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**Responses and Declaration on the
“CFTC Climate-Related Financial Risk RFI”
87 Fed. Reg. 34856 (June 8,2022)**

**SCIENCE DEMONSTRATES
THERE IS NO CLIMATE-RELATED FINANCIAL RISK
CAUSED BY FOSSIL FUELS AND CO₂,
BUT THERE WILL BE DISASTROUS TRANSITION RISK
CONSEQUENCES FOR PEOPLE WORLDWIDE AND THE U. S.
IF FOSSIL FUEL USE AND CO₂ EMISSIONS
ARE REDUCED TO “NET ZERO”**

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Index

I. SUMMARY OF RESPONSES AND DECLARATIONS	3
II. RELIABLE SCIENTIFIC THEORIES COME FROM VALIDATING THEORETICAL PREDICTIONS WITH OBSERVATIONS, NOT CONSENSUS, PEER REVIEW, GOVERNMENT OPINION OR MANIPULATED DATA.....	4
III. SCIENCE DEMONSTRATES THERE IS NO CLIMATE-RELATED FINANCIAL RISK CAUSED BY FOSSIL FUELS AND CO₂.....	6
A. The Theory There Are Extreme Weather Climate-Related Financial Risks Caused by Fossil Fuels and CO₂ is Contradicted By Facts and Thus Scientifically Invalid	6
B. The IPCC is Government Controlled and Thus Only Issues Government Opinions, Not Science, and Thus Provides No Reliable Science of Climate-Related Financial Risk Caused by Fossil Fuels and CO₂.....	14
C. The USGCRP 4th National Climate Assessment Manipulates Data and Relies on IPCC Findings, Thus Provides No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂	16
D. Climate Science is Awash with Manipulated Data, Which Provides No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂	17
E. The IPCC CMIP and Other Models Fail to Reliably Predict Temperatures, Thus	

Provide No Reliable Science of Climate-Related Financial Risk Caused by Fossil Fuels and CO₂	18
F. There is No Urgency to Act Now, Thus No Need for Any CFTC Action	20
G. Today’s 420 ppm CO₂ Level is Near a Record Low, Not Dangerously High, and Thus Provides No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂	21
H. 600 Million Years of CO₂ and Temperature Data Contradict the Theory that High Levels of CO₂ Will Cause Catastrophic Global Warming, Thus Confirming There is No Reliable Science Supporting CFTC Action	23
I. Two Recent Warming Periods Show Increased CO₂ Doesn’t Drive Extreme Temperature Increases, Thus Confirming There is No Climate-Related Financial Risk of Extreme Heat Caused By Fossil Fuels and CO₂	24
J. “Net Zero” Worldwide Emissions Would Have a Trivial Impact on Temperatures, Thus Contradicting of Climate-Related Financial Risk Caused by Fossil Fuels and CO₂ 25	
K. Climate Science Publishing Is Dominated by One-Sided, Paid-For Studies with No Disclosure, and Thus Provides No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂ Without Independent Verification and Disclosure of Funding	26
L. The Endangerment Findings Rely on IPCC Findings, and Thus Provide No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂	27
M. The Social Cost of Carbon TSD Estimates are Scientifically Invalid and Thus Provide No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂	28
N. NAS’ <i>Valuing Climate Damages</i> is Based on Peer Review and Consensus, Not Scientific Method, and Thus Cannot Provide Reliable Science Of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂	29
O. The Logarithmic Forcing from CO₂ Means that Its Contributions to Global Warming is Heavily Saturated, Instantaneously Doubling CO₂ Concentrations from 400 ppm to 800 ppm, a 100% Increase, Would Only Diminish the Thermal Radiation to Space by About 1.1%, Thus Contradicting There is Any Climate-Related Financial Risk Caused by Fossil Fuels and CO₂	29
IV. THERE WILL BE DISASTROUS TRANSITION RISK CONSEQUENCES FOR THE POOR, PEOPLE WORLDWIDE, FUTURE GENERATIONS AND THE UNITED STATES IF FOSSIL FUEL USE AND CO₂ EMISSIONS ARE REDUCED TO “NET ZERO”	32
A. CO₂ is Essential to Our Food, and Thus to Life on Earth	32
B. Photosynthesis from Atmospheric CO₂ Sustains Most Live on Earth	33
C. Greenhouse Gases Prevent Us from Freezing to Death	34
D. Enormous Social Benefits of Fossil Fuels	34
V. CONCLUSION	35
CURRICULUM VITAE	36

I. SUMMARY OF RESPONSES AND DECLARATIONS

Thank you for the opportunity to respond to the Commodity Futures Exchange Commission (“Commission”) requests for information on climate-related financial risk. CFTC Climate-Related Financial Risk RFI, 87 *Fed. Reg.* 34856 (June 8, 2022) states:

The effects of climate change and the transition to a low-carbon economy present emerging climate-related financial risks, which fall into two broad categories: physical risks and transition risks.

It then explains:

Physical risks generally are characterized by harm caused by acute, climate-related events such as hurricanes, wildfires, floods, and heatwaves; and chronic shifts in precipitation patterns, sea level rise, and ocean acidification. These extreme weather events and natural disasters, especially as they increase in frequency and/or intensity, can damage assets, disrupt operations, and increase costs.

Further it explains:

Transition risks generally are characterized by stresses to certain financial institutions or sectors that result from shifts in policy, regulations, customer and business preferences, technology, credit or insurance availability, or other market or social forces that can affect business operations. *Id.*, p. 34857 (emphasis added & footnotes omitted).

It explains the Commission may use responses to its “Request for Information,” which includes 34 questions, “to inform potential future actions including, but not limited to, the issuance of new or amended guidance, interpretations, policy statements, or regulations, or other potential Commission action.” *Id.*, at 34858.

In support, it cites the Financial Stability Oversight Council, “Report on Climate-Related Financial Risk 2021 (Oct., 2021), which states:

Over the past decade, there has been growing attention from financial regulators, business leaders, investors, and policy makers around the world to the threat climate change poses to financial systems and economies at global, national, and local scales. The intensity and frequency of extreme weather and climate-related disaster events are increasing and already imposing substantial economic costs. Such costs to the economy are expected to increase further as the cumulative impacts of past and ongoing global emissions continue to drive rising global temperatures and related climate changes, leading to increased climate-related risks to the financial system. ***

There is broad scientific consensus that climate change is driven by GHG emissions caused by human activity. According to the Intergovernmental Panel on Climate Change (IPCC), climate change is impacting every region of the Earth's climate, these impacts are intensifying, and some of these impacts, such as sea-level rise, are likely to be irreversible. *Id.*, p. 10-11 (emphasis added & footnotes omitted).

We (Happer and Lindzen) are career physicists who have specialized in radiation physics and dynamic heat transfer for decades.

In our scientific opinion, there is no scientific basis for the CFTC inquiry. Real science demonstrates there is no climate emergency and there are no climate-related financial or other risks caused by fossil fuels and CO₂.

Frankly, the “science” cited to support of the CFTC inquiry and possible action is merely government opinion by the International Panel for Climate Change (IPCC) and the U.S. Global Climate Research Program (USGCRP), which is not science and cannot be used as the scientific basis for any CFTC or other government action.

Moreover, there will be a disastrous transition risk for the poor, people worldwide, future generations and the country by reducing fossil fuel use and CO₂ emissions to “net zero.” Contrary to what is commonly reported, CO₂ is essential to life on earth. Without CO₂, there would be no photosynthesis, and thus no plant food. Reducing CO₂ will reduce the amount of food available for the poor and people worldwide.

And, without fossil fuels there will be no low-cost energy worldwide and less CO₂ for photosynthesis making food.

Thus, with all due respect, the Commission should not adopt any guidance, interpretations, policy statements, or regulations, or take other action on the erroneous science there is a climate-related financial or any other risk caused by fossil fuels and CO₂. If any such action is taken, it should be ruled invalid by the courts.

Here’s the science why.

II. RELIABLE SCIENTIFIC THEORIES COME FROM VALIDATING THEORETICAL PREDICTIONS WITH OBSERVATIONS, NOT CONSENSUS, PEER REVIEW, GOVERNMENT OPINION OR MANIPULATED DATA

Scientific knowledge is determined by scientific method. Prof. Richard Feynman, a Nobel Laureate in Physics, provided an incisive definition of scientific method:

“[W]e compare the result of [a theory’s] computation to nature, ... compare it directly with observations, to see if it works. If it disagrees with experiment it is wrong. In that simple statement is the key to science.” *The Character of Physical Law* (1965), p. 150.

Agreement with observations is the measure of scientific truth. Scientific progress proceeds by the interplay of theory and observation. Theory explains observations and makes predictions of what will be observed in the future. Observations anchor understanding and weed out the theories that don’t work. This has been the scientific method for more than three hundred years.

Never, in our experience, has anything in science been beyond dispute. It is astounding that one of the most complex questions in physics (namely, the behavior of a multi-phase, radiatively active, turbulent fluid) should be labeled by the government — and funding agencies it controls — to be so settled that skeptics are silenced. That models supporting the climate-crisis narrative fail to describe observations confirms that the puzzle remains unsolved. Making this peculiar situation particularly dangerous are world leaders who have abandoned the science and intellectual rigor bequeathed to us by the Enlightenment and its forebears.

However, scientific knowledge is not determined by:

Consensus. What is correct in science is not determined by consensus. but by experiment and observations. Historically, scientific consensus have often turned out to be wrong. The greatest scientists in history are great precisely because they broke with consensus. The frequent assertion that there is a consensus behind the idea that there is an impending disaster from climate change is not how the validity of science is determined to quote the profoundly true observation of Michael Crichton:

“If it’s consensus, it isn’t science. If it is science, it isn’t consensus.”

Government Opinion. Nobel physicist Richard Feynman put it clearly:

“No government has the right to decide on the truth of scientific principles.” *The Meaning of It All* (1998), p. 57.

The importance of scientific principles that government does not determine science was chillingly underscored when Stalin made Trofim Lysenko the czar of Russian biology. False

biology prevailed for 40 years in the Soviet Union because Lysenko gained dictatorial control, providing one of the most thoroughly documented and horrifying examples of the politicization of science. Lysenko was strongly supported by “scientists” who benefitted from his patronage. Millions died as a result. William Happer, Chapter 1 “Harmful Politicization of Science,” Michael Gough Ed., *Politicizing Science* (2003), pp. 29-35.

Peer Review. Peer review can be helpful in many areas of science, but it does not determine scientific validity. Agreement of theoretical predictions with observation or experiment, “the scientific method,” is the real touchstone of truth in science.

In our decades of personal experience in the field we have been dismayed that many distinguished scientific journals now have editorial boards that further the agenda of climate-change alarmism rather than objective science. Research papers with scientific findings contrary to the dogma of climate calamity are rejected by reviewers, many of whom fear that their research funding will be cut if any doubt is cast on the coming climate catastrophe. Journal editors have been fired for publishing papers that go against the party line of the climate-alarm establishment.

Alas, peer review of the climate literature is a joke. It is pal review, not peer review. The present situation violates the ancient principle “no man shall be a judge in his own cause.” Accordingly, all peer reviewed climate publications need to be viewed with skepticism. Some are right, but many have serious problems with confirmation bias.

Manipulated and Omitted Unfavorable Observations. Since theories are tested with observations, fabricating and omitting unfavorable facts to make a theory work is an egregious violation of scientific method.

Richard Feynman stated this fundamental principal of scientific method:

“If you’re doing an experiment, you should report everything that you think might make it invalid – not only what you think is right about it... Details that could throw doubt on your interpretation must be given, if you know them.” 1974 Caltech commencement address, *Surely You're Joking, Mr. Feynman!* (1985), p. 311-12

In our experience and as exemplified below, one of us (Lindzen) frankly explained: “misrepresentation, exaggeration, cherry picking, or outright lying pretty much covers all the so-called evidence” marshalled in support of the theory of imminent catastrophic global warming caused by fossil fuels and of the urgent need to achieve “net zero” fossil fuel and other human CO₂ emissions by 2050.¹

U.S. Supreme Court on Science. The U.S. Supreme Court has adopted essentially the same view of science, starting in 1993 with its landmark *Daubert* decision:

“[I]n order to qualify as ‘scientific knowledge,’ an inference or assertion must be derived by the scientific method,” “any and all scientific testimony or evidence admitted [must be] ...reliable,” “tested,” and “supported by appropriate validation.” *Daubert v. Merrell Pharmaceutical, Inc.*, 509 U.S. 579 (1993) (emphasis added).

Scientific evidence must be reliable, tested and validated -- or not be used.

As to peer review, the Supreme Court similarly explained that peer review can be helpful but “does not necessarily correlate with reliability” because “in some instances well-grounded but innovative theories will not have been published.” *Daubert, supra*, p. 593.

¹ Lindzen, “Global Warming for the Two Cultures,” Global Warming Policy Foundation (2018), p. 10. Accord Lindzen, “The Absurdity of the Conventional Global Warming Narrative (April 20, 2022) & “Straight Talk About Climate Change,” Acad. Quest (2017), p. 419.

Thus, scientific knowledge is determined by scientific method, testing theory with observations, not by consensus, government opinion, peer review or manipulated data.

These fundamental principles of science and scientific method are applied to the assertion that there are climate-related financial risks caused by fossil fuels and CO₂ underlying all of the request for information questions, and fortunately and respectfully demonstrates the assertion is not supported by science, next.

III. SCIENCE DEMONSTRATES THERE IS NO CLIMATE-RELATED FINANCIAL RISK CAUSED BY FOSSIL FUELS AND CO₂

A. The Theory There Are Extreme Weather Climate-Related Financial Risks Caused by Fossil Fuels and CO₂ is Contradicted By Facts and Thus Scientifically Invalid

Prof. Stephen Koonin in his book *Unsettled* (2021) devotes five chapters to applying scientific method analyzing facts of the extreme weather physical events identified by the CFTC, including heat waves, hurricanes, tornadoes, sea level rise, wildfires, floods, droughts and precipitation shifts. He concludes:

“The bottom line is that the science says that most extreme weather events show no long-term trends that can be attributed to human influence on the climate.”

“Observations extending back over a century indicate that most types of extreme weather events don’t show any significant change – and some such events have actually become less common or severe – even as human influences on the climate grow.” Id., pp. 99, 97 (emphasis added).

Poignant excerpts from his detailed 86 page analysis follow.

Heat. In “Hyping The Heat,” Chapter 5, he analyses the 2017 4th National Climate Assessment Volume I, called the Climate Science Special Report (CSSR).²

He notes “the CSSR’s Executive Summary says (prominently and with *Very High Confidence*):

“There have been marked changes in temperature extremes across the contiguous United States.” Id., p. 101, (emphasis added).

In support, it presents the chart below with the alarming heading “Record Warm Daily Temperatures Are Occurring More Often,” CSSR Figure ES.5 on p. 19 (Fig. 5.1 in his book on p. 101).

Note that the chart does not provide temperature data, but an unusual ratio, “the ratio of record highs to lows:”

² NCAs are required by the Global Change Research Act of 1990, and are prepared by numerous Federal agencies and departments and the U.S. Global Climate Research Program (“USGRP”). The 4th National Climate Assessment is the most recent. Vol. II is *Impacts, Risks, and Adaptation in the United States* (2018). The 5th NCA is being prepared now.

Record Warm Daily Temperatures Are Occurring More Often

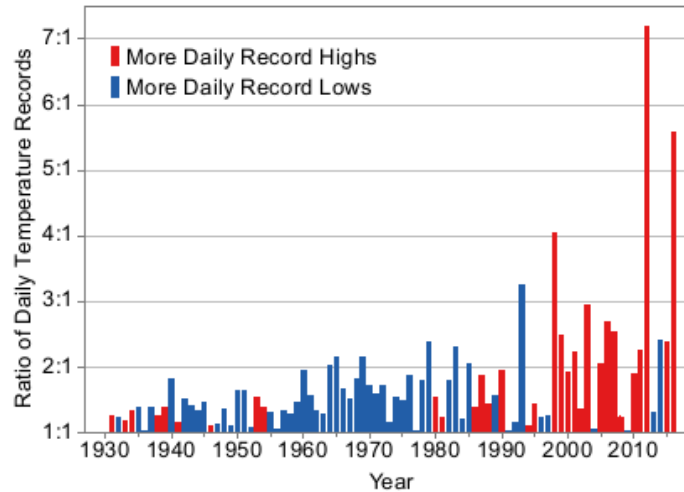
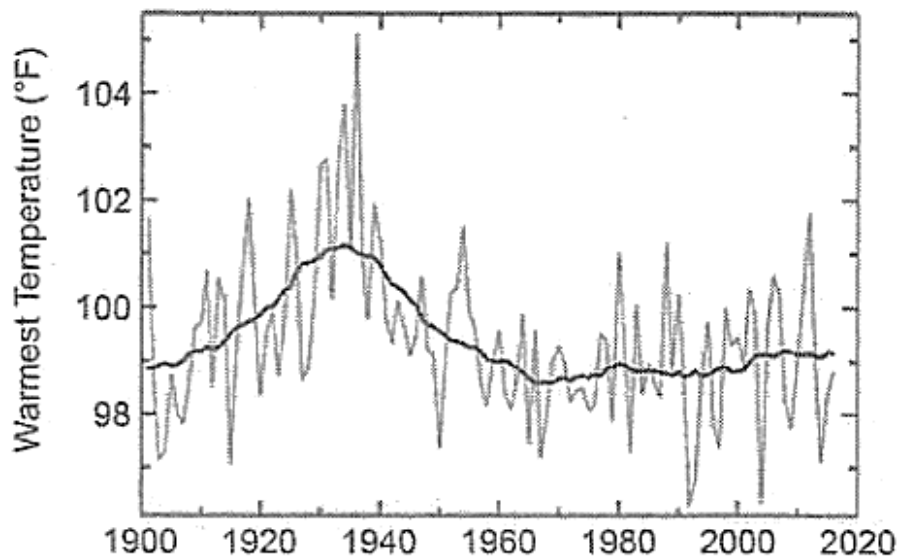


Figure ES.5: Observed changes in the occurrence of record-setting daily temperatures in the contiguous United States. Red bars indicate a year with more daily record highs than daily record lows, while blue bars indicate a year with more record lows than highs. The height of the bar indicates the ratio of record highs to lows (red) or of record lows to highs (blue). For example, a ratio of 2:1 for a blue bar means that there were twice as many record daily lows as daily record highs that year. (Figure source: NOAA/NCEI). From Figure 6.5 in Chapter 6.

He continued: “I suspect that most readers were shocked by that figure, as I was when I first saw it. Who wouldn’t be? An attention grabbing title (“Record Warm Daily Temperatures Are Occurring More Often”) backed up by data with a hockey-stick shape veering sharply upward in recent years.... It sure looks like temperatures are going through the roof.” Koonin, *supra*, p. 102.

So he looked deeper. He found a total “inconsistency” buried deep in the report that shows temperatures from 1900 to 2020. It showed warm temperatures were not occurring more often and that the “warmest temperature has hardly changed over the last 60 years and is about the same today as it was in 1900. It shows that daily high temperatures are no more frequent than they were a century ago. The spiky lines show yearly values, the dark line shows the average. Id.:



CSSR Fig. 6.3, p. 190, his Fig. 5.2, p. 102.

He confirmed this fact by contacting Prof. John Christy, who did an analysis of US daily

temperature extremes from 1895 until 2018. His results were similar to the second CSSR chart above. “The record highs clearly show the warm 1930s [during the Dust Bowl], but there is no significant trend over the 120 years of observations, or even since 1980, when human influences on the climate grew strongly.” Id., pp. 106-07.

As a result, Prof. Koonin did not mince words. “The US government’s most recent assessment report, the 2017 Climate Science Special Report (CSSR) is not just misleading on ... [high temperatures] – it’s wrong,” indeed “shockingly misleading” and “a prominent misrepresentation of climate science.” Id., pp.101, 107, 109.

Thus Prof. Koonin demonstrated two things. First, CSSR manipulated data on high temperatures using ratio numbers, not temperatures, to assert the theory that “Record Warm Daily Temperatures Are Occurring More Often,” which violate scientific method and is “wrong.”

Second, on extreme temperatures, he concluded: “*The annual number of high temperature records set shows no significant trend over the past century, nor over the past 40 years.*” Id., p. 110. Scientific method shows that there is no risk of increased damage by high temperatures as a result of increasing atmospheric CO₂ from fossil fuels. High temperatures will continue to cause damage, but the resulting increased financial losses will have nothing to do with increases of CO₂.

Hurricanes. “Tempest Terrors,” Chapter 6 of Prof. Koonin’s book, deals with the theory that “Storms are becoming more common and more intense and rising greenhouse gas emissions are going to make it all a lot worse.” Id., p. 111.

Prof. Koonin proves “the data and research literature are starkly at odds with this message,” and that “hurricanes and tornadoes have showed no changes attributable to human influences,” id., pp. 111-12, elaborated next.

He cites the 2014 3d National Climate Assessment issued by the US government asserting in “Key Message 8:”

The intensity, frequency and duration of North Atlantic hurricanes, as well as the frequency of the strongest (Category 4 and 5) hurricanes, have all increased since the early 1980s.... Hurricane-associated storm intensity and rainfall rates are projected to increase as the climate continues to warm. Koonin, p. 115 (emphasis added).

He explains, “The report backs up that statement with the graph reproduced in figure 6.3 showing a seemingly alarming increase in the North Atlantic PDI (that is, the strongest hurricanes),” and “the general upward trend is emphasized, so that in the non-expert eye, it looks like we’re in trouble – and headed for more.” Id., p. 115.

POWER DISSIPATION INDEX IN THE NORTH ATLANTIC OCEAN

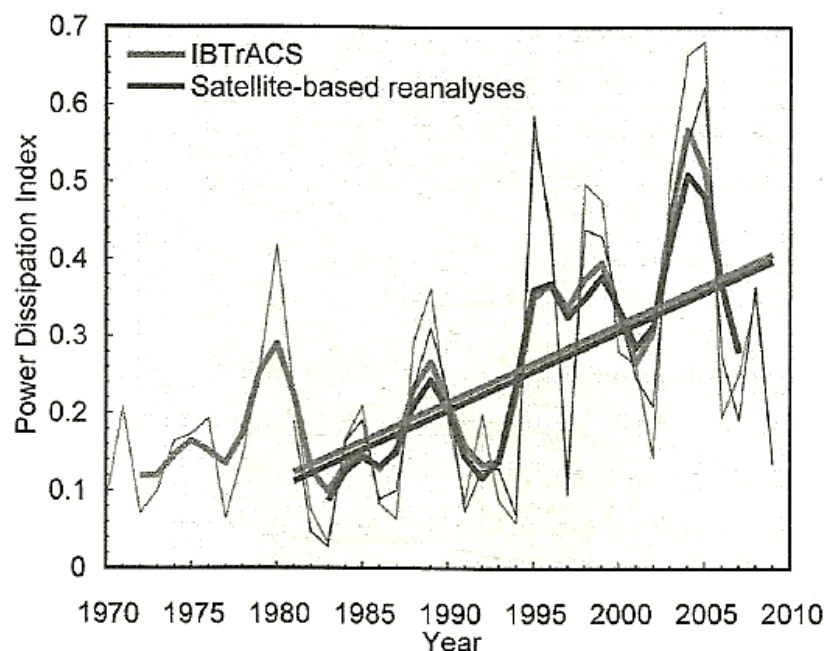


FIGURE 6.3 Power Dissipation Index in the North Atlantic Ocean. Two different analyses of the data are shown, along with straight lines indicating the trend in each. (NCA2014, Figure 2.23.)

Applying standard scientific method, Prof. Koonin examined the facts more deeply to see if they supported the theory that hurricanes were getting much stronger. Once again, he found that a USCCRP National Climate Assessment manipulated the facts and was wrong.

First he looked at the main research paper cited by the assessment. “To my surprise, I found it stated quite explicitly that there are *no* significant trends beyond natural variability in hurricane frequency, intensity, rainfall or storm surge flooding.” *Id.*, p. 115.

Next, he went back and searched the NCA more thoroughly. On page 769, buried in the text of appendix 3, he found this statement:

There has been no significant trend in the global number of tropical cyclones nor has any trend been identified in the number of US land-falling hurricanes. *Id.*, p.117 (footnotes omitted).

Further, he found that the absence of significant trends in hurricanes data was hardly unknown to the experts at the time the 2014 NCA was being prepared.

“The IPCC’s Fifth Assessment Report (AR 5), available in late 2013, states clearly that there is low confidence in any long-term increase in hurricane activity. And a 2012 reconstruction of the PDI back to 1880 reinforces the conclusion that recent decades are nothing out of the ordinary, noting that ‘there have been periods before 1949 that were relatively active compared to the post-1995 era of heightened activity.’ In other words, there have been times before human influences became significant that were at least as active as today.” *Id.*, p. 117.

Next, Prof. Koonin examined the next National Climate Assessment, the 2017 CSSR, to

see if it corrected the 2014 Assessment. It did not. It repeated the same false science: “Key Finding 1 of its Chapter 9 reads:

“Human activities have contributed substantially... to the observed upward trend in North Atlantic hurricane activity since the 1970s.” *Id.*, p. 118 (footnote omitted).

As a result, he again did not mince words: the CSSR “discussion of hurricanes in the 2017 CSSR is a profound violation of Feynman’s... [scientific method] caution, that a scientist must ‘try to give all of the information to help others to judge the value of your contribution; not just the information that leads to judgment in one particular direction or another.’” Koonin, *supra*, p. 119.

This is another egregious violation of scientific method by the USGCRP National Climate Assessment, and further proof that USGCRP National Climate Assessments are merely government opinions, not science, discussed more fully in section III. C below.

In summary, the scientific method shows that there is no risk of increased damage by hurricanes as a result of increasing atmospheric CO₂ from fossil fuels. Hurricanes will continue to cause damage, and the damages will increase with time as more valuable property is located in poorly drained and other hazardous areas. But the resulting increased financial losses will have nothing to do with increases of CO₂.

Tornadoes. The National Oceanic and Atmospheric Administration (“NOAA”) produced an alarming graph that shows the annual number of tornadoes in the US have more than doubled in frequency over the last 20 years compared to the twenty years from 1950 to 1970 *Id.*, p. 121.

Careful scrutiny of the data, however, proves this is false.

Prof. Koonin explained that radar could only detect strong tornadoes, not weak ones, until the last 20 years or so. Thus the alarming 1950 to 1970 NAOO graph only included strong tornadoes because it could not count weak tornadoes. The later graph counted both, weak and strong. Thus to get an accurate comparison, it’s necessary to exclude the weak tornadoes..

He presents two graphs of tornado numbers that exclude the weak tornadoes by using what is called the EF scale of tornado strength. One graph counts tornadoes of an EF of 1 or more, which excludes weak tornadoes. It shows the number of tornadoes has not increased over the past 60 years.

The second graph has even better news. It counts the strongest tornadoes, which have in EF of 3 and above. It shows the number of strong tornadoes *decreased* by about 40% during the last sixty years. *Id.*, p. 123.

Prof. Koonin reports this good news is further confirmed by the IPCC’s 2018 Special Report on Extreme Events, which states in the Executive Summary of its Chapter 3:

There is low confidence in projections of... tornadoes because competing physical processes may affect future trends and because climate models do not simulate such phenomena. Koonin, *supra*, p. 126.

Thus Prof. Koonin concludes “as human influences have grown since the middle of the twentieth century, the number of significant tornadoes hasn’t changed much at all,” and even better, “the strongest storms have become less frequent;” “US tornadoes have become more benign as the globe has warmed over the past seventy-five years, and we have no credible method for projecting future changes.” *Id.*, pp. 123, 126.

In summary, the scientific method shows that there is no risk of increased damage by tornados as a result of increasing atmospheric CO₂ from fossil fuels. Tornados will continue to cause damage, but the resulting increased financial losses will have nothing to do with increases

of CO₂.

Sea Level. “Sea Level Scares” is the subject of Chapter 8.

As background, Prof. Koonin provides data on sea level, reporting looking over hundreds of thousands of years the sea level has risen as much as 400 feet, and fallen 400 feet.

Since the Last Glacial Maximum 22,000 years ago, the sea level has risen 400 feet.

Since 1880, the sea level has risen 10 inches, with the annual rate of increase varying substantially and averaging .07 inches per year.

Between 1925-1940, the average rate of increase was .12 inches per year.

Between 1993-2013, two decades, the average rate of increase was also .12 inches per year. *Id.*, p. 151.

Examining the facts, he pointed out that both the IPCC and the CSSR unscientifically emphasized the sea level increase between 1993–2013, but totally ignored the same increase 1925-1940.

The “IPCC’s 2019 Special Report on the Ocean and Cryosphere in a Changing Climate Report (SROCC) expresses high confidence that the satellite data from 1993 to 2015 shows an acceleration (that is, the rate of [sea level] rise is increasing),” and the IPCC *Climate Change 2013: The Physical Science Basis*, AR5, “had this to say:”

“It has been clear for some time that there was a significant increase in the rate of sea level rise in the four oldest records from northern Europe starting in the early to mid-19th century.” Koonin *supra*, p. 156.

As to the 4th National Climate Assessment (CSSR), Prof. Koonin published “an Op-Ed calling out one of the more egregious misrepresentations in the CSSR” in the *Wall Street Journal* (Nov. 2, 2017), “A Deceptive New Report On Climate” on sea level rise. He singled out both the CSSR and IPCC for cherry-picking the recent two decade sea level rise, but omitting data of a similar sea level rise earlier in the century that contradicts their theory:

“Although decade-by-decade changes in the rate of sea level rise over the past century are central to untangling the effect of human influence from natural influences, the recent assessment reports (the CSSR and the IPCC’s 2019 SROCC [Special Report on the Oceans and Cryosphere in a Changing Climate]) hardly mention them. ***

“All of the assessment reports have plenty of text emphasizing that the rate of sea level rise in the past two decades is higher [.12 inches/year] than the average of the twentieth century [.07 inches/year]. ... The rate of rise over the most recent twenty-five-years should be compared to that other twenty-five year period [also .12 inches/year] to understand just how significant the recent rate is. ***

“The CSSR follows the lead of some prominent climate scientists in hiding the huge fluctuations in the rate of sea level rise over the past century... The report misleads by omission in not mentioning either the strong decadal variability of sea level rise during the twentieth century or the fact that the then most recent values of the rate were statistically indistinguishable from those during the first half of the twentieth century.” *Id.*, pp. 157-58.

Prof. Koonin concludes two things. First, omitting data that contradicts the CSSR and IPCC theory that human influences are raising sea levels dangerously is a fundamental violation of scientific method:

“CSSR and other assessment discussions of sea level rise omit important details that weaken the case for the rate of rise in recent decades being outside the scope of historical

variability, and hence for attribution to human influences.” Id., p. 165.

Second, his bottom line is “we don’t know how much of the rise in global sea levels is due to human caused warming and how much is a product of long-term natural cycles...there’s also scant evidence that [the human] ... contribution has been or will be significant, much less disastrous,” and that “even if we were the culprit and ceased all emissions tomorrow, global sea level would continue to rise.” Id., pp. 165-66.

In summary, the scientific method shows that there is no risk of increased damage from rising sea levels as a result of increasing atmospheric CO₂ from fossil fuels. Sea levels may rise and cause damage, but the resulting increased financial losses will have nothing to do with increases of CO₂.

Next, the following extreme weather events are analyzed more briefly. See his book for more details.

Flooding, Droughts, Wildfires and Other Precipitation Perils. Prof. Koonin’s “Precipitation Perils – From Floods to Fires” Chapter 7 deals with various weather events related to precipitation.

Flooding. He reports the US data shows “modest changes in US rainfall during the past century haven’t changed the average incidence of floods.”

Globally, he cites data from the IPCC that there is “*low confidence* regarding the sign of trend in the magnitude and/or frequency of floods on a global scale.”

Thus he concludes, “we don’t know whether floods globally are increasing, decreasing, or doing nothing at all.” Id., p. 137.

In summary, the scientific method shows that there is no risk of increased damage by flooding as a result of increasing atmospheric CO₂ from fossil fuels. Flooding will cause damage, but the resulting increased financial losses will have nothing to do with increases of CO₂.

Droughts. Prof. Koonin cites data in the US from 1895 to 2015 on the severity of droughts and finds “it’s difficult to see much long-term change.” Id., p. 138.

Globally, he cites the IPCC data showing “pretty much the same thing for the globe as a whole, expressing... ‘*Low confidence* in a global-scale trend in drought or dryness since the middle of the twentieth century,” and also noting “the current impact of human influences seems weak in comparison with natural variability.” Id., p. 140.

He also points out droughts have been more severe and longer lasting in the past, citing data from both the IPCC and a 2009 National Climate Assessment. According to the IPCC in 2014: “There is high confidence for droughts during the last millennium of greater magnitude and longer duration than those observed since the beginning of the twentieth century in many regions.” And the NCA in 2009, “data reveal that some droughts in the past have been more severe and longer lasting than any experienced in the last 100 years.” Koonin, *supra*, p. 140.

In summary, the scientific method shows that there is no risk of increased damage by droughts as a result of increasing atmospheric CO₂ from fossil fuels. Droughts will cause damage, but the resulting increased financial losses will have nothing to do with increases of CO₂.

Wildfires. Prof. Koonin explained there is a powerful new source of data on wildfire: “Sophisticated satellite sensors first began monitoring wildfires globally in 1993.” He cites NASA data that shows the global area burned by fires each year from 2003 to 2015.

The result of this new source of data is totally contrary to what is in the news.

“Unexpectedly, this analysis of the images shows that the area burned annually declined by about 25% from 1998 to 2015.” Further, “Despite the very destructive wildfires in 2020, that year was among the least active globally since 2003.” Id., p. 142.

As a result he suggests, this should change “the conversation about wildfires [from] only one of unavoidable doom due to ‘climate change,’” to a conversation about how “to take steps that would more directly curtail these catastrophes” as “we have significant power to address ... human factors.” Id., p. 144.

In summary, the scientific method shows that there is no risk of increased damage by wildfires as a result of increasing atmospheric CO₂ from fossil fuels. Wildfires will cause damage, but the resulting increased financial losses will have nothing to do with increases of CO₂.

In conclusion as to all of these precipitation perils, Prof. Koonin, applying scientific method and analyzing the facts, states:

“In the end, the data tells us there’s not very much changing very quickly with precipitation, either globally or in the US. Id., p. 147.

Scientific method shows that there is no risk of increased damage by precipitation perils as a result of increasing atmospheric CO₂ from fossil fuels. Precipitation perils of these varying types will cause damage, but the resulting increased financial losses will have nothing to do with increases of CO₂.

Climate-Related Deaths, Agricultural and Economic Disasters. “Apocalypses that Ain’t” is Chapter 9 of Prof. Koonin’s book, where he scientifically analyzes the facts regarding three other theories about extreme weather:

“One is ‘climate-related deaths,’ a menace based on speculation, strained assumptions and incorrect use of data. The second is a future agricultural ‘disaster’ that is belied by the evidence and requires acrobatic distortions to even detect. And the third is purportedly enormous economic costs – which turns out, even based on the data presented, to be minimal, if not too small to measure. Id., p. 167.

Thus none of the three theories are supported by the facts, and scientific method shows that there is no risk of increased damage by any of these three theories as a result of increasing atmospheric CO₂ from fossil fuels.

Extreme Weather Events Conclusion. The enormously important good news, admittedly contrary to conventional government and media wisdom, is that Prof. Koonin rigorously applied scientific method to numerous extreme weather theories identified by the CFTC and others and demonstrated there are no climate-related financial risks caused by fossil fuels and CO₂ that justify regulatory action.

Specifically, he proved “science says that most extreme weather events show no long-term trends that can be attributed human influence on the climate.” Id., pp. 99. This conclusion is fortified by the extensive additional science detailed in sections III and IV below.

His scientific analysis also underscores the disastrous consequences for the poor, people around the world, the U.S. and the West of reducing fossil fuel use and CO₂ emissions to “net zero,” which is detailed in part III.

B. The IPCC is Government Controlled and Thus Only Issues Government Opinions, Not Science, and Thus Provides No Reliable Science of Climate-Related Financial Risk Caused by Fossil Fuels and CO₂

Unknown to most, two IPCC rules require that IPCC governments control what it reports as “scientific” findings on CO₂, fossil fuels and manmade global warming, not scientists. IPCC governments meet behind closed doors and control what is published in its Summaries for Policymakers (“SPMs”), which controls what is published in full reports.

The picture below tells all.³



IPCC Summary for Policymakers writing meeting

This not how scientific knowledge is determined. In science, as the Lysenko experience chillingly underscores, and as Richard Feynman emphasized:

“No government has the right to decide on the truth of scientific principles.”

The two IPCC rules are:

IPCC SPM Rule No.1: All Summaries for Policymakers (SPMs) Are Approved Line by Line by Member Governments

“IPCC Fact Sheet: How does the IPCC approve reports? ‘Approval’ is the process used for IPCC Summaries for Policymakers (SPMs). Approval signifies that the material has been subject to detailed, line-by-line discussion, leading to agreement among the participating IPCC member countries, in consultation with the scientists responsible

³ Donna Framboise. “US Scientific Integrity Rules Repudiate the UN Climate Process (January 29, 2017) link [US Scientific Integrity Rules Repudiate the UN Climate Process | Big Picture News, Informed Analysis.](#)

for drafting the report.”⁴

Since governments control the SPMs, the SPMs are merely government opinions. Therefore, they have no value as reliable science.

What about the thousands of pages in the IPCC reports? A second IPCC rule requires that everything in an IPCC published report must be consistent with what the governments agree to in the SPMs about CO₂ and fossil fuels. Any drafts the independent scientists write are rewritten as necessary to be consistent with the SPM.

IPCC Reports Rule No. 2: Government SPMs Override Any Inconsistent Conclusions Scientists Write for IPCC Reports

IPCC Fact Sheet: “‘Acceptance’ is the process used for the full underlying report in a Working Group Assessment Report or a Special Report after its SPM has been approved.... **Changes ...are limited to those necessary to ensure consistency with the Summary for Policymakers.**” IPCC Fact Sheet, *supra*. (Emphasis added).

IPCC governments’ control of full reports using Rule No. 2 is poignantly demonstrated by the IPCC’s rewrite of the scientific conclusions reached by independent scientists in their draft of Chapter 8 of the IPCC report *Climate Change 1995, The Science of Climate Change* (“1995 Science Report”).

The draft by the independent scientists concluded:

“No study to date has positively attributed all or part (of the climate warming observed) to (manmade) causes.”

“None of the studies cited above has shown clear evidence that we can attribute the observed [climate] changes to the specific cause of increases in greenhouse gases.”

Frederick Seitz, “A Major Deception on Climate Warming,” *Wall Street Journal* (June 12, 1996).

However, the government written SPM proclaimed the exact opposite as to human influence:

“The balance of evidence suggests a discernible human influence on global climate.” 1995 Science Report SPM, p. 4.

What happened to the independent scientists’ draft? IPCC Rule No. 2 was applied, and their draft was rewritten to be consistent with the SPM in numerous ways:

- Their draft language was deleted.
- the SPM’s opposite language was inserted in the published version of Chapter 8 in the 1995 Science Report, on page 439: “The body of statistical evidence in chapter 8 ... now points towards a discernible human influence on global climate.”
- The IPCC also changed “more than 15 sections in Chapter 8 of the report ... after the scientists charged with examining this question had accepted the supposedly final text.” Seitz, *supra*.

⁴ Intergovernmental Panel on Climate Change, Principles Governing IPCC Work, the Procedures for the Preparation, Review, Acceptance, Adoption, Approval and Publication of IPCC Reports, Appendix A Sections 4.4-4.6, https://archive.ipcc.ch/news_and_events/docs/factsheets/FS_ipcc_approve.pdf; <http://www.ipcc.ch/pdf/ipcc-principles/ipcc-principles-appendix-a-final.pdf> (Emphasis added).

As to the full IPCC reports, hundreds of world-class scientists draft some very good science. What to do? Use a presumption that anything in IPCC reports should be presumed to be government opinion with no value as reliable science, unless independently verified by scientific method.

Stop for a moment. Just imagine what would have happened if the IPCC accurately reported the science. The scientists concluded there was no science that attributed all or most of the climate warming observed to manmade causes.

There would be no *Massachusetts v. EPA*, Green New Deal, "Net Zero" regulation, efforts to eliminate fossil fuels, huge subsidies of renewable energy and electric cars. For whatever reason, the IPCC as a government-controlled organization did not and has never followed the science if the facts contradicted the theory of catastrophic global warming caused by fossil fuels and other human emissions.

In conclusion, none of the IPCC SPMs, models, scenarios and other findings asserting that dangerous climate warming is caused by human CO₂ and GHG emissions and fossil fuels are reliable science, they are merely the opinions of IPCC governments.

Thus, as the Lysenko experience chillingly underscores, the IPCC SPMs, models, scenarios and other findings are merely government opinions, not science, and can provide no reliable science of climate-related financial risk caused by fossil fuels and CO₂.

C. The USGCRP 4th National Climate Assessment Manipulates Data and Relies on IPCC Findings, Thus Provides No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂

The 4th National Climate Assessment ("NCA") Vol I, the Climate Science Special Report (CSSR) as noted, is the most recent NCA by the U. S. Global Climate Research Program (USGCRP).

It is merely government opinion, not reliable science, for two reasons.

First, Prof. Koonin detailed numerous examples earlier where the USGCRP CSSR manipulated and omitted data that contradicted its theories, in his words, "egregious" violations of scientific method, "shockingly misleading" and "misrepresentation of climate science." This by itself means the CSSR and probably all the National Climate Assessments are merely government opinion, and the Lysenko experience chillingly reminds us, must be understood as having no value as science.

Second, it relies extensively on IPCC models and opinions that are government controlled "science." The "USGCRP Web site states that: 'When governments accept the IPCC reports and approve their Summary for Policymakers, they acknowledge the legitimacy of their scientific content.'"⁵ Id. (footnote omitted).

However, legitimacy of scientific content is not determined by government, Richard Feynman emphasized, as noted: "No government has the right to decide on the truth of scientific principles." Legitimacy of scientific content is determined by scientific method.

The CSSR chose to rely on IPCC government controlled "scientific" findings 240 times. As a result, their science is contaminated by the IPCC's government-dictated opinions and thus the 4th NCA is merely government opinion, as the Lysenko experience chillingly underscores,

⁵ Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act, 74 *Fed. Reg.* 66496 (Dec. 15, 2009) ("Endangerment Findings"), p. 66511.

has no value as reliable science.

As a result, the 4th NCA and undoubtedly the other NCAs provide no reliable science there is any climate-related financial risk caused by fossil fuels and CO₂.

D. Climate Science is Awash with Manipulated Data, Which Provides No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂

As noted at the outset by Prof. Lindzen, “Misrepresentation, exaggeration, cherry picking, or outright lying pretty much covers all the so-called evidence” marshalled in support of the theory of imminent catastrophic global warming caused by fossil fuels and CO₂.⁶

One of us (Lindzen) in the article “Straight Talk About Climate Change” *Acad. Quest.* (2017), details how an “accumulation of false and/or misleading claims” is what really underlies the so-called “‘overwhelming evidence’ of forthcoming catastrophe.” Lindzen states that he is “surprised that anyone who could get away with such sophistry and downright dishonesty,” covering:

- the hottest years on record
- extreme weather
- sea level rise
- Arctic sea rise
- ocean acidification
- death of coral reefs
- polar bears
- 97% of scientists agree
- global warming as the cause of everything

For example, as demonstrated earlier, the 4th National Climate Assessment Vol. I, the CSSR, Prof. Koonin explained included a “prominent misrepresentation of climate science in an official government report” by providing a chart with the alarming heading, “Record Warm Daily Temperatures Occurring More Often.” Bizarrely, buried later in the report was a chart that showed the facts that the hottest temperatures in the last century were during the Dust Bowl in the 1930s and otherwise hot temperatures had hardly changed in 100 years. See page 7 for both charts.

NASA and NOAA have also been fabricating temperature data to argue that that rising CO₂ levels have led to the hottest years on record according to a study by Wallace and others.⁷

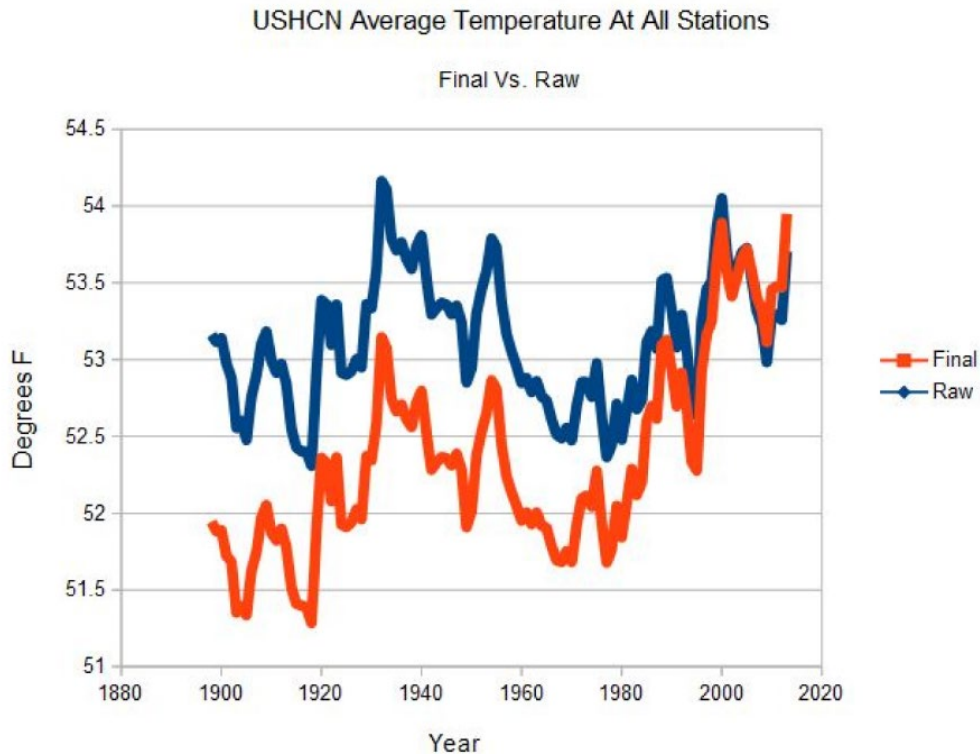
Typical NASA and NOAA alarmist temperature reports state:

- “2015 is Earth's warmest year by widest margin ... since record keeping began in 1880.” NOAA Global Summary Information December 2015 (Jan. 2016)
- “2019 was 2d hottest year on record for Earth say NOAA, NASA, just behind 2016.” NOAA Press Release (Jan. 15, 2020).

The chart below graphically illustrates the difference between actual temperature data, in blue, and NOAA and NASA fabricated temperature data, in red:

⁶ Lindzen, “Global Warming for the Two Cultures,” Global Warming Policy Foundation (2018), p. 10. *Accord* Lindzen, “Straight Talk About Climate Change,” *Acad. Quest* (2017), p. 419 & “The Absurdity of the Conventional Global Warming Narrative (April 20, 2022).

⁷ Wallace *et al*, “On the Validity of NOAA, NASA and Hadley CRU Global Average Surface Temperature Data and the Validity of EPA’s CO₂ Endangerment Finding” (June 2017), p. 30.



Thus, the NASA/NAOO data that argues we are experiencing the hottest temperatures in recorded history is false and manipulated, another egregious violation of scientific method.

Accordingly, none of the manipulated data can be used to provide reliable science that there is any climate-related financial risk caused by fossil fuels and CO₂.

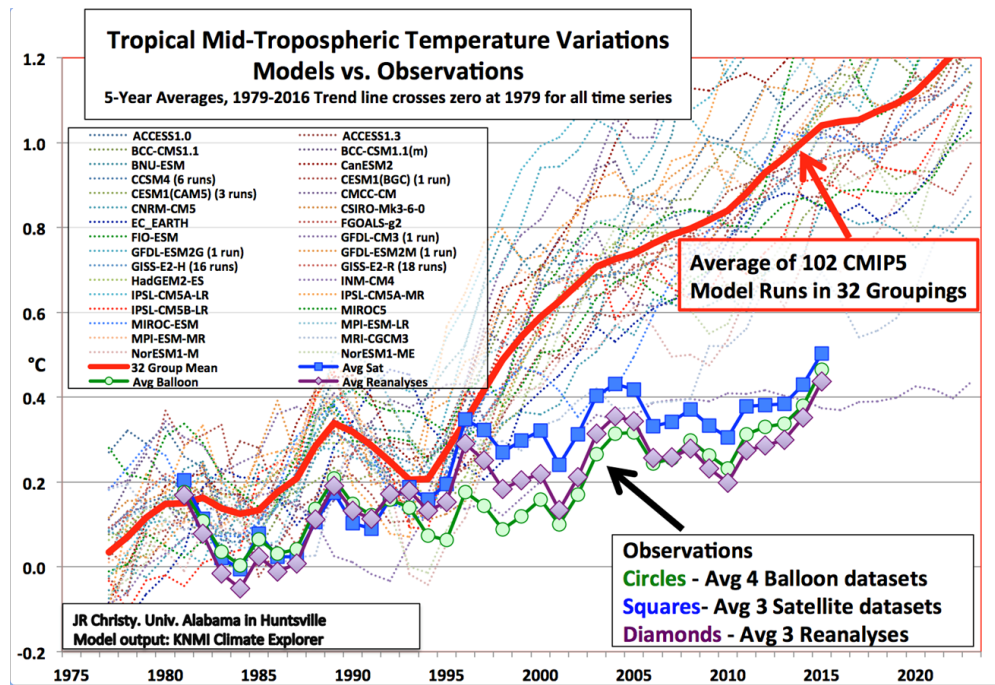
E. The IPCC CMIP and Other Models Fail to Reliably Predict Temperatures, Thus Provide No Reliable Science of Climate-Related Financial Risk Caused by Fossil Fuels and CO₂

The IPCC CMIP models (Coupled Model Intercomparison Project) do not reliably predict temperatures and therefore should be rejected under basic scientific method, demonstrated next.

CMIP5. John Christy, PhD, Professor of Atmospheric Science at the University of Alabama, applied the scientific method to CMIP5 102 predictions of temperatures 1979-2016 by models from 32 institutions.

He explained he used “the traditional scientific method in which a claim (hypothesis) is made and is tested against independent information to see if the claim can be sustained,” and produced the following chart:⁸

⁸ John Christy, House Comm. Science, Space and Technology (March 29, 2017), link [ChristyJR Written 170329 \(house.gov\)](https://www.house.gov/ChristyJR/Written/170329), pp. 3, 5



At the bottom, the blue, purple and green lines show the actual reality temperature observations against which the models' predictions were tested.

The dotted lines are 102 temperature “simulations” (predictions) made by the models from 32 institutions for the period 1979-2016.

The red line is the consensus of the models, their average.

The graph clearly shows 101 of the 102 predictions by the models (dotted lines) and their consensus average (red line) fail miserably to predict reality.⁹ Focusing on the consensus red line, he concluded:

“When the ‘scientific method’ is applied to the output from climate models of the IPCC AR5, specifically the bulk atmospheric temperature trends since 1979 (a key variable with a strong and obvious theoretical response to increasing GHGs in this period), I demonstrate that the consensus of the models [red line] fails the test to match the real-world observations by a significant margin. As such, the average of the models is considered to be untruthful in representing the recent decades of climate variation and change, and thus would be inappropriate for use in predicting future changes in the climate or related policy decisions.” *Id.*, p. 13 (emphasis added).

Thus, the models that produced the 101 predictions fail the Feynman test under scientific method. They do not “work,” and therefore provide no reliable science.

CMIP6. Steven Koonin, PhD., a Cal-Tech physicist, professor at New York University and author of *Unsettled* (2021), concluded:

“One stunning problem is that ... the later generation of [CMIP] models are actually more uncertain than the earlier one[s].”

“The CMIP6 models that inform the IPCC’s upcoming AR6 [Climate Change reports] don’t perform any better than those of CMIP5.” *Id.* pp. 87, 90 (emphasis added).

⁹ The one model that closely predicted the temperatures actually observed is a Russian model and is the only model that should be used in science. However, the IPCC did not use it but used the models that it should have rejected.

He elaborated CMIP6's failure using the scientific method in detail:

- “An analysis of 267 simulations run by 29 different CMIP6 models created by 19 modeling groups around the world shows that they do a very poor job [1] describing warming since 1950 and ... [2] underestimate the rate of warming in the early twentieth century.” *Id.* p. 90 (emphasis added).
- “Comparisons among the [29] models [show] ... model results differed dramatically both from each other and from observations ... [and] disagree wildly with each other.” *Id.* p. 90 (emphasis added).
- “One particularly jarring failure is that the simulated global average surface temperature ... varies among models ... three times greater than the observed value of the twentieth century warming they’re purporting to describe and explain.” *Id.* p. 87 (emphasis added).
- As to the early twentieth century warming when CO₂ levels only increased from 300 to 310 ppm, “strong warming [was] observed from 1910 to 1940. On average, the models give a warming rate over that period of about half what was actually observed. That the models can’t reproduce the past is the big red flag -- it erodes confidence in their projections of future climate.” *Id.* pp. 88, 95 (emphasis added).

Thus the CMIP6 model suite also fails the fundamental test under scientific method: they do not work and thus do not provide any reliable science of climate-related financial risk caused by fossil fuels and CO₂.

Other Models. Prof. Koonin’s book devoted an entire chapter to “Many Muddled Models,” not just the CMIP models.

He asked, “how good are our climate models? And how much confidence should we have in what they say about future climates?” He concluded all the models are “demonstrably unfit for the purpose,” elaborating:

“The uncertainties in modeling of both climate change and the consequences of future greenhouse gas emissions make it impossible today to provide reliable, quantitative statements about relative risks and consequences and benefits of rising greenhouse gases to the Earth system as a whole, let alone to specific regions of the planet.” *Unsettled*, pp. 24, 96.

In conclusion, the IPCC CMIP models that are widely used, and are the basis for the IPCC climate risk assessments and scenarios referred to in the FEDSOC Report, fail the fundamental test of scientific method. They do not work.

Thus, contrary to common reporting, these models can provide no reliable science there is any climate-related financial risk caused by fossil fuels and CO₂.

F. There is No Urgency to Act Now, Thus No Need for Any CFTC Action

Our informed scientific opinion is that doubling CO₂ concentrations will cause about 1 C or less of warming. But assuming that doubling CO₂ levels from today’s 420 ppm to 840 ppm will raise temperatures by a “dangerous” 2° C (about 4° F), which is unsupported by science, it would take a century or more for that to happen at the levels of CO₂ emissions today that at about 2.5 ppm annually. See <https://gml.noaa.gov/ccgg/trends/>

Thus, assuming for sake of argument there is a climate risk caused by fossil fuels and CO₂ (there is not), there is no urgency for the CFTC to act.

G. Today's 420 ppm CO₂ Level is Near a Record Low, Not Dangerously High, and Thus Provides No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂

As noted earlier, “Misrepresentation, exaggeration, cherry picking, or outright lying pretty much covers all the so-called evidence” marshalled in support of the theory of imminent catastrophic global warming caused by fossil fuels and of the urgent need to achieve “net zero” fossil fuel and other human CO₂ emissions by 2050.¹⁰

One classic example of cherry picking and omitting observations that contradict a theory is the repeated reporting that recent CO₂ levels, now 420 ppm, and its rise from 280 ppm at the beginning of the Industrial Age, are dangerously high and unprecedented in tens of thousands and even 20 million years.

For example, the EPA's Endangerment Findings warned ominously, “[C]urrent atmospheric greenhouse gas concentrations are now at elevated and essentially unprecedented levels” and that carbon dioxide and methane at higher levels than they have been for “at least the last 650,000 years.”¹¹

The Supreme Court in its landmark *Massachusetts v. EPA* stated that the CO₂ level that reached 382 ppm in 2006 was higher than “at any point over the last 20 million years.” 549 U. S. 504, 507 n. 10 (2007).

But in geological time, tens of thousands of years and even 20 million years is just a moment in time.

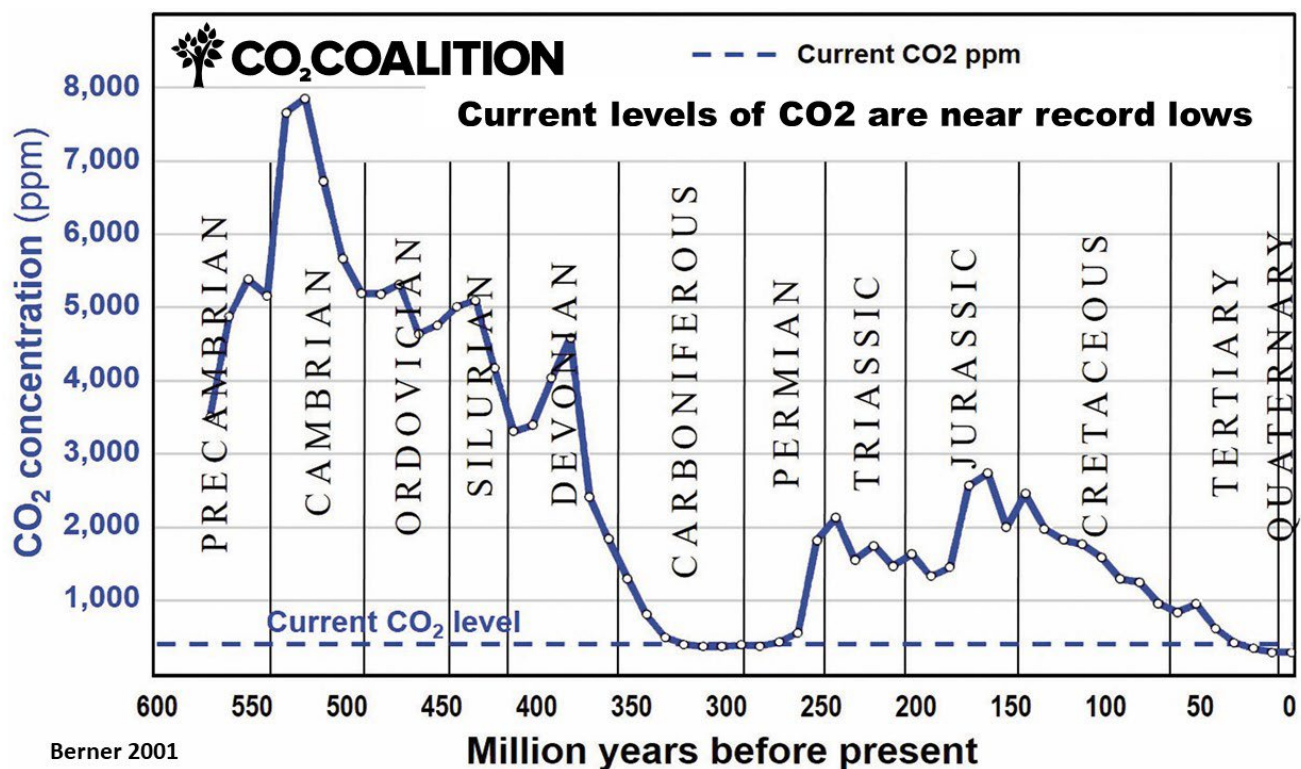
Why are the hundreds of millions of years of data on CO₂ and temperature always omitted?

This hundreds of millions of years of geological data disproves the theory that CO₂ is a major determinant of Earth's temperature, that atmospheric CO₂ concentrations are the “control knob” for Earth's temperature and that there will be catastrophic global warming unless the use of fossil fuels is reduced to “net zero” soon, is contradicted by this data and therefore is scientifically invalid, shown in the commonly cited chart below:¹²

¹⁰ Lindzen, "Global Warming for the Two Cultures," Global Warming Policy Foundation (2018), p. 10. *Accord* Lindzen, "The Absurdity of the Conventional Global Warming Narrative (April 20, 2022) & “Straight Talk About Climate Change,” Acad. Quest (2017), p. 419.

¹¹ EPA, "Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act," 74 *Fed. Reg.* 66496 (Dec. 15, 2009) (“Endangerment Findings”), p. 66511 (emphasis added).

¹² Gregory Wrightstown, *Inconvenient Facts* (2017), p. 16; CO2 Coalition, [CO2_07.jpg \(1280×720\) \(co2coalition.org\)](https://co2coalition.org/CO2_07.jpg)



The omitted data shows that that today's 420 ppm CO₂ level is near a record low, not a record high, and that the 135 ppm increase over the past two centuries is trivially small compared to changes in the geological history of life on Earth.

The chart also makes clear:

- CO₂ levels were over 1,000 ppm for hundreds of millions of years
- CO₂ levels ranged from a high of over 7,000 ppm -- almost 20 times higher than today's 420 ppm, to a low of 200 ppm, close to today's low 420 ppm
- CO₂ has been declining for 145 million years from about 2,800 ppm to today's low 420 ppm
- Today's 420 ppm is not far above the minimal level when plants die of CO₂ starvation, around 150 ppm, and therefore all human and other life would die for lack of food.

Applying scientific method, omitting unfavorable data that contradict a theory to make it work is an egregious violation of scientific method, unfortunately commonly used by those arguing there is a climate emergency.

Here the omitted observations falsify the theory that there is a climate-related financial risk caused by fossil fuels and CO₂ that will lead to catastrophic global warming unless fossil fuels are reduced to "net zero." The theory is "wrong" under Feynman's definition of scientific method and thus is invalid and unreliable science.

These observations also demonstrate there is no reliable science of climate-related financial risk caused by fossil fuels and CO₂.

What about temperatures?

H. 600 Million Years of CO₂ and Temperature Data Contradict the Theory that High Levels of CO₂ Will Cause Catastrophic Global Warming, Thus Confirming There is No Reliable Science Supporting CFTC Action

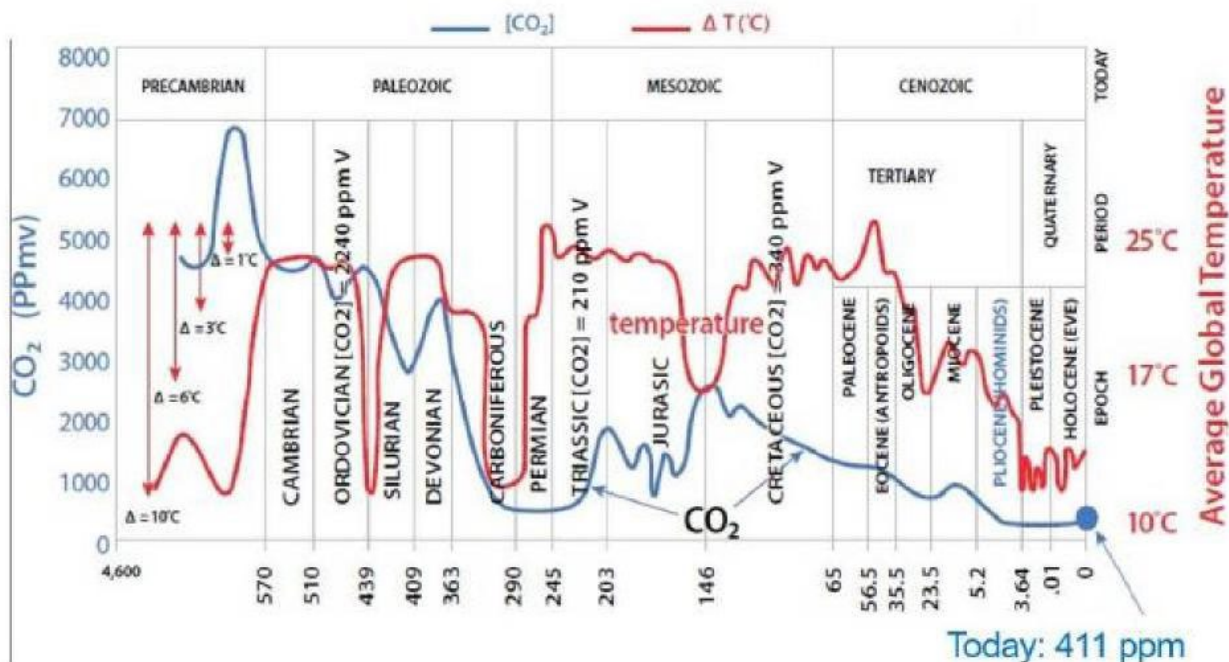
The chart below shows estimates 600 million years of CO₂ concentrations and temperatures.

The blue line shows CO₂ levels.

The red line shows temperature.

CO & Temperature long term view - 600 million years of climate change

Geological Timescale: Concentration of CO₂ and Temperature fluctuations



1- *Analysis of the Temperature Oscillations in Geological Eras* by Dr. C. R. Scotese © 2002. 2. Ruddiman, W.F. 2001. *Earth's Climate: past and future* W.H. Freeman & Sons. New York, NY. 3 - Mark Pegani et al. *Marked Decline in Atmospheric Carbon Dioxide Concentrations During the Paleocene*. *Science*; Vol. 309, No. 5734; pp. 600-603. 22 July 2005. *Corrected on 07 July 2008 (CO2: Ordovician Period)*.

Reconstructed atmospheric carbon dioxide concentrations (Berner, 2001) & global mean surface temperature (Scotese, 1999) over the last 550 million years

The chart¹³ shows:

- CO₂ concentrations and temperature were uncorrelated over the past 600 million years.
- For hundreds of millions of years, temperatures were low when CO₂ levels were high, and temperatures were high when CO₂ levels were low.
- When CO₂ was record high of about 7,000 ppm, temperatures were at a record low

¹³ Nahle, "Geologic Global Climate Changes," *Biology Cabinet J.* (March 2007), Gregory Wrightstone revision.

- temperatures were the highest they have ever been about 60 million years ago, but CO₂ levels were low.
- temperatures have been higher than today over most of the past 600 million years, and life flourished
- CO₂ levels have been relatively low for the last 300 million years, and have been sharply declining for the last 145 million years from 2,800 ppm today's low 420 pm.

Thus Paleoclimate data going back 600 million years to the present show an inverse relation between CO₂ and climate temperatures most of the time, and little correlation between them, implying that the effects of CO₂ are, in fact, marginal. Although the data are based on various proxies, with the attendant uncertainties, they are good enough to demolish the argument that atmospheric CO₂ concentrations control Earth's climate. They do not.

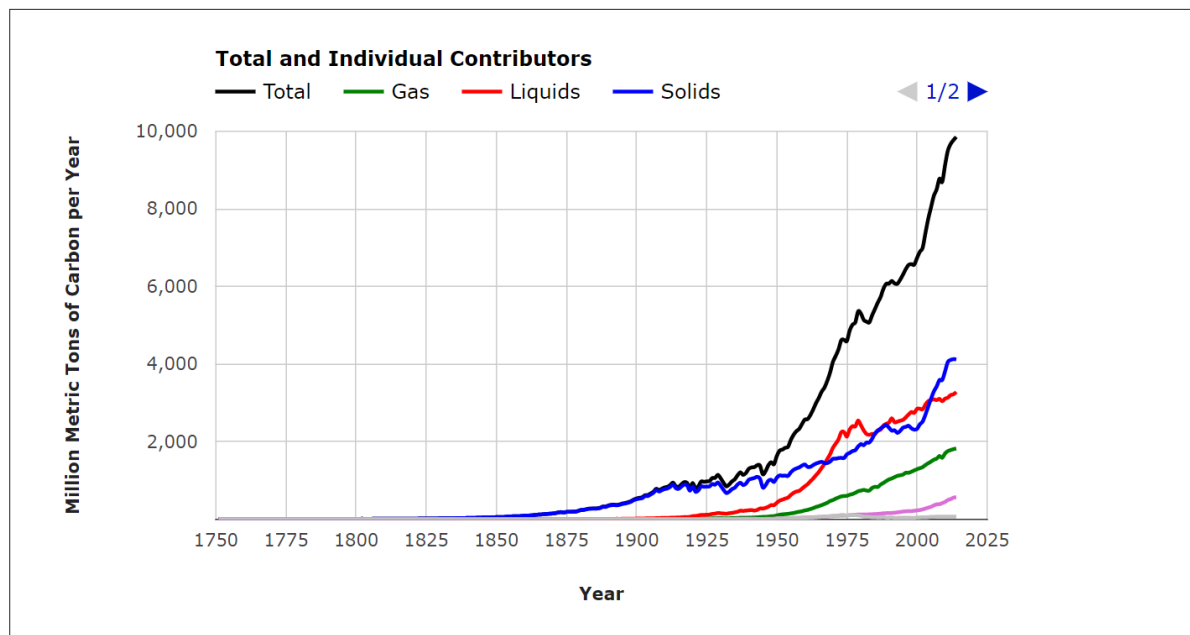
Applying scientific method, this data shows there is no climate-related financial risk caused by CO₂ and fossil fuels and that the theory of catastrophic global warming from high CO₂ levels is wrong. The theory does not agree with the observations. Scientifically it must be rejected. This is another reason there is no reliable science of climate-related financial risk caused by fossil fuels and CO₂.

I. Two Recent Warming Periods Show Increased CO₂ Doesn't Drive Extreme Temperature Increases, Thus Confirming There is No Climate-Related Financial Risk of Extreme Heat Caused By Fossil Fuels and CO₂

Curiously, the IPCC and many others focus on the Industrial Age around 1750 as the starting point to analyze fossil fuel and human emissions of CO₂ to the climate. The facts are that fossil fuel emissions were trivial then, and for 200 years until about 1940.

The facts are half of fossil fuel CO₂ and other carbon emissions since 1750 have occurred since the late 1980s, shown below:¹⁴

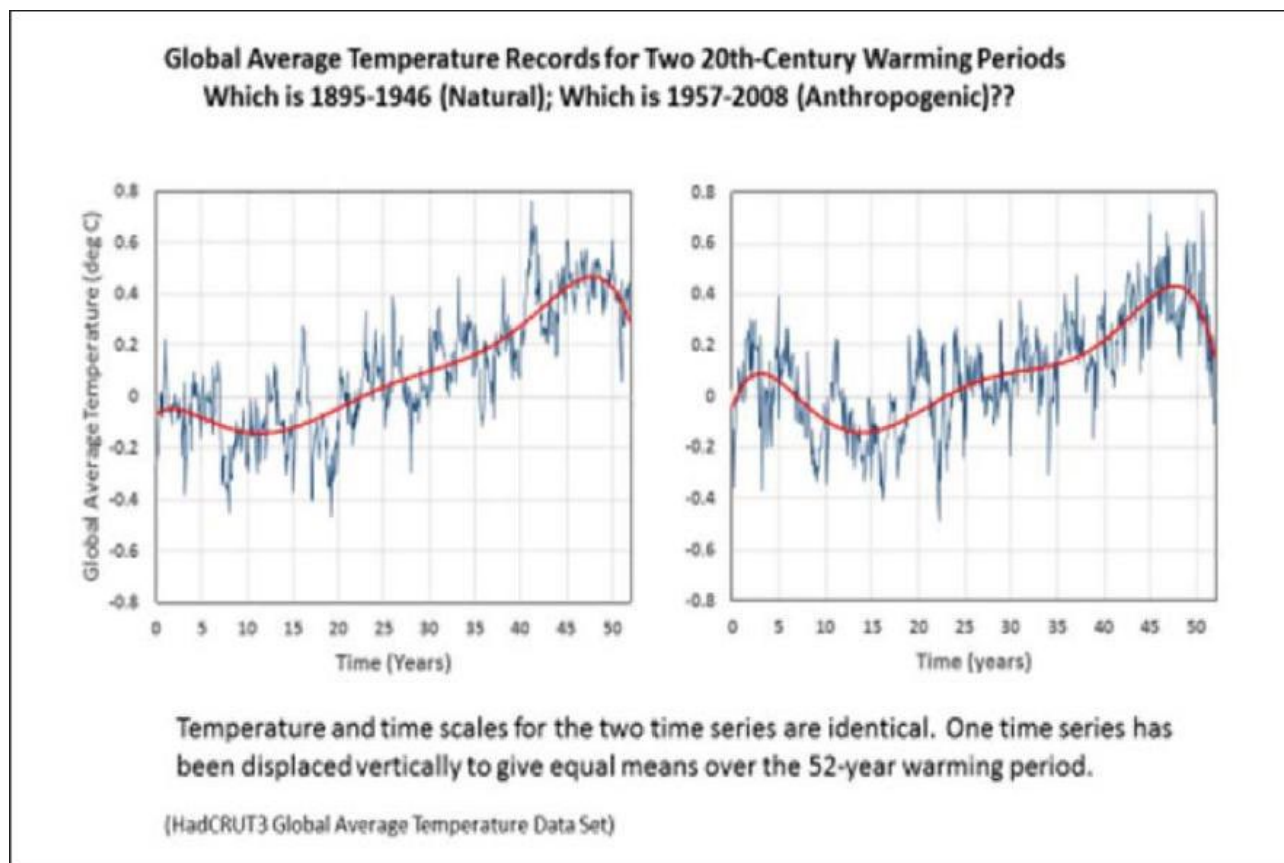
Carbon Emission Estimates



¹⁴ Boden, T.A., G. Marland, and R.J. Andres. 2017. Global, Regional, and National Fossil-Fuel CO₂ Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy.

I (Prof. Lindzen) show two recent warming periods, one 1895-1946 on the left and the second 1957-2008 on the right.¹⁵

Both look nearly the same.



However, increased CO₂ could not be responsible for the warming on the left between 1895-1946 because there was so little fossil fuel and other human CO₂ emissions during that time, as the chart above shows. Fossil fuel emissions were trivial then.

Accordingly, using scientific method, this data is another contradiction of the theory that higher fossil fuel CO₂ emissions will create catastrophic global warming.

And it's yet further proof there is no reliable science of any climate-related financial risk caused by fossil fuels and CO₂.

J. “Net Zero” Worldwide Emissions Would Have a Trivial Impact on Temperatures, Thus Contradicting of Climate-Related Financial Risk Caused by Fossil Fuels and CO₂

The surprising reality is that full implementation of the “net zero” emission goals of the Biden regulations, the Green New Deal legislation, the Paris Agreement and others would have a trivial impact on the climate according to the EPA’s own model. All would reduce global temperatures by less than 1° C by 2100.

Benjamin Zycher and Patrick Michaels provide more detail, based on a climate model developed with funding from the Environmental Protection Agency.¹⁶ “The predicted effects of

¹⁵ Lindzen, “On Climate Sensitivity,” *CO₂ Coalition* (Dec. 2019), p. 13.

¹⁶ Zycher, *The Case for Climate-Change Realism*, at 107-09; Zycher and Michaels Prepared Statement on S. 2754, “American Innovation and Manufacturing Act of 2019,” Sen. Comm. Environment and Public Works (April 2020).

the various proposals put forth may surprise many readers. Even if we were to incorporate assumptions that exaggerate the impact of reduced greenhouse-gas emissions, full implementation of the “net-zero” emissions goals of--

- “the Biden administration would reduce global temperatures by 0.17 degrees Celsius by 2100.
- “Green New Deal ... would have about the same effect.
- “The Paris agreement, if implemented immediately and enforced strictly, would have a similar impact of about 0.17 degrees Celsius.
- “50% emissions cut by China would yield an impact of 0.18 degrees Celsius.
- “A net reduction to zero greenhouse-gas emissions by all 37 member states of the Organization for Economic Cooperation and Development would increase that figure to about 0.35 degrees Celsius.
- “Immediate global emissions cut of 75% would yield an impact of 0.54 degrees Celsius.

This means reducing the current 40 Gigaton CO₂ annual emissions worldwide and the 6 Gigaton annual U.S. CO₂ emissions to “net zero” would cause only tiny changes of the heat radiation to space, and therefore only tiny changes of Earth’s surface temperature. But these tiny changes would come at enormous cost financially and to the economies of the world. Worst of all, “net zero” CO₂ emissions would cause a huge reduction in the amount of food available worldwide. See section IV for details.

This also means there is no climate-related financial risk from the continued use of fossil fuels and increasing CO₂.

K. Climate Science Publishing Is Dominated by One-Sided, Paid-For Studies with No Disclosure, and Thus Provides No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂ Without Independent Verification and Disclosure of Funding

There has been enormous one-sided funding for research that reinforced the message of imminent doom from the use of fossil fuels and increasing CO₂ but very little funding of contrary research. Dr. Harold Lewis, a distinguished physics professor, bluntly described this reality:

“The global warming scam, with the (literally) trillions of dollars driving it ... has corrupted so many scientists ... It is the greatest and most successful pseudoscientific fraud I have seen in my long life as a physicist.” (October 6, 2010 resignation letter to the American Physical Society).

Trillions of dollars had been spent on one-sided research 12 years ago, and much more since.

The GAO reported that between 1993 and 2017, the Federal government has spent \$154 billion on clean energy, international assistance and climate science. GAO, *Climate Science: Analysis of Reported Federal Funding* (April 2018).

From our personal experience over decades, it is very difficult to obtain funding either from U.S. government sources or from private foundations for research that does not presuppose impending environmental doom.

When I (Prof. Happer) was the Director of Energy Research of the Department of Energy in the early 1990s, I was amazed that the great bulk of federal funds for environmental studies

from the DOE, NASA, EPA and other federal agencies flowed into research programs that reinforced the message of imminent doom, humanity and planet Earth devastated by global warming, pestilence, famine, and flood. None of this was true then or now, but the shrill warnings have become more and more apocalyptic.

To date, one-sided papers have rarely disclosed funding sources, which include substantial funding from China and Russia. See, e.g., Rupert Darwall, *Green Tyranny* (details Russian and other foreign funding of the “climate industrial climate complex”) & Patricia Adams, *The Red and The Green: China’s Useful Idiots*, Global Warming Policy Foundation (2020).

Government and private foundation funded research should be particularly scrutinized as potentially biasing the results toward alarmism. The websites of most government agencies and private foundations clearly imply that the agency or foundation is working hard to counter “the climate crisis,” with the clear implication that proposed research that does not promise to support this narrative would be unlikely to receive funding.

Accordingly, all climate publications should require funding disclosure and independent verification before they are used as science.

L. The Endangerment Findings Rely on IPCC Findings, and Thus Provide No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂

The EPA Endangerment Findings and Technical Support Document (TSD)¹⁷ rely on IPCC models and opinions that are government controlled “science” and thus have no value as reliable science.

The Endangerment Findings expressly state in the section entitled “The Science on Which the Decisions Are Based,” that its Administrator relied on the IPCC and USGCRP assessments as two of the three “primary scientific and technical basis of her endangerment decision.”¹⁸

“[The] Administrator is relying on the major assessments of the USGCRP, IPCC, and NRC as the primary scientific and technical basis of her endangerment decision.”

The Technical Support Document of the Endangerment Findings emphasized that the IPCC controlling document, the Summary for Policymakers, was “approved line by line by” IPCC governments, not scientists:

“Each [IPCC] Summary for Policymakers is approved line-by-line, and the underlying chapters then accepted, by government delegations in formal plenary sessions.” TSD, p. 4.

Thus relying on IPCC and NCA assessments as science contaminates the EPA Endangerment Findings and its TSD. Specifically, the EPA Endangerment Findings and TSD rely on IPCC government-dictated findings many times:

- 433 times in the Technical Support Document
- 49 times directly in the Endangerment Findings
- 52 times indirectly in the Endangerment Findings.

¹⁷ Endangerment Findings, *supra* & “Technical Support Document for Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act” (Dec. 7, 2009), <http://epa.gov/climatechange/endangerment.html> (“TSD”).

¹⁸ Endangerment Findings, *supra*, 74 *Fed. Reg.*, p. 66511.

As a result, the Endangerment Findings and its TSD chose to be controlled by government opinion rather than scientific method. Accordingly, they are merely government opinions, and, as the Lysenko experience chillingly underscores, can provide no reliable science of climate-related financial risk caused by fossil fuels and CO₂.

M. The Social Cost of Carbon TSD Estimates are Scientifically Invalid and Thus Provide No Reliable Science of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂

On February 26th, 2021, the Interagency Working Group (IWG) published “Technical Support Document: Social Cost of Carbon, Methane, and Nitrous Oxide Interim Estimates under Executive Order 13990” (“SCC TSD Estimates”). The SCC TSD Estimates are scientifically invalid for three alternative reasons.

First, the IWG estimated the social cost of carbon by combining three models, DICE, PAGE and FUND, together called Integrated Assessment Models (IAMs).

However, two of the three models, DICE and PAGE, only computed the social costs of CO₂ and excluded data on the enormous social benefits of CO₂ (detailed in Part III below).¹⁹ This is another example omitting unfavorable data that is an egregious violation of scientific method. It is like promoting the theory the world is flat by only considering observations as far as the eye can see, excluding all the evidence the world is round. For this reason alone, the SCC TSD Estimates are fatally flawed science.

Second, the SCC TSD Estimates expressly state it relied on peer review and consensus, not scientific method, to determine its estimates:

“In developing the SC-GHG estimates in 2010, 2013, and 2016 the IWG used **consensus**-based decision making, relied on **peer-reviewed** literature and models Going forward the IWG commits to maintaining a **consensus** driven process for making evidence-based decisions that are guided by the best available science and input from the public, stakeholders, and **peer reviewers**.” SCC TSD Estimates, p. 36 (emphasis added).

As explained, peer review and consensus do not determine scientific knowledge, scientific method does. Accordingly, for this reason alone the SCC TSD Estimates are scientifically invalid.

Third, the SCC TSD Estimates states key numbers used in its estimates were based on IPCC government-dictated models from the IPCC’s Fourth Assessment Synthesis Report in 2007 (IPCC AR4), and that four “recent scientific assessments by the IPCC” and two others “confirm and strengthen the science” used in the model runs. SCC TSD Estimates, p.32.

The five IPCC government-dictated publications relied upon were:

1. Climate Change 2007: Synthesis Report, Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change
2. *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*
3. *Global Warming of 1.5°C* (2018)
4. *Climate Change and Land* (2019)
5. *Special Report on the Ocean and Cryosphere in a Changing Climate* (2019).

¹⁹ Dayaratna, McKittrick & Michaels, "Climate Sensitivity, Agricultural Productivity and the Social Cost of Carbon in FUND," *Environmental Economics & Policy Studies* (2020), pp. 443-48

Relying on IPCC government-dictated publications contaminates the science in the SCC TSD Estimates and makes them scientifically invalid.

Therefore, for these three reasons, separately and together, the SCC TSD Estimates are scientifically invalid and can provide no reliable science of climate-related financial risk from fossil fuels and CO₂.

N. NAS' *Valuing Climate Damages* is Based on Peer Review and Consensus, Not Scientific Method, and Thus Cannot Provide Reliable Science Of Climate-Related Financial Risk Caused By Fossil Fuels and CO₂

In 2017, the National Academy of Sciences (NAS) published *Valuing Climate Damages: Updating Estimating the Social Cost of Carbon Dioxide* (2017).

For whatever reason, the book expressly stated that it was not following scientific method, but instead stated that it was adopting “peer reviewed literature” as the ““Scientific basis” for all “modules, their components, their interactions, and their implementation.”

“RECOMMENDATION 2-2 The Interagency Working Group should use three criteria to evaluate the overall integrated SC-CO₂ framework and the modules to be used in that framework: scientific basis, uncertainty characterization, and transparency.

- “**Scientific basis:** Modules, their components, their interactions, and their implementation should be consistent with **the state of scientific knowledge as reflected in the body of current, peer-reviewed literature.**” Id., p. 47 (emphasis added).

With all due respect, this very prestigious scientific group chose not to follow scientific method. Instead, they based their analysis and thus all of its recommendations on peer review and consensus, which provide opinions but have no value as scientific evidence. No matter how distinguished the group, groupthink support of theories does not make them reliable science. Theories become reliable science when their predictions agree with observations. Climate models’ predictions of warming have turned out to be hundreds of percent larger than observed warmings, as demonstrated in section III.E.

Accordingly, this book cannot provide any reliable science of climate-related financial risk caused by fossil fuels and CO₂.

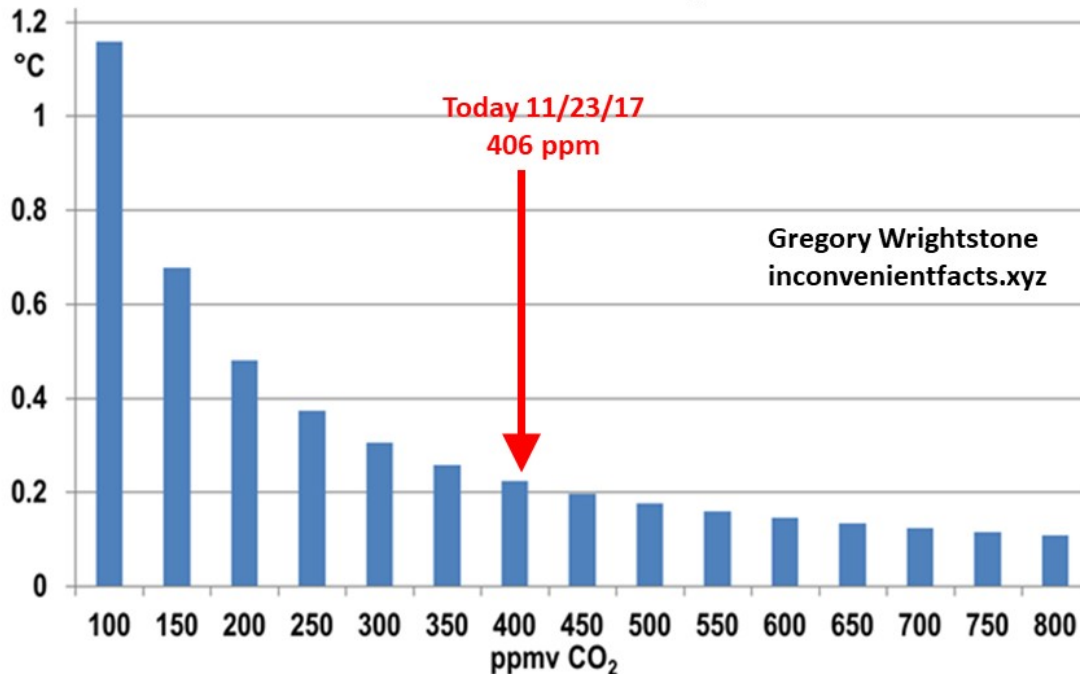
O. The Logarithmic Forcing from CO₂ Means that Its Contributions to Global Warming is Heavily Saturated, Instantaneously Doubling CO₂ Concentrations from 400 ppm to 800 ppm, a 100% Increase, Would Only Diminish the Thermal Radiation to Space by About 1.1%, Thus Contradicting There is Any Climate-Related Financial Risk Caused by Fossil Fuels and CO₂

Both of us have special expertise in radiation transfer, the prime mover of the greenhouse effect in Earth’s atmosphere. It is important to understand the radiation physics of what the effect is of adding CO₂ at current atmospheric concentrations.

CO₂ becomes a less effective greenhouse gas at higher concentrations because of what is often called “saturation.” Each additional 100 ppm increase of CO₂ in the atmosphere causes a smaller and smaller change in “radiative forcing,” or in temperature, since there are very good reasons to assume that temperature changes are proportional to changes in radiative forcing. The saturation is shown in the chart below.²⁰

²⁰ Gregory Wrightstone, *Inconvenient Facts*, p. 7.

Figure I-3: Less global warming for each additional 50 parts-per-million-by-volume of CO₂ concentration



**(Graph calculated using IPCC's formula $\Delta T_0 = \frac{5.35}{3.2} \ln \frac{C}{C_0}$;
AR3, Ch. 6.1. Courtesy Monckton 2017)**

This means that from now on our emissions from burning fossil fuels could have little impact on global warming. There is no climate emergency. No threat at all. We could emit as much CO₂ as we like, with little warming effect.

Doubling CO₂ concentrations, from 400 ppm to 800 ppm, a 100% increase, would cause tiny changes of the heat radiation to space, and therefore tiny changes of Earth's surface temperature, on the order of 1° C (about 2° F) of surface warming for every doubling of CO₂ concentrations.

Saturation also explains why temperatures were not catastrophically high over the hundreds of millions of years when CO₂ levels were 10-20 times higher than they are today, shown in the chart above.

Further, saturation also provides another reason why reducing the use of fossil fuels to "net zero" by 2050 would have a trivial impact on climate, contradicting the theory there is a climate-related financial risk from fossil fuel and CO₂ emissions.

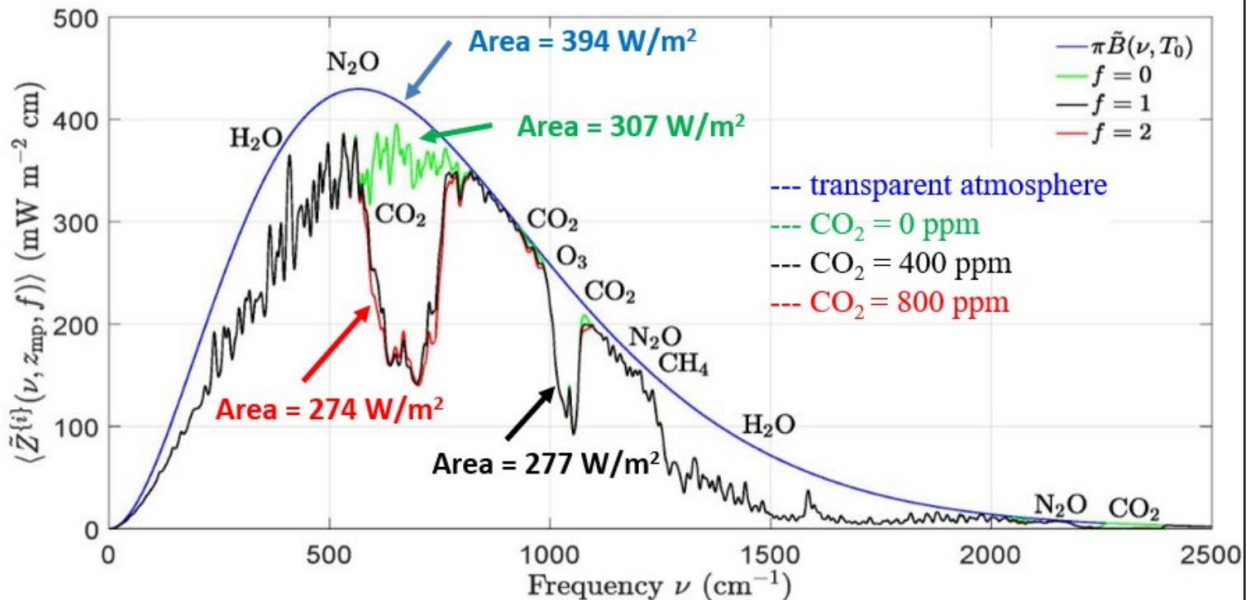
Adding more CO₂ to the atmosphere slightly decreases the flux of long-wave infrared radiation to space. The magnitude of this decrease is called the "forcing increment," dF, and it is measured in Watts per square meter (W/m²). The details are shown in the graph below.²¹

The smooth, deep blue curve shows the spectral intensity of heat energy the Earth would radiate to space if our atmosphere had no greenhouse gases or clouds. It is one of the most famous curves in physics. The formula for the curve was discovered by Max Planck, whose

²¹ Happer & Wyngarden, "Dependence of Earth's Thermal Radiation on Five Most Abundant Greenhouse Gases" (June 8, 2020), [2006.03098.pdf \(arxiv.org\)](https://arxiv.org/abs/2006.03098)

discovery of quantum mechanics began with the blue curve.

The area under the blue curve is about 394 W/m^2 . It is the total flux if the Earth would radiate to space if the surface were at a temperature of 60° F and there were no greenhouse gases to retard the escape of radiation. Without greenhouse gases, the total heat loss of 394 W/m^2 through a transparent atmosphere would soon cool the Earth's surface to 16° F , well below freezing. Most life would end at these low temperatures. We should be grateful for greenhouse warming of the Earth.



Below Planck's blue curve is a jagged black curve. It shows how much less the Earth radiates infrared radiation to space with the current concentration of greenhouse gases, water vapor, H_2O , nitrous oxide N_2O , carbon dioxide, CO_2 , ozone, O_3 , and methane CH_4 . Because of the greenhouse gases, the Earth radiates 277 W/m^2 to space, the area under the jagged black curve, and 70% ($277/394$) of what it would radiate without greenhouse gases.

The red curve is the radiation emitted to space if CO_2 concentrations were to be doubled from 400 ppm to 800 ppm. As can be seen, the difference is hardly noticeable, a decrease of radiation to space of about 3 W/m^2 , which decreases the radiation to space from 277 W/m^2 to 274 W/m^2 , a decrease of 1.1% ($3/277$). So, a 100% increase of CO_2 concentration.

On average, the heat carried to space by infrared radiation is equal to the heat deposited on Earth by absorbed sunlight. Thus, if the heating rate of sunlight were to stay the same after an increase of greenhouse gases, heat energy would be added to the Earth and its temperature would increase.

This would be analogous to putting a lid on a pan of water, kept lukewarm by low heat on a stove burner. The lid would retard the convective heat loss and cause the water to get warmer. Eventually the pan with the lid would warm enough to lose heat at the same rate as the pan without the lid, and the temperature would stop rising.

Earth would respond to the 1.1% loss of radiation to space much like the pan of water. Earth's radiation flux F to space is very nearly that of a black body with an absolute temperature T of Earth's surface. This flux is given by the Stefan-Boltzmann law as $F = \sigma T^4$. Here σ is the Stefan-Boltzmann constant. From elementary calculus, we recall that an increment dT of the absolute temperature will cause an increment dF of the flux given by $dF = 4\sigma T^3 dT$. Dividing the left and right sides of these simple equations by each other we find $dF/F = 4dT/T$ or vice versa, $\sigma dT/T = \frac{1}{4} dF/F$. Thus, to increase the flux by 1.1% and bring solar heating back into

balance with radiative cooling, a temperature increase of dT/T , of $\frac{1}{4} 1.1\% = 0.28\%$, is needed. Since the absolute temperature of the Earth is approximately $T = 300\text{ K}$, (60° F), the required temperature increment is $dT = 0.0028 \times 300\text{ K} = 0.84\text{ K} = 0.84\text{ C}^\circ$. This estimate, 0.84 C° , is four times smaller than the 3° C "most likely" warming claimed by the IPCC for a doubling of CO_2 .

IPCC's much larger temperature increase from doubling CO_2 is due to huge hypothetical positive feedbacks from changes in water vapor and clouds in the atmosphere. We note that large positive feedbacks are unusual in nature. Most feedbacks are negative, and this observation is even dignified with the name LeChatelier's Principle, which is often stated as:

"When any system at equilibrium for a long period of time is subjected to a change in concentration, temperature, volume, or pressure, (1) the system changes to a new equilibrium, and (2) this change partly counteracts the applied change."

The large positive feedbacks assumed by the IPCC violate Le Chatelier's Principle. They are not at all consistent with the geological history of Earth's temperature and CO_2 concentrations.

Thus, basic physics shows that doubling CO_2 would result in a temperature increase of less than 1° C . Accordingly, this is another reason why there is no reliable science there is any climate-related financial risk caused by fossil fuels and CO_2 .

IV. THERE WILL BE DISASTROUS TRANSITION RISK CONSEQUENCES FOR THE POOR, PEOPLE WORLDWIDE, FUTURE GENERATIONS AND THE UNITED STATES IF FOSSIL FUEL USE AND CO_2 EMISSIONS ARE REDUCED TO "NET ZERO"

There is overwhelming scientific evidence that fossil fuels and CO_2 provide enormous social benefits for low-income people, people worldwide, future generations and United States. Therefore science demonstrates there will be disastrous transition risk consequences for the poor, people worldwide, future generations and the United States if fossil fuel use and CO_2 emissions are reduced to "net zero," with no benefit to the climate, elaborated next.

A. CO_2 is Essential to Our Food, and Thus to Life on Earth.

We owe our existence to green plants that, through photosynthesis, convert CO_2 and water, H_2O , to carbohydrates with the aid of sunlight, and release oxygen. Land plants get the carbon they need from the CO_2 in the air. Other essential nutrients — water, nitrogen, phosphorus, potassium, etc. — come from the soil. Just as plants grow better in fertilized, well-watered soils, they grow better in air with several times higher CO_2 concentrations than present values. As far as green plants are concerned, CO_2 is part of their daily bread—like water, sunlight, nitrogen, phosphorus, potassium and other essential elements.

Without CO_2 , there would be no photosynthesis, no food and no human or other life.

What happens with a doubling of CO_2 ? Many experiments and studies confirm that when CO_2 is doubled, agricultural yields are increased significantly, especially in arid regions where more CO_2 increases the resistance of plants to droughts. Greenhouse operators routinely pay to double or triple the concentrations of CO_2 over their plants. The improved yield and quality of fruits and flowers more than pay for the cost of more CO_2 , with only small and beneficial warming.

A dramatic example of the response of green plants to increases of atmospheric CO_2 is shown below: Dr. Sherwood Idso grew Eldarica (Afghan) pine trees with increasing amounts of CO_2 in experiments about 10 years ago, starting with an ambient concentration of CO_2 of 385 ppm. He showed what happens over the 10 years when CO_2 is increased by 150, 300 and 450

ppm, for total CO₂ concentrations of 385, 535, 685 and 835 ppm:²²



More CO₂ has made a significant contribution to the increased crop yields of the past 50 years, as well. The benefits to plants of more CO₂ are documented in hundreds of scientific studies.

B. Photosynthesis from Atmospheric CO₂ Sustains Most Life on Earth.

Nearly all of the food we eat comes ultimately from photosynthesis on the land or in the oceans. The oxygen we breathe was produced by photosynthesis over the geological history of the Earth. In the process of photosynthesis, energy from sunlight forces molecules of water, H₂O, and molecules of carbon dioxide and CO₂ to combine to make sugars and other organic molecules. A molecule of oxygen, O₂, is released to the atmosphere for every molecule of CO₂ converted to sugar. An interesting scientific aside is that the O₂ comes from the water molecules, H₂O, used in photosynthesis, not from CO₂.

Without CO₂, there would be no photosynthesis, plants would die and the animals that eat them would starve to death, and most higher life forms would become extinct. The peculiar biological communities at deep sea vents and various chemotropic bacteria in sediments below Earth's surface would be all that remains of the once flourishing web of life that was sustained by atmospheric CO₂, water and sunlight.

Most green plants evolved at CO₂ levels of several thousand parts per million (ppm), many times higher than now. Plants grow better and produce better flowers and fruit at higher levels. Commercial greenhouse operators recognize this when they artificially increase CO₂ concentrations inside their greenhouses to over 1,000 ppm.

²² CO₂ Coalition, [CO₂_3.jpg \(1280×720\) \(co2coalition.org\)](#)

All green plants grow faster with more atmospheric CO₂, including the CO₂ released by the combustion of fossil fuels, which is almost identical to the CO₂ respired by human beings and other living creatures.

C. Greenhouse Gases Prevent Us from Freezing to Death

Greenhouse gases hinder the escape of thermal radiation to space. We should be grateful for them. Greenhouse gases keep the Earth's surface temperature warm enough and moderate enough to sustain life on our verdant planet. Without them, we'd freeze to death.

To quote John Tyndall, the Anglo-Irish physicist who discovered greenhouse gases in the 1850's:

"Aqueous vapor is a blanket, more necessary to the vegetable life of England than clothing is to man. Remove for a single summer-night the aqueous vapor from the air which overspreads this country, and you would assuredly destroy every plant capable of being destroyed by a freezing temperature. The warmth of our fields and gardens would pour itself unrequited into space, and the sun would rise upon an island held fast in the iron grip of frost." John Tyndall, *Heat, a Mode of Motion* (5th Ed. 1875).

Tyndall identified "aqueous vapor" (water vapor) as the most important greenhouse gas. Water vapor, and clouds which condense from it, are the dominant greenhouse agents of Earth's atmosphere.

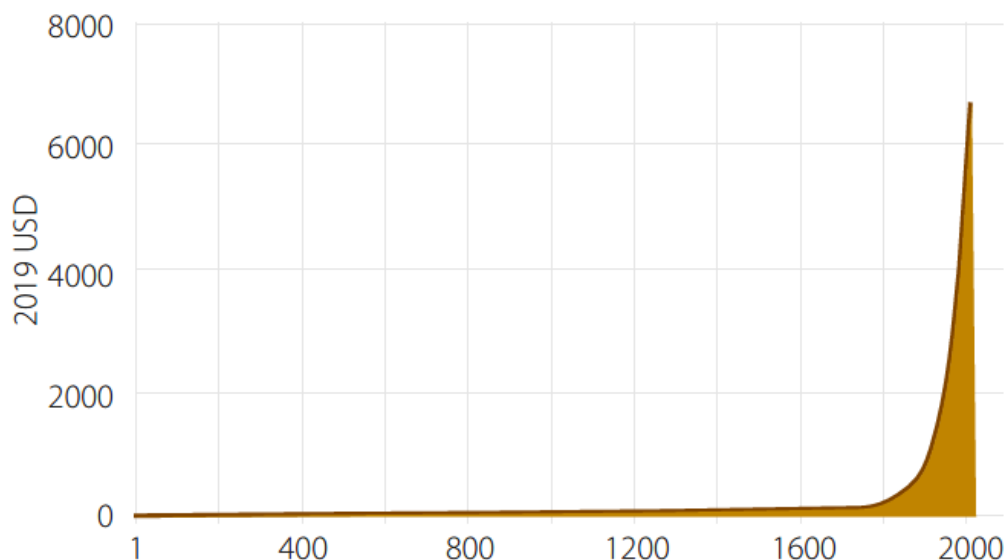
Carbon dioxide, CO₂, is also a greenhouse gas, and does cause a small amount of warming of our planet. But it is far less effective than water vapor and clouds.

Without the greenhouse warming of CO₂ and its more potent partners, water vapor and clouds, the earth would be too cold to sustain its current abundance of life. We would freeze.

D. Enormous Social Benefits of Fossil Fuels

Contrary to the incessant attack on fossil fuels, affordable, abundant fossil fuels have given ordinary people the sort of freedom, prosperity and health that were reserved for kings in ages past.

The following chart of the GDP per person for the last 2,000 years powerfully illustrates what has happened:²³



²³ Rupert Darwall, *Climate Noose: Business, Net Zero and the IPCC's Anticapitalism* Global Warming Policy Foundation, p. 21.

In the mid-1800s, CO₂ levels were at a very low level, about 280 ppm. The great news is that CO₂ emissions from nature and fossil fuels has resulted in CO₂ levels rising from this low level to about 420 ppm today.

As a result, crop yields have increased by more than 15% over the past century. Better crop varieties, better use of fertilizer, better water management, etc., have all contributed. But the fact remains that a substantial part of the increase is due to the increase in CO₂ from about 300 ppm in 1850 to about 420 ppm from fossil fuels.

Mathematically, the growth rate of plants is approximately proportional to the square root of the CO₂ concentration. Thus, the increase in CO₂ concentration from about 280 ppm (300 ppm rounded) to 420 ppm over the past century increased growth rates by a factor of about $\sqrt{4/3} = 1.15$, or 15%.

As to temperature, CO₂ is a greenhouse gas and adding CO₂ to the atmosphere by burning coal, oil, and natural gas as a matter of radiation physics can only modestly increase the surface temperature of the earth. Specifically, physics proves that doubling the CO₂ concentration from our current 420 ppm to 830 ppm will directly cause about 1° C in warming.

In summary, the social benefits for people and life all over the world are enormous:

- since CO₂ is a plant fertilizer, agricultural and forestry yields have risen substantially over the last hundred years.
- economies have grown substantially, so that many people have prospered, and poverty has been reduced.
- electricity has become more affordable and available to many more people worldwide.
- and there has been a small but beneficial warming of the planet, about 2° Fahrenheit. This warming has been caused by a combination of natural causes and CO₂ increasing from its low level in 1850 and other greenhouse gases. See also Goklany, *Carbon Dioxide: The Good News* (2015) & Happer, “The Truth About Greenhouse Gases,” CO₂ Coalition (June 2011).

V. CONCLUSION

In our scientific opinion as career scientists, there is no scientific basis for the CFTC inquiry. Real science demonstrates there is no climate emergency and there are no climate-related financial or other risks caused by fossil fuels and CO₂.

Frankly, the “science” cited to support of the CFTC inquiry and possible action is merely government opinion by the International Panel for Climate Change (IPCC) and the U.S. Global Climate Research Program (USGCRP), which is not science and as the Lysenko experience chillingly underscores, cannot be used as the scientific basis for any CFTC or other government action.

Moreover, there will be a disastrous transition risk for the poor, people worldwide, future generations and the country by reducing fossil fuel use and CO₂ emissions to “net zero.” Contrary to what is commonly reported, CO₂ is essential to life on earth. Without CO₂, there would be no photosynthesis, and thus no plant food. Reducing CO₂ will reduce the amount of food available for the poor and people worldwide.

And, without fossil fuels there will be no low-cost energy worldwide and less CO₂ for photosynthesis making food.

Thus, with all due respect, the Commission should not adopt any guidance, interpretations, policy statements, or regulations, or take other action on the disastrous assumption under the name of science there is a climate-related financial or any other risk caused by fossil fuels and CO₂. If any such action is taken, it should be ruled invalid by the courts.

CURRICULUM VITAE

William Happer, Ph. D

I am a Professor Emeritus in the Department of Physics at Princeton University.

I began my professional career in the Physics Department of Columbia University in 1964, where I served as Director of the Columbia Radiation Laboratory from 1976 to 1979. I joined the Physics Department of Princeton University in 1980.

I invented the sodium guidestar that is used in astronomical adaptive optics systems to correct for the degrading effects of atmospheric turbulence on imaging resolution. I have published over 200 peer-reviewed scientific papers, am a Fellow of the American Physical Society, the American Association for the Advancement of Science, and a member of the American Academy of Arts and Sciences, the National Academy of Sciences and the American Philosophical Society.

I served as Director of Energy Research in the U.S. Department of Energy from 1991 to 1993. I was a co-founder in 1994 of Magnetic Imaging Technologies Incorporated (MITI), a small company specializing in the use of laser-polarized noble gases for magnetic resonance imaging. I served as Chairman of the Steering Committee of JASON from 1987 to 1990.

I served as Deputy Assistant to the President and Senior Director for Emerging Technologies at The National Security Council in the White House from 2018 to 2019.

I am the Chair of the Board of Directors of the CO2 Coalition, a non-profit (501 (c)(3) organization established in 2015 to educate thought leaders, policy makers and the public about the vital contribution made by carbon dioxide to our lives and our economy.

Richard Lindzen, Ph. D

I am a Alfred P. Sloan Professor of Atmospheric Science Emeritus at MIT. After completing my doctorate at Harvard in 1964 (with a thesis on the interaction of photochemistry, radiation and dynamics in the stratosphere), I did postdoctoral work at the University of Washington and at the University of Oslo before joining the National Center for Atmospheric Research as a staff scientist. At the end of 1967, I moved to the University of Chicago as a tenured associate professor, and in 1971 I returned to Harvard to assume the Gordon McKay Professorship (and later the Burden Professorship) in Dynamic Meteorology. In 1981 I moved to MIT to assume the Alfred P. Sloan Professorship in Atmospheric Sciences. I have also held visiting professorships at UCLA, Tel Aviv University, and the National Physical Laboratory in Ahmedabad, India, the Hebrew University in Jerusalem, the Jet Propulsion Laboratory in Pasadena, and the Laboratory for Dynamic Meteorology at the University of Paris.

I developed our current understanding of the quasi-biennial oscillation of the tropical stratosphere, the current explanation for dominance of the solar semidiurnal and diurnal tides at various levels of the atmosphere, the role of breaking gravity waves as a major source of friction in the atmosphere, and the role of this friction in reversing the meridional temperature gradient at the tropopause (where the equator is the coldest latitude) and the mesopause (where temperature is a minimum at the summer pole and a maximum at the winter pole). I have also developed the basic description of how surface temperature in the tropics controls the distribution of cumulus convection, and led the group that discovered the iris effect where upper level cirrus contract in response to warmer surface temperatures. I have published approximately 250 papers and books. I am an award recipient of the American Meteorological Society and the American Geophysical Union. I am a fellow of the American Meteorological Society, the American Geophysical Union and the American Association for the Advancement of Science, and a member of the National Academy of Sciences and the American Academy of Arts and Sciences.

I have served as the director of the Center for Earth and Planetary Sciences at Harvard, and on numerous panels of the National Research Council. I was also a lead author on the Third Assessment Report of the UN's Intergovernmental Panel on Climate Change – the report for which the IPCC shared the Nobel Peace Prize with Al Gore. I am currently a member of the CO2 Coalition.

CO2 Coalition

The CO2 Coalition is the nation's leading organization providing facts, resources and information about the vital role carbon dioxide plays in our environment. Membership is comprised of more than 90 of the world's foremost experts on climate change and represent a wide range of expertise including atmospheric physics, geology, geology, oceanography, economics and more. The Coalition provides facts and science without political ideology to the public through publications, public presentations, commentaries and interviews. Our membership has published many thousands of peer-reviewed scientific papers wide over a wide spectrum climate-related topics.