics/254292/global-corn-production-by-country.

[113] Center for the Study of Carbon Dioxide and Global Change, Plant Dry Weight (Biomass) Responses to Atmospheric CO_2 Enrichment, http://co2science.org/data/plant_growth/dry/dry_subject_c.php; Plant

Dayaratna et al. (2020), a study recalculating the social cost of carbon (SCC) under reasonable climate sensitivity and CO_2 fertilization assumptions, finds that CO_2 emissions have high probabilities of producing net economic benefits through at least the mid-21st century.[114] The following table, taken from that study, shows the discounted cost/benefit estimates under various reasonable assumptions. A negative SCC means a net-positive externality or benefit to society.

Table 2 Mean social cost of carbon in FUND model at discount rates of 2.5%, 3%, 5% and 7%, using Roe and Baker (2007) ECS distribution and Lewis and Curry (2018) ECS distribution ("LC18"), under the base case (second column), and with 15% and 30% increases in the CO_2 fertilization parameters (LC18 + 15%, LC18 + 30%, respectively)

	Roe–Baker	LC18	LC18 + 15%	LC18 + 30%
2.5%				
2020	$32.90	$3.78/0.46	$0.62/0.53	− $1.53/0.59
2030	$36.16	$4.69/0.44	$1.25/0.51	− $1.02/0.57
2040	$39.53	$5.76/0.42	$2.03/0.48	− $0.33/0.54
2050	$42.98	$6.98/0.39	$2.96/0.46	− $0.55/0.51
3.0%				
2020	$19.33	$1.61/0.49	− $0.82/0.57	− $2.74/0.63
2030	$21.78	$2.32/0.47	− $0.35/0.54	− $2.39/0.61
2040	$24.36	$3.18/0.44	$0.28/0.51	− $1.85/0.57
2050	$27.06	$4.21/0.42	$1.08/0.48	− $1.12/0.54
5.0%				
2020	$2.54	− $1.02/0.62	− $2.25/0.71	− $3.41/0.78
2030	$3.31	− $0.77/0.58	− $2.14/0.67	− $3.41/0.74
2040	$4.21	− $0.39/0.54	− $1.89/0.63	− $3.24/0.70
2050	$5.25	$0.15/0.49	− $1.47/0.58	− $2.87/0.65
7.0%				
2020	− $0.37	− $1.25/0.71	− $2.06/0.80	− $2.84/0.85
2030	− $0.13	− $1.18/0.67	− $2.08/0.76	− $2.94/0.82
2040	$0.19	− $0.98/0.62	− $1.98/0.71	− $2.91/0.77
2050	$0.63	− $0.66/0.56	− $1.74/0.65	− $2.71/0.72

In the last three columns the entry shows the SCC estimate and the associated probability of a negative SCC

Figure 20. Social Cost of Carbon Estimates. Dayaratna et al. (2020

Fourth, whatever negative impacts climate change may be having on corn production, farmers continue to increase yields both in the United States and globally.[115]

Photosynthesis (Net CO_2 Exchange Rate) Responses to Atmospheric CO_2 Enrichment, http://co2science.org/data/plant_growth/photo/photo_subject_c.php.

[114] Kevin D. Dayaratna, Ross McKitrick & Patrick J. Michaels. 2020. Climate sensitivity, agricultural productivity and the social cost of carbon in FUND. *Environmental Economics and Policy Studies*, 22, p. 433–448, https://link.springer.com/article/10.1007/s10018-020-00263-w.

[115] Our World in Data, Crop Yields, https://ourworldindata.org/crop-yields.

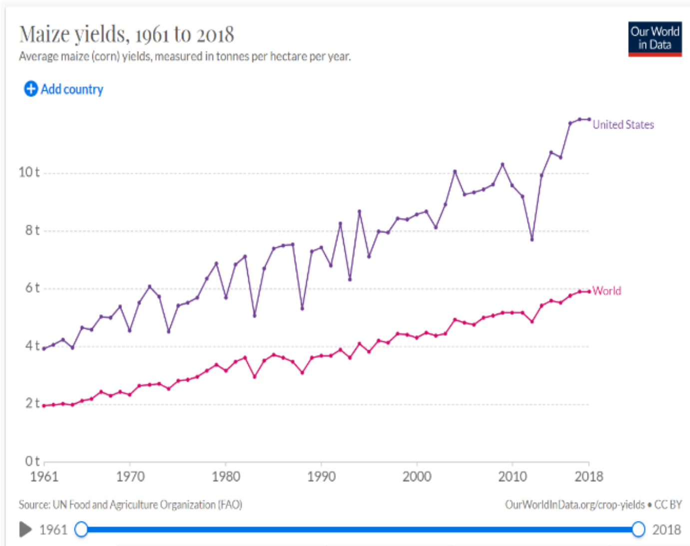

Figure 21. Corn Yields, US & Global

Similarly, despite potential negative impacts from climate change, global crop production keeps increasing.

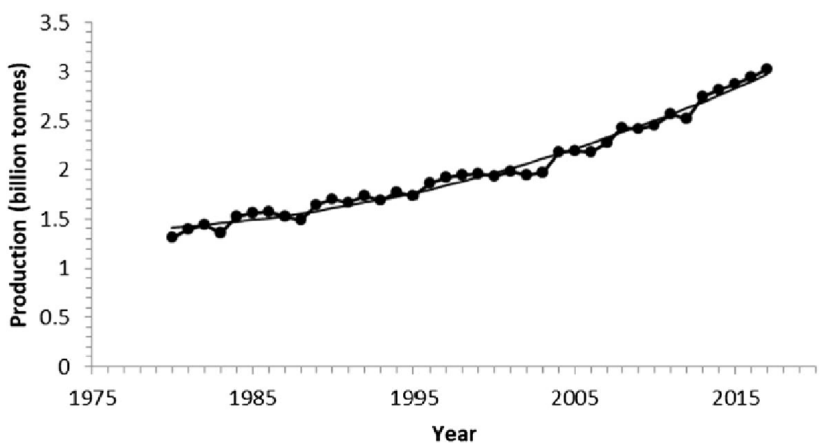

Figure 22. Global crop production shown as sum of maize, rice, soybean, and wheat grown during 1980-2017. Dayaratna et al. (2020)

The scariest climate impact scenarios are the high-end sea-level rise estimates associated with RCP8.5 and SSP5-8.5. *Underwater*, a Union of Concerned Scientists (UCS) study cited by the SEC,[116] predicts sea-level rise will "put more than 300,000 of today's homes and commercial properties in the contiguous United States at risk of chronic, disruptive flooding" by 2045, imperiling properties with a cumulative current value of about $136 billion.[117]

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[116] 87 FR 21351, fn. 203.

[117] Union of Concerned Scientists, *Underwater: Rising Seas, Chronic Floods, and the Implications for US Coastal Real Estate*, 2018, https://www.ucsusa.org/resources/underwater.

UCS acknowledges that those results "are based on the high sea level rise scenario, a scenario that results in 6.6 feet of global sea level rise by 2100." For perspective, 6.6 feet—2.0 meters—is twice the amount of sea-level rise projected in the upper bound of NOAA's "very high" (5.0°C/SSP5-8.5) warming scenario.[118]

Global Mean Surface Air Temperature 2081–2100	1.5°C	2.0°C	3.0°C	4.0°C	5.0°C	Unknown Likelihood, High Impact – Low Emissions	Unknown Likelihood, High Impact – Very High Emissions
Closest Emissions Scenario–Based GMSL Projection	Low (SSP1-2.6)	Low (SSP1-2.6) to Intermediate (SSP2-4.5)	Intermediate (SSP2-4.5) to High (SSP3-7.0)	High (SSP3-7.0)	Very High (SSP5-8.5)	Low (SSP1-2.6), *Low Confidence* processes	Very High (SSP5-8.5), *Low Confidence* processes
Total (2050)	0.18 (0.16–0.24)	0.20 (0.17–0.26)	0.21 (0.18–0.27)	0.22 (0.19–0.28)	0.25 (0.22–0.31)	0.20 (0.16–0.31)	0.24 (0.20–0.40)
Total (2100)	0.44 (0.34–0.59)	0.51 (0.40–0.69)	0.61 (0.50–0.81)	0.70 (0.58–0.92)	0.81 (0.69–1.05)	0.45 (0.32–0.79)	0.88 (0.63–1.60)

Figure 23. IPCC warming level–based global mean sea level projections. NOAA (2022)

A useful antidote to such alarmism is Hinkel et al. (2014), a sea-level rise study published in *Proceedings of the National Academy of Sciences*, and reviewed by Lomborg in his book *False Alarm*. The study includes a worst-case RCP8.5 scenario in which rising sea levels flood up to 350 million people every year by century's end, with costs reaching $100 trillion or 11 percent of global GDP annually.[119] However, those extraordinary damages are projected to occur only if people do nothing more than maintain current flood control infrastructure.

If "enhanced" adaptive measures are taken, so that coastal protections keep pace with sea-level rise, annual flood costs increase from $11 billion in 2000 to $38 billion in 2100. Similarly, annual dike costs increase from $13 billion to $48 billion. However, Lomborg notes, "the total cost to the economy will actually decline, from 0.05 percent of GDP to 0.008 percent." Moreover, the number of people experiencing flood damages drops from 3.4 million in 2000 to 15,000 in 2100—a 99.6 percent reduction in flood victims.

In other words, with reasonable adaptation, people are projected to be much safer, and the global economy much less affected by sea-level rise in 2100, despite high-end warming.[120]

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[118] NOAA et al. Global and Regional Sea Level Rise Scenarios, Op. Cit.

[119] Jochen Hinkel et al. 2014. Coastal flood damage and adaptation cost under 21st century sea-level rise. *Proceedings of the National Academies of Sciences*, 111(9):3292-7, https://www.researchgate.net/publication/260528772_Coastal_flood_damage_and_adaptation_cost_under_21st_century_sea-level_rise.

[120] Bjorn Lomborg, *False Alarm: How Climate Change Panic Costs Us Trillions, Hurts the Poor, and Fails to Fix the Planet* (New York: Basic Books, 2020), pp. 29-34, 185-186. In their study, Hinkel et al. state that enhanced adaptation can reduce flood damages from an RCP8.5 warming by "2-3 orders of magnitude." Lomborg's numbers for costs and flood victims come from charts in the study's supplementary material, available at https://www.pnas.org/content/pnas/suppl/2014/01/29/1222469111.DCSupplemental/pnas.201222469SI.pdf.

In the charts below, “enhanced adaptation” decreases by orders of magnitude both the number of people exposed to flood risks and the GDP losses under a worst-case warming scenario.[121]

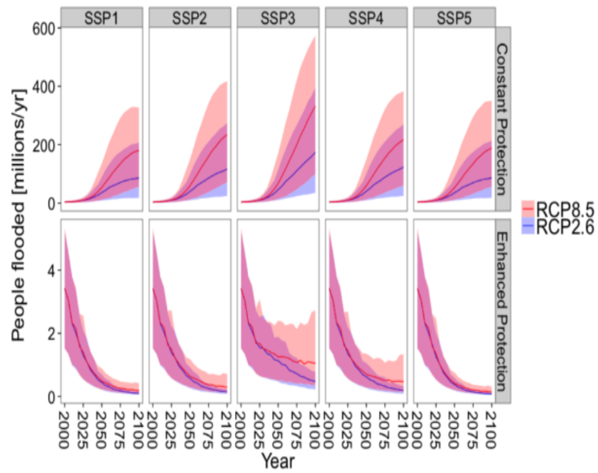

Fig. S4. Global expected annual number of people flooded. The lines show the average impacts across the range of DEMs, population datasets, GCMs, and land-ice scenarios used. The shaded areas show the respective uncertainty ranges defined by the maximum and minimum impacts.

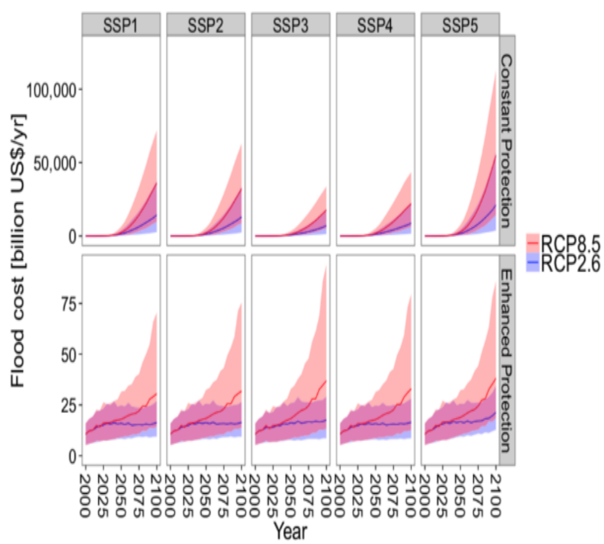

Fig. S5. Global expected annual flood cost. The lines show the average impacts across the range of DEMs, population datasets, GCMs, and land-ice scenarios used. The shaded areas show the respective uncertainty ranges defined by the maximum and minimum impacts.

Figure 24. Constant Protection vs. Enhanced Adaptation to RCP8.5 Sea-Level Rise. Hinkel et al. (2014)

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[121] “DEMs” stand for digital elevation models.

Unsurprisingly, ESG investors underestimate the resilience of the financial sector itself. According to the SEC, the financial costs of climate-related risks "would likely be broadly felt as they are passed through supply chains and to customers and as they reduce firms' ability to service debt or produce returns for investors." Such impacts could "negatively affect the economy as a whole and create systemic risk for the financial system."[122] The proposal similarly states: "The increasing frequency and severity of climate events can potentially lead to destabilizing losses for insurance companies, banks, and other financial intermediaries with direct and indirect exposures to different affected industries and assets."[123]

Sounds plausible, and some people apparently worry about it. So, the Staff of the Federal Reserve Bank of New York decided to investigate. In November 2021, they published a report addressing the question: "How Bad Are Weather Disasters for Banks?" "Not very" are the first words of the abstract, which continues:

> We find that FEMA disasters over the last quarter century had insignificant or small effects on U.S. banks' performance. This stability seems endogenous rather than a mere reflection of federal aid. Disasters increase loan demand, which offsets losses and actually boosts profits at larger banks. Local banks tend to avoid mortgage lending where floods are more common than official flood maps would predict, suggesting that local knowledge may also mitigate disaster impacts.[124]

The body of the study reports that even smaller banks tend to profit from extreme weather events:

> Extreme weather is expected to become more extreme as the globe warms, so we also look separately at the most damaging (90th percentile) of disasters. We again find that losses at larger (multi-county) banks are barely affected and their income increases significantly with exposure. For local banks, we do find more negative stability effects from extreme disasters. However, even these are not sufficiently large to threaten bank solvency. In part this may be due to offsetting effects. Local banks' incomes also increase after these more severe disasters.

Not reporting the New York Fed Staff study—not even in a footnote acknowledging an alternative perspective—exposes the Commission to allegations of bias. Other omissions also seem tendentious. The proposal does not qualify the findings or positions of any the reports or comment letters it cites. The word "extreme" occurs 25 times. In nearly all cases "extreme" is paired with "weather," "temperatures," "sea-level rise," or "water stress," never paired with "model," "scenario," "assumption," or "projection."

VIII. Exaggerating the Certainty of Transition Risks to Fossil-Intensive Industries

[122] 87 FR 21336.

[123] 87 FR 21446.

[124] Kristian S. Blickle, Sarah N. Hamerling, and Donald P. Morgan. *How Bad Are Weather Disasters for Banks?* Federal Reserve Bank of New York Staff Reports, no. 990 November 2021; revised January 2022, https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr990.pdf.

Because ESG advocates exaggerate the magnitude and certainty of climate change risks, they also exaggerate the political prospects of the NetZero agenda and, thus, the certainty (as distinct from the magnitude) of the transition risks facing fossil-intensive industries. As if looming planetary disaster leaves us no choice but to phase out fossil fuels as rapidly as possible. As our comments show, that is a political doctrine, not a scientific finding.

To explain investors' "need for information about climate-related risks," the SEC cites the FSOC's October 2021 report on climate-related financial risk, which confuses the administration's wishes with realistic predictions.

From the FSOC report's executive summary:

> The United States has made a commitment to lowering U.S. greenhouse gas (GHG) emissions by 50-52 percent from 2005 levels by 2030 and set a goal of a net-zero emissions economy by 2050 . . . Sectors of the economy that are GHG-intensive, which include the energy, transportation, manufacturing, and agricultural sectors, likely need to undergo significant structural changes. These changes will likely require technological innovations and complementary policy actions that incentivize transitions to low-GHG methods of production. These could include regulation of GHG emissions, tax policies, or other measures that would incentivize or require reductions in GHG emissions. The necessary structural changes are likely to broadly affect households, communities, and businesses.[125]

The FSOC writes as if President Biden's nationally determined contribution (NDC)—his emission-reduction pledge under the Paris Agreement[126]—were an actual "commitment" of the "United States." It is not. An NDC is an administration policy statement, not unlike the President's annual *Budget of the United States*, which congressional critics routinely pronounce "dead on arrival." An NDC is non-binding under international law and has no domestic legal force or effect unless Congress, via existing or new statutes, authorizes and funds the component policies. The FSOC report came out just as the Clean Electricity Performance Program,[127] which was to be the centerpiece of President Biden's "clean energy" program, failed to win majority support in the U.S. Senate.[128]

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[125] Financial Stability Oversight Council, *Report on Climate-Related Financial Risk 2021,* October 2021, https://home.treasury.gov/system/files/261/FSOC-Climate-Report.pdf.

[126] The United States of America Nationally Determined Contribution. Reducing Greenhouse Gases in the United States: A 2030 Emissions Target, April 15, 2030, https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/United%20States%20of%20America%20First/United%20States%20NDC%20April%2021%202021%20Final.pdf.

[127] Ashley J. Lawson, *The Clean Electricity Performance Program (CEPP): In Brief*, Congressional Research Service, October 11, 2021, https://sgp.fas.org/crs/misc/R46934.pdf.

[128] Josh Lederman, Sahil Kapur and Leigh Ann Caldwell, "Clean energy program likely to be dropped because of Manchin's objections," NBC News, October 16, 2021, https://www.nbcnews.com/politics/politics-news/clean-energy-program-likely-be-dropped-because-manchin-s-objections-n1281698.

Since the late 1980s, climate campaigners have lobbied Congress to impose "binding requirements or enforceable mandates to reduce GHGs." None has ever been enacted.[129] Congress today is no closer to enacting a carbon tax, an economywide cap-and-trade program, or a federal clean electricity standard than it was in 2010.

If anything, the legislative prospects for "bold" climate policies are dimmer now than in January 2021. High energy prices are a feature, not a bug, of anti-fossil fuel policies. Inflation, soaring energy prices, interest-rate hikes, recession worries, and energy-security concerns all weigh against legislative proposals to curb or penalize fossil energy use, which would further drive up the cost of energy and other necessities.

Figure 25, for example, taken from Dayaratna, Tubb, and Kreutzer (2022), which will be discussed below, shows how policies aimed at achieving NetZero emissions can affect household electricity expenditures.

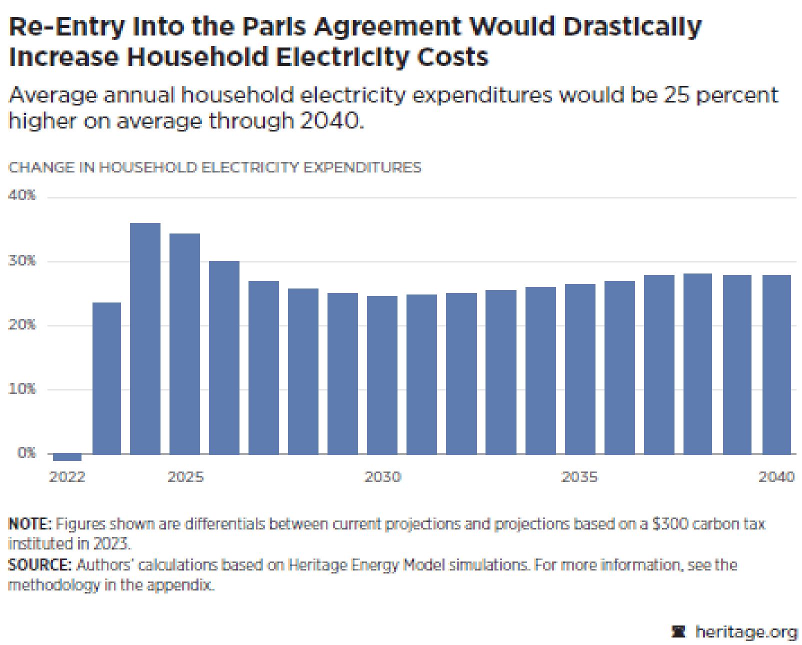

Figure 25. How re-entry into the Paris agreement (modeled via a $300 carbon tax) would impact household electricity expenditures

Climate "ambition" still runs high in federal agencies, but courts are increasingly skeptical of rulemakings that would vastly expand an agency's powers without a clear congressional authorization.[130] The clear statement doctrine has obvious implications for the SEC's rulemaking.

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[129] Arnold W. Reitze Jr., Global Warming, *31 ENVTL. L. REP. News & Analysis* 10253 (2001).

[130] "We expect Congress to speak clearly when authorizing an agency to exercise powers of vast economic and political significance." *Nat'l Fed' of Indep. Bus. V. Dep't of Lab., Occupational Safety & Health Admin., 142* S.Ct. 661, 665 (2022) (citation omitted). See also *Utility Air Regulatory Group v. EPA*, 573 U.S. 302, 324 (2014) ("When an agency claims to discover in a long-extant statute an unheralded power to regulate 'a significant portion of the

Far from expressly authorizing the SEC to channel capital flows for climate change purposes, the Securities and Exchange Act does not contain the words "climate," "global," "warming," "greenhouse," "carbon," "environment," or "pollution."[131] Moreover, as the Supreme Court has stated, "Normally, an agency action would be arbitrary and capricious if the agency has relied on factors which Congress has not intended it to consider . . . ."[132]

The proposed rule does not discuss the economic, legal, or political factors that continue to constrain U.S. climate policy. The effect is to exaggerate the likelihood that "changes in regulations, consumer preferences, availability of financing, technology and other market forces"[133] will soon turn fossil-fuel company stock into worthless paper.

No previous energy transition occurred in the space of three decades, nor in previous transitions did one class of energy sources replace another. Rather, energy analyst Daniel Yergin reminds us, citing technology scholar Vaclav Smil, "past energy transitions have also been 'energy additions'—one source atop another. Oil, discovered in 1859, did not surpass coal as the world's primary energy source until the 1960s, yet today the world uses almost three times as much coal as it did in the '60s."[134]

The SEC overlooks this history and the economic and technological realities (discussed below) that make implementation of NetZero policies anything but a sure thing. By raising unrealistic expectations, the SEC not only ignores "an important aspect of the problem," namely, the long-term additive nature of energy transitions, it also risks misleading investors by making speculative distant outcomes appear to be near and certain. In those respects, too, the rule is arbitrary and capricious, and should not be implemented.

IX. Ignoring Climate Policy Costs to Consumers, Non-Fossil Fuel Company Shareholders, and the Economy

Recent Carbon Tax Studies

The NetZero agenda aims to drive private capital out fossil-intensive investments and into "climate-aligned" investments. Proponents typically prefer a combination of mandates and subsidies to decarbonize the economy, but forecasting the economic impacts is difficult because there are many moving parts and hidden costs.

American economy,' . . . we typically greet its announcement with a measure of skepticism. We expect Congress to speak clearly if it wishes to assign to an agency decisions of vast 'economic and political significance.'" (citations omitted.)

[131] Securities and Exchange Act of 1934 (As Amended Through P.L. 116–283, Enacted January 1, 2021), https://www.govinfo.gov/content/pkg/COMPS-1885/pdf/COMPS-1885.pdf.

[132] *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983)

[133] 87 FR 21336.

[134] Daniel Yergin, "Why the Energy Transition Will Be So Complicated," The Atlantic, November 27, 2021, https://www.theatlantic.com/international/archive/2021/11/energy-shock-transition/620813/.

It is simpler to model the cost of carbon taxes set at different prices and calculate the emission reductions and associated macroeconomic, household, and energy market impacts. Another virtue of this approach is that it can give a reasonable picture of the lowest cost required to achieve a specific level of emission reduction. Most economists agree that a carbon tax is a more efficient mitigation policy than a hodgepodge of mandates, prohibitions, and subsides. Unlike prescriptive regulations, project denials, or massive spending programs, taxing CO_2 emissions incentivizes all economic actors to find and exploit economical emission-reduction opportunities. In addition, the revenues can be used to cut other taxes.

A just-completed Heritage Foundation study uses a clone of the U.S. Energy Information Administration's National Energy Modeling System (NEMS) to project the economic impacts and emission reductions from seven alternative revenue-neutral carbon taxes.[135]

The Heritage analysts modeled carbon taxes with per-ton prices of $35, $54, $75, $100, $150, and $300. Each alternative tax begins in 2022 with half of the specified value per ton of CO_2, and increases annually by 2.5 percent each year thereafter until it doubles to its full value. In these simulations, revenues from the tax are rebated back to consumers in a deficit-neutral manner.

As it turns out, none of the alternatives comes close to achieving NetZero emissions by 2050. Notably, even the $300 per ton carbon tax would only reduce emissions to 44 percent of 2005 levels in 2030 and 47 percent in 2040. At higher-priced carbon taxes, the model crashes, so it is not able to simulate the economic impacts of achieving NetZero emissions by 2050.[136]

Nonetheless, the $300 per ton carbon tax has severe economic impacts, including:

- An overall average reduction of more than 1.2 million jobs per year;
- A peak employment reduction of more than 7.8 million jobs;
- An average annual income loss for a family of four of $5,100;
- A total income loss for a family of four exceeding $87,000 over the 18-year time horizon;
- An aggregate GDP loss of over $7.7 trillion over the 18-year time horizon; and,
- Increases in household electricity expenditures averaging 23 percent per year.

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[135] Kevin D. Dayaratna, Katie Tubb, and David Kreutzer, *The Unsustainable Costs of President Biden's Climate Agenda*, Heritage Foundation, Backgrounder No. 3713, June 16, 2022, https://www.heritage.org/sites/default/files/2022-06/BG3713_0.pdf.

[136] Specifically, higher level taxes cause a contraction in residential investment beyond what the model can mathematically handle.

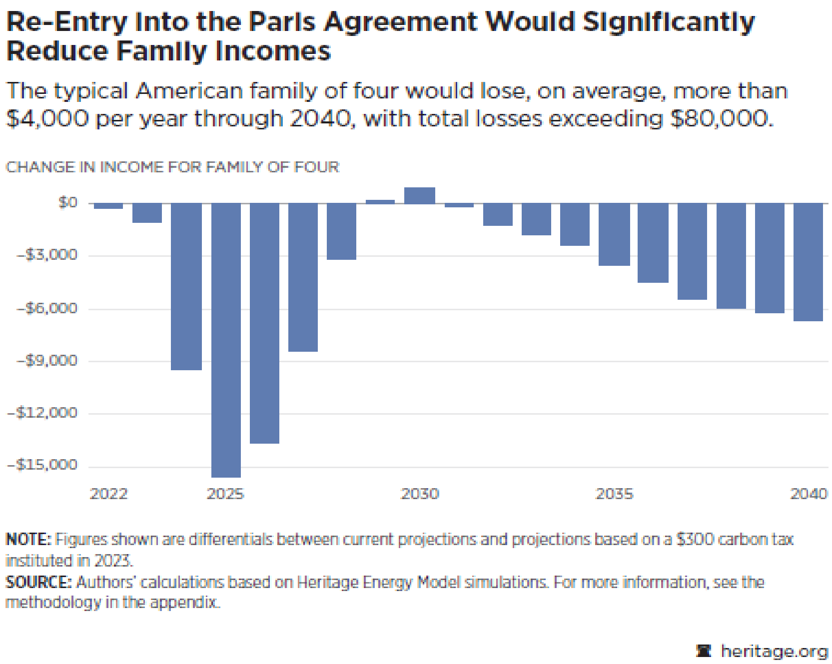

Figure 26. Family income impact $300 carbon tax (simulated as re-entry into Paris agreement)

Those formidable economic sacrifices would achieve no detectable climate benefits. Even assuming a climate sensitivity of 4.5°C—50 percent higher than the IPCC's best estimate of 3.0°C[137]—eliminating all U.S. emissions immediately would avert less than 0.2°C of global warming by 2100. Figure 27 illustrates this result.

[137] IPCC, AR6, *Climate Change 2021: The Physical Science Basis*, Summary for Policymakers, p. 11, https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf.

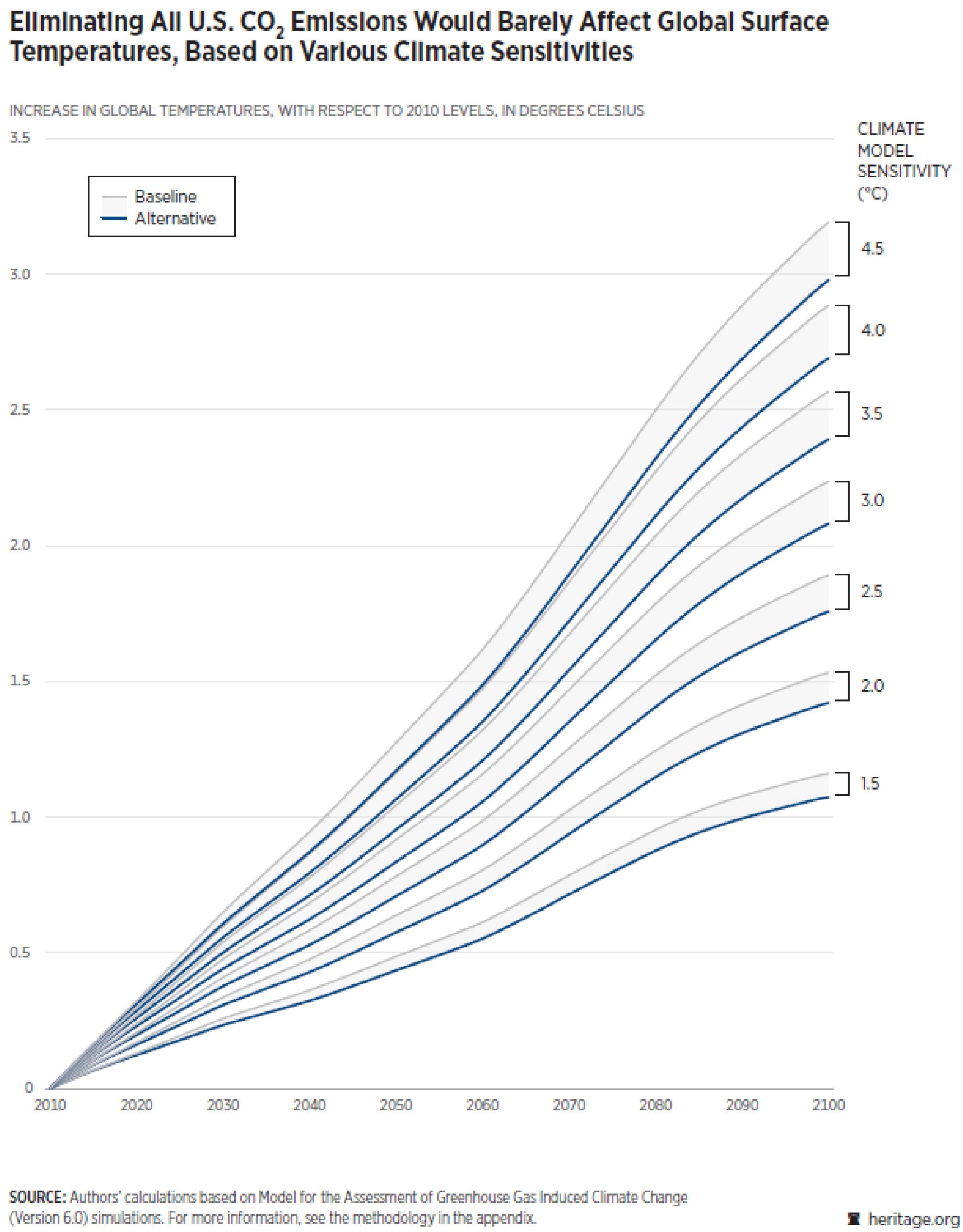

Figure 27. The climate impact of eliminating CO2 emissions from fossil fuels completely.

The $300 per ton tax would avert less than 0.1°C. If the IPCC's best sensitivity estimate is used, the warming reduction achieved by the $300 per ton tax is below the 0.08°C margin of error.[138] It would be undetectable with current technologies.

As indicated above, the adverse economic impacts of a $300 per ton carbon tax are likely smaller than those of regulations that achieve comparable emission reductions. In other words, achieving

[138] NOAA, Global Temperature Uncertainty, https://www.ncei.noaa.gov/access/monitoring/dyk/global-precision (accessed June 14, 2022).

a 47 percent reduction in U.S. emissions via regulatory changes in capital and credit markets would likely have more severe economic impacts than those resulting from a $300 per ton carbon tax.

Peng et al. (2021) find that a U.S. carbon tax would have to be set at $1,500 per ton to achieve 80 percent decarbonization by 2050.[139] An even higher tax would be needed to achieve 95 percent decarbonization.

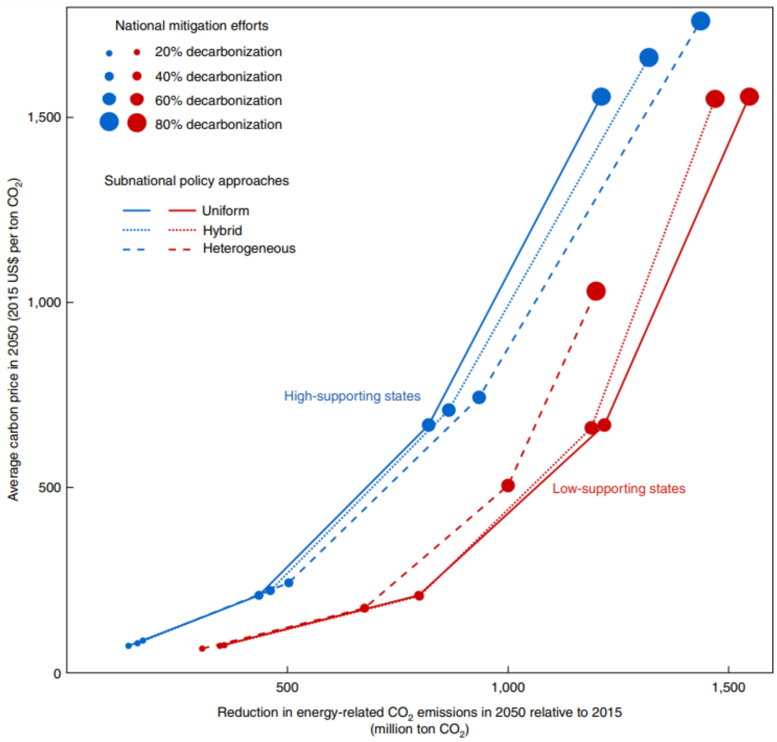

Figure 28. Per-ton price of 80% CO2 emission reduction, carbon tax vs. state policies

When the near-NetZero tax maxes out in 2050, the cost to the economy amounts to 11.9 percent of GDP. Lomborg put that number in perspective in an October 2021 *Wall Street Journal* op-ed:

> Total expenditure on Social Security, Medicare, and Medicaid came to 11.6 percent of GDP in 2019. The annual cost of trying to hit Mr. Biden's target will rise to $4.4 trillion by 2050. That's more than everything the federal government is projected to take in this year in tax revenue. It breaks down to $11,300 per person per year, or almost 500 times more than what a majority of Americans is willing to pay.

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[139] Wei Peng et al. 2021. The surprisingly inexpensive cost of state-driven emission control strategies. *Nature Climate Change* Vol. 11, 738–745, https://www.nature.com/articles/s41558-021-01128-0. Don't be fooled by the title. What is surprising is that achieving NetZero through heterogeneous state policies would not be much more expensive than a draconian national carbon tax!

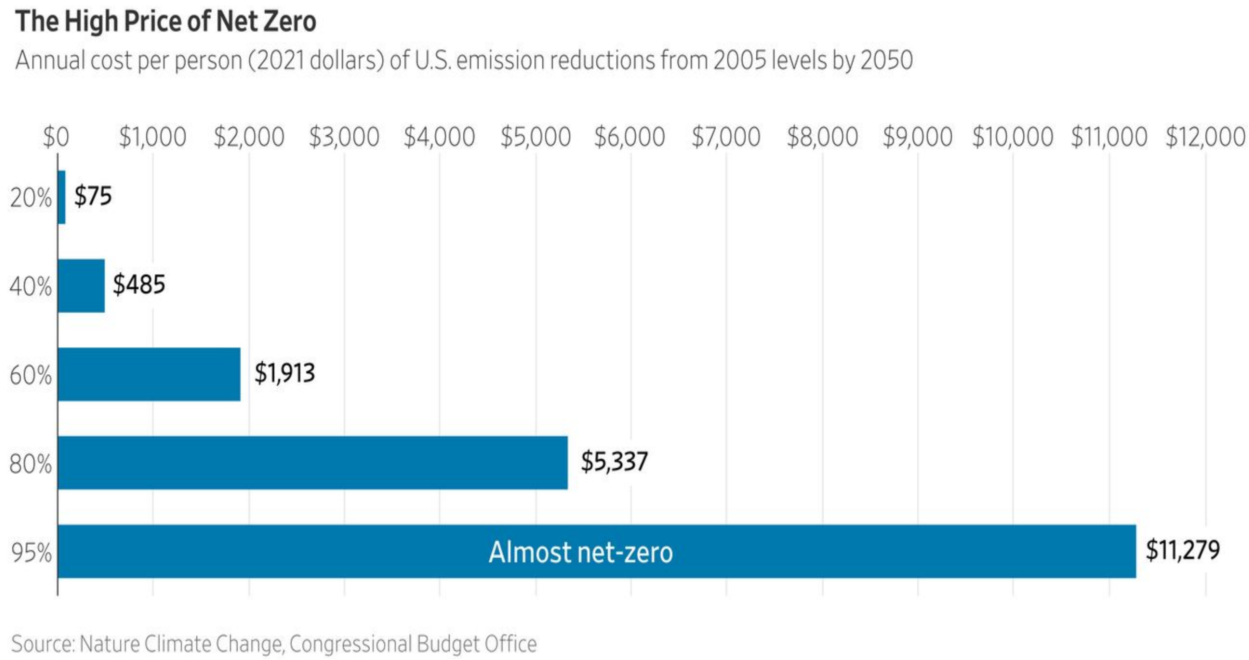

Figure 29. Per-person cost of reducing U.S. CO2 emissions by 2050

Clearly, transition risks are not limited to the fossil-fuel companies in the crosshairs of climate campaigners. Long-term investors in general will suffer if, as the Heritage and Peng et al. analyses suggest, the pursuit of NetZero imposes crushing burdens on households and the economy.

The expenses associated with pursuing a NetZero agenda will vastly outweigh the value to the public. Most Americans are unwilling to spend $20 or $10 a month in higher electric bills to combat climate change.[140] A recent poll finds that more than one third of registered voters were unwilling to spend $1 per month on climate policies.[141]

Nowhere does the proposed rule address the macroeconomic, household, and energy market costs of forcibly reducing emissions on the pace and scale envisioned by the Biden administration, namely, a 50-52 percent reduction below 2005 emissions by 2030 and NetZero by 2050. The proposal thus ignores a hugely "important aspect of the problem." It is therefore arbitrary and capricious, and should not be implemented.

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[140] AEA Press Office, Press Release: "Survey Makes Clear: Voters Don't Want to Pay for Biden's Global Warming Agenda," April 28, 2021, https://www.americanenergyalliance.org/2021/04/aea-survey-makes-clear-voters-dont-want-to-pay-for-bidens-global-warming-agenda/; Emily Ekins, "68 Percent of Americans Wouldn't Pay $10 a Month in Higher Electric Bills to Combat Climate Change, Cato at Liberty, March 8, 2019, https://www.cato.org/blog/68-americans-wouldnt-pay-10-month-higher-electric-bills-combat-climate-change.

[141] Kent Lassman, "More than One-third of Registered Voters Are Unwilling to Spend $1 Per Month on Climate Change Policies," Open Market, May 25, 2021,

Granular Analysis: Batteries, NetZero, New York

Francis Menton, author of the Manhattan Contrarian blog, has been writing about the technical debate on NetZero-related issues for several years. We commend to the SEC's attention Menton's detailed but layman-friendly essay, "The Full Cost of Electrifying Everything Using Only Wind, Solar, and Batteries."[142]

Menton observes that academic analysts rely almost exclusively on complex modeling to determine the cost and feasibility of replacing fossil fuels with wind, solar, and batteries. He has yet to find any demonstration projects designed to test the claim that affordable battery storage can power an entire state during week-long periods of calm winds and cloudy skies.[143]

In recent testimony on New York's NetZero scoping plan, Menton raised several basic technical objections. Just to replace New York's current fossil-fuel generation with renewables, the State would need 10,000 gigawatt hours (GWh) of storage capacity. At the price of Tesla batteries, that would cost about $1.5 trillion—roughly the size of New York's GDP. The planned electrification of homes and vehicles could triple annual electricity consumption, pushing up the cost of storage to 3 times the State's GDP.[144]

Menton reports that of the approximately 60 other speakers who testified, "not a one addressed or attempted to refute any of my points. Clearly, to a person, they were unaware of these issues. It's kind of shocking."

The SEC's proposal does not mention battery storage, much less discuss the cost and feasibility of backing up a wind- and solar-dominated electricity system without fossil fuels. Nor does the proposal consider how the cost and reliability problems arising from rapid phaseout of fossil-fuel electricity could damage America as a country in which to invest and build wealth.

Again, the proposal ignores "an important aspect of the problem." It is therefore arbitrary and capricious, and should not be implemented.

VII. Ignoring the Economic, Environmental, and Geopolitical Risks of Mandating a Material-Intensive Energy System

[142] Francis Menton, "The Full Cost of Electrifying Everything Using Only Wind, Solar, and Batteries," Manhattan Contrarian, January 14, 2022, https://www.manhattancontrarian.com/blog/2022-1-14-calculating-the-full-costs-of-electrifying-everything-using-only-wind-solar-and-batteries.

[143] Menton, "MIT Weighs in On Energy Storage," Manhattan Contrarian, May 26, 2022, https://www.manhattancontrarian.com/blog/2022-5-26-mit-weighs-in-on-energy-storage.

[144] Menton, "My Testimony on New York's 'Scoping Plan' to Achieve Net Zero Carbon Emissions," Manhattan Contrarian, May 03, 2022, https://www.manhattancontrarian.com/blog/2022-5-3-my-testimony-on-new-yorks-scoping-plan-to-achieve-net-zero-carbon-emissions.

In May 2021, the International Energy Agency (IEA) released *The Role of Critical Minerals in Clean Energy Transitions*.[145] The IEA is perhaps the first agency to clarify the nature of "clean energy transitions." What the Paris treaty and NetZero agendas aim at most fundamentally is a "shift from a fuel-intensive to a material-intensive energy system."[146] Such a project creates substantial economic, environmental, and geopolitical risks seldom discussed by ESG proponents. Moreover, the shift to a material-intensive energy system may not even be feasible, as Manhattan Institute scholar Mark Mills explained in a review of the IEA report.[147]

The important issues raised by the IEA report and Mills's commentary are nowhere addressed in the SEC's proposal. We summarize them here.

Point One: "Green-energy machines use far more critical minerals than conventional-energy machines do."[148] The IEA chart below shows that an electric car typically requires six times the energy transition mineral (ETM) inputs of a conventional car, and an onshore wind plant requires nine times the mineral resources of a gas-fired power plant.

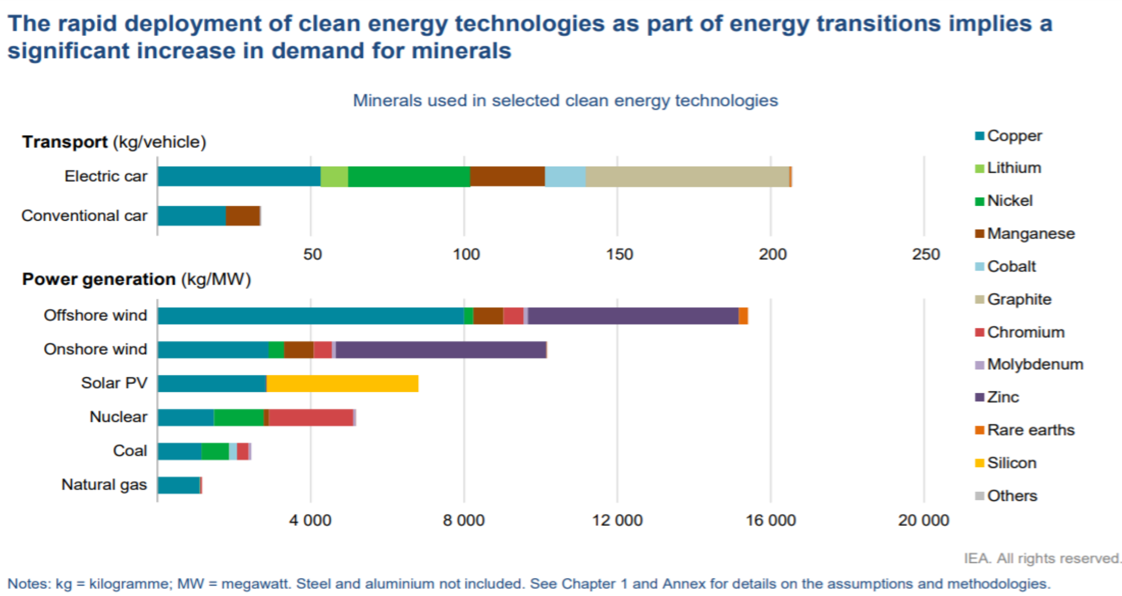

Figure 30. Comparative mineral intensities of conventional and "clean" technologies

Point Two: The IEA estimates that by 2040, Paris climate treaty goals will require the global economy to consume 4 times more minerals than in 2020, including: 7 times more rare earths, 19

[145] International Energy Agency (IEA), *The Role of Critical Minerals in Clean Energy Transitions*, May 2021, https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions (hereafter IEA Minerals).
[146] IEA Minerals, p. 28.
[147] Mark P. Mills, "Biden's Not-So-Clean Energy Transition," *Wall Street Journal*, May 11, 2021, https://www.wsj.com/articles/bidens-not-so-clean-energy-transition-11620752282?mod=hp_opin_pos_1.
[148] Mills, Ibid.

times more nickel, 21 times more cobalt, 25 times more graphite, and 42 times more lithium.[149] "An even faster transition, to hit net-zero *globally* by 2050, would require six times more mineral inputs in 2040 than today."[150]

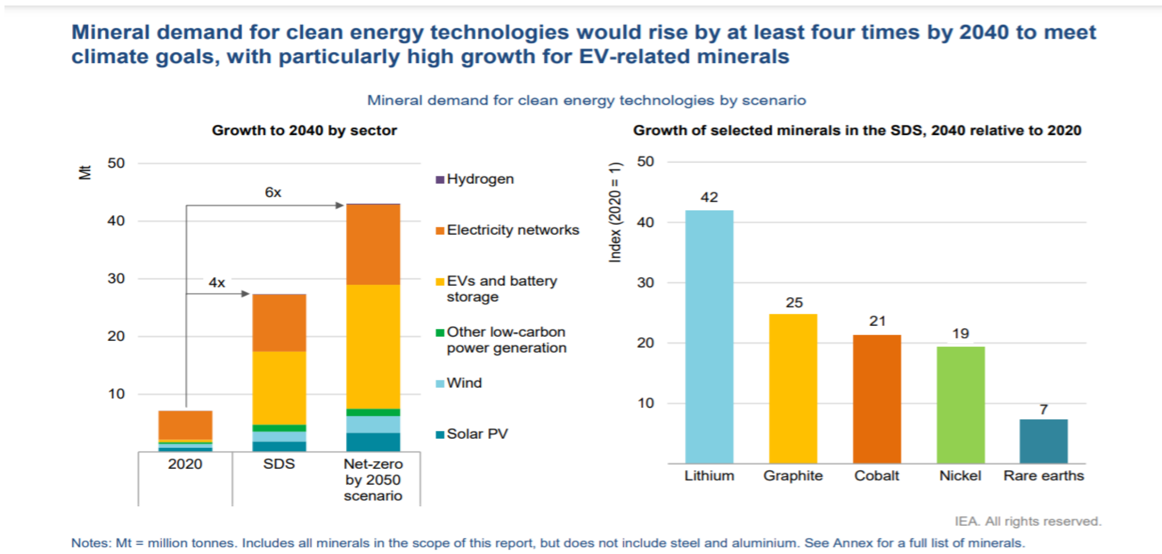

Figure 31. Mineral demand increases by 2040 under Paris and global NetZero targets

Point Three: "The world doesn't have the capacity to meet such demand. As the IEA observes, albeit in cautious bureaucratese, there are no plans to fund and build the necessary mines and refineries."[151] "It has taken on average over 16 years to move mining projects from discovery to first production," according to the IEA. Mills comments: "Start tomorrow and new ETM production will begin only after 2035. This is a considerable problem for the Biden administration's plan to achieve 100 percent carbon-free electricity by 2035."

Figure 32. Global average lead times from discovery to production

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[149] IEA Minerals, p. 9.
[150] IEA Minerals, p. 8.
[151] Mills, Op Cit.

Point Four: The IEA projects "moderate growth" in mineral prices, yet acknowledges that implementing the Paris Agreement would "supercharge demand for critical minerals," and cites multiple factors that could constrain supplies, causing prices to spike. Those include lack of preparation worldwide for an accelerated energy transition, the aforementioned long development times to get mining projects up and running, growing environmental scrutiny of (and opposition to) extractive industries, and the high concentration of mineral production and processing in a handful of countries, notably China.

The May 2021 IEA report acknowledged that increases in EV battery costs could "eat up the anticipated learning effects associated with a doubling of capacity" and that "market tightness can appear much more quickly than new projects." That is now occurring as demand for lithium and other energy transition minerals exceed supply. A May 2022 report by research firm E Source forecasts that car battery cell prices will surge 22 percent from 2023 through 2026, peaking at $138 per kilowatt-hour.[152]

Some NetZero advocates also fiercely oppose new ETM mining projects. For example, the Center for Biological Diversity recently persuaded the Biden administration to list the Tiehm's buckwheat as an endangered species.[153] As reported in the *Wall Street Journal*, the proposed critical habitat designation for the plant would block Ioneer Ltd.'s planned lithium mine in Nevada. The project could supply more than four times current annual U.S. lithium production, producing enough lithium to make 400,000 electric vehicles each year.[154]

Point Five: The high geographic concentration of ETM mining and processing infrastructure has significant geopolitical implications. In a nutshell, the Paris treaty and NetZero agendas require America to exchange its hard-won global leadership in oil and gas production[155] and recent net energy-exporter status[156] for a future of increasing dependence on OPEC and Russia for hydrocarbons and China for energy transition minerals.

Figures 33 and 34 show the following. China is the world's dominant supplier of graphite and rare earths, and is the largest processor of all the main ETMs: copper, lithium, nickel, cobalt, and rare earths. The United States is not a significant processor of any ETM, nor a significant producer of any ETM except rare earths.

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[152] Phil LeBeau, "EV battery costs could spike 22 percent by 2026 as raw material shortages drag on," CNBC, May 18, 2022, https://www.cnbc.com/2022/05/18/ev-battery-costs-set-to-spike-as-raw-material-shortages-drags-on.html.

[153] Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Tiehm's Buckwheat, 87 FR 6101, February 3, 2022, https://www.govinfo.gov/content/pkg/FR-2022-02-03/pdf/2022-02298.pdf.

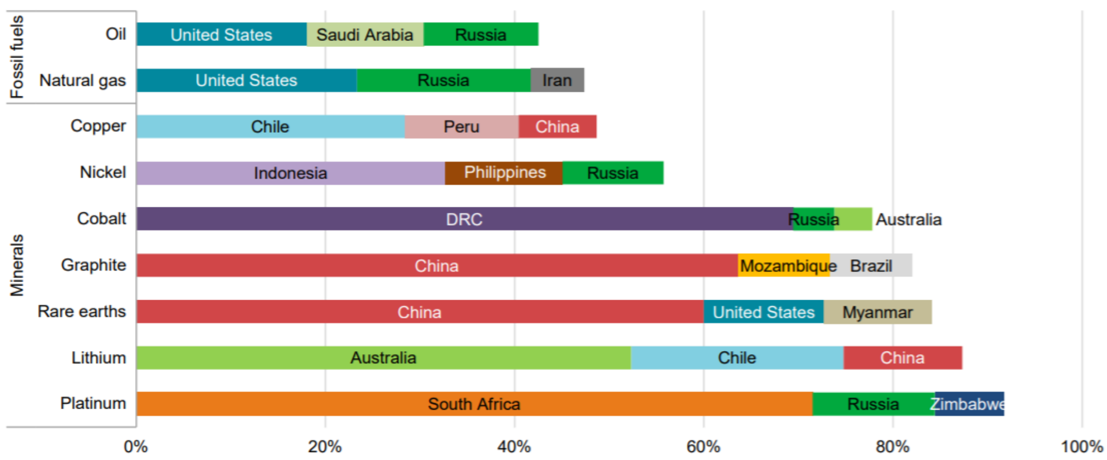
[154] Editorial Board, "Critical Mineral Contradictions: Does Biden Know His Own Regulators Are Blocking Mining Projects?" *Wall Street Journal*, April 3, 2022, https://www.wsj.com/articles/critical-mineral-green-energy-climate-change-electric-cars-biden-mining-zinc-lithium-copper-china-pollution-endangered-species-defense-production-act-11648850666.

[155] Energy Information Administration, "The U.S. leads global petroleum and natural gas production with record growth in 2018," August 20, 2019, https://www.eia.gov/todayinenergy/detail.php?id=40973.

[156] Energy Information Administration, "U.S. total energy exports exceed imports in 2019 for the first time in 67 years," April 20, 2020, https://www.eia.gov/todayinenergy/detail.php?id=43395#.

Current production of many energy transition minerals is more geographically concentrated than that of oil or natural gas

Share of top three producing countries in total production for selected minerals and fossil fuels, 2019

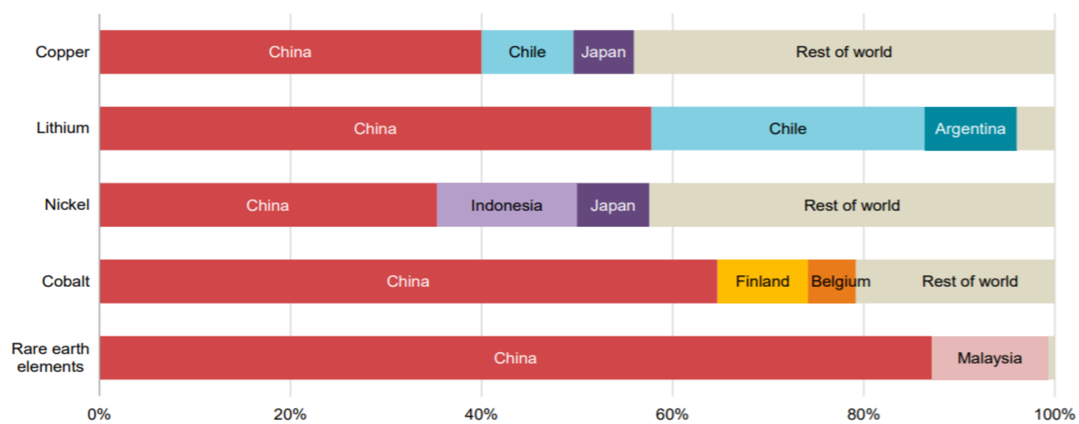


Sources: IEA (2020b); USGS (2021).

Figure 33. Top three producing countries, fossil fuels and ETMs

The level of concentration is similarly high for processing operations, with China's significant presence across the board

Share of processing volume by country for selected minerals, 2019



Note: The values for copper are for refining operations.
Sources: World Bureau of Metal Statistics (2020); Adamas Intelligence (2020) for rare earth elements.

Figure 34. Top three processors, ETMs

The information in those charts has an important implication: Whereas America's geopolitical influence is set to increase in a global economy powered by gas and oil, China's is set to increase in a global economy powered by ETMs.

The relevance of these ETM issues to the SEC's proposal is profound. The proposal mentions "mining" and "minerals" but only with regard to SEC filing issues, not with regard to the inadequacy of current U.S. mining and processing infrastructure, or the technical, economic, and regulatory challenges to developing such capabilities in a timely manner.

Similarly, the proposal does not discuss the eco-litigation risks to companies seeking to mine and process ETMs, the potential for significant price spikes if mandate- and subsidy-fueled demand exceeds available supplies, or the risks to the economy and shareholders if America becomes increasingly depend on geopolitical rivals for both hydrocarbons and critical minerals.

All those concerns are "important aspect[s] of the problem," and all are ignored in the SEC proposal. If the energy "transition" is not "smooth" but "disorderly" and "disruptive,"[157] America could become a poorer and riskier place in which to invest and build wealth. The SEC acknowledges the potential for disorder and disruption, but does not explicate it, invite comment on it, or explain why such "systemic" risks are worth taking. In short, this one-sided rulemaking is arbitrary and capricious, and should not be implemented.

IX. Downplaying Regulatory Impediments

Last year, University of Colorado professor Roger Pielke, Jr. outlined a simple way to keep track of the Biden administration's progress in achieving a zero-emission electric power sector:

> In January 2021, according to the U.S. Energy Information Administration, in the United States there were 1,852 coal and natural gas power plants that generated electricity.[158] By 2035, to hit President Biden's target all of these power plants will have to be either shut down or converted into zero-emissions power plants (using carbon capture and storage technologies that presently do not exist).
>
> There are 164 months until 2035. That means that more than 11 of the fossil fuel power plants operational in January 2021 will need to be closed every month, on average, starting today until 2035.[159]

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[157] IEA, 21357.

[158] EIA, Electricity, Form EIA-923 detailed data with previous form data (EIA-906/920), https://www.eia.gov/electricity/data/eia923/.

[159] Roger Pielke, Jr., The Honest Broker, "Tracking Progress Towards President Biden's 2030 Emissions Reduction Target," April 22, 2021, https://rogerpielkejr.substack.com/p/tracking-progress-towards-president?mc_cid=98f7be9b02&mc_eid=6aca7d7399.

Commenting on Pielke, Jr.'s metric, Florida International University professor and CEI Senior Fellow Mario Loyola explains the scope of the challenge confronting the Biden administration:

> Hundreds of those plants produce several multiples as much electricity as the largest solar-power plant in the United States, which means that as those coal and natural-gas plants close, they will have to be replaced by dozens of new renewable-energy plants *every month*. Meanwhile, back in the real world, the federal government can barely manage to issue permits for a small handful of renewable-energy projects *every year*.[160]

The sheer number of renewable energy projects required to achieve NetZero electricity by 2035 and the land surface area affected are staggering. Loyola explains:

> Focusing just on the solar part, consider that each new solar project might have a total footprint of 10,000 acres. Multiply that by 1,000 projects, and you've already covered an area twice the size of New Jersey with solar panels. Because of intermittency and other issues, you can multiply that area by maybe two. Now add thousands of utility-scale batteries (just to extend the power output of solar plants through evening hours and cover increasingly frequent shortfalls), and hundreds of thousands of miles of transmission lines.[161]

The problem, Loyola contends, is that, as implemented by agencies, the federal permitting and environmental review process established by the National Environmental Policy Act (NEPA) only has the bandwidth to complete about 70 environmental impact statements (EISs) per year. If a federal permit is required, a major project cannot move forward until its EIS is completed and the responsible agency or agencies have granted project developers a permit. The average time to complete an EIS is 4.5 years. For transportation projects, the average is 7 years. "In a typical year, federal agencies issue permits to, at most, a few dozen solar and wind projects across the entire country. Individual federal agencies get totally overwhelmed by just a handful of permit applications," he explains.

Granting a permit is seldom the end of the story. The risk of lawsuits is almost 100 percent, and litigation can drag on for years. Loyola acknowledges that Congress could exempt renewable energy projects from NEPA review. Politically, however, that is a non-starter. A major purpose of NEPA is to empower local communities to raise environmental concerns about federal agency actions, including permitting decisions. "What those congressmen would be voting for is to cut their local constituents out of voicing their concerns about a local project."[162]

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[160] Mario Loyola, "Biden's Green Pie in the Sky," *National Review*, April 29, 2021, https://www.nationalreview.com/2021/04/bidens-green-pie-in-the-sky/.

[161] Mario Loyola, "The Green Dream: What AOC's Signature Policy Really Aims to Accomplish," *National Review*, April 22, 2021, https://www.nationalreview.com/2021/04/the-green-dream-what-aocs-signature-policy-really-aims-to-accomplish/.

[162] "Do NEPA and other Permitting Requirements Doom Green Energy and Infrastructure Plans?" Panel Discussion, C. Boyden Gray Center for the Study of Administrative Law, Antonin Scalia Law School, George Mason University, May 14, 2021, https://administrativestate.gmu.edu/events/do-nepa-and-other-permitting-requirements-doom-green-energy-and-infrastructure-plans/.

The Trump administration made some modest reforms in NEPA procedural rules to expedite construction projects, including renewable energy infrastructure. But on day one, the Biden administration targeted those reforms for repeal,[163] and finalized a major rollback in April 2022.[164]

The most detrimental revision was to reinstate the non-statutory focus on the proposed project—its purpose, the need for it, and alternatives to it—rather than the statutorily-required focus on the proposed agency action. Loyola, in an article about litigation that killed the 125-mile Cardinal-Hickory Creek renewable energy transmission project, explains why flouting the statutory focus matters:

> Alternatives to the federal action are few: Grant the permit or deny the permit. But alternatives to the project are infinitely many. Hence . . . [a]ny court wanting to block an agency action need only ignore the actual wording of NEPA, think of an alternative to the proposed project that the agency didn't consider, and presto—agency action vacated.[165]

America's sclerotic permitting system poses a "systemic risk" to ESG-aligned investing. As one commentator put it, "the New York Subway system opened with 28 stations in 1904, just four and a half years after the first contract was awarded. By contrast, the 2017 Second Avenue subway opening, with just three stations, took seventeen years." That does not bode well for those who claim we have 12 years (now eight) to save the planet.[166]

The proposed rule uses the word "permit" 65 times but only to describe the filing options available to registrants under the proposed SEC rules. There is no discussion of the impediments to ESG-aligned investment from the slow- and litigation-prone environmental review and permitting process. Ignoring this "important aspect of the problem" also makes the rulemaking arbitrary and capricious. Consequently, it should not be implemented.

IX. Conclusion: NetZero or Green Bubble?

[163] Executive Order on Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis, Section 7(e), January 20, 2021, https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/20/executive-order-protecting-public-health-and-environment-and-restoring-science-to-tackle-climate-crisis/.

[164] Council on Environmental Quality, National Environmental Policy Act Implementing Regulations Revisions, 87 FR 23453, April 20, 2022, https://www.govinfo.gov/content/pkg/FR-2022-04-20/pdf/2022-08288.pdf.

[165] Mario Loyola, "The Environmental Left Is Its Own Worst Enemy," *National Review*, January 20, 2022, https://www.nationalreview.com/2022/01/the-environmental-left-is-its-own-worst-enemy/.

[166] Alan Cole, "Why America can't build quickly anymore," FullStackEconomics, March 17, 2022, https://fullstackeconomics.com/why-america-cant-build-big-things-any-more/.

A forced march towards a material-intensive energy system on anything like the schedule contemplated by the Biden administration is unlikely to happen. Inflation, soaring energy costs, massive deficits, and energy-security concerns have derailed expectations of spending additional trillions of dollars on "climate-aligned" energy infrastructure in the 117th Congress. Judicial skepticism about regulatory agendas lacking clear congressional authorization could constrain agencies' pursuit of NetZero. A growing awareness of the methodological malpractices underpinning the "climate crisis" narrative could embolden advocates of pro-growth energy policies while inducing some NetZero proponents to reconsider their views.

Furthermore, the high costs and limited benefits of all carbon-reduction policies, the prospective lack of affordable battery storage on the scale needed to ensure the reliability of a wind- and solar-centric electric grid, the long development times required to scale up the mining and processing infrastructure for a material-intensive energy system, and a permitting process that makes it hard to build anything quickly in America are factors that combine to make significant progress towards NetZero infeasible in the foreseeable future.

In a formula, the supposed transition from fossil fuels to renewables is more likely to be a shift from abundant and affordable fossil fuels to scarce and unaffordable fossil fuels. The recent spikes in energy and mineral prices are certainly consistent with that concern.

Disclosure advocates warn of a carbon bubble. However, even a watered-down version of the Green New Deal paired with constant propaganda about the superiority of "sustainable" investing could set the stage for a green bubble. Beguiled by the false security of government favor, many investors may chase windfall profits, purchasing stock in companies based on the latter's alignment with an ideological echo chamber in Washington, D.C. rather than on market fundamentals.

In his remarks for the September 2009 Solyndra groundbreaking ceremony, then-Vice President Biden boasted that the Department of Energy's $535 million loan guarantee would create "1,000 permanent new jobs," "jobs of the future," "jobs that cannot be exported." Energy Secretary Steven Chu agreed: "And here's the best part, none of these jobs can be outsourced."[167] Almost two years later to the day, all the Solyndra jobs disappeared and the company filed for bankruptcy protection.

The Solyndra loan guarantee was part of a $30 billion program administered by one agency. The administration and its political allies seek to channel capital flows totaling trillions of dollars into what they claim are "industries of the future." As our comments show, the scientific, economic, and political assumptions on which NetZero investing is based are detached from reality. Somebody should warn the public of the risks to investors. If not the Commission, then who?

Respectfully Submitted,

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[167] Solyndra Loan Guarantee Announcement, September 9, 2009, https://www.youtube.com/watch?v=oDpgDxxYQgs&t=518s.

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