

1 STATE OF NEW MEXICO
2 BEFORE THE ENVIRONMENTAL IMPROVEMENT BOARD

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4
5 **IN THE MATTER OF PROPOSED NEW REGULATION,**
6 20.2.350 NMAC – *Greenhouse Gas Cap and Trade Provisions* No. EIB 10-04 (R)
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11 **REBUTTAL TESTIMONY OF DAVID S. GUTZLER**
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15 **I. REBUTTAL TO TESTIMONY OF JAMES M. TAYLOR**

16 Mr. Taylor makes many assertions about climate change by alluding to statements taken
17 out of context from publications without actually citing those publications or presenting the
18 actual results from them. This makes it impossible for me or anyone else to properly evaluate
19 many of his statements. At other times, Mr. Taylor makes statements that in my opinion are not
20 supported by the scientific record. I will respond to the latter statements in the following
21 testimony.

22
23 **MR. TAYLOR SUGGESTS THAT "WARMING TEMPERATURES ARE OF LITTLE**
24 **CONCERN IF THE WARMING TREND IS MERELY RESCUING THE PLANET**
25 **FROM A PROLONGED PERIOD OF ABNORMALLY COLD TEMPERATURES". DO**
26 **YOU AGREE?**

27 No. Mr. Taylor's statement is based on the premise that the planet has experienced
28 "abnormally cold temperatures" during the past 10,000 years. We know that the climate has
29 changed very significantly over geologic time, but these very slow, millennial fluctuations are
30 not of much relevance to the welfare of New Mexico citizens. It was much warmer than today
31 many thousands or millions of years ago, and much colder than today during and just after the

1 last ice age (including the first half of the "10,000 years" mentioned by Mr. Taylor). What
2 matters for policy purposes is the period of time during which our current cities were settled and
3 current agricultural practices were established, perhaps the last 1,000 years or so. During this
4 period, current temperatures stand out as exceptionally warm. Furthermore, even allowing for
5 considerable uncertainty in climate model projection, the magnitude of temperature change over
6 the next century projected to occur globally, or in New Mexico, could be far warmer than any
7 previous temperature regime experienced in human history.

8 Although Mr. Taylor provides no explicit references in this section to support his
9 statement, the most extensive proxy climate datasets for assessing climate change in the centuries
10 prior to the 20th Century (when instrumental records become widely available) are from tree ring
11 reconstructions. In the absence of references, we can assume that Mr. Taylor is relying on the
12 tree ring record to support his discussion of natural climate variability. I will return to this point
13 in my rebuttal to Dr. Christy's testimony.

14
15 **MR. TAYLOR ASSERTS THAT NATURAL FACTORS, SUCH AS SOLAR OUTPUT,**
16 **ARE DRIVING GLOBAL TEMPERATURE CHANGES. DO YOU AGREE?**

17 No. The primary role of an enhanced greenhouse effect, resulting from anthropogenic
18 emissions, for explaining climate change in recent decades has been convincingly demonstrated.
19 A summary of the extensive evidence supporting this conclusion is presented in the recent
20 Congressional testimony of Dr. Benjamin Santer, which is introduced as NMED-Gutzler
21 Rebuttal Exhibit 1. Reconstructed solar variability seems to account for a considerable fraction
22 of reconstructed temperature variability until the early 20th Century, but not thereafter. Both data
23 and models suggest that the mid-20th Century hiatus in warming is explainable through the
24 effects of aerosol pollution, that were considerably ameliorated in the 1970s and thereafter by the

1 imposition of pollution controls in North America and Europe. On a global basis, these controls
2 are now less effective with the dramatic expansion of dirty industry and energy production in
3 developing economies outside North America and Europe.

4 Important evidence against the hypothesis that recent warming is attributable to solar
5 variability comes from clear evidence that the stratosphere (the layer of the atmosphere tens of
6 kilometers above the surface) is getting cooler at the same time that the troposphere (the
7 atmospheric layer just above the surface) is getting warmer. These simultaneous changes are
8 consistent with an intensification of Earth's greenhouse effect, which traps heat near the surface,
9 but inconsistent with solar-forced changes, which would warm both the troposphere and the
10 stratosphere.

11
12 **MR. TAYLOR STATES THAT GLOBAL TEMPERATURES WERE COOLING**
13 **BETWEEN 1998 AND 2009. IS THIS AN ACCURATE STATEMENT?**

14 No. The description is incorrect. The most recent ten years is the warmest decade in the
15 instrumental record. A single exceptionally warm year (1998), completely explainable by the
16 occurrence that year of the most intense El Niño event ever observed, cannot be interpreted as
17 the onset of a period of long-term cooling.

18
19 **MR. TAYLOR SAYS THAT OCEAN CIRCULATION PATTERNS HAVE A**
20 **SUBSTANTIAL IMPACT ON GLOBAL CLIMATE, AND CITES DR. SPENCER'S**
21 **WORK TO SUPPORT HIS ASSERTION. DO YOU AGREE WITH HIS ANALYSIS?**

22 No. Mr. Taylor makes several fundamental errors in his statement. The PDO and AMO
23 refer to ocean temperatures, not currents. As such, indices of the PDO and AMO include the

1 effects of long-term climate change, whatever the cause of such change. Hence it is
2 extraordinarily difficult to separate radiation-driven climate change from circulation-driven
3 ocean temperature change on the basis of these oceanic indices. There is no evidence to support
4 his assertion that the PDO and AMO are "regular cycles", as there is no well-established
5 periodicity associated with these temperature fluctuations.

6

7 **MR. TAYLOR ARGUES THAT "ALARMIST COMPUTER MODELS" ARE THE**
8 **ROOT OF THE PROBLEM WITH CLIMATE SCIENCE. DO YOU AGREE?**

9 No. Mr. Taylor's testimony in this section includes several scientific errors, omissions,
10 and biased comments. Climate models indicate that the direct radiative effect of increasing
11 greenhouse gases, such as carbon dioxide, is generally amplified by feedback processes within
12 the climate system. Processes within the climate system that amplify forced change are called
13 "positive feedbacks"; processes that counteract forced changes are called "negative feedbacks".
14 Mr. Taylor repeatedly refers to positive feedbacks as "speculative", although he does not explain
15 why this may be so. The peer-reviewed scientific literature abounds with studies that support the
16 existence of strong positive feedbacks associated with water vapor and albedo generated by
17 current climate models.

18 Mr. Taylor errs in several respects in his discussion of the "three most important assumed
19 feedbacks". First, it is incorrect to assert that these feedbacks are "assumed". By definition,
20 feedback effects are directly simulated by climate models; they arise from the basic physics and
21 chemistry equations that form the basis for the models themselves. Second, Mr. Taylor's
22 description of water vapor feedback is incorrect. A basic principle of thermodynamics known as
23 the Clausius-Clapeyron equation quantitatively describes the increase in saturation vapor pressure

1 of an air-water system with increasing temperature. In lay terms, "warm air can hold more water
2 than cold air." Thus, as temperature increases, even a constant relative humidity will represent an
3 increase in the atmospheric concentration of water vapor, which itself is a short-lived greenhouse
4 gas. This is a powerful positive feedback effect, and it does not require an increase in relative
5 humidity as asserted by Mr. Taylor. Third, Mr. Taylor neglects another well-known positive
6 feedback, the ice-albedo feedback, associated with the high reflectivity ("albedo") of ice and
7 snow surfaces. As ice and snow melt, the fraction of incoming sunlight absorbed by the
8 underlying surface increases (because almost any underlying surface is less reflective than ice),
9 which further warms the near-surface climate. For Earth as a whole, this is a modest feedback
10 relative to the water vapor feedback in the current climate (because the fraction of Earth's surface
11 area covered by ice is relatively modest already), but provides a powerful local positive feedback
12 near the current ice margin. The ice-albedo feedback is unambiguously positive, and plays a
13 more central role in the overall climatic feedback to imposed radiative forcing than the cirrus
14 cloud feedback he mentions.

15 Mr. Taylor provides no supporting evidence - and I am aware of none - for his
16 extraordinarily broad and vague contention that "scientists have proven" the non-existence of
17 certain positive feedbacks regarding relative humidity, cloud cover, and non-greenhouse gas
18 pollution. The complete absence of supporting evidence renders the statement entirely devoid of
19 scientific substance, and I disagree completely with the statement. The consensus view of
20 climatic feedbacks is that they are, on the whole, positive.

21

22

23

1 **MR. TAYLOR CONTENDS THAT WARMING TEMPERATURES WILL BENEFIT**
2 **THE PLANET. WHAT IS YOUR OPINION?**

3 I will not comment on Mr. Taylor's list of alleged "benefits" of a warmer planet, except to
4 note the general contradiction between asserting these alleged benefits and denying that climate
5 change is significant at all, as he discussed in the earlier part of his testimony. One cannot help
6 but wonder if a more recent study of soil moisture in Australia would reach the same optimistic
7 conclusions apparently drawn from a 2004 study, considering the unprecedented drought that has
8 gripped that continent since then. More generally, the EIB needs to focus on impacts to New
9 Mexico, where so much of our agriculture and economic development is limited by water
10 resources, and should keep in mind that climate change impacts need to be assessed over
11 decades. Members of the EIB may wish to re-examine the temperature changes projected for
12 New Mexico in my testimony and exhibits, and make their own judgements regarding Mr.
13 Taylor's conclusion that "[the effects of warming] will likely remain largely beneficial for
14 centuries to come." I am not confident that the projected warming trend of about 7 degrees
15 Fahrenheit per century across New Mexico, derived from global models forced by a mid-range
16 scenario of increasing greenhouse gases (Gutzler and Robbins 2010; NMED-Gutzler Exhibit 3)
17 would be beneficial to New Mexicans for the remainder of this century, never mind "centuries to
18 come."

19

20

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22

1 **MR. TAYLOR CONCLUDES THAT ADOPTING RULES TO REDUCE CARBON**
2 **DIOXIDE EMISSIONS IS "SWIMMING AGAINST THE TIDE" OF PUBLIC OPINION.**
3 **DO YOU AGREE?**

4 This is a political statement, with no basis in science. My direct testimony included recent
5 statements from multiple independent scientific societies, reaffirming the scientific rigor and
6 integrity of climate change science. Within the past month the U.S. Environmental Protection
7 Agency has reaffirmed the science-based justification for regulating greenhouse gas emissions,
8 emphatically rejecting the myriad arguments of climate skeptics and deniers, such as the
9 arguments raised by Mr. Taylor and others in this proceeding. The EPA report is introduced as
10 NMED-Gutzler Rebuttal Exhibit 2. The results of the climate change experiment being carried
11 out by humanity, through our emissions of greenhouse gases, will not be mitigated by wishful
12 thinking or public opinion polls.

13

14 **SHOULD THE EIB VIEW CLIMATE CHANGE AS AN IMMINENT THREAT?**

15 Mr. Taylor begins his testimony with the statement that "Global warming is not an
16 imminent crisis." He repeats this statement using slightly different words ("imminent threat"
17 instead of "imminent crisis") at the conclusion of his testimony. I agree with this assessment, but
18 disagree with his implication that policymakers should not address climate change unless and
19 until it becomes an "imminent" crisis or threat. For decades prior to 2005, atmospheric scientists
20 and hydrologists argued that the City of New Orleans was highly vulnerable to the threat posed
21 by hurricanes. Of course, no one could predict with any certainty when a hurricane might
22 actually hit New Orleans, no hurricanes seemed to come close to the city for many years, and

1 there were always other short-term infrastructure needs that trumped funding for levee
2 strengthening and other expensive hurricane-related investments.

3 With the benefit of perfect hindsight, we now know that policymakers failed utterly to
4 prepare New Orleans for Hurricane Katrina despite clear, credible warnings over many years.
5 When the imminent threat associated with Katrina's approach became obvious, it was much too
6 late to make significant preparations.

7 The analogy I am drawing is imperfect; there is no credible way to prevent hurricanes, for
8 example, so mitigation was not a policy option for New Orleans. However I think it is
9 appropriate to ask ourselves whether we should adopt an "imminent crisis" threshold to
10 consideration of climate change mitigation policy based on a responsible assessment of risk. Is
11 this to be our society's approach to climate change? I concluded my own direct testimony with an
12 appeal for policymakers to adopt a long-term view of the challenge posed to our society by
13 projected climate change. It seems obvious that Mr. Taylor's perspective is exactly the opposite:
14 that policy should be driven entirely by short-term considerations. It is my hope that responsible
15 policy on climate change can be formulated before a significant risk becomes an imminent crisis.

16

17

18 **II. REBUTTAL TO TESTIMONY TO JOHN R. CHRISTY**

19 Dr. Christy has presented testimony that includes original material, as well as specific
20 rebuttal to testimony and exhibits presented by several witnesses, including myself. The science-
21 based component of his testimony (which comprises the majority of his submission) emphasizes
22 the uncertainties in climate data and climate models. In general, his assessment of uncertainties
23 seems selective and biased. Many of Dr. Christy's explicit rebuttal arguments are based on what I
24 would call "straw man" arguments: he mischaracterizes results concerning data or forecast
precision, and then knocks down that mischaracterization. First, I will address some specific

1 statements in his original testimony, next address his comments on my testimony, and then make
2 some general concluding remarks.

3

4 **A. DR. CHRISTY'S DIRECT TESTIMONY**

5

6 **DR. CHRISTY PRESENTS A LINEAR TREND ANALYSIS OF NEW MEXICO**
7 **TEMPERATURES FROM 1895-2009. WHAT DO YOU THINK OF THIS APPROACH?**

8 As Dr. Christy acknowledges later in his testimony, a simple linear trend coefficient
9 (such as he presents on page 3 of his testimony) is, by itself, insufficient to describe climate
10 change in a region such as ours that exhibits large interannual and decadal variability. A more
11 thorough approach is presented in Figure 1b of Gutzler and Robbins (2010; NMED-Gutzler
12 Exhibit 3). In that figure, to the left of the dashed line in 2007 we see that observed temperature
13 in northern New Mexico decreased slightly in the early 20th Century, exhibited little long-term
14 change until a short-lived “bump” in the 1950s during a pronounced drought, and then increased
15 more substantially in the late 20th Century. We assume that the interannual variability
16 superimposed on the trend is unpredictable; for this scenario I have chosen for the sake of
17 simplicity to reproduce the observed (detrended) interannual variability from the 20th Century in
18 the future.

19 Any linear trend needs to be considered together with shorter-term variability. This is
20 why I do not think a linear trend analysis, by itself, is very meaningful. In Figure 1b the
21 projected linear trend in temperature (the only feature I have kept from global model
22 simulations) really starts to stand out from the interannual variability by the second half of the
23 21st Century. The projected future temperature trend, derived from an average of many models,

1 to the right of the dashed line essentially continues the observed trend from the late 20th
2 Century, and so is not at all inconsistent with observed data.

3 Long-term trends in precipitation are small compared to the huge interannual and decadal
4 fluctuations that occur naturally, as shown in Fig. 1d of Gutzler and Robbins (2010). So a linear
5 trend analysis of precipitation, as presented on page 4 of Dr. Christy's testimony, tells us very
6 little without the context of short-term natural interannual variability. However, a primary
7 conclusion of Gutzler and Robbins (2010) is that the surface water budget trends strongly toward
8 drier conditions despite the small trend in projected precipitation. That is because higher
9 temperatures, especially in summer months, increase evaporation off the surface regardless of
10 variability in precipitation. In other words, the pronounced projected future warming trend has
11 important hydrologic consequences for New Mexico, regardless of the smaller, uncertain trend in
12 precipitation.

13
14 **DR. CHRISTY HIGHLIGHTS THE UNCERTAINTIES OF CLIMATE MODELS, AND**
15 **CONTENDS THAT THE DEPARTMENT HAS DOWNPLAYED THESE**
16 **LIMITATIONS. DO YOU AGREE?**

17 No. I acknowledged in my testimony the uncertainties in climate models. Indeed, the
18 IPCC and most other climate scientists (myself included) do not even use the word "forecast"
19 when we discuss possible future climate change; the term "projection" is used, specifically to
20 avoid confusion with deterministic forecasts such as those presented for tomorrow's weather.
21 Because I have been quite clear about this, I disagree with Dr. Christy's claim that the
22 Department has presented "the scenarios generated by these models as predictions of the earth's
23 future climate." The projections indicate possible future states; they are not definite forecasts.

1 I agree in general with Dr. Christy that climate models "cannot predict precisely how
2 climate will change." No one has claimed otherwise. The question at hand is not whether models
3 are imperfect and limited, but whether modern models have collectively demonstrated sufficient
4 skill at reproducing the large-scale features of observed climate change in order to use them to
5 (1) ascertain cause and effect with regard to what is causing observed climate change, and (2)
6 generate useful projections of climate change under a range of assumed forcing scenarios. In my
7 opinion, modern global climate models are sufficiently skillful to use for describing and
8 projecting climate change.

9 My opinion on this matter is entirely consistent with the consensus view among climate
10 change scientists, as evidenced by the assessments published by the IPCC and U.S. Global
11 Change Research Project, and endorsed by many independent scientific societies. The most
12 recent endorsement of climate change science, and the validity of the envelope of climate change
13 projections derived from modern global models, comes from the EPA, which as noted earlier,
14 validated its endangerment finding and rejected in a comprehensive analysis the arguments
15 raised by Dr. Christy.

16

17 **DR. CHRISTY SUGGESTS THAT UNCERTAINTIES IN HISTORICAL**
18 **TEMPERATURE DATA UNDERMINES THE EVIDENCE FOR GLOBAL CLIMATE**
19 **CHANGE. HOW DO YOU RESPOND?**

20 As I have stated repeatedly and at length, all climate data sets contain uncertainties and
21 limitations. Dr. Christy outlines many of these issues, but does not seem to admit the presence of
22 uncertainties and limitations in the satellite-derived data record that he helped to develop, and
23 instead attributes the disagreements between other datasets and his data as unambiguous

1 evidence of flaws in other data. For example, he states that "the surface-based temperature record
2 is unreliable and biased" because it disagrees with his satellite data, and he then uses his satellite
3 data to infer that climate models incorrectly simulate tropical temperatures.

4 It is perhaps understandable that Dr. Christy would view his own data as flawless and all
5 other data sets as inferior, but the EIB needs to understand that this extreme opinion is not shared
6 by other experts in this field. My statement in this regard is supported by the Congressional
7 testimony of Dr. Benjamin Santer (NMED-Gutzler Rebuttal Exhibit 1), who has many years of
8 experience in the joint assessment of climate data and climate model output for the purpose of
9 exploring possible causes of observed climate change. Dr. Santer's testimony (pp. 11-15)
10 contains an extensive discussion of the quality of Dr. Christy's data, concluding that "The
11 extraordinary claim that the tropical troposphere had cooled since 1979 has not survived rigorous
12 scrutiny. We have learned that uncertainties in satellite estimates of tropospheric temperature
13 change are far larger than originally believed, and now fully encompass computer model results.
14 There is no longer a fundamental discrepancy between modeled and observed estimates of
15 tropospheric temperature changes."

16

17 **B. DR. CHRISTY'S RESPONSE TO MY DIRECT TESTIMONY**

18 Dr. Christy reiterates his opinion that my testimony "largely overlooks the significant
19 uncertainties that characterize climate science." As I have stated already, I dispute that opinion. I
20 believe that I have been extremely transparent in acknowledging and discussing uncertainties,
21 but members of the EIB will need to make their own judgements regarding our disagreements
22 over uncertainty assessment. I will offer some general remarks on climate change uncertainties at
23 the end of my rebuttal testimony.

1 Many of Dr. Christy's explicit arguments regarding my testimony are based on "straw
2 man" arguments: he mischaracterizes my testimony, and then attacks the mischaracterization.
3 However, as I will discuss, his prescribed straw men are largely irrelevant to the results and
4 interpretation actually presented in my papers. In particular, he repeatedly draws on the assertion
5 that the projections in my results "depend in large part on declining precipitation generally".

6 This assertion is false, as I discussed at some length on pages 8-10 of this rebuttal. The
7 assertion misrepresents my studies and should be disregarded. Moreover, Dr. Christy contradicts
8 his own assertion when he cites my statement that explicitly acknowledges uncertainties in
9 precipitation projections. The difference in certainty between temperature and precipitation
10 projections is due to the very different physical processes involved in determining temperature
11 and precipitation, which are handled in different sections of climate model code. I disagree with
12 Dr. Christy's assertion that there is a "profound inconsistency" here; it is just much harder for any
13 model to simulate the processes that modulate precipitation compared to the processes that
14 modulate temperature. I have repeatedly shown and clearly described both data and model results
15 that demonstrate the very significant temperature changes that have already been observed and
16 that are projected to continue in future, together with precipitation data and model results that
17 suggest uncertain and unclear long-term precipitation projections together with very large
18 interannual and decade-scale fluctuations.

19

20 **HOW SHOULD WE INTERPRET LINEAR TREND CALCULATIONS OF RECENT**
21 **PRECIPITATION, STREAMFLOW AND SNOWMELT RUNOFF DATA?**

22 Dr. Christy cites a paper that discusses precipitation and streamflow trends from 1948-
23 1997. In my opinion it is inappropriate to interpret precipitation "trends" from this time period as

1 representative of long-term climate change. If one calculates a precipitation "trend" over a period
2 of time that contains the 1950s drought near the beginning of the record, and the wet spell of the
3 1980s and early 1990s at the end of the record, then one inevitably finds an upward "trend" in the
4 data. It seems much more reasonable to me to interpret precipitation variability over a 50-year
5 period in terms of natural drought/pluvial cycles, as Dr. Christy himself emphasizes on page 5 of
6 his testimony. If anything, the finding of no increase in streamflow during several recent
7 decades when precipitation increased, provides support for my hypothesis that increasing
8 temperatures act to diminish the amount of streamflow that results from precipitation. This is
9 entirely consistent with my argument that significantly warmer temperatures should result in
10 lower streamflow in New Mexico rivers in the 21st Century, regardless of uncertainties in
11 precipitation projections.

12 Dr. Christy also cites a paper on snowmelt runoff to criticize studies of runoff that "have
13 relied on trend analyses". As stated above with regard to precipitation, I too would be critical of
14 studies relying just on linear trend analysis, and that is precisely why the regional climate change
15 and drought study that is attached to my testimony explicitly includes observed natural
16 variability in the future scenario described therein. This criticism is just another straw man
17 argument. Note that Dr. Christy's criticism of trend analysis conflicts with his own presentation
18 of a trend analysis of temperature, as noted earlier in my testimony.

19 Finally, Dr. Christy views the Gila Trout study with skepticism, "especially in light of
20 studies that contradict projections of decreasing water supply and decreasing precipitation related
21 to climate change." But precipitation uncertainties are not the focus of the Gila Trout study. That
22 study focused on temperature change and its potential effect on restricting the range of this cold-
23 water fish.

1 **DOES “CLIMATEGATE” INVALIDATE CLIMATE CHANGE SCIENCE?**

2 Like other climate change skeptics, Dr. Christy is eager to use the set of stolen emails
3 known as "Climategate" to justify dismissal of the entire body of work in climate science. He
4 argues against "racing to adopt scientific positions", as if more than 20 years' accumulation of
5 diverse and progressively stronger evidence for anthropogenic climate change since the
6 establishment of the IPCC in 1988 could be described meaningfully as a "race". He states that
7 "many of the principal scientists who authored key chapters of the IPCC scientific assessments
8 may have suppressed scientific information." This statement is irresponsible and unjustified.
9 Very few scientists were ever alleged to have behaved in such a way, and multiple investigations
10 since the release of the emails have fully exonerated them. The EPA provides links to each of
11 these investigations in support of its decision to reject the various petitions seeking
12 reconsideration of its endangerment finding. Dr. Overpeck will have more to say about this topic
13 in his testimony.

14 The emails at issue were stolen from the Climate Research Unit (CRU) at the University
15 of East Anglia, and while the CRU is indeed an important climate data center, it is hardly the
16 only such data center. The broader implications of any hint of impropriety in CRU's data
17 processing can be assessed by comparing CRU's estimate of global mean temperature change
18 with other estimates, produced independently by other data centers such as the U.S. National
19 Climatic Data Center, which is operated by the U.S. National Oceanic and Atmospheric
20 Administration (NOAA). As expected, the various instrumental data records exhibit small but
21 measurable differences in individual years, but in all major respects, the globally-averaged
22 surface temperature data records from NOAA and NASA show the same multi-decadal
23 variations in temperature as the CRU data.

1 **C. CONCLUDING REMARKS**

2 In my reading of Dr. Christy's testimony, it seems that he views the uncertainties inherent
3 in current data and model projections to be so large that policymakers should not use them at all.
4 It is unclear from his testimony what increase in scientific certainty he feels would be sufficient
5 to justify any climate change policy.

6 In my opinion Dr. Christy's description of the various uncertainties associated with
7 different datasets or model simulations is both selective and biased. He regards positive
8 feedbacks in models to be unproven and uncertain, echoing Mr. Taylor's description of these
9 feedbacks as "speculative". In particular, he views the potential for positive feedbacks associated
10 with clouds to be uncertain and unreliable, and promotes the potential for negative cloud
11 feedbacks explored by his colleague Dr. Spencer.

12 With regard to datasets, Dr. Christy's testimony is contradictory. In one segment of his
13 testimony he emphasizes the natural variability illustrated in tree ring reconstructions of past
14 climate to emphasize the modest climate change seen so far in the temperature record. But in
15 another segment of his testimony, when he wishes to emphasize uncertainty in climate data, he
16 makes the remarkably sweeping assertion that the "divergence" problem "casts doubt upon the
17 validity of tree ring series as proxies for past climates", thereby broadly dismissing an entire
18 class of climate data.

19 Dr. Christy cannot have it both ways. Data sets and model results cannot be deemed
20 unreliable if they are inconsistent with his desired policy outcome, but reliable if they support his
21 desired outcome. Policy advocates are free to selectively pick and emphasize data and
22 interpretation to support their position, and to deliberately downplay other results that do not
23 support it. Objective scientists, however, do not enjoy such freedom if they wish to retain their

1 credibility as "honest brokers" of information. It may be convenient for Dr. Christy to selectively
2 fit his arguments to suit the policy he wishes to advocate. However I suggest that this sort of
3 inconsistency should be viewed with extreme suspicion by policymakers, as it would be within
4 the scientific community.

5 In my opinion, Dr. Christy has assembled a biased collection of results intended to
6 selectively amplify uncertainties, and thereby justify the dismissal of most current analyses of
7 climate change based on either data or models. In my direct testimony, in the papers submitted as
8 exhibits attached to my testimony, and in my rebuttal testimony, I have made no attempt to hide
9 the presence of inherent uncertainties in climate data, climate models, and the projections of
10 future climate obtained using those models. All climate datasets (including the satellite-based
11 microwave data that Dr. Christy and his collaborators developed) contain some level of
12 uncertainty that must be considered when using the data for scientific purposes. Individual
13 climate model projections contain uncertainties, and are fundamentally less certain than weather
14 forecasts. Nevertheless, in my professional opinion the collective weight of the evidence is
15 extremely compelling in support of the hypothesis that greenhouse gas-forced climate change is
16 already occurring, and that there is a high likelihood of very significant greenhouse-gas forced
17 climate change in this century.

18 The scenarios presented by Gutzler and Robbins (2010) clearly show that a "middle-of-
19 the-road" projection of climate change yields increasing temperatures in New Mexico that lie
20 within the historical range of interannual variability until mid-century. Precipitation exhibits very
21 little long-term change relative to natural interannual and decadal fluctuations in this scenario.
22 But by the second half of the 21st Century temperatures warm up far beyond the observed range
23 in the 20th Century historical record. The hydrologic consequences for the surface water budget,

1 expressed as a Palmer Drought Index, are profound, despite minimal long-term precipitation
2 change. Even if this scenario represents a significant overestimate of temperature change (and I
3 see no reason to assume such a bias), a slower rate of temperature change would still have
4 profound effects for New Mexico within the lifetime of our children.

5 The EIB faces the difficult task of formulating policy on the basis of uncertain
6 projections such as the one I just described. This is a challenging task, but hardly unprecedented.
7 All environmental and economic policies are based on limited data and complex, hard-to-predict
8 outcomes. Dr. Christy and Mr. Taylor would have you believe that the risks associated with
9 climate change can be safely and totally ignored. I respectfully but profoundly disagree with that
10 assessment. The EIB should keep in mind that the consensus view on climate change science, as
11 expressed in multiple assessments of the IPCC, and more recent reports by the U.S. Global
12 Change Research Program, is much closer to my view than to theirs. This is why Dr. Christy is
13 working to change the structure of IPCC assessment to include an "alternative view" section that
14 would explicitly incorporate minority opinions such as his.

15 I cannot say with complete certainty that Dr. Christy's dismissal of the consensus view is
16 wrong. However a prudent and appropriate approach to climate change-related policy must
17 recognize that the testimony presented by Dr. Christy is far from the consensus view, and
18 represents one end of the spectrum of opinions among climate change scientists. The EIB should
19 take equally seriously the views of respected scientists at the other end of the spectrum from Dr.
20 Christy, who believe that climate change could be much more rapid and extreme than indicated
21 by a "middle-of-the-road" projection such as was used in the Gutzler and Robbins (2010) study.
22 The possibility of a near-term "tipping point", as discussed by Mr. Jim Norton in his testimony
23 based on the research of Dr. James Hansen, is an example of such a scenario.

1 **III. REBUTTAL TESTIMONY TO WILLIAM D. BALGORD**

2 Dr. Balgord's testimony relies entirely on citations to a document published by the
3 Heartland Institute. The bulk of the material in the Heartland Institute document is presented
4 with little or no credible scientific support. The established basis for credible science is the
5 scientific peer-review process, and in this regard it is important to note that most of the material
6 in the Heartland Institute document has not undergone peer review.

7 One of the stated motivations for the Heartland Institute report is to present a "second
8 opinion" about climate change, presumably because the contributors to the report do not like the
9 conclusions drawn from peer-reviewed results in the Intergovernmental Panel on Climate
10 Change (IPCC) assessments of climate change research -- the implication being that the IPCC
11 report is a potentially suspect "first opinion".

12 With regard to "second opinions", however, it should be noted that the United States
13 government, under Republican presidential administrations, has mandated independent national
14 assessments of climate change: first the National Assessment of Climate Change (NACC,
15 mandated in 1990, final report published in 2000), then the U.S. Climate Change Science
16 Program (CCSP, mandated in 2002, which has issued synthesis reports on different topics
17 starting in 2006). The CCSP still operates under the title U.S. Global Change Research Program,
18 and issued several major climate change assessment reports last year.

19 These large and comprehensive national assessments emphatically confirm the IPCC
20 results, while also providing considerably more regional detail. So the Heartland Institute
21 document is not really a "second opinion"; it is perhaps a third or fourth opinion, generated
22 because a relatively small number of holdout "skeptics" simply refuse to accept any synthesis of
23 peer-reviewed research that conflicts with their deeply-held personal beliefs. It is legitimate and

1 appropriate for the EIB to accept all opinions submitted by the public, but the EIB should
2 recognize that the level of scientific rigor and peer-review in the Heartland Institute document is
3 vastly inferior to the science reflected in the peer-reviewed research underlying the IPCC and
4 national assessments.

5 Turning now to Dr. Balgord's testimony, it consists of a series of brief, and often vague,
6 critical comments derived largely from the Heartland Institute document. I will attempt to assess
7 these comments, but given their very sketchy scientific support, this will be difficult. Rather than
8 repeating each comment, I direct the EIB's attention to Dr. Balgord's testimony which is attached
9 to the Coalition of Counties' Notice of Intent as Exhibit 1.

10 (1) This conclusion is contradicted by the vast majority of peer-reviewed studies.

11 (2) This assertion is false. Global climate models have been shown to reproduce the
12 major multi-decadal fluctuations in temperature during the 20th Century, if (and only if) they are
13 forced with observed anthropogenic greenhouse gas and aerosol pollution during that time.

14 (3) This assertion is overblown. All numerical weather and climate models contain
15 approximations and parameterizations (in which small-scale variables such as clouds are
16 represented statistically in terms of the large-scale variables resolved in the model). However, all
17 of the phenomena listed in Dr. Balgord's comment are represented in the models, and the global
18 models developed at major modeling centers, such as those used for projections disseminated
19 through the IPCC, have been very extensively tested and validated.

20 (4) This assertion is false. The Mann et al. paper in question is now more than a
21 decade old. Many investigators have since generated analogous time series using different
22 sources of proxy climate data and different analysis techniques. The more recent results tend to

1 show more century-scale variability prior to the Industrial Revolution than the Mann et al.
2 “hockey stick”. However the rapid increase in temperature in the 20th Century still stands out as
3 very unusual compared to temperature reconstructed for the previous millennium in the newer
4 reconstructions cited in the 2007 IPCC assessment.

5 5) This assertion is false, as noted in response to comment 4. The climate research
6 community has long since advanced beyond the “hockey stick” diagram as noted in response to
7 comment 4. Skeptics who continue to harp on the deficiencies of the "hockey stick" have simply
8 failed to keep up with current research.

9 (6) This assertion is false. Climate does show discernable variations, but at time
10 scales longer than the modest 11 year cycle associated with solar variability, they are not
11 significantly cyclic.

12 (7) This assertion is false. There is no known solar cycle that can account for the
13 century-scale cooling that seems to have played a large role in the Little Ice Age. The best, peer-
14 reviewed estimates of solar variability show that solar brightness was reduced during the Little
15 Ice Age, associated with the disappearance of sunspots. But there is no known cyclicity
16 associated with the Maunder Minimum in sunspots during the Little Ice Age. No known solar
17 cycle that can plausibly explain long-term warming in the 20th Century, long after the re-
18 establishment of the 11 year solar cycle in the 18th Century.

19 (8) This statement demonstrates ignorance of how climate feedbacks work. Ice age
20 cycles are thought to be forced by fluctuations in Earth’s orbit around the sun that change the
21 distribution of solar radiation. The direct solar forcing at the initiation of a glacial episode is
22 relatively modest, but the direct forcing is amplified by positive feedback effects: growing ice

1 sheets that reflect sunlight, the uptake of carbon dioxide by a cooling ocean, and the probable
2 decrease in humidity as temperatures cool.

3 It is not clear to me that Dr. Balgord understands the implications of these strong positive
4 feedback mechanisms for the current climate. That is because, far from contradicting the
5 hypothesis that increasing greenhouse gases could produce a significant climate change, our
6 understanding of how ice ages develop provides powerful support for the concept that strong
7 positive feedbacks exist and are likely to amplify the direct effects of imposed forcing on the
8 climate system. In the present day, that forcing comes overwhelmingly from anthropogenic
9 increases in the greenhouse effect, not from the much slower orbital changes that force ice ages.

10 (9) This vague statement (“various factors ... are incompletely understood”) is both
11 unsupported and meaningless. The increase in atmospheric carbon dioxide is unambiguously
12 human-caused, as outlined in my response to comment 17.

13 (10) This statement is only true if all else in the climate system stays the same. In New
14 Mexico, flora and fauna are largely water-limited, not carbon dioxide-limited. Therefore the
15 deleterious effects of diminished snowpack and increased evaporation rates associated with a
16 significantly warmer climate are much more important than the fertilization effect of increasing
17 atmospheric carbon dioxide concentration.

18 (11) I am not an economist so I will not address this comment, other than to make the
19 observation that it is yet another unsupported assertion.

20 (12) I concur with the estimate of 1 degree C warming given here as the direct radiative
21 effect of doubling carbon dioxide. But there is no evidence whatsoever that the negative
22 feedbacks vaguely asserted here (due to “clouds and other atmospheric agents”) exist in the

1 climate system. On the other hand, there is abundant evidence, both theoretical and observed, for
2 positive feedbacks that amplify the direct radiative effect of increasing carbon dioxide (as
3 discussed above in response to comment 8). Dr. Balgord fails to acknowledge any of this
4 evidence.

5 (13) This assertion is false. There are numerous “fingerprint” tests that confirm that
6 much of recent observed warming is due to an increased greenhouse effect. For example, the
7 stratosphere has been observed to cool in recent decades, which is consistent with greenhouse
8 gas-forced surface warming but inconsistent with solar forcing.

9 (14) This assertion is false. Temperatures have been observed to rise across most of the
10 continental areas with long-term records, not just in growing urban areas. Weather records
11 suspected of having an urban warming bias are routinely inspected by comparison with rural
12 sites that are well outside the city but close enough to experience comparable weather patterns. I
13 have studied temperature trends in New Mexico in some detail, and I find warming trends in
14 rural areas that are entirely comparable to the trends observed at more urban sites.

15 (15) Observations and global climate models all tend to show that the increased
16 humidity in a warmer climate adds to the greenhouse effect, providing a positive feedback on the
17 system and amplifying the warming effect of increasing carbon dioxide. Over the past several
18 decades Prof. Lindzen has proposed different conceptual alternative mechanisms that could lead
19 to a negative water vapor feedback. But there is no observational evidence that Lindzen’s
20 proposed negative feedback mechanisms are significant in the actual climate system.

21 (16) I agree with this statement, except for the characterization of computer models as
22 "notoriously" inadequate. My own research on climate change in western North America

1 suggests that the climate change signal associated with the trend toward warmer temperatures is
2 much stronger (relative to natural interannual variability) than projected trends in precipitation.
3 But temperature trends have pronounced effects on the hydrologic cycle, especially regarding
4 decreases in snowpack and increases in evaporation off the surface. Both of these temperature-
5 related impacts have the effect of drying in New Mexico, a semiarid region whose major rivers
6 are snowfed.

7 (17) This assertion is false. Combustion-generated carbon dioxide has a different
8 carbon isotopic ratio than carbon dioxide generated from volcanoes, vegetation decay, or oceans.
9 Isotopic studies unambiguously show that the current observed increase in carbon dioxide is due
10 to combustion. In addition, the overall rate of change of atmospheric carbon dioxide, the
11 interannual variability of carbon dioxide increase, and the interhemispheric gradient of
12 atmospheric carbon dioxide, are all clearly correlated with anthropogenic carbon dioxide
13 emissions.

14 (18) The assertion that the IPCC makes any attempt to estimate future anthropogenic
15 carbon dioxide emissions is false. The IPCC has coordinated the development of many emissions
16 “scenarios”, with the express goal of testing a wide range of possible emissions futures for policy
17 guidance (and explicitly refraining from prescribing which scenario is preferable or most likely).
18 Having said that, it should be noted that the most commonly cited “mid-range” scenario
19 generated by the IPCC in the early 1990s provides a dramatic underestimate of emissions that
20 have occurred since then, direct contradicting Dr. Balgord’s assertion.

21 (19) This statement is true, but it is totally irrelevant to this hearing. The EIB is not
22 concerned with the general survival of life on Earth millions of years ago. The EIB needs to

1 consider whether the changes in climate projected to occur over the next century or less (an
2 extraordinarily abrupt and rapid change by geological standards) due to anthropogenic carbon
3 dioxide emissions are likely to be deleterious to human health and prosperity in New Mexico,
4 including the management of ecosystems within the state. The likelihood that carbon dioxide
5 levels were highly elevated millions of years ago actually provides considerable support for the
6 concept that atmospheric carbon dioxide concentrations could rise far above current levels in the
7 future as anthropogenic emissions continue unabated.

8 (20, 21) Actual climate change is not equivalent to a controlled study of elevated carbon
9 dioxide on plants in a closed environment. Specifically, potential water supply decreases in a
10 warmer climate that are highlighted in studies of climate change in New Mexico and in my own
11 direct testimony will be much more significant for plant growth than carbon dioxide fertilization
12 effects.

13 (22) This hearing pertains to the state of New Mexico. Dr. Balgord's testimony is in
14 large part a generic denial of climate change science, and this comment happens to emphasize
15 coral reefs and polar bears. However neither coral reefs nor polar bears are present in the state of
16 New Mexico. In another setting it would be appropriate to dispute the plausibility of the
17 assertions presented in this comment, but that would be irrelevant to this hearing.

18 (23) This hearing pertains to the state of New Mexico. Dr. Balgord's testimony, which
19 in large part is a generic denial of climate change science, fails to address the issues of potential
20 water supply decreases in a warmer climate that are highlighted in studies of climate change in
21 New Mexico and in my own direct testimony.

22

1 **IV. REBUTTAL TO TESTIMONY OF ROBERT L. KAPPELMANN**

2 Mr. Kappelmann has submitted testimony and exhibits attempting to refute peer-
3 reviewed climate change science, particularly as synthesized and disseminated through the
4 Intergovernmental Panel on Climate Change (IPCC). A substantial fraction of Mr.
5 Kappelmann's testimony and exhibits are based on his view that the IPCC is a corrupt and
6 biased organization. First, I will address Mr. Kappelmann's general criticism of the IPCC and
7 then will review his science-related exhibits.

8 The scientific validity of the IPCC's assessments has been affirmed by numerous
9 independent scientific societies. In the United States, formal public statements confirming the
10 reality of current climate change and the attribution of current change to increasing greenhouse
11 gases of anthropogenic origin have been issued by many independent professional groups that
12 have no affiliation with the IPCC. Several such statements are appended to my direct testimony,
13 including:

14 American Association for the Advancement of Science (AAAS) (February 2007)

15 American Meteorological Society (February 2007)

16 American Physical Society (November 2007, with Commentary added April 2010)

17 American Geophysical Union (December 2007)

18 Geological Society of America (April 2010)

19 In addition, the AAAS sponsored a letter to the United States Senate in October 2009 signed
20 by the leaders of 18 separate scientific organizations affirming the reality and severity of ongoing
21 and projected climate change. In December 2009 the AAAS published a comment explicitly
22 reaffirming its previously published opinion on climate change science, specifically stating that
23 "the illegal release of private emails stolen from the University of East Anglia should not cause

1 policy-makers and the public to become confused about the scientific basis of global climate
2 change.”

3 The assessments of IPCC and climate science listed above are much more serious,
4 objective, and credible than Mr. Kappelmann’s personal opinions, and therefore are much more
5 germane to this hearing. It is important for the EIB to understand that claims of uncertainty and
6 ongoing scientific debate about the most basic results of climate change science are contradicted
7 by a mountain of diverse scientific evidence, vetted by hundreds of climate scientists, and
8 endorsed by the foremost independent scientific societies in this country and abroad.

9

10 Exhibit RLK 5

11 Raw political contempt for the IPCC is a central theme of Mr. Kappelmann’s testimony.
12 For example, this exhibit, which his testimony describes as “a summary of problems with IPCC
13 Climate Change reports”, is nothing more than a sarcastic list of “Gates” that plays on the public
14 controversy generated by the release of stolen emails from a server at the University of East
15 Anglia in 2009. It is certainly true that the three-volume set of principal IPCC assessments
16 published in 2007 -- each volume nearly 1000 pages long -- contains several significant editorial
17 errors that have been widely publicized (and promptly corrected). As an active researcher who
18 frequently uses the IPCC reports as reference materials, especially for their exhaustive list of
19 peer-reviewed references, my personal opinion is that the number of identified errors is
20 remarkably small.

21 At least five different independent reviews carried out this year have exonerated the
22 scientists involved in “Climategate” from the charges of fraud or bias repeatedly mentioned by
23 Mr. Kappelmann. The most recent review, carried out by an independent panel of British

1 scientists commissioned by the University of East Anglia, stated that “We find that [the] rigor
2 and honesty [of the University scientists whose emails were stolen] as scientists are not in
3 doubt”. To be sure, this controversy has highlighted the need for improved transparency in data
4 processing. But claims that “Climategate” exposed some grand conspiracy are overblown by
5 skeptics to the point of absurdity. If climate change science is nothing but a hoax generated by
6 an IPCC-led conspiracy, then the conspiracy must include the U.S. government (which
7 commissioned its own national assessments under both Presidents Bush), the British government
8 (which commissioned its own review of "Climategate"), and the independent, nongovernmental
9 scientific societies that have released their own statements supporting the basic conclusions of
10 the climate change research community. It should be noted that the December 2009 AAAS letter
11 and the April 2010 GSA statement were both issued after the publicity surrounding
12 "Climategate", illustrating the non-impact of that episode on the scientific community.

13

14 Exhibit RLK 6

15 This exhibit illustrates two estimates of reconstructed global temperatures, extending
16 backward in time before the instrumental record. Both of these estimates were generated more
17 than a decade ago, and neither of them should be considered representative of current research.
18 A tremendous amount of research has been carried out over the past decade to refine
19 paleoclimatic estimates of Holocene temperatures. Arguing over results from the 1990s on this
20 topic is irrelevant to this hearing.

21

22

23

1 Exhibit RLK 6a

2 This document presents a critique of climate change science by Dr. Alan Carlin. A point-
3 by-point review of this document would be tedious and, in my opinion, unnecessary. As a
4 general and very important comment, however, it should be noted once again that -- like the
5 principal exhibit submitted by Dr. Balgord -- this document has not been peer-reviewed, which is
6 the standard scientific method for quality control. As a result, it is not surprising that most of the
7 references cited and discussed in the exhibit have not been peer-reviewed. In essence, Exhibit
8 RLK 6a is merely a compendium of Dr. Carlin's personal opinions selectively compiled from the
9 personal opinions of others, with no attempt made (insofar as I can tell) to comprehensively
10 review the best and most recent science.

11 For example, one of Dr. Carlin's three principal criticisms is that "satellite microwave
12 sounding units show no appreciable temperature increases during the critical period 1978-1997,
13 just when the surface data show a pronounced rise". It is false to assert that discrepancies
14 between estimates of global temperature change derived from satellites and surface
15 thermometers disprove any basic conclusions regarding recent global warming. Apparent
16 discrepancies between surface temperature and satellite microwave data have been widely
17 discussed since the late 1980s. Given the importance of this matter, the U.S. National Research
18 Council (NRC) commissioned a report on precisely this topic, published in 2000 ("Reconciling
19 Observations of Global Temperature Change", National Academy Press). Data through 1998
20 were available at the time the report was written (the satellite data record begins in 1979). The
21 panel that produced the NRC's report included representatives from the group that produced the
22 satellite data as well as independent atmospheric scientists, and the report was thoroughly peer-
23 reviewed following standard NRC practice.

1 The principal conclusion of the NRC report, given in boldface type in its Executive
2 Summary, is as follows: “In the opinion of the panel, the warming trend in global-mean
3 temperature during the past 20 years is undoubtedly real and is substantially greater than the
4 average rate of warming during the 20th Century. The disparity between surface and upper-air
5 trends in no way invalidates the conclusion that surface temperature has been rising.”

6 Six years later the first of the CCSP reports ("Temperature Trends in the Lower
7 Atmosphere: Steps for Understanding and Reconciling Differences", CCSP Synthesis and
8 Assessment Report 1.1, 2006) also reviewed this topic, incorporating new research since the
9 publication of the NRC report. The CCSP SAP 1.1 concluded that "There is no longer a
10 discrepancy in the rate of global average temperature increase for the surface compared with
11 higher levels in the atmosphere".

12 Finally, the 2000 NRC report and the 2006 CCSP report both present independent,
13 objective, and thorough reviews of satellite-surface temperature discrepancies, but Dr. Carlin
14 simply ignores them. It is difficult to understand the value in promoting uncertainties and
15 discrepancies that no longer exist.

16

17 Exhibit RLK 7

18 This exhibit illustrates projected warming trends derived from different methods. I have
19 not seen a thorough description of how these results were generated so the purported trends
20 cannot be assessed in detail. However, it seems that the “observation-based ‘estimates’”
21 represent an attempt to extrapolate short-term trends in temperature to the entire 21st Century.
22 Any such extrapolation has no statistical validity whatsoever.

1 upward -- are projected with more certainty than corresponding precipitation trends. The EIB
2 will need to deliberate with these uncertainties in mind. However the wholesale denial of climate
3 change science presented in adverse testimony to this hearing has no credible basis beyond
4 political posturing.

Testimony for House Select Committee on Energy Independence and Global Warming

Benjamin D. Santer

May 20, 2010

1. Biographical information

My name is Benjamin Santer. I am a climate scientist. I work at Lawrence Livermore National Laboratory (LLNL) in Livermore, California. I am testifying today as a private citizen rather than as an official representative of Lawrence Livermore National Laboratory.

I have been employed since 1992 in LLNL's Program for Climate Model Diagnosis and Intercomparison (PCMDI). PCMDI was established in 1989 by the U.S. Department of Energy, and has been at LLNL since then. PCMDI's mission is to quantify how well computer models simulate important aspects of present-day and historical climate, and to reduce uncertainties in model projections of future climate change.

PCMDI is not engaged in developing its own computer model of the climate system ("climate model"). Instead, we study the performance of all of the world's major climate models. We also coordinate international climate modeling simulations, and help the entire climate science community to analyze and evaluate climate models.

I have a Ph.D. in Climatology from the Climatic Research Unit of the University of East Anglia in the United Kingdom. I went to the Climatic Research Unit in 1983 because it was (and still is) one of the world's premier institutions for studying past, present, and future climate. During the course of my Ph.D., I was privileged to work together with exceptional scientists – with people like Tom Wigley, Phil Jones, Keith Briffa, and Sarah Raper.

My thesis explored the use of so-called “Monte Carlo” methods in assessing the quality of different climate models. After completing my Ph.D. in 1987, I spent five years at the Max-Planck Institute for Meteorology in Hamburg, Germany. During my time in Hamburg, I worked with Professor Klaus Hasselmann on the development and application of “fingerprint” methods, which seek to improve our understanding of the nature and causes of climate change.

Much of the following testimony is adapted from a chapter Tom Wigley and I recently published in a book by Dr. Stephen Schneider (1).

2. Introduction

In 1988, the Intergovernmental Panel on Climate Change (IPCC) was jointly established by the World Meteorological Organization and the United Nations Environment Programme. The goals of this panel were threefold: to assess available scientific information on climate change, to evaluate the environmental and societal impacts of climate change, and to formulate response strategies. The IPCC's first major scientific assessment, published in 1990, concluded that *“unequivocal detection of the enhanced greenhouse effect from observations is not likely for a decade or more”* (2).

In 1996, the IPCC's second scientific assessment made a more definitive statement regarding human impacts on climate, and concluded that "*the balance of evidence suggests a discernible human influence on global climate*" (3). This cautious sentence marked a paradigm shift in our scientific understanding of the causes of recent climate change. The shift arose for a variety of reasons. Chief amongst these was the realization that the cooling effects of sulfate aerosol particles (which are produced by burning fossil fuels) had partially masked the warming signal arising from increasing atmospheric concentrations of greenhouse gases (4).

A further major area of progress was the increasing use of "fingerprint" studies (5, 6, 7). The strategy in this type of research is to search for a "fingerprint" (the climate change pattern predicted by a computer model) in observed climate records. The underlying assumption in fingerprinting is that each "forcing" of climate – such as changes in the Sun's energy output, volcanic dust, sulfate aerosols, or greenhouse gas concentrations – has a unique pattern of climate response (see Figure 1). Fingerprint studies apply signal processing techniques very similar to those used in electrical engineering (5). They allow researchers to make rigorous tests of competing hypotheses regarding the causes of recent climate change.

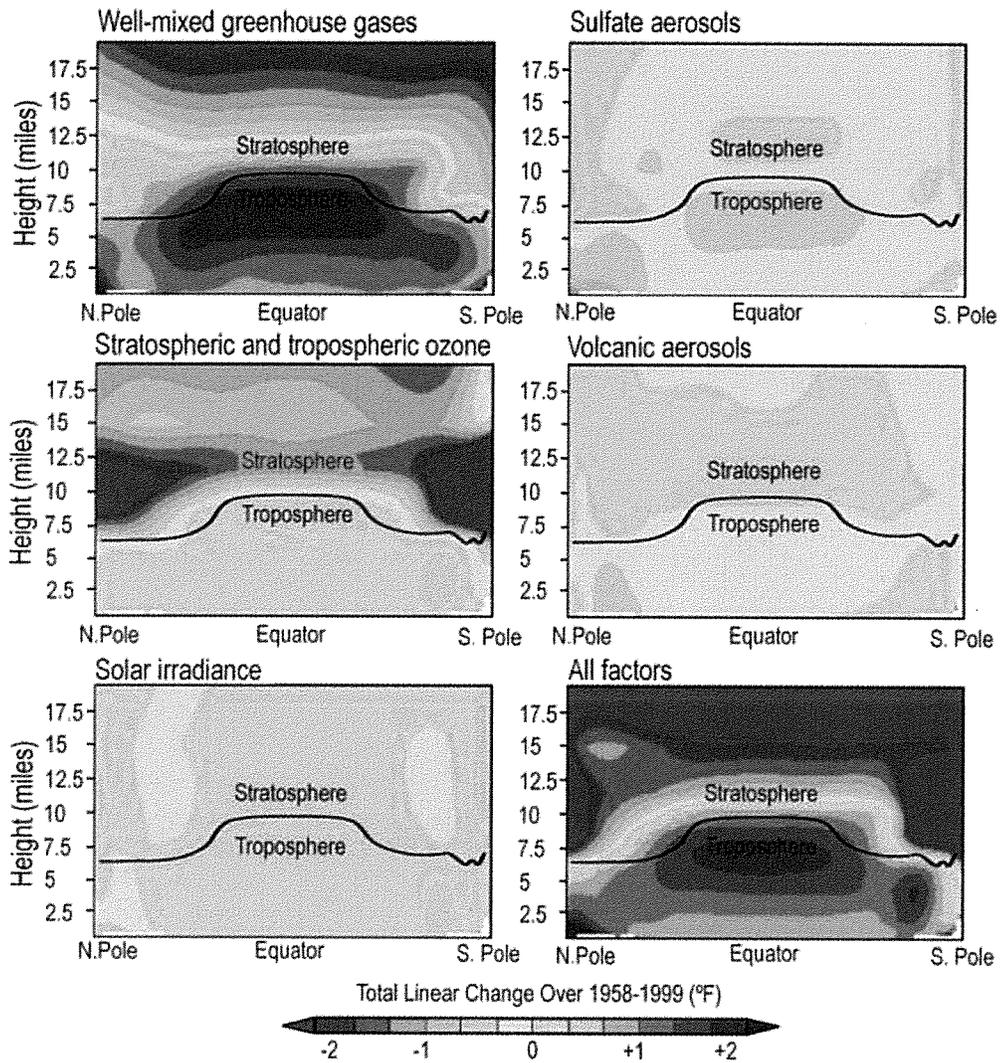


Figure 1: Climate simulations of the vertical profile of temperature change due to five different factors, and the effect due to all factors taken together. The panels above represent a cross-section of the atmosphere from the North Pole to the South Pole, and from the surface up into the stratosphere. The black lines show the approximate location of the tropopause, the boundary between the lower atmosphere (troposphere) and the stratosphere. This Figure is reproduced from Karl *et al.* (8).

The third IPCC assessment was published in 2001, and went one step further than its predecessor. The third assessment reported on the magnitude of the human effect on climate. It found that *“There is new and stronger evidence*

that most of the warming observed over the last 50 years is attributable to human activities" (9). This conclusion was based on improved estimates of natural climate variability, better reconstructions of temperature fluctuations over the last millennium, continued warming of the climate system, refinements in fingerprint methods, and the use of results from more (and improved) climate models, driven by more accurate and complete estimates of the human and natural "forcings" of climate.

This gradual strengthening of scientific confidence in the reality of human influences on global climate continued in the IPCC AR4 report, which stated that *"warming of the climate system is unequivocal"*, and that *"most of the observed increase in global average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations"* (10) (where "very likely" signified >90% probability that the statement is correct). The AR4 report justified this increase in scientific confidence on the basis of *"...longer and improved records, an expanded range of observations and improvements in the simulation of many aspects of climate and its variability"* (10). In its contribution to the AR4, IPCC Working Group II concluded that anthropogenic warming has had a discernible influence not only on the physical climate system, but also on a wide range of biological systems which respond to climate (11).

Extraordinary claims require extraordinary proof (12). The IPCC's extraordinary claim that human activities significantly altered both the chemical composition of Earth's atmosphere and the climate system has received

extraordinary scrutiny. This claim has been independently corroborated by the U.S. National Academy of Sciences (13), the Science Academies of eleven nations (14), and the Synthesis and Assessment Products of the U.S. Climate Change Science Plan (15). Many of our professional scientific organizations have also affirmed the reality of a human influence on global climate (16).

Despite the overwhelming evidence of pronounced anthropogenic effects on climate, important uncertainties remain in our ability to quantify the human influence. The experiment that we are performing with the Earth's atmosphere lacks a suitable control: we do not have a convenient "undisturbed Earth", which would provide a reference against which we could measure the anthropogenic contribution to climate change. We must therefore rely on numerical models and paleoclimate evidence (17) to estimate how the Earth's climate might have evolved in the absence of any human intervention. Such sources of information will always have significant uncertainties.

In the following testimony, I provide a personal perspective on recent developments in the field of detection and attribution ("D&A") research. Such research is directed towards detecting significant climate change, and then attributing the detected change to a specific cause or causes (18, 19, 20, 21).

3. Recent Progress in Detection and Attribution Research

Fingerprinting

The IPCC and National Academy findings that human activities are affecting global-scale climate are based on multiple lines of evidence:

1. Our continually-improving physical understanding of the climate system and the human and natural factors that cause climate to change.
2. Evidence from paleoclimate reconstructions, which enables us to place the warming of the 20th century in a longer-term context (22, 23).
3. The qualitative consistency between observed changes in different aspects of the climate system and model predictions of the changes that should be occurring in response to human influences (10, 24).
4. Evidence from rigorous quantitative fingerprint studies, which compare modeled and observed patterns of climate change.

Most of my testimony will focus on the fingerprint evidence, since this is within my own area of scientific expertise.

As noted above, fingerprint studies search for some pattern of climate change (the “fingerprint”) in observational data. The fingerprint can be estimated in different ways, but is typically obtained from a computer model experiment in

which one or more human factors are varied according to the best-available estimates of their historical changes. Different statistical techniques are then applied to quantify the level of agreement between the fingerprint and observations and between the fingerprint and estimates of the natural internal variability of climate. This enables researchers to make rigorous tests of competing hypotheses (25) regarding the possible causes of recent climate change (18, 19, 20, 21).

While early fingerprint work dealt almost exclusively with changes in near-surface or atmospheric temperature, more recent studies have applied fingerprint methods to a range of different variables, such as ocean heat content (26, 27), Atlantic salinity changes (28), sea-level pressure (29), tropopause height (30), zonal-mean rainfall (31), surface humidity (32), atmospheric moisture (33, 34), and Arctic sea ice extent (35). The general conclusion is that for each of these variables, natural causes alone cannot explain the observed climate changes over the second half of the 20th century. The best statistical explanation of the observed climate changes invariably involves a large human contribution.

These results are robust to the processing choices made by different groups, and show a high level of physical consistency across different climate variables. For example, observed atmospheric water vapor increases (36) are physically consistent with increases in ocean heat content (37, 38) and near-surface temperature (39, 40).

There are a number of popular misconceptions about fingerprint evidence. One misconception is that fingerprint studies consider global-mean temperatures only, and thus provide a very poor constraint on the relative contributions of human and natural factors to observed changes (41). In fact, fingerprint studies rely on information about the detailed spatial structure (and often the combined space and time structure) of observed and simulated climate changes. Complex patterns provide much stronger constraints on the possible contributions of different factors to observed climate changes (42, 43, 44).

Another misconception is that computer model estimates of natural internal climate variability (“climate noise”) are accepted uncritically in fingerprint studies, and are never tested against observations (45). This is demonstrably untrue. Many fingerprint studies test whether model estimates of climate noise are realistic. Such tests are routinely performed on year-to-year and decade-to-decade timescales, where observational data are of sufficient length to obtain reliable estimates of observed climate variability (46, 47, 48, 49).

Because regional-scale climate changes will determine societal impacts, fingerprint studies are increasingly shifting their focus from global to regional scales. Such regional studies face a number of challenges. One problem is that the noise of natural internal climate variability typically becomes larger when averaged over increasingly finer scales (50), so that identifying any human-caused climate signal becomes more difficult.

Another problem relates to the climate forcings used in computer model simulations of historical climate change. As scientific attention shifts to ever smaller spatial scales, it becomes more important to obtain reliable information about these forcings. Some forcings are both uncertain and highly variable in space and time (51, 52). Examples include human-induced changes in land surface properties (53) or in the concentrations of carbon-containing aerosols (54, 55). Neglect or inaccurate specification of these factors complicates D&A studies.

Despite these problems, numerous studies have now shown that the climate signals of greenhouse gases and sulfate aerosols are identifiable at continental and sub-continental scales in many different regions around the globe (56, 57, 58, 59). Related work (60, 61) suggests that an human-caused climate signal has already emerged from the background noise at even smaller spatial scales (at or below 500 km) (62), and may be contributing to regional changes in the distributions of plant and animal species (63).

In summarizing this section of my testimony, I note that the focus of fingerprint research has evolved over time. Its initial emphasis was on global-scale changes in Earth's surface temperature. Subsequent research demonstrated that human fingerprints were identifiable in many different aspects of the climate system – not in surface temperature only. We are now on the verge of detecting human effects on climate at much finer regional scales of direct relevance to policymakers, and in variables tightly linked to climate change impacts (64, 65, 66, 67, 68).

The Microwave Sounding Unit Debate

For over a decade, scientists critical of “fingerprint” studies have argued that tropospheric temperature measurements from satellites and weather balloons (radiosondes) show little or no warming of the troposphere over the past several decades, while climate models indicate that that the troposphere should have warmed markedly in response to increases in greenhouse gases (see Figure 1, upper left panel). This apparent discrepancy between climate model estimates and observations has been used to cast doubt on the reality of a “discernible human influence” on the climate system (69).

It is unquestionable that satellites have transformed our scientific understanding of the weather and climate of planet Earth. Since 1979, Microwave Sounding Units (MSU) on polar-orbiting satellites have measured the microwave emissions of oxygen molecules in the atmosphere. These emissions are proportional to atmospheric temperatures. By monitoring microwave emissions at different frequencies, scientists can obtain information about the temperatures of broad atmospheric layers. Most attention has focused on the temperatures of the lower stratosphere and mid- to upper troposphere (T_4 and T_2 , respectively) as well as on an estimate of lower tropospheric temperatures (T_{2LT}) (70).

The first attempts to obtain climate records from MSU data were made by scientists at the University of Alabama in Huntsville (UAH) (71, 72, 73). Until recently, the UAH group’s analysis of the MSU data suggested that the tropical

lower troposphere had cooled since 1979. Concerns regarding the reliability of the MSU-based tropospheric temperature trends were countered with the argument that weather balloons also suggested cooling of the tropical troposphere (74), and constitute a completely independent temperature monitoring system (75, 76).

Throughout most of the 1990s, only one group (the UAH group) was actively working on the development of temperature records from MSU data. In 1998, the Remote Sensing Systems (RSS) group in California identified a problem in the UAH data related to the progressive orbital decay and altitude loss over the lifetimes of individual satellites. This introduced a spurious cooling trend in the UAH data (77). The RSS scientists (Wentz and Schabel) found that the lower troposphere had warmed over the satellite era.

The UAH group subsequently identified two new corrections that approximately compensated for the cooling influence of orbital degradation. The first correction was related to the effects of orbital drift on the sampling of Earth's diurnal temperature cycle. The second (the so-called "instrument body effect") was due to variations in measured microwave emissions arising from changes in the temperature of the MSU instrument itself, caused by changes in the instrument's exposure to sunlight (78).

Additional research cast doubt on the UAH results. Three separate groups found that the mid- to upper troposphere had warmed markedly over the satellite era (79, 80, 81, 82, 83, 84, 85), in contrast to the UAH results (74, 78). The

UAH group, however, continued to claim close correspondence between their own MSU-based estimates of tropospheric temperature trends and trends derived from weather balloons (“radiosondes”) (74). This raised critical questions regarding the quality of radiosonde temperature measurements. Were these measurements an unambiguous gold standard?

Recent research indicates that the answer to this question is “no”. The temperature sensors carried by weather balloons have changed over time, as has the shielding that protects the sensors from direct solar heating. Solar heating of the sensors can affect the temperature measurements themselves. The introduction of progressively more effective shielding results in less solar heating, and this in turn imparts a non-climatic cooling trend to the daytime measurements.

Sherwood *et al.* (86) discovered this effect by comparing the radiosonde-based temperature trends based on nighttime ascents (with no solar heating effects) and daytime launches. When this solar heating effect was properly accounted for, weather balloons yielded tropospheric temperature trends that were in better agreement with RSS estimates than with UAH results (86, 87).

Two papers shed further light on these issues. The first paper was by the RSS group, and described a new MSU retrieval of lower tropospheric temperatures (88). RSS obtained substantially larger T_{2LT} trends than UAH (89). Mears and Wentz (88) attributed most of these differences to an error in UAH’s method of adjusting for drift in the time of day at which satellites sample the

Earth's daily temperature cycle. This error was acknowledged by Christy and Spencer (90). When the UAH group remedied this problem, however, their lower tropospheric trends increased by much smaller amounts than expected on the basis of the RSS analysis (91).

The second paper addressed the physics that governs changes in atmospheric temperature profiles. It compared the relationship between surface and tropospheric temperature changes over a wide range of observational and climate model datasets (92). The focus was on the deep tropics (20°N-20°S), where the UAH and RSS tropospheric temperature trends diverged most markedly. The intent was to investigate whether the simple physics that governs the vertical structure of the tropical atmosphere could be used to constrain the uncertainties in satellite-based trends.

This “simple physics” involves the release of latent heat when moist air rises due to convection and condenses to form clouds. Because of this heat release, tropical temperature changes averaged over large areas (and averaged over sufficient time to damp day-to-day “weather noise”) are generally larger in the lower and mid-troposphere than at the surface of the tropical ocean. This “amplification” behavior is well-known from basic theory (93), observations (94), and climate model results (95).

The UAH amplification results were puzzling. For month-to-month fluctuations in tropical temperatures, UAH T_{2LT} anomalies were 1.3 to 1.4 times larger than surface temperature anomalies, consistent with models, theory, and

other observational datasets. But for decade-to-decade temperature changes, the UAH T_{2LT} trends were smaller than surface trends, implying that the troposphere damped surface warming. In contrast, the computer model amplification results were consistent across all timescales considered, despite large differences in model structure. Like the models, the RSS observational data also showed similar amplification of surface warming on different timescales.

These results have at least two possible explanations (15, 20, 96). The first is that the UAH data are reliable, and different physical mechanisms control the response of the tropical atmosphere to “fast” and “slow” surface temperature fluctuations. Such time-dependent changes in the physics seem unlikely given our present understanding, and mechanisms that might explain such changes have yet to be identified.

A second explanation is that there are still non-climatic artifacts in the UAH tropospheric temperature records, leading to residual cooling biases in the UAH long-term trend estimates. This is both a simpler and more plausible explanation given the consistency of amplification results across models and timescales, our theoretical understanding of how the tropical atmosphere should respond to sustained surface heating (97), and the currently large uncertainties in observed tropospheric temperature trends (15).

The extraordinary claim that the tropical troposphere had cooled since 1979 has not survived rigorous scrutiny. We have learned that uncertainties in satellite estimates of tropospheric temperature change are far larger than

originally believed, and now fully encompass computer model results (98). There is no longer a fundamental discrepancy between modeled and observed estimates of tropospheric temperature changes (15).

Assessing Risks of Changes in Extreme Events

Although we cannot confidently attribute any specific extreme event to human-induced climate change (99), we are capable of making informed scientific statements regarding the influence of human activities on the likelihood of extreme events (100, 101). This is an important distinction.

As noted previously, computer models can be used to perform the control experiment (no human effects on climate) that we cannot perform in the real world. Using the “unforced” climate variability from a multi-century control run, it is possible to determine how many times an extreme event of a given magnitude should have been observed in the absence of human interference. The probability of obtaining the same extreme event is then calculated in a perturbed climate – for example, in a model experiment with historical or future increases in greenhouse gases, or under some specified change in mean climate (102). Comparison of the frequencies of extremes in the control and perturbed experiments allows one to make probabilistic statements about how human-induced climate change may have altered the likelihood of the extreme event (48, 102, 103). This is sometimes referred to as an assessment of “fractional attributable risk” (102).

Recently, a “fractional attributable risk” study involving the European summer heat wave of 2003 concluded that *“there is a greater than 90% chance that over half the risk of European summer temperatures exceeding a threshold of 1.6 K is attributable to human influence on climate”* (102).

This study (and related work) illustrates that the “D&A” community has moved beyond analysis of changes in the mean state of the climate. We now apply rigorous statistical methods to the problem of estimating how human activities may alter the probability of occurrence extreme events. The demonstration of human culpability in changing these risks is likely to have significant implications for the debate on policy responses to climate change.

4. Conclusions

In evaluating how well a novel has been crafted, it is important to look at the internal consistency of the plot. Critical readers examine whether the individual storylines are neatly woven together, and whether the internal logic makes sense.

We can ask similar questions about the “story” contained in observational records of climate change. The evidence from numerous sources (paleoclimate data, rigorous fingerprint studies, and qualitative comparisons of modeled and observed climate changes) shows that the climate system is telling us an internally consistent story about the causes of recent climate change.

Over the last century, we have observed large and coherent changes in many different aspects of Earth’s climate. The oceans and land surface have

warmed (26, 27, 37, 38, 39, 40, 104). Atmospheric moisture has increased (32, 33, 34, 36). Glaciers have retreated over most of the globe (105, 106, 107). Sea level has risen (108). Snow and sea-ice extent have decreased in the Northern Hemisphere (35, 109, 110). The stratosphere has cooled (111), and there are now reliable indications that the troposphere has warmed (15, 112). The height of the tropopause has increased (30). Individually, all of these changes are consistent with our scientific understanding of how the climate system should be responding to anthropogenic forcing. Collectively, this behavior is inconsistent with the changes that we would expect to occur due to natural variability alone.

There is now compelling scientific evidence that human activity has had a discernible influence on global climate. However, there are still significant uncertainties in our estimates of the size and geographical distribution of the climate changes projected to occur over the 21st century (10). These uncertainties make it difficult for us to assess the magnitude of the mitigation and adaptation problem that faces us and our descendants. The dilemma that confronts us, as citizens and stewards of this planet, is how to act in the face of both hard scientific evidence that our actions are altering global climate and continuing uncertainty in the magnitude of the planetary warming that faces us.

5. Personal Thoughts on Harassment of Climate Scientists

My job is to evaluate climate models and improve our scientific understanding of the nature and causes of climate change. I chose this profession because of a deep and abiding curiosity about the world in which we live. The same intellectual curiosity motivates virtually all climate scientists I know. We care about getting

the science right – not about getting rich quick, retiring early, or altering global systems of government.

In April 1994, I was asked to act as Convening Lead Author of Chapter 8 of the IPCC's second assessment report. The chapter was entitled "*Detection of Climate Change and Attribution of Causes*". I did not seek this responsibility. It was offered to me after at least two other scientists had refused the Convening Lead Author job.

Chapter 8 reached the historic conclusion that there is "*a discernible human influence on global climate*". This single sentence changed my life. Immediately after publication of the second assessment report in 1996, I became the subject of Congressional inquiry and unwelcome media attention. I was wrongly accused of "political tampering" and "scientific cleansing", of abuses of the peer-review system, and even of irregularities in my own scientific research.

Responses to these unfounded allegations have been given in a variety of different fora – by myself, by the IPCC, and by other scientists. A complete record of these responses was recently posted on RealClimate.org (113). I refer this post to your attention.

I firmly believe that I would now be leading a different life if my research suggested that there was no human effect on climate. I would not be the subject of Congressional inquiries, Freedom of Information Act requests, or email threats.

I would not need to be concerned about the safety of my family. I would not need to be concerned about my own physical safety when I give public lectures.

It is because of the research I do – and because of the findings my colleagues and I have obtained – that I have experienced interference with my ability to perform scientific research.

As my testimony indicates, the scientific evidence is compelling. We know, beyond a shadow of a doubt, that human activities have changed the composition of Earth's atmosphere. And we know that these human-caused changes in the levels of greenhouse gases make it easier for the atmosphere to trap heat. This is not rocket science. It is simple, basic physics.

Some take comfort in clinging to the false belief that humans do not have the capacity to influence global climate; that we do not need to make any changes in how we produce and use energy; that "business as usual" is good enough for today.

Sadly, "business as usual" will not be good enough for tomorrow. The decisions we reach today will impact the climate future that our children and grandchildren inherit. I think most American want those decisions to be based on the best-available scientific information – not on wishful thinking, or on well-funded disinformation campaigns.

This is one of the defining moments in our country's history, and in the history of our civilization. For a little over decade, we have achieved true awareness of our ever-increasing influence on global climate. We can no longer plead that we were ignorant; that we did not know what was happening. Future generations will judge us on how effectively we addressed the problem of human-caused climate change.

I respectfully request that you do everything in your power to permit my colleagues and I to continue studying the nature and causes of climate change. We need to follow the research wherever it leads us, without fear of the consequences of speaking truth to power.

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Climate Change - Regulatory Initiatives

You are here: [EPA Home](#) [Climate Change](#) [Regulatory Initiatives](#) Denial of Petitions for Reconsideration

Denial of Petitions for Reconsideration of the Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act

Action

EPA determined in December 2009 that climate change caused by emissions of greenhouse gases threatens the public's health and the environment. Since then, EPA received ten petitions challenging this determination. On July 29, 2010, EPA denied these petitions.

The petitions to reconsider EPA's "Endangerment Finding" claimed that climate science can't be trusted, and asserted a conspiracy that calls into question the findings of the [Intergovernmental Panel on Climate Change \(IPCC\)](#) [EXIT Disclaimer](#), the [U.S. National Academy of Sciences](#) [EXIT Disclaimer](#), and the [U.S. Global Change Research Program](#). After months of serious consideration of the petitions and of the state of climate change science, EPA found no evidence to support these claims.

The scientific evidence supporting EPA's finding is robust, voluminous, and compelling. Climate change is happening now, and humans are contributing to it. Multiple lines of evidence show a global warming trend over the past 100 years. Beyond this, melting ice in the Arctic, melting glaciers around the world, increasing ocean temperatures, rising sea levels, altered precipitation patterns, and shifting patterns of ecosystems and wildlife habitats all confirm that [our climate is changing](#).

Response to Petitions

[Decision document: Copy of FR Notice](#) Download a [PDF version of the Decision Document](#) (40 pp, 722K)

Related Links

Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act
Climate Science
Assessment reports (IPCC, NAS, NOAA, USGCRP)
Recent inquiries and investigations of the CRU
emails and IPCC
Indicators of Climate Change in the United States

"[T]here is a strong, credible body of evidence, based on multiple lines of research, documenting that climate is changing, and that these changes are in large part caused by human activities... . Climate change... poses significant risks for - and in many cases is already affecting - a broad range of human and natural systems."
['Advancing the Science of Climate Change,' May 2010, National Research Council of the National Academy of Sciences](#) [EXIT Disclaimer](#)

You will need Adobe Acrobat Reader, available as a free download, to view some of the files on this page. See [EPA's PDF page](#) to learn more about PDF, and for a link to the free Acrobat Reader.

NMED - GUTZLER
REBUTTAL EXHIBIT 2

Response to Petitions Document

[Preface](#) Download a PDF version of the Preface (7 pp, 39K)

[Volume 1: Climate Science and Data Issues Raised by Petitioners](#) Download a PDF version of Volume 1 (166 pp, 1.4MB)

[Volume 2: Issues Raised by Petitioners on EPA's Use of IPCC](#) Download a PDF version of Volume 2 (84 pp, 368K)

[Volume 3: Process Issues Raised by Petitioners](#) Download a PDF version of Volume 3 (116 pp, 568K)

Resources

[Press release](#)

[Fact sheet \(PDF\)](#) (3 pp, 45K)

[Myths vs. Facts](#)

Scientific Assessment Reports

[Intergovernmental Panel on Climate Change Fourth Assessment Report](#) [EXIT Disclaimer](#)

[National Academy of Sciences: America's Climate Choices](#) [EXIT Disclaimer](#)

[NOAA: State of the Climate in 2009](#)

[U.S. Global Change Research Program: Global Climate Change Impacts in the United States](#)

Recent inquiries and investigations of the CRU emails and IPCC

Recent investigations and inquiries into the emails by other organizations have all resulted in clearing the scientists of alleged wrong-doing.

Many of the links on this page are to sites outside of EPA. See [EXIT Disclaimer](#) to learn more.

[The Independent Climate Change E-mails Review \(University of East Anglia\)](#)

[EXIT Disclaimer](#)

[Report of the International Panel set up by the University of East Anglia to examine the research of the Climatic Research Unit \(University of East Anglia\)](#) [EXIT Disclaimer](#)

[The disclosure of climate data from the Climatic Research Unit at the University of East Anglia \(U.K. House of Commons Science and Technology Committee\) \(PDF\)](#) (61 pp, 313K) [EXIT Disclaimer](#)

[Assessing an IPCC assessment – An analysis of statements on projected regional impact in the 2007 report \(Netherlands Environmental Assessment Agency\) \(PDF\)](#) (100 pp, 1.9MB) [EXIT Disclaimer](#)

[RA-10 Final Investigation Report Involving Dr. Michael E. Mann \(Pennsylvania State University\) \(PDF\)](#) (19 pp, 779K) [EXIT Disclaimer](#)

Petitions

[Arthur Randol – Petition for Reconsideration \(PDF\)](#) (12 pp, 169K)

[Chamber of Commerce of the United States of America – Petition for Reconsideration and for Stay Pending Reconsideration \(PDF\)](#) (38 pp, 120K)

[Coalition for Responsible Regulation et al. – Petition for Reconsideration \(PDF\)](#) (40 pp, 571K)

[Commonwealth of Virginia – Petition for Reconsideration \(PDF\)](#) (5 pp, 273K)

[Competitive Enterprise Institute et al. – Petition for Reconsideration \(PDF\)](#) (13 pp, 3.82MB)

[Supplement to Petition \(PDF\)](#) (6 pp, 1.62MB)

[Ohio Coal Association – Petition for Reconsideration \(PDF\)](#) (11 pp, 97K)

[Supplemental Petition \(PDF\)](#) (25 pp, 219K)

[Pacific Legal Foundation – Petition for Reconsideration \(PDF\)](#) (58 pp, 461K)

[Peabody Energy Company – Petition for Reconsideration \(PDF\)](#) (238 pp, 1.04MB)

[Southeastern Legal Foundation et al. – Petition for Reconsideration \(PDF\)](#) (28 pp, 236K)

[First Amendment to Petition for Reconsideration \(PDF\)](#) (3 pp, 43K)

[Second Amendment to Petition for Reconsideration \(PDF\)](#) (4 pp, 44K)
[Third Amendment to Petition for Reconsideration \(PDF\)](#) (49 pp, 729K)
[Fourth Amendment to Petition for Reconsideration \(PDF\)](#) (2 pp, 43K)
[Fifth Amendment to Petition for Reconsideration \(PDF\)](#) (23 pp, 343K)
[State of Texas – Petition for Reconsideration \(PDF\)](#) (38 pp, 1.28MB)



Fact Sheet

EPA's Denial of Petitions to Reconsider EPA's Greenhouse Gas Endangerment Findings

ACTION

- After several months of careful review, on July 29, 2010, EPA denied 10 petitions to reconsider the 2009 Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act (the "Endangerment Finding").
- With this decision, EPA decided there was no scientific or other basis to change its 2009 finding that climate change caused by emissions of greenhouse gases threatens public health and the environment. The science remains strong and has been reinforced by recent additional major science assessments and individual studies.
- The petitioners argued that the science underlying EPA's determination is flawed or that the review process has been corrupted. EPA finds that the evidence provided does not support these claims.
- EPA received petitions from Coalition for Responsible Regulation, Commonwealth of Virginia, Competitive Enterprise Institute, Ohio Coal Association, Pacific Legal Foundation, Peabody Energy Company, Southeastern Legal Foundation, State of Texas, U.S. Chamber of Commerce, and one private citizen.

OVERVIEW OF PETITIONERS' KEY ARGUMENTS AND EPA RESPONSES

The primary information provided by the petitioners to back their arguments includes a set of disclosed private e-mail communications among several scientists associated with the temperature record from the Climatic Research Unit (CRU) at the University of East Anglia in the United Kingdom; a small number of actual or alleged errors in the voluminous 3,000-page Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report; and a limited number of new studies that have been published in the literature.

Climate Change Science and Data

- Petitioners questioned the reliability of the global temperature record and the finding that observed recent warming is unusual and based on increasing levels of greenhouse gases. However, three global temperature records—including CRU's—indicate increasing temperatures, and there are other lines of evidence, such as rising sea levels, linking recent global warming to human activities. Petitioners' criticisms of the CRU record are unfounded.
- Petitioners asserted that some scientists' discussion in private CRU e-mails undermines the credibility of the temperature record. After careful review of all of the e-mail statements (not just the ones highlighted by petitioners), EPA finds nothing in

the e-mails that calls into question the validity of the data or of CRU's analysis. To the contrary, analysis of the e-mails shows scientists working through the problems involved in compiling large datasets.

- Petitioners asserted that warming has slowed or stopped over the last decade, contrary to scientists' expectations, and in spite of increasing greenhouse gases in the atmosphere. In reality, the last decade was warmer than the previous decade, and warming has not stopped. Climate change is a long-term phenomenon, unlike day-to-day variations in weather. Thus, climate change trends should be discussed over the long term, as opposed to on a year-by-year basis.
- Petitioners also challenged the temperature records of the National Oceanic and Atmospheric Administration (NOAA) and the National Aeronautics and Space Administration (NASA). The truth is that NOAA's and NASA's data are fully transparent, accessible, and peer reviewed. EPA's confidence in the quality of the NOAA, NASA, and CRU temperature records is further strengthened by the fact that all three datasets show similar results despite the fact that they are prepared independently and with different methods.
- Petitioners claim that new studies not previously considered contradict key conclusions in the Endangerment Finding. EPA examined each of these new studies and documented that they neither undermine the key scientific findings nor change the scientific basis for the Endangerment Finding.

Use of IPCC Information and EPA's Approach to Developing the Findings

- Petitioners claimed that recently found and alleged errors in IPCC's Fourth Assessment Report undermine IPCC's credibility, and by extension, EPA's use of the report as a reference document. EPA has carefully reviewed each of the alleged errors. Collectively, they are minor and have no bearing on the Endangerment Finding, are not relied on by EPA to support the Finding, and most are not even errors. The two factual errors in a document the size of IPCC's 3,000-page Fourth Assessment Report do not substantiate petitioners' claim that IPCC science, as a whole, is not credible.
- Petitioners asserted that the IPCC has a policy agenda and is not an objective scientific body, but this assertion is not backed up by credible evidence. The Agency has carefully examined the extensive process used by IPCC as well as the U.S. government's approach to approving IPCC documents, and found that they are well grounded and based on science rather than policy considerations.
- Petitioners claimed that the scientific assessments of the U.S. Global Change Research Program and the National Academy of Sciences are not separate and independent assessments from IPCC. This is not correct. Each of these organizations is separately administered and relies on its own scientific processes and collaborating scientists. That similar and consistent conclusions are reached by each body does not

substantiate the petitioners' claim. To the contrary, when independent institutions reach similar findings, it strengthens confidence in those findings.

- Petitioners suggested that EPA's process to develop scientific support for the Findings was not rigorous. This is not the case. EPA thoroughly reviewed the scientific literature and summarized it in the Technical Support Document (<http://www.epa.gov/climatechange/endorsement.html#tsd>). EPA invited public comment on both the Technical Support Document and the proposed Endorsement Findings. Before finalizing the Findings, EPA carefully and comprehensively responded to all comments, reviewed additional science, and considered issues raised by commenters. EPA's detailed responses are provided in a comprehensive, 11-volume Response to Comments document (<http://www.epa.gov/climatechange/endorsement.html#comments>).
- Petitioners asserted that improper data sharing, peer review, and editorial practices biased the underlying scientific literature used by the major assessments. Petitioners' assertions of an extensive, concerted effort to manipulate peer-reviewed literature are unsupported. The CRU e-mails, for example, show a small group of scientists privately discussing their scientific views of a handful of papers. The petitioners raised concerns that certain research papers were kept out of the IPCC Fourth Assessment Report, but these concerns are unfounded; the papers did appear in the IPCC assessment.

Results of Recent and External Inquiries Into the CRU E-mails

- Several independent committees have examined many of the same allegations brought forward by the petitioners as a result of the disclosure of the private CRU e-mails. Their conclusions are consistent with EPA's review and analysis. The independent inquiries have found no evidence of intentional data manipulation or any lack of scientific integrity and rigor on the part of the climate researchers associated with the e-mails. A list of the inquiries completed to date is available here: <http://www.epa.gov/climatechange/endorsement/petitions.html>

For More Information:

<http://www.epa.gov/climatechange/endorsement/petitions.html>



Federal Register

Friday,
August 13, 2010

Part II

Environmental Protection Agency

40 CFR Chapter 1

**EPA's Denial of the Petitions To
Reconsider the Endangerment and Cause
or Contribute Findings for Greenhouse
Gases Under Section 202(a) of the Clean
Air Act; Final Rule**

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Chapter 1

[EPA-HQ-OAR-2009-0171; FRL-9184-8]

EPA's Denial of the Petitions To Reconsider the Endangerment and Cause or Contribute Findings for Greenhouse Gases Under Section 202(a) of the Clean Air Act

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice, denial of petitions to reconsider.

SUMMARY: The Environmental Protection Agency (EPA) is denying the petitions to reconsider the Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act. The Findings were signed by the Administrator on December 7, 2009. EPA has carefully reviewed all of the petitions and revisited both the scientific record and the Administrator's decision process underlying the Findings in light of these petitions. EPA's analysis of the petitions reveals that the petitioners have provided inadequate and generally unscientific arguments and evidence that the underlying science supporting the Findings is flawed, misinterpreted or inappropriately applied by EPA. The petitioners' arguments fail to meet the criteria for reconsideration under the Clean Air Act. The science supporting the Administrator's finding that elevated concentrations of greenhouse gases in the atmosphere may reasonably be anticipated to endanger the public health and welfare of current and future U.S. generations is robust, voluminous, and compelling, and has been strongly affirmed by the recent science assessment of the U.S. National Academy of Sciences.

DATES: This denial is effective July 29, 2010.

ADDRESSES: EPA's docket for this action is Docket ID No. EPA-HQ-OAR-2009-0171. All documents in the docket are listed on the <http://www.regulations.gov> Web site. Although listed in the index, some information is not publicly available, e.g., confidential business information (CBI) or other information whose disclosure is restricted by statute. Certain other material, such as copyrighted material, is not placed on the Internet and will be publicly available only in hard copy form. Publicly available docket materials are available either electronically through <http://www.regulations.gov> or in hard copy at EPA's Docket Center, Public

Reading Room, EPA West Building, Room 3334, 1301 Constitution Avenue, NW., Washington, DC 20004. This Docket Facility is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566-1744, and the telephone number for the Air Docket is (202) 566-1742.

FOR FURTHER INFORMATION CONTACT: Jeremy Martinich, Climate Change Division, Office of Atmospheric Programs (MC-6207J), Environmental Protection Agency, 1200 Pennsylvania Ave., NW., Washington, DC 20460; telephone number: (202) 343-9927; fax number: (202) 343-2202; e-mail address: ghgendangerment@epa.gov. For additional information regarding this Notice, please go to the Web site <http://www.epa.gov/climatechange/endorsement.html>.

SUPPLEMENTARY INFORMATION: *Acronyms and Abbreviations.* The following acronyms and abbreviations are used in this Decision.

ACUS Administrative Conference of the United States
 ANPR Advance Notice of Proposed Rulemaking
 APA Administrative Procedure Act
 CAA Clean Air Act
 CAFE Corporate Average Fuel Economy
 CAIT Climate Analysis Indicators Tool
 CBI confidential business information
 CCSP Climate Change Science Program
 CFR Code of Federal Regulations
 CH₄ methane
 CO₂ carbon dioxide
 CRU Climatic Research Unit
 DOT U.S. Department of Transportation
 EISA Energy Independence and Security Act
 EO Executive Order
 EPA U.S. Environmental Protection Agency
 EPCA Energy Policy and Conservation Act
 FOIA Freedom of Information Act
 FR Federal Register
 GHG greenhouse gas
 HadCRUT Climatic Research Unit (CRU) temperature record
 ICTA International Center For Technology Assessment
 IPCC Intergovernmental Panel on Climate Change
 MWP Medieval Warm Period
 N₂O nitrous oxide
 NAAQS National Ambient Air Quality Standards
 NAS National Academy of Sciences
 NASA National Aeronautics and Space Administration
 NHTSA National Highway Traffic Safety Administration
 NOAA National Oceanic and Atmospheric Administration
 NO_x nitrogen oxide
 NRC National Research Council
 NSPS new source performance standards
 PM particulate matter
 PSD Prevention of Significant Deterioration

TSD technical support document
 U.S. United States
 UNFCCC United Nations Framework Convention on Climate Change
 USGCRP U.S. Global Change Research Program
 WMO World Meteorological Organization

Table of Contents

- I. Introduction
 - A. Summary
 - B. Background
 - 1. The ICTA Petition and *Massachusetts v. EPA*
 - 2. *Post-Massachusetts v. EPA*
 - 3. Proposed and Final Endangerment and Cause or Contribute Findings
 - 4. Petitions for Reconsideration and Stay Requests
- II. Standard for Reconsideration
- III. Science Related Issues
 - A. General Summary of Petitioners' Arguments
 - B. Summary of the Science Underlying the Administrator's Endangerment Finding in Light of the Petitioners' Claims
 - 1. What effects do greenhouse gases have on the environment and on climate in particular?
 - 2. How are human activities changing the amount of greenhouse gases in our atmosphere?
 - 3. What is the evidence indicating that average temperatures are increasing and climate change is occurring consistent with the direction one would expect with increasing greenhouse gases in our atmosphere?
 - 4. What is the evidence linking observed temperature changes and climate change to the anthropogenic increase in greenhouse gases?
 - 5. How are public health and welfare threatened by these changes to climate and the environment, now and in the future?
 - C. Review of the Administrator's Findings
 - D. General Response to the Petitioners' Scientific Arguments in Light of the Full Body of Scientific Evidence
 - E. Specific Responses to the Claims and Arguments Raised by Petitioners
 - 1. Climate Science and Data Issues Raised by the Petitioners
 - 2. Issues Raised by EPA's Use of the IPCC AR4 Assessment
 - 3. Process and Other Issues Raised by the Petitioners
 - F. Petitioners' Arguments Do Not Meet the Standard for Reconsideration
- IV. Other Issues
 - A. The Tailoring Rule/Impacts of PSD and Title V Permitting Are Not of Central Relevance to the Findings
 - B. NHTSA Rule
 - C. Other Issues
 - 1. Effects of the Findings and Subsequent Rulemakings on States and Businesses
 - 2. A Formal Rulemaking Process Is Not Required
 - 3. Discretion in Making an Endangerment Finding
- V. Conclusion

I. Introduction

A. Summary

This is EPA's response denying the petitions to reconsider the Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act ("Findings" or the "Endangerment Finding") (74 FR 66496, December 15, 2009). EPA has considered all 10 petitions, including the arguments presented therein and the supplemental information provided by the petitioners as supporting evidence of their claims. EPA has evaluated the merit of the petitioners' arguments in the context of the entire body of scientific and other evidence before the Agency. This response (hereafter "Denial" or "Decision") provides EPA's scientific and legal justification for denying these petitions. This Denial is accompanied by a 3-volume, roughly 360-page Response to Petitions (RTP) document (<http://www.epa.gov/climatechange/endangerment.html>), containing further responses and technical detail concerning every significant claim and assertion made by the petitioners. Section III of this Decision summarizes many of the responses provided in the RTP document.

After a comprehensive, careful review and analysis of the petitions, EPA has determined that the petitioners' arguments and evidence are inadequate, generally unscientific, and do not show that the underlying science supporting the Endangerment Finding is flawed, misinterpreted by EPA, or inappropriately applied by EPA. The science supporting the Administrator's finding that elevated concentrations of greenhouse gases in the atmosphere may reasonably be anticipated to endanger the public health and welfare of current and future U.S. generations is robust, voluminous, and compelling. The most recent science assessment by the U.S. National Academy of Sciences strongly affirms this view. In addition, the approach and procedures used by EPA to evaluate the underlying science demonstrate that the Findings remain robust and appropriate.

Petitioners generally argue that recent revelations show that the science supporting EPA's Endangerment Finding was flawed or questionable, and that EPA should therefore reconsider the Endangerment Finding. The petitioners' arguments and claims are based largely on disclosed private communications among various scientists, a limited number of errors and claimed errors in the 2007 Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment

Report (AR4),¹ and submissions of a limited number of additional studies not previously considered as part of the scientific record of the Endangerment Finding.

As discussed in detail throughout this Decision and in fuller detail in the RTP document, petitioners' claims and the information they submit do not change or undermine our understanding of how anthropogenic emissions of greenhouse gases cause climate change and how human-induced climate change generates risks and impacts to public health and welfare. This understanding has been decades in the making and has become more clear over time with the accumulation of evidence. The information provided by petitioners does not change any of the scientific conclusions that underlie the Administrator's Findings, nor do the petitions lower the degrees of confidence associated with each of these major scientific conclusions.

More specifically, the petitions do not change EPA's proper characterization of the current body of knowledge and our ability to state with confidence our conclusions in the following key areas of greenhouse gas and climate change science: (1) That anthropogenic emissions of greenhouse gases are causing atmospheric levels of greenhouse gases in our atmosphere to rise to essentially unprecedented levels in human history; (2) that the accumulation of greenhouse gases in our atmosphere is exerting a warming effect on the global climate; (3) that there are multiple lines of evidence, including increasing average global surface temperatures, rising ocean temperatures and sea levels, and shrinking Arctic ice, all showing that climate change is occurring, and that the observed rate of climate change stands out as significant compared to recent historical rates of climate change; (4) that there is compelling evidence that anthropogenic emissions of greenhouse gases are the primary driver of recent observed increases in average global temperature; (5) that atmospheric levels of greenhouse gases are expected to continue to rise for the foreseeable future; and (6) that risks and impacts to public health and welfare are expected to grow as climate change continues, and that climate change over this century is expected to be greater compared to observed climate change over the past century.

¹ IPCC (2007). Fourth Assessment Report: Climate Change 2007. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

The core defect in petitioners' arguments is that these arguments are not based on consideration of the body of scientific evidence. Petitioners fail to address the breadth and depth of the scientific evidence and instead rely on an assumption of inaccuracy in the science that they extend even to the body of science that is not directly addressed by information they provide or by arguments they make. This assumption of error is based on various statements and views expressed in some of the e-mail communications between scientists at the Climatic Research Unit (CRU) of the University of East Anglia in the United Kingdom and several other scientists ("the CRU e-mails")². As EPA's review and analysis shows, the petitioners routinely take these private e-mail communications out of context and assert they are "smoking gun" evidence of wrongdoing and scientific manipulation of data. EPA's careful examination of the e-mails and their context shows that the petitioners' claims are exaggerated, are often contradicted by other evidence, and are not a material or reliable basis to question the validity and credibility of the body of science underlying the Administrator's Endangerment Finding or the Administrator's decision process articulated in the Findings themselves. Petitioners' assumptions and subjective assertions regarding what the e-mails purport to show about the state of climate change science are clearly inadequate pieces of evidence to challenge the voluminous and well documented body of science that is the technical foundation of the Administrator's Endangerment Finding.

Inquiries from the UK House of Commons, Science and Technology Committee, the University of East Anglia, Oxburgh Panel, the Pennsylvania State University, and the University of East Anglia, Russell Panel,³ all entirely independent from EPA, have examined the issues and many of the same allegations brought forward by the petitioners as a result of the disclosure of the private CRU e-mails. These inquiries are now complete. Their conclusions are in line with EPA's review and analysis of these same CRU e-mails. The inquiries have

² All of the disclosed CRU e-mails at issue in this Decision can be found in full in EPA's docket for the Endangerment Finding. See Docket ID No. EPA-HQ-OAR-2009-0171, "CRU E-mails 1996-2009."

³ These inquiries plus another addressing IPCC AR4 issues are referred to throughout this Decision and the RTP document. Every inquiry is provided in full in EPA's docket for the Endangerment Finding. See Docket ID No. EPA-HQ-OAR-2009-0171, "Recent Inquiries and Investigations of the CRU E-mails and the IPCC Fourth Assessment Report."

found no evidence of scientific misconduct or intentional data manipulation on the part of the climate researchers associated with the CRU e-mails. The recommendation for more transparent procedures concerning availability of underlying data appears appropriate, but it has not cast doubt on the underlying body of science developed by these researchers. These inquiries lend further credence to EPA's conclusion that petitioners' claims that the CRU e-mails show the underlying science cannot or should not be trusted are exaggerated and unsupported.

Petitioners' also point to a limited number of factual mistakes in IPCC AR4, some confirmed, some alleged, to argue that the climate science supporting the Administrator's Endangerment Finding is flawed. EPA's review confirmed two factual mistakes. These two confirmed instances of factual mistakes are tangential and minor and do not change the key IPCC AR4 conclusions that are central to the Administrator's Endangerment Finding. While it is unfortunate that IPCC's review process did not catch these errors, in the context of a report of this size and scope (almost 3,000 pages), it is an inappropriate and unfounded exaggeration to claim that these two confirmed mistakes delegitimize all of the scientific statements and findings contained in IPCC AR4. To the contrary, given the scrutiny to which IPCC AR4 has been subjected, the limited nature of these mistakes demonstrates that the IPCC review procedures have been highly effective and very robust.

In a limited number of cases, the petitioners identify new scientific studies and data, published since the Endangerment Finding was finalized, which they claim require EPA to reconsider the Endangerment Finding. Some petitioners also argue that EPA ignored or misinterpreted scientific data that were significant and available when the Finding was made. EPA's review of these claims shows that in many cases the issues raised by the petitioners are not new, but were in fact considered prior to issuing the Endangerment Finding. In other cases, the petitioners have misinterpreted or misrepresented the meaning and significance of recent scientific literature, findings, and data. Finally, there are instances in which the petitioners have failed to acknowledge other new studies in making their arguments. The RTP document contains study-by-study analysis of these failed arguments on the part of petitioners.

Finally, in May 2010, the National Research Council (NRC) of the U.S. National Academy of Sciences published its comprehensive

assessment, "Advancing the Science of Climate Change"⁴ (NRC, 2010). It concluded that "climate change is occurring, is caused largely by human activities, and poses significant risks for—and in many cases is already affecting—a broad range of human and natural systems." Furthermore, the NRC stated that this conclusion is based on findings that are "consistent with the conclusions of recent assessments by the U.S. Global Change Research Program, the Intergovernmental Panel on Climate Change's Fourth Assessment Report, and other assessments of the state of scientific knowledge on climate change." These are the same assessments that served as the primary scientific references underlying the Administrator's Endangerment Finding. Importantly, this recent NRC assessment represents another independent and critical inquiry of the state of climate change science, separate and apart from the previous IPCC and U.S. Global Change Research Program (USGCRP) assessments. The NRC assessment is a clear affirmation that the scientific underpinnings of the Administrator's Endangerment Finding are robust, credible, and appropriately characterized by EPA.

The endangerment to public health and welfare from atmospheric concentrations of greenhouse gases and associated climate change is too important an issue to be decided on any grounds other than a close and comprehensive scrutiny of the entire body of the scientific evidence. This principle calls for an outright rejection of the petitioners' arguments. The petitioners' arguments amount to a request that EPA ignore the deep body of science that has been built up over several decades and the direction it points in, and to do so based not on a careful and comprehensive analysis of the science, but instead on what amount to assertions and leaps in logic, unsupported by a rigorous examination of the science itself. The petitioners do not provide any substantial support for the argument that the Endangerment Finding should be revised. Therefore, none of the petitioners' objections are of central relevance to the considerations that led to the final Endangerment Finding. In addition, in many cases these arguments by the petitioners either were or could have been raised during the comment period on the Endangerment Finding. In summary, EPA's thorough review of petitioners' arguments shows that the petitioners

have not met the criteria for reconsideration under section 307(d) the Clean Air Act (CAA).⁵

B. Background

The Findings were signed by the Administrator on December 7, 2009, were published in the **Federal Register** on December 15, 2009, and became effective January 14, 2010. The Administrator's Endangerment Finding concluded that atmospheric concentrations of the group of six greenhouse gases are reasonably anticipated to endanger both the public health and public welfare of current and future U.S. generations. The Administrator also decided that the combined emissions of greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas air pollution that endangers both public health and public welfare (*i.e.*, the second finding or "cause or contribute" finding). These Findings were made under CAA section 202(a). The Findings were also supported by a Technical Support Document (TSD) (Docket EPA-HQ-OAR-2009-0171-11645), containing the underlying greenhouse gas emissions data and a synthesis of climate change science, as well as an 11-volume RTC document (Docket EPA-HQ-OAR-2009-0171) that provides EPA's responses to all significant public comments that had been received during the 60-day public comment period following the Administrator's proposed Findings, signed April 17, 2009.

Since finalization of the Findings in December 2009, EPA has received 10 petitions and supplements thereto requesting that EPA reconsider the Findings. The general bases of the petitions are the following: (1) Recent disclosure of private e-mail communications among some scientists who were involved in constructing one of the global temperature records and were involved in certain sections of IPCC AR4; (2) alleged and confirmed mistakes or alleged unsupported statements in the IPCC AR4; and (3) some new scientific studies not previously considered as part of the scientific record of the Endangerment Finding. Petitioners claim these pieces of evidence show that the science underlying the Administrator's Endangerment Finding is potentially

⁴ National Research Council (NRC) (2010). *Advancing the Science of Climate Change*. National Academy Press. Washington, DC.

⁵ Some petitioners also raise objections to EPA's Endangerment Finding based on legal arguments related to other EPA or National Highway Traffic Safety Administration actions. For the reasons discussed in Section IV of this Decision, those objections also fail to meet the standard for reconsideration and are denied.

flawed, and that therefore EPA should reopen the process and reconsider the Endangerment Finding. For reasons stated above and throughout this Decision and accompanying RTP document, EPA is denying the request to reconsider the Findings.

As discussed further in sections III and IV of this Decision, some of the objections raised in the petitions fail to demonstrate that it was impracticable to raise the objections during the comment period following the proposed Findings, or that the grounds for the objections arose after the period for judicial review. For all issues and arguments presented by the petitioners, the objections are not of central relevance to the outcome of the Findings, as explained in detail below. Thus, none of the objections meet the criteria for reconsideration under the CAA. EPA is also denying two requests to stay the Findings pending reconsideration.

1. The ICTA Petition and *Massachusetts v. EPA*

a. ICTA Petition

In October 1999, the International Center for Technology Assessment (ICTA) and 18 other organizations filed a petition with EPA, requesting that EPA issue emission standards for emissions of carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons from motor vehicles under CAA section 202(a) (ICTA Petition). The ICTA Petition alleged that emissions of these four greenhouse gases—CO₂, CH₄, N₂O, and HFCs—constituted emissions of “air pollutants” under section 302(g) of the Act, 42 U.S.C. 7602(g). The ICTA Petition further argued that emissions of these gases from motor vehicles fully met the criteria for regulation under CAA section 202(a)(1), 42 U.S.C. 7521(a)(1), and claimed that it would be feasible for EPA to regulate greenhouse gas emissions from mobile sources.

After soliciting and considering approximately 50,000 public comments on the ICTA Petition, *see* 66 FR 7486, January 23, 2001), the Agency ultimately denied it on several independent grounds. EPA first explained that Congress did not intend in the CAA to provide the Agency with authority to regulate CO₂ and other greenhouse gases to address global climate change (68 FR 52925–29). For a variety of reasons, EPA determined that it was unreasonable to read the Act as providing the Agency with authority to regulate emissions of CO₂ and other greenhouse gases to address global climate change. *Id.* at 52928. Based on this conclusion, the Agency also determined that greenhouse gases could

not be considered air pollutants for purposes of the CAA’s regulatory provisions for any contribution they may make to climate change. *Id.*

The Agency also explained why, even if it had the authority to issue such regulations, it still believed that the ICTA Petition should be denied. To begin with, EPA found that requiring passenger cars and light trucks to emit less CO₂, the predominant greenhouse gas, would be tantamount to imposing more stringent fuel economy standards on those vehicles. *Id.* at 52929. The Agency pointed out, however, that the Energy Policy and Conservation Act (EPCA) authorizes only the Department of Transportation (DOT) to increase the stringency of motor vehicle fuel economy standards, and specifies a detailed regulatory regime that an EPA requirement to significantly reduce motor vehicle CO₂ emissions would unavoidably abrogate. *Id.*; *see also* 49 U.S.C. 32902 (relevant provision of EPCA).

EPA also disagreed with the petitioners’ view that, assuming the Act gives EPA authority to regulate CO₂ and other greenhouse gases to address global climate change, the Agency had already made statements that triggered a mandatory duty to issue motor vehicle standards for CO₂ and other greenhouse gases (68 FR 52929, September 8, 2003). After summarizing the findings of a 2001 report on global climate change by the National Academy of Sciences (NAS), the Agency concluded that “[u]ntil more is understood about the causes, extent and significance of climate change and the potential options for addressing it, EPA believes it is inappropriate to regulate [greenhouse gas] emissions from motor vehicles.” *Id.* at 52,931.

b. *Massachusetts v. EPA*

EPA’s initial denial of the ICTA petition (68 FR 52922, September 8, 2003) was the basis for the U.S. Supreme Court’s decision in *Massachusetts v. EPA*, 549 U.S. 497 (2007). In *Massachusetts v. EPA*, the Supreme Court held that EPA had improperly denied the petition. The Court held that greenhouse gases meet the definition of air pollutant in the CAA, and that the grounds EPA gave for denying the petition were “divorced from the statutory text” and hence improper. Specifically, the Court held that carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons fit the CAA’s “sweeping definition of ‘air pollutant’” since they are “without a doubt ‘physical [and] chemical * * * substances which [are] emitted into * * * the ambient air.’” The statute is

unambiguous.” *Id.* at 529. The Court also rejected the argument that EPA could not regulate motor vehicle emissions of the chief greenhouse gas, carbon dioxide, because doing so would essentially require control of vehicle fuel economy, and Congress delegated that authority to the Department of Transportation in the Energy Policy and Conservation Act. The Court held that the fact “that DOT sets mileage standards in no way licenses EPA to shirk its environmental responsibilities. EPA has been charged with protecting the public’s ‘health’ and ‘welfare,’ 42 U.S.C. 7521(a)(1), a statutory obligation wholly independent of DOT’s mandate to promote energy efficiency.” *Id.* at 532 (citation omitted). The two obligations may overlap “but there is no reason to think the two agencies cannot both administer their obligations and yet avoid inconsistency.” *Id.*

Turning to EPA’s alternative grounds for denial, the Court held that EPA’s decision on whether or not to grant the petition must relate to “whether an air pollutant ‘causes, or contributes to, air pollution which may reasonably be anticipated to endanger public health or welfare.’” *Id.* at 532–33. Thus, “[u]nder the clear terms of the Clean Air Act, EPA can avoid taking further action only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do.” *Id.* at 533. The Court held that three of the four reasons EPA advanced as alternative grounds for denying the petition were unrelated to whether greenhouse gas emissions from new motor vehicles cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare. Thus, EPA had failed to offer a reasoned explanation for its action. The Court further held that EPA’s generalized concerns about scientific uncertainty were likewise insufficient unless “the scientific uncertainty is so profound that it precludes EPA from making a reasoned judgment as to whether greenhouse gases contribute to global warming,” in which case EPA must so find. *Id.* at 534.

The Supreme Court was careful to note that it was not dictating EPA’s action on remand, and was not deciding whether or not EPA must find that greenhouse gases endanger public health or welfare. Nor did the Court rule on “whether policy concerns can inform EPA’s actions in the event that it makes such a finding.” *Id.* at 534–35. The Court also observed that under CAA section 202(a), “EPA no doubt has significant latitude as to the manner, timing,

content, and coordination of its regulations with those of other agencies." *Id.* at 533. Nonetheless, any EPA decisions concerning the endangerment and cause or contribute criteria must be grounded in the requirements of CAA section 202(a).

On September 17, 2007, EPA's denial of the ICTA petition was vacated and remanded to EPA for further proceedings consistent with the Supreme Court's opinion.

2. *Post-Massachusetts v. EPA*

In response to a May 2007 Executive Order (EO 13432) and instructions from then-President Bush, EPA began working closely with the Departments of Transportation, Energy and Agriculture to develop, under the CAA, proposals for greenhouse gas standards for motor vehicles and renewable and alternative fuel requirements for gasoline.

However, after enactment of the Energy Independence and Security Act of 2007 (EISA) in late December 2007, work in response to the Supreme Court's decision shifted. Rather than moving forward with the proposed endangerment determination and attendant greenhouse gas vehicle standards under the CAA, EPA developed an Advance Notice of Proposed Rulemaking (ANPR) on "Regulating Greenhouse Gas Emissions under the Clean Air Act," which was published on July 30, 2008 (73 FR 44354). The ANPR presented information relevant to, and solicited public comment on, a wide variety of issues regarding the potential regulation of greenhouse gases under the CAA, including EPA's response to the Supreme Court's decision in *Massachusetts v. EPA*. Section V of the ANPR contained an earlier version of much of the material in the Findings, including the legal framework, a summary of the science of climate change, and an illustration of how the Administrator could analyze the cause or contribute element using information regarding the greenhouse gas emissions of the portion of the U.S. transportation sector covered by CAA section 202(a). A July 2008 version of the TSD for the endangerment finding was also in the docket for the ANPR (EPA-HQ-OAR-2008-0318).

The comment period for the ANPR was 120 days, and it provided an opportunity for EPA to hear from the public with regard to the issues involved in endangerment and cause or contribute findings, as well as the supporting science. EPA received, reviewed, and considered numerous comments at that time and this public input was reflected in the Findings that

the Administrator proposed in April 2009. In addition, many comments were received on the TSD released with the ANPR. These comments are reflected in revisions to the TSD that was released in April 2009 to accompany the Administrator's proposal.

3. Proposed and Final Endangerment and Cause or Contribute Findings

In April 2009, the Administrator proposed to find under CAA section 202(a) that the mix of six key greenhouse gases in the atmosphere may reasonably be anticipated to endanger public health and welfare. Specifically, the Administrator proposed to define the "air pollution" referred to in CAA section 202(a) to be the mix of six key directly emitted and long-lived greenhouse gases: Carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (74 FR 18886, April 24, 2009). The Administrator further proposed to find that combined greenhouse gas emissions from new motor vehicles and new motor vehicle engines contribute to this air pollution that endangers public health and welfare.

The Administrator's proposal was subject to a 60-day public comment period, which ended June 23, 2009, and also included two public hearings. Over 380,000 public comments were received on the Administrator's proposed endangerment and cause or contribute findings, including comments on the elements of the Administrator's April 2009 proposal, the legal issues pertaining to the Administrator's decisions, and the underlying TSD containing the scientific and technical information.

After carefully reviewing the public comments and all the information before her, on December 7, 2009, the Administrator signed the final Findings (74 FR 66496, December 15, 2009). Specifically, she found under CAA section 202(a) that atmospheric concentrations of the six greenhouse gases taken in combination may reasonably be anticipated to endanger both the public health and the public welfare of current and future generations. The Administrator also found that the combined emissions of these greenhouse gases from new motor vehicles and new motor vehicle engines contribute to the greenhouse gas air pollution that endangers public health and welfare under CAA section 202(a).

The July 2008 ANPR and the April 2009 proposed Findings were accompanied by draft versions of the TSD and the Findings were supported by the final TSD. The TSD provided an

overview of all the major scientific assessments available at the time of each action, and greenhouse gas emission inventory data relevant to the contribution finding. Each of these three versions of the TSD were subject to review by Federal climate experts to ensure that they represented an accurate summary of the major scientific assessments. Moreover, the July 2008 and the April 2009 versions of the TSD were subject to public review as part of the public comment periods for the ANPR and proposed Findings.

4. Petitions for Reconsideration and Stay Requests

Between December 2009 and March 2010, EPA received 10 petitions (and supplements thereto) to reconsider the Findings.⁶ Nine of these petitions base their requests on allegations that developments since the close of the comment period on the proposed Findings call into question the science underlying the Findings. One petition focuses on statements since the close of the comment period regarding the impact of regulating stationary sources under the CAA, and the relationship between EPA's proposed Light-Duty Vehicle Rule (see below) and the National Highway Transportation Safety Administration's (NHTSA) proposed Corporate Average Fuel Economy (CAFE) rule as a basis for their request that EPA reconsider the Findings. Each significant objection in the petitions is discussed in detail below and the accompanying RTP document. Note that when more than one petitioner raised an objection, our response to that objection is provided only once.

In addition, EPA received two requests to administratively stay the final Findings. One administrative stay request under CAA section 307(d)(7)(b) was tied to a petition to reconsider the findings based on concerns about the science and requested that EPA stay the final Findings for three months. The other administrative stay request was filed under CAA section 307(d)(7)(B), the Administrative Procedures Act (APA) section 705, and Federal Rule of Appellate Procedure 18(a)(1) as part of the petition for reconsideration relating to stationary source concerns, and requested a stay pending EPA's completion of its reconsideration of the final Findings.

II. Standard for Reconsideration

Section 307(d)(7)(B) of the CAA strictly limits petitions for

⁶ The West Virginia Coal Association also filed a letter in support of the existing petitions for reconsideration.

reconsideration both in time and scope. It states that: "Only an objection to a rule or procedure which was raised with reasonable specificity during the period for public comment (including any public hearing) may be raised during judicial review. If the person raising an objection can demonstrate to the Administrator that it was impracticable to raise such objection within such time or if the grounds for such objection arose after the period for public comment (but within the time specified for judicial review) and if such objection is of central relevance to the outcome of the rule, the Administrator shall convene a proceeding for reconsideration of the rule and provide the same procedural rights as would have been afforded had the information been available at the time the rule was proposed. If the Administrator refuses to convene such a proceeding, such person may seek review of such refusal in the United States court of appeals for the appropriate circuit (as provided in subsection (b)). Such reconsideration shall not postpone the effectiveness of the rule. The effectiveness of the rule may be stayed during such reconsideration, however, by the Administrator or the court for a period not to exceed three months."

Thus the requirement to convene a proceeding to reconsider a rule is based on the petitioner demonstrating to EPA: (1) That it was impracticable to raise the objection during the comment period, or that the grounds for such objection arose after the comment period but within the time specified for judicial review (i.e., within 60 days after publication of the final rulemaking notice in the **Federal Register**, see CAA section 307(b)(1); and (2) that the objection is of central relevance to the outcome of the rule.

As to the first procedural criterion for reconsideration, a petitioner must show why the issue could not have been presented during the comment period, either because it was impracticable to raise the issue during that time or because the grounds for the issue arose after the period for public comment (but within 60 days of publication of the final action). Thus, CAA section 307(d)(7)(B) does not provide a forum to request EPA to reconsider issues that actually were raised, or could have been raised, prior to promulgation of the final rule.

In EPA's view, an objection is of central relevance to the outcome of the rule only if it provides substantial support for the argument that the regulation should be revised. See Denial of Petition to Reconsider, 68 FR 63021 (November 7, 2003), Technical Support Document for Prevention of Significant

Deterioration (PSD) and Nonattainment New Source Review (NSR): Reconsideration at 5 (Oct. 30, 2003) (EPA-456/R-03-005) (available at <http://www.epa.gov/nsr/documents/petitionresponses10-30-03.pdf>); Denial of Petition to Reconsider NAAQS for PM, 53 FR 52698, 52700 (December 29, 1988), citing Denial of Petition to Revise NSPS for Stationary Gas Turbines, 45 FR 81653-54 (December 11, 1980), and decisions cited therein.

This interpretation is clearly appropriate in light of the criteria adopted by Congress in this and other provisions in section 307(d). Section 307(d)(4)(B)(i) provides that "[a]ll documents which become available after the proposed rule has been published and which the Administrator determines are of central relevance to the rulemaking shall be placed in the docket as soon as possible after their availability." This provision draws a distinction between comments and other information submitted during the comment period, and other documents which become available after publication of the proposed rule. The former are docketed irrespective of their relevance or merit, while the latter must be docketed only if a higher hurdle of central relevance to the rulemaking is met. Congress also used the phrase "central relevance" in sections 307(d)(7)(B) and (d)(8), and in both cases Congress set a more stringent hurdle than in section 307(d)(4). Under section 307(d)(7)(B), the Administrator is required to reconsider a rule only if the objection is "of central relevance to the outcome of the rule." Likewise, section 307(d)(8) authorizes a court to invalidate a rule for procedural errors only if the errors were "so serious and related to matters of such central relevance to the rule that there is a substantial likelihood that the rule would have been substantially changed if such errors had not been made." In both of these provisions, it is not enough that the objection or error be of central relevance to the issues involved in the rulemaking, as in section 307(d)(4). Instead, the objection has to be of central relevance "to the outcome of the rule" itself, and the procedural error has to be of such central relevance that it presents a "substantial likelihood that the rule would have been substantially changed." Central relevance to the issues involved in the rulemaking is not enough to meet the criteria Congress set under sections 307(d)(7) or (d)(8). Both of those provisions require that the objection or error be central to the substantive decision that is the outcome of the

rulemaking. This difference is significant, and indicates that Congress set a much higher hurdle for disturbing a final rule that has already been issued, as compared to the less stringent criteria for docketing of documents before a decision has been made and a rule has been issued.

In this context, EPA's interpretation of section 307(d)(7)(B) gives full and appropriate meaning to the criteria adopted by Congress. An objection is considered of central relevance to the outcome of the rule only if it provides substantial support for the argument that the regulation should be revised. This properly links the criteria to the outcome of the rulemaking, not just the issues in the rulemaking. It requires that the objection be of such substance and merit that it can be considered central to the outcome of the rulemaking. This interpretation is consistent with section 307(d)(8), which also ties central relevance to the outcome of the rulemaking, in terms of a "substantial likelihood" that the rule would be "substantially changed." This interpretation gives proper weight to the approach throughout section 307(b) and (d) of the importance Congress attributed to preserving the finality of agency rulemaking decisions. This interpretation is also consistent with the case law, as discussed below.

As discussed in this Decision, EPA is denying the petitions because they fail to meet these criteria. In many cases, the objections raised in the petitions to reconsider were or could have been raised during the comment period of the proposed Findings. In all cases, the objections are not of central relevance to the outcome of the rule because they do not provide substantial support for the argument that the Endangerment Finding should be revised.

Pacific Legal Foundation (PLF) argues that its objections are of central relevance because the CRU documents and e-mails "cast substantial uncertainty over" the final Endangerment Finding, and that EPA is required to grant the petition or reconsider "if information not available in the rulemaking record for public comment casts substantial uncertainty over the final regulation." PLF Pet at 8-9. They argue that this is the case even if one does not assume or even argue that the statements in the CRU documents and e-mails are true. PLF Pet. at 6. They base this claim on *Kennecott Corp. v. EPA*, 684 F.2d 1007, 1017-20 (DC Cir. 1982).

PLF's view of *Kennecott* fails to account for the specific procedural issues that were central to that case. In *Kennecott*, petitioners objected that EPA had not provided adequate notice and

an opportunity for comment in the underlying rulemaking, in violation of various CAA section 307(d) provisions. Petitioners had two different notice and comment objections. First, they objected to EPA's failure to include certain documents in the docket at the time of the proposal, including various EPA financial analyses performed prior to the proposal. The court found that these documents were part of the basis for the proposed regulations and needed to be docketed so comment could be taken on them during the comment period. The court found that the failure to submit these documents to the docket at the time of the proposal was a procedural violation of CAA section 307(d)'s notice and comment requirements, because the documents EPA failed to docket made impossible any meaningful comment on the merits of EPA's proposal. The missing documents led to uncertainty over EPA's basis for the proposal, which the documents could clarify. This procedural violation met the test under CAA section 307(d)(9) for reversible error, because it indicated a "substantial likelihood" that the regulations would "have been significantly changed." *Kennecott*, 684 F.2d at 1018-1019.⁷

Petitioners in *Kennecott* also objected to EPA's submission to the docket, one week prior to promulgation of the final rule, of certain economic forecast data upon which EPA relied for the final rule, where the forecast data differed significantly from the forecast data provided during the public comment period. The court found that this late submission of important information relied on by EPA, without an opportunity to comment, also violated the notice and comment requirements of CAA section 307(d). *Id.* at 1019.

Given these two violations of the notice and comment requirements of CAA section 307(d), the court determined that consideration of a petition to reconsider after promulgation of the final rule was not an adequate substitute for the statutory required notice and opportunity to comment prior to promulgation of the rule. EPA failed to provide adequate notice and an opportunity to comment during the rulemaking process, and could not cure that by later considering the merits of the petitioner's comments post-promulgation, through a petition to reconsider, where the issues involved

⁷ It is this discussion of uncertainty that is cited by PLF. However this concerns the criteria for reversible error under CAA section 307(d)(9)(D)(iii) for a procedural violation. The court did not address this as the test for CAA section 307(d)(7)(B), and certainly did not do so for cases where there is no procedural violation.

were critical to the central issues involved in the rule. *Id.* at 1019.

EPA's failure to provide adequate notice and an opportunity to comment in violation of CAA section 307(d) was the critical underpinning for the court's determination that in that case consideration of the merits of the objections through a post-promulgation petition to reconsider was not an adequate substitute for providing the required procedural rights prior to promulgation. That, however, is not the case here. Petitioners are not claiming that the CRU e-mails or other documents show that EPA failed to provide adequate notice and an opportunity to comment because EPA failed to docket any documents or EPA docketed late any documents used to support EPA's final Endangerment Finding. Instead, petitioners are claiming that EPA should reopen the rulemaking and reconsider the Endangerment Finding based on new documents and arguments that petitioners bring to EPA, which they claim undermine the basis for EPA's Endangerment Finding.⁸ There is no basis for treating the court's decision in *Kennecott* as precedent here, where there is no comparable procedural notice and comment violation by EPA. There is no reason to limit EPA's ability to consider the merits of the petitioners' objections through a post-promulgation petition to reconsider, whereas in this case there is no violation of a statutory right to notice and comment and EPA's consideration of the merits of the petitioners' objections is not being used as an improper substitute or cure for an EPA failure to provide adequate notice and an opportunity to comment prior to promulgation of the final rule. Unlike the situation in *Kennecott*, EPA's consideration of the petitions to reconsider is focused on whether the claimed new evidence and arguments warrant a reopening of a prior, properly noticed rulemaking. Absent a demonstration that the objections raised by petitioners provide substantial support for the argument that the regulation should be revised, such

⁸ Southeastern Legal Foundation, Inc. (SLF) inappropriately points to the docketing requirements under CAA section 307(d)(3) related to a proposed rule, SLF at 3-5. However, the documents SLF refers to are not EPA documents, were not part of the basis for EPA's proposal, and arose after the comment period, not prior to proposal. The provisions for a petition to reconsider under CAA section 307(d)(7), not the provisions of CAA section 307(d)(3), apply to the concerns raised by SLF with respect to the arguments and documents submitted to the agency after the end of the comment period, in the petitions to reconsider.

reopening is not warranted. Nothing in *Kennecott* holds otherwise.

Appalachian Power Company et al. v. EPA, 249 F.3d 1032 (D.C. Cir. 2001) clearly supports this view. In that case, petitioners presented comments to EPA requesting that EPA consider various materials concerning the issue of substantial contribution under section 126. Because EPA had already promulgated a rule that addressed the issue of significant contribution, EPA properly treated the request as a petition to reconsider the prior rule. EPA evaluated the evidence and its relevance to the section 126 rule and for a variety of reasons rejected it on the merits as a basis for reopening the rule. The court upheld EPA's decision, stating that "[g]iven the deferential standard employed in this context, the EPA's refusal to reopen and reconsider its significant contribution findings must be upheld." *Id.* at 1060.

Part III of this Decision explains why EPA is denying the petitions with respect to the objections set forth in these petitions for reconsideration. With respect to some of these issues, the petitioners clearly have not met the procedural predicate for reconsideration. That is, the petitioners have not demonstrated that it was impracticable to raise these objections during the comment period, or that the grounds for these objections arose after the close of the comment period but within 60 days after publication of the final rule. As such, they do not meet the statutory criteria for administrative reconsideration under CAA section 307(d)(7)(B).⁹ For all of the objections, whether or not the petitions might be considered to meet the procedural criterion for reconsideration, the petitioners' objections and arguments in terms of substance are not "of central relevance" to the outcome of the rulemaking. Thus, none of the objections meet the criteria for reconsideration under the CAA.

As noted in Section I.B.4 of this Decision, EPA also received two requests to administratively stay the final Findings. Two petitioners requested an administrative stay under

⁹ The Chamber of Commerce's petition was based on grounds that it claims arose after the time period for seeking judicial review of the underlying rulemaking. The Chamber argues that EPA should grant reconsideration in its discretion, even if it is not required to do so under section 307(d). The failure of the Chamber to file timely objections or to demonstrate that the objections it raises provide substantial support for the argument that the regulation should be revised are a fully adequate basis for EPA to deny the Chamber's petition. In any case, even if the petition were timely, EPA has considered the objections raised by the Chamber and is denying their petition as discussed in more detail herein.

CAA section 307(d)(7)(B), tied to the petitions to reconsider the findings, requesting that EPA stay the Findings for three months. Southeastern Legal Foundation at 8, Chamber of Commerce at 1. EPA has authority to issue a stay for up to 3 months if it grants a petition to reconsider under CAA section 307(d)(7)(B). As described below, EPA is denying the petitions to reconsider, hence there is no basis for issuance of an administrative stay under this provision.

One of the administrative stay requests was filed under section 705 of the Administrative Procedure Act (APA) as part of the petition for reconsideration relating to stationary source concerns, and requested a stay pending EPA's completion of its reconsideration of the final Findings. Chamber at 23–34. 5 U.S.C. 705 authorizes an agency to postpone the effective date of an agency action pending judicial review when the agency finds that justice so requires. In this case, the Endangerment Finding was effective as of January 14, 2010. The request for an administrative stay was submitted by petition dated March 15, 2010, after the Endangerment Finding was effective. Even if EPA believed that an administrative stay was warranted, which it does not, it is not clear whether EPA would have the authority under APA section 705 to stay an agency action that has already gone into effect. Postponing an effective date implies acting before the effective date occurs.

In any case, an administrative stay of the Endangerment Finding is not warranted. In response to the arguments raised by the Chamber, (1) the Chamber has not made a strong showing on the merits, for all of the reasons upon which EPA is denying the petitions to reconsider; (2) the Chamber's arguments concerning irreparable harm fail to adequately account for the proposed or recently issued Final Prevention of Significant Deterioration (PSD) and Title V Greenhouse Gas Tailoring Rule (75 FR 31518, 31579–84; June 3, 2010) (Final Tailoring Rule), and present general, unspecific, and unsupported arguments; (3) the Chamber's arguments that EPA's standards for emissions of GHGs from light-duty vehicles would have no important benefit because of the related NHTSA CAFE rule are rejected for the reasons discussed in Section IV.B of this Notice, and (4) the Chamber's arguments concerning the public interest, which repeat its prior arguments, are rejected for the same reasons.

III. Science Related Issues

A. General Summary of Petitioners' Arguments

The petitioners generally claim that the science underlying the Administrator's Endangerment Finding is flawed and/or that EPA did not follow an appropriate or robust process in evaluating the underlying science for purposes of making an endangerment finding for greenhouse gases. Many of the 10 petitions present similar arguments. Some of the petitioners' arguments were raised during the 60-day public comment period following the proposed Findings (74 FR 18886, April 24, 2009).

Many of the petitioners critique specific elements of the underlying science that support the Findings, primarily the HadCRUT temperature record showing increases in global surface temperatures. There are many elements of the underlying science that support the Administrator's Endangerment Finding that are not addressed by the petitioners. Petitioners assert that the global temperature record is so central to all greenhouse gas and climate change science that the problems with a global surface temperature record essentially mean all scientific knowledge linking greenhouse gases and climate change, and by extension all public health and welfare risks associated with human-induced climate change, must also be called into question. Petitioners also question the credibility of the IPCC and, by extension, EPA's use of IPCC AR4 as a significant reference document supporting the Findings.

The primary information provided by the petitioners to back their arguments are:

(1) A set of disclosed private e-mail communications among some scientists associated with the HadCRUT temperature record and associated with certain sections of IPCC AR4.

(2) A small number of factual mistakes and claimed factual mistakes and alleged unsupported statements in the voluminous, 2,927-page IPCC AR4.

(3) A limited number of new studies for EPA to consider.

EPA's responses to the petitioners' evidence, arguments, and claims are summarized in this section of this Decision and provided in fuller technical detail in the accompanying three-volume RTP document. More specifically, the petitioners' arguments can generally be grouped into three broad categories:

- Climate science and data issues, including (1) the validity of the reconstructed surface temperature

record from the distant past and whether or not recent observations of global warming are unusual; (2) the validity of the more recent surface temperature record and whether recent temperature changes can be attributed to human emissions of greenhouse gases; (3) the validity of the HadCRUT surface temperature record of the Climatic Research Unit (CRU); (4) the validity of the recent surface temperature records constructed by the National Oceanographic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA); and (5) the implications of new studies not previously considered.

- Issues raised by EPA's use of IPCC reports, including: (1) Claims that recently found errors and claimed errors in IPCC AR4 undermine IPCC's credibility and therefore EPA's use of IPCC AR4 as a primary reference document; and (2) claims that IPCC has a policy agenda and is not an objective scientific body.

- Process and other issues, including claims that: (1) The USGCRP and the NRC are not separate and independent assessments from IPCC; (2) EPA's process to develop the scientific support for the Findings was inappropriate; (3) there are improper peer-review processes in the underlying scientific literature used by the major assessments; and (4) certain scientists did not adhere to UK and U.S. Freedom of Information Act Requests.

B. Summary of the Science Underlying the Administrator's Endangerment Finding in Light of the Petitioners' Claims

Before addressing the petitioners' general and specific assertions, this section briefly describes the major scientific conclusions and data that support the Administrator's Endangerment Finding that elevated atmospheric concentrations of the group of six key greenhouse gases are reasonably anticipated to endanger the public health and public welfare of current and future generations. As noted above, the petitioners do not take issue with the large body of scientific evidence. Rather, they focus most of their attention on questioning the validity of the global surface temperature record—specifically the HadCRUT temperature record, one of the three major global surface temperature records used by climate researchers—which show that temperatures are increasing. This section puts the global temperature record in the broader context of greenhouse gas and climate change

science, and demonstrates the limited scope of the petitioners' arguments.

There is a causal chain linking atmospheric concentrations of greenhouse gases to impacts and risks to public health and welfare. The elements of this causal chain are:

- What effects do greenhouse gases have on the environment and on climate in particular?

- Are human activities changing the amount of greenhouse gases in our atmosphere?

- What is the evidence indicating that average temperatures are increasing and that climate change is occurring, consistent with the direction one would expect from increasing greenhouse gases in our atmosphere?

- What is the evidence linking observed temperature changes and climate change to the anthropogenic increase in greenhouse gases?

- How are public health and welfare threatened by these changes to climate and the environment, now and in the future?

Each element of the causal chain is discussed below. Evidence related to each element is based on the underlying scientific assessments (e.g., IPCC and USGCRP) that EPA relied on to develop the TSD to support the Administrator's Endangerment Finding, and, where noted, is also based on the most recent scientific assessment, published in May 2010, of the NRC.¹⁰

1. What effects do greenhouse gases have on the environment and on climate in particular?

The physical effect of greenhouse gases on climate and the environment remains a basic scientific fact—greenhouse gases slow the loss of Earth's heat, which would otherwise escape to space. Much like a blanket keeps a person warm by preventing heat loss, greenhouse gases blanket the planet and warm the Earth by trapping in heat that would otherwise escape to space. This is the Earth's natural greenhouse effect. An increase in the amount of greenhouse gases in our atmosphere intensifies the natural greenhouse effect and thus exerts a warming effect on the global climate. These are well-established physical properties of greenhouse gases. The six greenhouse gases grouped together in the Administrator's Endangerment Finding are long-lived in the atmosphere and, once emitted, can remain in the atmosphere for decades to

centuries. Carbon dioxide has other non-climate effects as well. Increases in atmospheric carbon dioxide concentrations can affect oceanic acidity and the growth rates of crops, weeds, and trees. Petitioners have not presented information challenging the basic physical properties of how the six greenhouse gases affect the climate and the environment.

2. How are human activities changing the amount of greenhouse gases in our atmosphere?

It is a well-documented and straightforward observation that levels of carbon dioxide and other greenhouse gases are increasing in our atmosphere. The six key greenhouse gases included in the Administrator's Findings are at essentially unprecedented levels compared to the recent and distant past. Their concentrations are climbing, and this is projected to continue well into this century. The two most important directly emitted greenhouse gases, carbon dioxide and methane, are well above the natural range of atmospheric concentrations compared to at least the last 650,000 years (see TSD EPA-HQ-OAR-2009-0171-11645). The most recent report of the NRC states that carbon dioxide levels are now at 388 parts per million and increasing by almost two parts per million per year.

The fact that greenhouse concentrations are now at such high levels is absolutely central to the Administrator's Endangerment Finding. Without such a large and ever-increasing buildup of atmospheric levels of greenhouse gases there would be less concern about the potential future warming caused by human activities. Greenhouse gases are at such high levels in our atmosphere and continue to climb because human activities are adding greenhouse gases to the atmosphere in larger quantities and more quickly than the environment can handle. Our annual emissions from fossil fuel combustion, deforestation, and other sources are overwhelming the natural removal systems in the ocean, atmosphere, and terrestrial biosphere (e.g., trees and other vegetation).

Furthermore, human activities are unambiguously the driver of the increase in atmospheric levels of greenhouse gases. The EPA TSD states: "The global atmospheric CO₂ concentration has increased about 38% from pre-industrial levels to 2009, and almost all of the increase is due to anthropogenic emissions." This is supported by the most recent NRC report, which states that, "We know that this increase is largely the result of human activities because the chemical

signature of excess CO₂ in the atmosphere can be linked to the composition of the CO₂ emissions from fossil fuel burning. Moreover, analyses of bubbles trapped in ice cores from Greenland and Antarctica reveal that atmospheric CO₂ levels have been rising steadily since the start of the Industrial Revolution." Petitioners do not provide any evidence that cause EPA to question this scientific conclusion.

3. What is the evidence indicating that average temperatures are increasing and climate change is occurring consistent with the direction one would expect with increasing greenhouse gases in our atmosphere?

The scientific literature is clear that the heating effect caused by the buildup of greenhouse gases is warming the climate system. As summarized in the TSD:

- The global average net effect of the increase in atmospheric GHG concentrations, plus other human activities (e.g., land-use change and aerosol emissions), on the global energy balance since 1750 has been one of warming. This total net heating effect, referred to as forcing, is estimated to be +1.6 (+0.6 to +2.4) watts per square meter (W/m²), with much of the range surrounding this estimate due to uncertainties about the cooling and warming effects of aerosols.

- Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level. Global mean surface temperatures have risen by 1.3 ± 0.32 °F (0.74 °C ± 0.18 °C) over the last 100 years. Eight of the 10 warmest years on record have occurred since 2001. Global mean surface temperature was higher during the last few decades of the 20th century than during any comparable period during the preceding four centuries.

- U.S. temperatures also warmed during the 20th and into the 21st century; temperatures are now approximately 1.3 °F (0.7 °C) warmer than at the start of the 20th century, with an increased rate of warming over the past 30 years. Both the IPCC and the USGCRP¹¹ reports attributed recent North American warming to elevated GHG concentrations. In the U.S. Climate Change Science Program (CCSP) (2008)¹² report, the authors find that for

¹¹ USGCRP now encompasses the former Climate Change Science Program (CCSP) under the previous Administration.

¹² CCSP (2008). Reanalysis of Historical Climate Data for Key Atmospheric Features: Implications for Attribution of Causes of Observed Change. A Report

¹⁰ National Research Council (2010) Advancing the Science of Climate Change: America's Climate Choices, National Academies Press, Washington, DC.

North America, “more than half of this warming [for the period 1951–2006] is likely the result of human-caused GHG forcing of climate change.”

- Widespread changes in extreme temperatures have been observed in the last 50 years across all world regions, including the United States. Cold days, cold nights, and frost have become less frequent, while hot days, hot nights, and heat waves have become more frequent.

- There is strong evidence that global sea level gradually rose in the 20th century and is currently rising at an increased rate.

- Satellite data since 1979 show that annual average Arctic sea ice extent has shrunk by 4.1% per decade.

- Observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate change, particularly temperature increases.

- Observations show that climate change is currently affecting U.S. physical and biological systems in significant ways.

- Ocean CO₂ uptake has lowered the average ocean pH (increased acidity) level by approximately 0.1 since 1750.

These conclusions are consistent with, or strengthened by, the most recent NRC report which states the following: “Earth is warming. Detailed observations of surface temperature assembled and analyzed by several different research groups show that the planet’s average surface temperature was 1.4 °F (0.8 °C) warmer during the first decade of the 21st century than during the first decade of the 20th century, with the most pronounced warming over the last three decades. These data are corroborated by a variety of independent observations that indicate warming in other parts of the Earth system, including the cryosphere (snow and ice covered regions), the lower atmosphere, and the oceans.”

These multiple lines of evidence highlight a number of things. First, there is well-documented evidence that the buildup of greenhouse gases in our atmosphere is exerting, as expected, a significant heating effect called radiative forcing. This is not to be confused with temperature change or the temperature data that is the subject of many of the petitions. This heating effect or radiative forcing refers to a change in the energy balance of the planet, and is thus the driver of temperature change.

by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research [Randall Dole, Martin Hoerling, and Siegfried Schubert (eds.)]. Asheville, NC: National Oceanic and Atmospheric Administration, National Climatic Data Center. 156 pp.

The magnitude of this heating effect caused by the buildup in atmospheric greenhouse gases has been quantified in the scientific literature. The petitioners do not challenge these estimates and do not challenge the fact that the observed buildup of greenhouse gases is having a clear and quantifiable heating effect on the planet. This is a fundamental pillar of climate change science, and is a fundamental piece of supporting evidence for the Administrator’s Endangerment Finding.

Second, the underlying science indicates that there is significant and unambiguous warming for the Earth and for North America. This is the first place along the causal chain where the petitioners question the science. Many petitioners question the validity of the global temperature evidence by pointing to the CRU e-mails and their impact on the scientific assessment reports used by EPA. This particular critique is addressed below and in fuller detail in Volume 1 of the RTP document.

Third, the evidence of climate change caused by human activities goes beyond average increases in global and continental temperatures. There are well-documented increases in sea level, declines in sea ice, and changes to physical and biological systems, all primarily driven by, and therefore showing further evidence of, increases in average temperatures. These changes are documented by datasets other than temperature datasets, and bear no relation to the particular CRU temperature dataset that is the primary focus of many of the petitioners.

Similarly, the observation that elevated levels of carbon dioxide are increasing the acidity of the world’s oceans is direct evidence of a large-scale and significant environmental effect that does not depend on any evidence from a temperature dataset. This particular effect was considered supporting evidence by the Administrator in the Endangerment Finding. This documented effect is not challenged by any of the petitioners.

4. What is the evidence linking observed temperature changes and climate change to the anthropogenic increase in greenhouse gases?

The underlying science has clearly attributed the observed warming to the buildup of greenhouse gases in our atmosphere. Summarized here is the underlying science that shows that increases in average global and continental temperatures, as well as other climatic changes, can confidently be attributed to the increases in greenhouse gas emissions from human activities. The extent to which observed

warming can be attributed to the human-induced buildup of greenhouse gases in the atmosphere is the second area of the causal chain where some petitioners question the science.

IPCC statements on the linkage between greenhouse gases and temperatures have strengthened since the organization’s early assessments (Solomon et al., 2007).¹³ The IPCC’s *First Assessment Report* in 1990 contained little observational evidence of a detectable anthropogenic influence on climate (IPCC, 1990).¹⁴ In its *Second Assessment Report* in 1995, the IPCC stated that the balance of evidence suggests a discernible human influence on the climate of the 20th century (IPCC, 1996).¹⁵ The *Third Assessment Report* in 2001 concluded that most of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations (IPCC, 2001b).¹⁶ The conclusion in IPCC’s 2007 *Fourth Assessment Report* (2007b)¹⁷ is the strongest yet: “Most of the observed increase in global average temperatures since the mid-20th century is very likely¹⁸ due to the observed increase in anthropogenic GHG concentrations.”

The strength of this statement reflects our current, much better understanding

¹³ Solomon, S., D. Qin, M. Manning, R.B. Alley, T. Berntsen, N.L. Bindoff, Z. Chen, A. Chidthaisong, J.M. Gregory, G.C. Hegerl, M. Heimann, B. Hewitson, B.J. Hoskins, F. Joos, J. Jouzel, V. Kattsov, U. Lohmann, T. Matsuno, M. Molina, N. Nicholls, J. Overpeck, G. Raga, V. Ramaswamy, J. Ren, M. Rusticucci, R. Somerville, T.F. Stocker, P. Whetton, R.A. Wood and D. Wratt (2007). Technical Summary. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 996 pp.

¹⁴ IPCC (1990). *First Assessment Report: Climate Change 1990*. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

¹⁵ IPCC (1996). *Climate Change 1995: The Science of Climate Change*. Intergovernmental Panel on Climate Change [J.T. Houghton, L.G. Meira Filho, B.A. Callander, N. Harris, A. Kattenberg, and K. Maskell (eds.)]. Cambridge University Press, Cambridge, United Kingdom.

¹⁶ IPCC (2001b). *Summary for Policymakers*. In: *Climate Change 2001: The Scientific Basis. Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change* [J.T. Houghton et al. (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

¹⁷ IPCC (2007b). *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* [Core Writing Team, Pachauri, R.K. and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

¹⁸ According to IPCC terminology, “very likely” conveys a 90 to 99% probability of occurrence. See Box 1.2 of the TSD for a full description of IPCC’s uncertainty terms.

of all the factors, not just greenhouse gases, that influence temperature fluctuations and other climatic changes. On this point, EPA's TSD (citing Hegerl *et al.*, 2007)¹⁹ listed the major scientific advances between the Third and Fourth Assessment Reports of the IPCC that led to this increased confidence in the ability to attribute observed temperature and other climate changes to anthropogenic greenhouse gases:

- An expanded and improved range of observations allowing attribution of warming to be more fully addressed jointly with other changes in the climate system.

- Improvements in the simulation of many aspects of present mean climate and its variability on seasonal to inter-decadal time scales.

- More detailed representations of processes related to aerosol and other forcings (i.e., heating and cooling effects) in models.

- Simulations of 20th-century climate change that use many more models and much more complete anthropogenic and natural forcings.

- Multi-model ensembles that increase confidence in attribution results by providing an improved representation of model uncertainty.

Climate model simulations suggest that natural heating factors alone cannot explain the observed warming for the entire globe, the global land, or the global ocean. The observed warming can only be reproduced with models that contain both natural and anthropogenic heating and cooling influences.

EPA's TSD, based on the underlying assessment literature, states that if the additional heating effect of elevated levels of greenhouse gases were the only external influence on the global climate, this likely would have resulted in warming greater than observed. This statement is made because our understanding of the climate system is sophisticated enough to consider and model multiple and simultaneous influences on the global climate. For example, there are known and quantifiable cooling effects from human emissions of aerosols and natural forcings (e.g., volcanic eruptions and solar variability) that have offset some of the greenhouse gas-induced warming during the past half century.

The sophistication of climate models that examine the influence of human

emissions of greenhouse gases has increased. Confidence in these models comes from their foundation in accepted physical principles and from their ability to reproduce observed features of current climate and past climate changes (IPCC, 2007a).²⁰ One petitioner questions the reliability of the models by pointing to certain CRU e-mails. Questions regarding the reliability of climate models are addressed in Volume 4 of the RTP document and in Volume 1 of the RTP document.

Furthermore, warming of the climate system has been detected in changes of surface and atmospheric temperatures, in the upper several hundred meters of the ocean (as evident by the observed increase in ocean heat content), and in contributions to sea level rise. The scientific assessments have established human contributions to all of these changes.

Not only has an anthropogenic warming signal been detected for the surface temperatures, but evidence has also accumulated of an anthropogenic influence throughout different layers of the atmosphere. Some petitioners have raised one potential inconsistency between observed warming and modeled warming higher in the atmosphere over the tropics. Karl *et al.* (2009)²¹ state that when uncertainties in models and observations are properly accounted for, newer observational datasets are in agreement with climate model results. A detailed discussion of this issue is contained in Volume 1, section 1.2 of the RTP document.

Lastly, evidence from climates in the geologic past, going back millions of years, also supports the conclusion that elevated levels of greenhouse gases in the atmosphere are expected to lead to warmer climates. Measurements show that climates from the geologic past have been both warmer and colder than present, and that warmer periods have generally coincided with high atmospheric carbon dioxide levels. Analyses of these paleoclimate data have increased confidence in the role of external influences on climate. Climate models for predicting future climate have been used to reproduce key features of past climates using

conditions and radiative forcing for those periods.

Here too, these conclusions are reinforced by the most recent NRC report, which states:

"Global warming can be attributed to human activities. Many lines of evidence support the conclusion that most of the observed warming since the start of the 20th century, and especially the last several decades, can be attributed to human activities, including the following:

- Earth's surface temperature has clearly risen over the past 100 years, at the same time that human activities have resulted in sharp increases in CO₂ and other GHGs.
- Both the physics of the greenhouse effect and more detailed calculations dictate that increases in atmospheric GHGs should lead to warming of Earth's surface and lower atmosphere.

- The vertical pattern of observed warming—with warming in the bottommost layer of the atmosphere and cooling immediately above—is consistent with warming caused by GHG increases, and inconsistent with other possible causes.

- Detailed simulations with state-of-the-art computer-based models of the climate system are able to reproduce the observed warming trend and patterns only when human-induced GHG emissions are included.

Based on these and other lines of evidence, the Panel on Advancing the Science of Climate Change—along with an overwhelming majority of scientists (Rosenberg *et al.*, 2010)—conclude that much of the observed warming since the start of the 20th century, and most of the warming over the last several decades, can be attributed to human activities" [NRC at 29].

The clear conclusion from all of this evidence is that the human-induced buildup of greenhouse gases in the atmosphere is primarily responsible for most of the observed warming and other climate changes occurring now. The information petitioners present to challenge this part of the scientific record is clearly inadequate.

- Petitioners provide no credible evidence to question the clear observation that greenhouse gases are increasing in our atmosphere to significant levels.

- The petitioners provide no information to question the quantified radiative forcing (heating effect) caused by this greenhouse gas buildup.

- Petitioners' objections about paleoclimate temperature reconstructions focus on one type of reconstruction (tree ring analysis). The objections, addressed in Volume 1 of the RTP document, do not withstand scrutiny, nor do they undermine our confidence in the conclusions of the studies. These conclusions, and the accompanying limitations and uncertainties, have been properly characterized in the assessment reports

¹⁹ Hegerl, G.C., *et al.* (2007). Understanding and Attributing Climate Change. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

²⁰ IPCC (2007a) Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor, and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

²¹ Karl, T., J. Melillo, and T. Peterson (Eds.) (2009) Global Climate Change Impacts in the United States. Cambridge University Press, Cambridge, United Kingdom.

and the Endangerment Finding. Petitioners do not contest or address the variety of other aspects of paleoclimate research supporting the attribution of recent warming to anthropogenic greenhouse gases.

- With respect to the variety of evidence on observed temperature change, the petitioners focus their criticism on the validity of one of three global surface temperature records, the HadCRUT temperature record. Petitioners' objections are addressed in detail below and in Volume 1 of the RTP document, as are the petitioners' related criticisms of the NOAA and NASA temperature datasets. Their objections do not withstand scrutiny, nor do they reduce our confidence in these temperature records, which have been properly characterized in the assessment reports and the Endangerment Finding. In addition, the petitioners ignore and do not address the clear information and observations showing that other elements of the climate system are undergoing changes consistent with these average temperature increases (e.g., ocean heating, sea level rise, Arctic ice loss). Petitioners do not show that these observations are in error or are the result of some other, unidentified mechanism.

- Petitioners focus their criticism on a possible discrepancy between model predictions and the vertical temperature structure of the atmosphere in the tropics; this criticism is not substantively supported, as discussed below and in Volume 1 of the RTP document.

- The petitioners do not attempt to provide an alternative explanation of the compellingly strong match between the observed magnitude and pattern of warming and the modeled simulations, which include all known factors, including the greenhouse gas buildup, the offsetting cooling influence of aerosols, and variability in solar output.

- Petitioners' arguments that a possible slowdown in the rate of warming over the last 10 years should weaken confidence in the fact that human emissions of greenhouse gases are the primary driver of recent warming are not valid. EPA addresses this issue more fully below and in Volume 1 of the RTP document.

5. How are public health and welfare threatened by these changes to climate and the environment, now and in the future?

The TSD summarizes a number of conclusions from the underlying science on this issue. In addition to documenting many of the key observed changes to atmospheric composition

and climate, such as those outlined above, the TSD summarizes key findings about projected increases in greenhouse gas emissions and the future climate change associated with these future scenarios:

- Most future scenarios that assume no explicit greenhouse gas mitigation actions (beyond those already enacted) project increasing global greenhouse gas emissions over the century, with climbing greenhouse gas concentrations.

- Future warming over the course of the 21st century, even under scenarios of low-emission growth, is very likely to be greater than observed warming over the past century.

- All of the United States is very likely to warm during this century, and most areas of the United States are expected to warm by more than the global average.

- It is very likely that heat waves will become more intense, more frequent, and longer-lasting in a future warm climate, whereas cold episodes are projected to decrease significantly.

- Increases in the amount of precipitation are very likely in higher latitudes, while decreases are likely in most subtropical latitudes and in the southwestern United States, continuing observed patterns.

- Intensity of precipitation events is projected to increase in the United States and other regions of the world.

- It is likely that hurricanes will become more intense, with stronger peak winds and more heavy precipitation associated with ongoing increases of tropical sea surface temperatures. Frequency changes in hurricanes are currently too uncertain for confident projections.

- By the end of the century, global average sea level is projected by the IPCC to rise between 7.1 and 23 inches (18 and 59 centimeter [cm]), relative to around 1990, in the absence of increased dynamic ice sheet loss.

- Sea ice extent is projected to shrink in the Arctic under all IPCC emission scenarios.

The validity of these future climate change projections is not addressed by the petitioners, although some of the petitioners do call into question the climate models that are used to conduct these climate change projections. The petitioners claim that some of the models must be calibrated with the current temperature record, which in turn they assert appears to be flawed. EPA addresses this faulty critique of the models in Volume 1, section 1.2.3 of the RTP document, and had previously addressed similar critiques of climate models in Volume 4 of the RTC document.

It is important to note that none of the petitioners question the conclusion that atmospheric levels of greenhouse gases are expected to continue climbing for the foreseeable future, given the long-lived physical properties of the greenhouse gases themselves and the plausible pathways of human-emitting activities over the next few decades. Climate models aside, it is difficult to imagine a world where the heating effect of climbing greenhouse gas concentrations does not increase for the foreseeable future.

With regard to the impacts and risks to public health and welfare, the TSD and the Administrator's Findings stated the following:

- Severe heat waves are projected to intensify in magnitude and duration over the portions of the United States where these events already occur, with potential increases in mortality and morbidity, especially among the elderly, young, and frail.

- Some reduction in the risk of death related to extreme cold is expected. It is not clear whether reduced mortality from cold will be greater or less than increased heat-related mortality in the United States due to climate change. In addition, the latest USGCRP report refers to a study that analyzed daily mortality and weather data in 50 U.S. cities from 1989 to 2000 and found that, on average, cold snaps in the United States increased death rates by 1.6 percent, while heat waves triggered a 5.7 percent increase in death rates. The study concludes that increases in heat-related mortality due to global warming in the United States are unlikely to be compensated for by decreases in cold-related mortality.

- Increases in regional ozone pollution relative to ozone levels without climate change are expected due to higher temperatures and weaker circulation in the United States and other world cities relative to air quality levels without climate change.

- CCSP concludes that, with increased CO₂ and temperature, the life cycle of grain and oilseed crops will likely progress more rapidly. But, as temperature rises, these crops will increasingly begin to experience failure, especially if climate variability increases and precipitation lessens or becomes more variable.

- Higher temperatures will very likely reduce livestock production during the summer season in some areas, but these losses will very likely be partially offset by warmer temperatures during the winter season.

- Cold-water fisheries will likely be negatively affected; warm-water fisheries will generally benefit; and the

results for cool-water fisheries will be mixed, with gains in the northern and losses in the southern portions of ranges.

- Climate change has very likely increased the size and number of forest fires, insect outbreaks, and tree mortality in the interior West, the Southwest, and Alaska, and will continue to do so.

- Coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution.

- Climate change will likely further constrain already overallocated water resources in some regions of the United States, increasing competition among agricultural, municipal, industrial, and ecological uses.

- Higher water temperatures, increased precipitation intensity, and longer periods of low flows will exacerbate many forms of water pollution, potentially making attainment of water quality goals more difficult.

- Ocean acidification is projected to continue, resulting in the reduced biological production of marine calcifiers, including corals.

- Climate change is likely to affect U.S. energy use and energy production and physical and institutional infrastructures.

Furthermore, the most recent NRC report from 2010 states that: "Global warming is closely associated with a broad spectrum of other climate changes, such as increases in the frequency of intense rainfall, decreases in snow cover and sea ice, more and increasingly intense heat waves, rising sea levels, and widespread ocean acidification. Individually and collectively, and in combination with the effects of other human activities, these changes pose risks for a wide range of human and environmental systems, including freshwater resources, the coastal environment, ecosystems, agriculture, fisheries, human health, and national security, among others."

The petitioners have not raised any objections to EPA's analysis and judgments concerning these risks and impacts to public health and welfare, which were the foundation of the Administrator's Endangerment Finding.

C. Review of the Administrator's Findings

Throughout this Decision, EPA explains why the petitioners' arguments and information fail to show that the scientific underpinnings of the Endangerment Finding are flawed. EPA remains convinced that the underlying science is robust, and that the

Administrator appropriately interpreted the science to make the Endangerment Finding. This section summarizes the Administrator's December 2009 rationale and judgment based on the underlying science.

The Administrator exercised her judgment under CAA section 202(a) by evaluating what the body of scientific evidence indicates with respect to how greenhouse gases affect the climate, and the degree of scientific consensus about the appropriate conclusions to draw from this evidence. Based on this consideration, the Administrator proposed and took comment on her preliminary judgment of endangerment to public health and welfare. The Administrator found the case to be compelling that greenhouse gas air pollution endangers both public health and welfare within the United States. The underlying science that EPA relied on included careful qualifications and characterizations about the degree of certainty regarding the scientific conclusions that were germane to the Administrator's Findings. The Administrator's reasoning and decision-making process to reach the Findings make clear that there was full acknowledgement that certain elements of the science are known with virtual certainty and others are currently more uncertain.

A robust and comprehensive opportunity for comment allowed any and all objections regarding her judgment to be raised. After carefully reviewing the comments, the Administrator confirmed her judgment on endangerment and provided responses to the scientific, legal, and policy issues raised by commenters. The final rule explains in detail the basis for the Administrator's Endangerment Finding. Key elements of the Administrator's justification and decision process are summarized in the following 10 paragraphs from the December 15, 2009 Findings (74 FR 66523–24).

"As described in Section II of these Findings, the endangerment test under CAA section 202(a) does not require the Administrator to identify a bright line, quantitative threshold above which a positive endangerment finding can be made. The statutory language explicitly calls upon the Administrator to use her judgment. This section describes the general approach used by the Administrator in reaching the judgment that a positive endangerment finding should be made, as well as the specific rationale for finding that the greenhouse gas air pollution may reasonably be anticipated to endanger both public health and welfare.

First, the Administrator finds the scientific evidence linking human emissions and

resulting elevated atmospheric concentrations of the six well-mixed greenhouse gases to observed global and regional temperature increases and other climate changes to be sufficiently robust and compelling. This evidence is briefly explained in more detail in Section V of these Findings. The Administrator recognizes that the climate change associated with elevated atmospheric concentrations of carbon dioxide and the other well-mixed greenhouse gases have the potential to affect essentially every aspect of human health, society, and the natural environment.

The Administrator is therefore not limiting her consideration of potential risks and impacts associated with human emissions of greenhouse gases to any one particular element of human health, sector of the economy, region of the country, or to any one particular aspect of the natural environment. Rather, the Administrator is basing her finding on the total weight of scientific evidence, and what the science has to say regarding the nature and potential magnitude of the risks and impacts across all climate-sensitive elements of public health and welfare, now and projected out into the foreseeable future. The Administrator has considered the state of the science on how human emissions and the resulting elevated atmospheric concentrations of well-mixed greenhouse gases may affect each of the major risk categories, i.e., those that are described in the TSD, which include human health, air quality, food production and agriculture, forestry, water resources, sea level rise and coastal areas, the energy sector, infrastructure and settlements, and ecosystems and wildlife. The Administrator understands that the nature and potential severity of impacts can vary across these different elements of public health and welfare, and that they can vary by region, as well as over time.

The Administrator is therefore aware that, because human-induced climate change has the potential to be far-reaching and multi-dimensional, not all risks and potential impacts can be characterized with a uniform level of quantification or understanding, nor can they be characterized with uniform metrics. Given this variety in not only the nature and potential magnitude of risks and impacts, but also in our ability to characterize, quantify and project into the future such impacts, the Administrator must use her judgment to weigh the threat in each of the risk categories, weigh the potential benefits where relevant, and ultimately judge whether these risks and benefits, when viewed in total, are judged to be endangerment to public health and/or welfare.

This has a number of implications for the Administrator's approach in assessing the nature and magnitude of risk and impacts across each of the risk categories. First, the Administrator has not established a specific threshold metric for each category of risk and impacts. Also, the Administrator is not necessarily placing the greatest weight on those risks and impacts, which have been the subject of the most study or quantification.

Part of the variation in risks and impacts is the fact that climbing atmospheric

concentrations of greenhouse gases and associated temperature increases can bring about some potential benefits to public health and welfare in addition to adverse risks. The current understanding of any potential benefits associated with human-induced climate change is described in the TSD and is taken into consideration here. The potential for both adverse and beneficial effects are considered, as well as the relative magnitude of such effects, to the extent that the relative magnitudes can be quantified or characterized. Furthermore, given the multiple ways in which the buildup of atmospheric greenhouse gases can cause effects (e.g., via elevated carbon dioxide concentrations, via temperature increases, via precipitation increases, via sea level rise, and via changes in extreme events), these multiple pathways are considered. For example, elevated carbon dioxide concentrations may be beneficial to crop yields, but changes in temperature and precipitation may be adverse and must also be considered. Likewise, modest temperature increases may have some public health benefits as well as harms, and other pathways such as changes in air quality and extreme events must also be considered.

The Administrator has balanced and weighed the varying risks and effects for each sector. She has judged whether there is a pattern across the sector that supports or does not support an endangerment finding, and if so, whether the support is of more or less weight. In cases where there is both a potential for benefits and risks of harm, the Administrator has balanced these factors by determining whether there appears to be any directional trend in the overall evidence that would support placing more weight on one than the other, taking into consideration all that is known about the likelihood of the various risks and effects and their seriousness. In all of these cases, the judgment is largely qualitative in nature, and is not reducible to precise metrics or quantification.

Regarding the timeframe for the endangerment test, it is the Administrator's view that both current and future conditions must be considered. The Administrator is thus taking the view that the endangerment period of analysis extend from the current time to the next several decades, and in some cases to the end of this century. This consideration is also consistent with the timeframes used in the underlying scientific assessments. The future timeframe under consideration is consistent with the atmospheric lifetime and climate effects of the six well-mixed greenhouse gases, and also with our ability to make reasonable and plausible projections of future conditions.

The Administrator acknowledges that some aspects of climate change science and the projected impacts are more certain than others. Our state of knowledge is strongest for recently observed, large-scale changes. Uncertainty tends to increase in characterizing changes at smaller (regional) scales relative to large (global) scales. Uncertainty also increases as the temporal scales move away from present, either backward, but more importantly, forward in time. Nonetheless, the current state of

knowledge of observed and past climate changes and their causes enables projections of plausible future changes under different scenarios of anthropogenic forcing for a range of spatial and temporal scales.

In some cases, where the level of sensitivity to climate of a particular sector has been extensively studied, future impacts can be quantified whereas in other instances only a qualitative description of a directional change, if that, may be possible. The inherent uncertainty in the direction, magnitude, and/or rate of certain future climate change impacts opens up the possibility that some changes could be more or less severe than expected, and the possibility of unanticipated outcomes. In some cases, low probability, high impact outcomes (i.e., known unknowns) are possibilities but cannot be explicitly assessed."

The Findings show that the Administrator took a measured, balanced and systematic approach in judging the body of scientific evidence for the Endangerment Finding. The Administrator did not take a narrow view of the science, nor consider only those pieces of evidence that would support a positive endangerment finding.

In taking this approach, the Administrator determined that the body of scientific evidence compellingly supports a positive endangerment finding. The major assessments by the USGCRP, IPCC, and the NRC (published before 2010) served as the primary scientific basis supporting the Administrator's endangerment finding. The Administrator reached her determination by considering both observed and projected effects of greenhouse gases in the atmosphere, their effect on climate, and the public health and welfare risks and impacts associated with such climate change. The Administrator's assessment focused on public health and public welfare impacts within the United States. She also examined the evidence with respect to impacts in other world regions, and she concluded that these impacts strengthen the case for endangerment to public health and welfare because impacts in other world regions can in turn adversely affect the United States.

The Administrator considered how elevated concentrations of the well-mixed greenhouse gases and associated climate change affect public health by evaluating the risks associated with changes in air quality, increases in temperatures, changes in extreme weather events, increases in food- and water-borne pathogens, and changes in aeroallergens. The Administrator placed weight on the fact that certain groups, including children, the elderly, and the poor, are most vulnerable to these climate-related health effects.

The Administrator considered how elevated concentrations of the well-mixed greenhouse gases and associated climate change affect public welfare by evaluating numerous and far-ranging risks to food production and agriculture, forestry, water resources, sea level rise and coastal areas, energy, infrastructure, and settlements, and ecosystems and wildlife. For each of these sectors, the evidence provides support for a finding of endangerment to public welfare. The evidence concerning adverse impacts in the areas of water resources and sea level rise and coastal areas provides the clearest and strongest support for an endangerment finding, both for current and future generations. Strong support is also found in the evidence concerning infrastructure and settlements, as well as ecosystems and wildlife. Across the sectors, the potential serious adverse impacts of extreme events, such as wildfires, flooding, drought, and extreme weather conditions, provide strong support for such a finding.

The petitioners have not provided information that would lead EPA to believe that the Administrator's approach, briefly summarized here and explained in full in the December 2009 Findings, was flawed, should have been carried out differently, or should have led to a different conclusion.

D. General Response to the Petitioners' Scientific Arguments in Light of the Full Body of Scientific Evidence

EPA's overarching conclusion is that there is no material or reliable basis to question the validity and credibility of the body of science underlying the Administrator's Endangerment Finding or the Administrator's decision process articulated in the Findings themselves. The large body of scientific evidence and the Administrator's conclusions drawn from this evidence, including the appropriate characterizations as to the degrees of certainty and uncertainty in the underlying science, has not been changed by the arguments presented by the petitioners. While the petitioners largely rely on making broad assertions about the science based on private communications, EPA's focus is on the actual science itself, and the petitioners have not presented a valid basis supporting the view that the credibility or reliability of either the science or the scientific conclusions that petitioners contest have been undermined or changed in any material way.

The petitioners present very little scientific evidence or scientific arguments to support their views. As demonstrated above, they do not rely on an in-depth and comprehensive analysis of the science and make arguments on

that basis. Instead they largely rely on a small number of statements from the CRU e-mails in which certain scientists expressed various thoughts and feelings, such as frustration and disrespect for other scientists, along with strong views on scientific issues and what constitutes good science. From this evidence, the petitioners conclude that the scientists acted together to distort the review and presentation of the body of science, and presented false, inaccurate, or misleading conclusions about what the body of scientific studies tells us about various aspects of climate change.

Petitioners do not argue their case by marshalling and synthesizing the breadth of the body of scientific evidence and demonstrating why it leads to a different conclusion than that presented in the underlying science supporting the Findings. Instead, they largely argue that the state of mind of these scientists and their private remarks must lead to the conclusions drawn by the petitioners. They also conclude, based on a selective reading of the CRU e-mails, that the state of the science must be much more uncertain than how it is characterized in the underlying assessment reports used by EPA and the Endangerment Finding. Other than the conduct of sending e-mails that evidence strong emotions or unprofessional language, the petitioners present almost no evidence of any actual conduct by the scientists that support their conclusion that the science was assessed inaccurately. Most of the conduct that is identified, such as statements about the professional challenges of working as an IPCC lead author or the discussion with a journal editor to delay the paper publication (but not the online publication) of a study, is of no relevance to the evaluation of the science involved in the assessment reports and the EPA rulemaking.

Petitioners' claims of distortion of data, withholding of temperature data, or abuses in data analysis also do not withstand scrutiny. These issues are addressed in fuller detail in volumes 1 and 3 of the RTP document. In addition, some of these issues were raised and addressed by EPA during the public comment period, and thus fail to meet the test in CAA 307(d). Petitioners have shown no evidence that the HadCRUT temperature record based on the underlying raw temperature data was flawed in any way, or that CRU's lack of possession of a small portion of the raw temperature data impedes the ability of other researchers to check the publically available data, or that it changes the scientific validity of the analyses performed by CRU. The

HadCRUT temperature record remains consistent with all of the other evidence of warming, including other surface temperature analyses as well as other evidence of warming, such as satellite data, ocean temperature data, and physical and biological evidence of the effects of warming.

The petitioners ask EPA to reject the comprehensive and well-documented views reflecting a synthesis of the body of scientific evidence produced by the U.S. and the world's climate science community, and instead accept assertions and three profound leaps in logic, based on a very limited discussion of the underlying science. The first leap is that petitioners' objections to the HadCRUT surface temperature record and objections to reconstructions of past global temperatures are correct, and that as a result all other elements of greenhouse gas and climate change science indicating temperatures are increasing and that anthropogenic greenhouse gases are the primary driver should be called into question. The second leap is that some errors found in the IPCC AR4—errors that are both minor and tangential to EPA's Endangerment Finding—mean that any and all information from that report should be called into question. The third is that any other assessment report that relies on or references the IPCC AR4 in any way is also suspect and cannot serve as a foundation for the Endangerment Finding. EPA's review, discussed in the following sections and in fuller detail in the three volumes of the RTP document, plus the latest conclusions of the May 2010 NRC scientific assessment, lead us to the firm conclusion that the petitioners' specific arguments and broad claims must be rejected for their lack of supporting evidence and absence of comprehensive and clear scientific reasoning.

As stated in one of the findings of the Independent Climate Change E-mails Review, "In particular, we did not find any evidence of behaviour that might undermine the conclusions of the IPCC assessments." EPA's review and analysis leads to this same conclusion.

E. Specific Responses to the Claims and Arguments Raised by Petitioners

EPA's responses to the petitioners' specific claims and arguments are summarized here, and provided in more detail in the RTP document. The more general conclusions provided in this Decision, articulated above, are based on EPA's detailed analysis of and responses to the petitioners' issues contained in the RTP document. As stated previously, the science-based objections raised by petitioners fall into

three categories: Climate science and data issues; issues raised by EPA's use of IPCC AR4; and process issues. This section and the three volumes of the RTP document are organized around these three categories.

1. Climate Science and Data Issues Raised by the Petitioners

The climate science and data issues raised by the petitioners include (a) the validity of the temperature record from the distant past and whether or not recent observations of global warming are unusual; (b) the validity of the more recent surface temperature record; (c) the validity of the HadCRUT surface temperature record and other CRU datasets; (d) the validity of the recent surface temperature record as constructed by the National Oceanographic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA); and (e) the implications of new studies not previously considered. Each of these issues is addressed in general here and in fuller detail in the Volume 1 of the RTP document.

a. Validity of Paleoclimate Temperature Reconstructions and Attribution of Observed Temperature Trends to Greenhouse Gases

Petitioners raise various claims about the comparisons of current temperatures with historic temperatures of the distant past (called paleoclimate temperature reconstructions). Petitioners use these claims to contest the view that current warming is unusual and argue that EPA should not rely on this evidence to support the statement in the Endangerment Finding that recent warming can be primarily attributed to increased atmospheric concentrations of greenhouse gases caused by human emissions. EPA addresses these claims in Volume 1, section 1.1 of the RTP document, and summarizes the responses here.

As background, surface temperature records based on observation have global coverage over approximately the last 150 years. To determine temperatures in time periods before the instrumental record, climate scientists use indirect methods called "proxies." These indirect methods include examining tree rings, pollen, plankton records in sediment cores, and other proxies such as atomic isotope ratios in corals and other marine organisms. The statistical relationships found between the proxy and regional temperatures over the past 150 years (*i.e.*, the period when the datasets overlap) are then used to extrapolate over the hundreds or thousands of years before instrumental

records. Researchers combine a number of different proxies from around the world to develop their temperature reconstructions of the past. The further back in the past, the fewer proxies that exist and the greater the uncertainty becomes about estimating past temperatures. These reconstructions contribute to our understanding of historical temperatures and variability and enable comparison of present changes to changes in the past. They also allow testing of climate models and our understanding of how the climate system responded to historical conditions. The term “divergence” refers to a certain subset of the tree ring records whose growth in recent decades no longer correlates with (*i.e.*, it “diverges” from) temperature change in recent decades.

Petitioners claim the CRU e-mails provide new reason to highlight this divergence issue as it may undermine the use of historical temperature reconstructions. EPA disagrees, and finds that the CRU e-mails demonstrate that the scientists were well aware of the divergence issue and addressed it appropriately in their research and publications. A cursory examination of this literature and the assessment reports makes clear that the science community has long been aware of the tree ring divergence issue, as well as other issues concerning the certainty of proxy reconstructions. The uncertainties in the proxy reconstructions were fully presented in the assessment literature, and were considered by EPA in making the Endangerment Finding. In fact, during public comment on the proposed Finding, EPA evaluated and responded to these issues (See EPA RTC, Volume 2, comments 2–64 and 2–67). A recent NRC assessment (2006)²² focused specifically on surface temperature reconstructions and it found that divergence is not an issue with all tree ring proxies, much less the many non-tree ring proxies used in the temperature reconstructions. The petitioners cite some studies²³ in support of their views that the divergence issue was hidden and not appropriately acknowledged. These studies do not support the petitioners’ arguments, instead stating that the divergence problem is neither new nor

hidden, that it is actually “widely perceived” and that the “potential consequences [are] discussed (*e.g.*, IPCC, 2007).”

Nonetheless, petitioners allege that a number of the CRU e-mails suggest that these temperature reconstructions were manipulated and that data has been hidden. Several petitioners refer to an e-mail including the phrase “Mike’s Nature trick”, claiming that this quote is evidence of deception. However, this e-mail about how to connect tree ring data and thermometer data was written in 1999, prior to the publication of the IPCC Third Assessment Report from 2001. The e-mail refers to a graph prepared for the front cover of World Meteorological Organization (WMO) report, unrelated to IPCC, published in 2000. This graph and underlying analysis that is being objected to by petitioners has no relevance to the discussion in either IPCC AR4 or EPA’s TSD, and therefore did not enter into the Administrator’s consideration for the Endangerment Finding. The IPCC AR4 and other assessment literature very transparently document, illustrate, and discuss the divergence issue, as did EPA in the TSD and RTC document. See Figure 4.3, TSD. Other quotes provided by the petitioners do not support a claim of “deliberate manipulation” or “artificial adjustments” when considered in context. This issue of historic temperature reconstructions is discussed in detail in Volume 1 of the RTP document. The UK Independent Climate Change E-Mails Review reached a similar conclusion to EPA’s, stating that they “do not find that the way that data derived from tree rings is described and presented in IPCC AR4 and shown in its Figure 6.10 is misleading” and regarding the phenomenon of divergence that they “are satisfied that it is not hidden and that the subject is openly and extensively discussed in the literature, including CRU papers.”

Petitioners also claim that the Medieval Warming Period may have been warmer than present temperatures, undermining the conclusion that greenhouse gases are a primary cause of current warming. Issues involving the Medieval Warming Period were addressed during the public comment period (see Response 2–62 of the RTC document). Petitioners raise this issue again because of their assertion that the CRU e-mails indicate that the current temperature record may be faulty, which to them gives the Medieval Warming Period new significance. In making their case, petitioners cite a temperature reconstruction without tree rings, notably a study that could have been submitted during the public

comment period.²⁴ However, that paper uses an improper methodology, a straight average of 18 proxies, apparently without weighting them to account for geographic distribution or the strength of the data to detect temperature changes. In contrast, another study using a more sophisticated methodology²⁵ found that recent Northern Hemispheric warmth was anomalous regardless of whether tree ring data were included.

Petitioners argue that if the current warming is not “unprecedented,” our ability to attribute the current warming to greenhouse gases is undermined, and that EPA has not provided “compelling” evidence that the current temperatures are unusual compared to the last 1,000 years. Petitioners misstate EPA’s conclusions and overstate the role of this line of evidence. EPA has not claimed that current warming is “unprecedented”; the Administrator’s Endangerment Finding stated that “The second line of evidence arises from indirect, historical estimates of past climate changes that suggest that the changes in global surface temperature over the last several decades are unusual.” (74 FR 66518) EPA found the scientific evidence “supports” this conclusion (see for example section 4 of the TSD), not that it compels it, as petitioners incorrectly assert. EPA clearly characterized the uncertainty in this line of the evidence, properly stating that there is significant uncertainty in the temperature record prior to 1600 A.D. (see section 4(b) of the TSD).

This comparison to past temperature estimates is also only one part of the paleoclimate evidence. Other parts, not contested by petitioners, include (1) the correlation and interactions over time between periods of higher greenhouse gas concentrations and higher temperatures, and (2) the use of temperature reconstructions to evaluate and improve climate models. Overall, this comparison of current to past temperatures is but one part of one line of evidence in attributing current warming to greenhouse gases; it is not the primary line of evidence. The petitioners have not shown that EPA failed to properly characterize this evidence, and the petitioners’ assertions regarding EPA’s treatment and reliance

²² National Research Council (NRC) (2006). *Surface Temperature Reconstructions For the Last 2,000 Years*. National Academy Press. Washington, DC.

²³ D’Arrigo, R. *et al.* (2008). On the “divergence problem” in northern forests: a review of the tree-ring evidence and possible causes, 60 *Glob. Planet. Chng.* 289. Esper, J. and D. Frank (2009). Divergence pitfalls in tree-ring research. *Clim. Chng.* 94: 261, 262.

²⁴ Loehle, C. and J. H. McCulloch, 2008. Correction to: A 200-year global temperature reconstruction based on non-tree proxies. *Energy & Environment*. 19(1): 93–100.

²⁵ Mann, M.E. *et al.* (2008). Proxy-based reconstructions of hemispheric and global surface temperature variations over the past two millennia. *PNAS*. 105:36.

on this evidence are inaccurate and misleading.

Petitioners claim that characteristics of trends in the vertical temperature profile of the atmosphere should present a “fingerprint” of human-induced warming, and that this expected fingerprint has not been observed in the tropics, and that therefore the attribution of recent warming to human causes is placed into doubt. However, EPA recognized and already addressed this issue in the TSD (see section 5(a) of the TSD) which notes newer data sets are in general agreement with climate models in the tropics and therefore there is no longer an inconsistency. In addition, petitioners do not contest any of the other important pieces of evidence that link current warming to greenhouse gases, such as rates of sea level rise and Arctic ice loss.

Petitioners claim that the projections from climate models do not support attribution to greenhouse gases because the models have not explained why there may have been a slowdown in the rate of warming over the last 10 or so years. First, according to the latest NOAA (2010) data,²⁶ the decade spanning 2000–2009 was substantially warmer than the prior decade (1990–1999) (see also the figure in Response 1–22 in Volume 1 of the RTP document). The exact rate of warming in the past decade depends on one’s choice of temperature record and the start and stop date chosen for computing a trend in that record. Second, whether models can reproduce a short-term slowdown in the warming in no way invalidates their use for attributing or projecting long-term changes in global climate from anthropogenic forcing of the climate system. The later long-term projections are their primary purpose, not year-to-year projections of changes over a period of around a decade or less. In addition, recent studies indicate that short-term trends can run counter to overall long term trends, and the climate models can reproduce this.

The IPCC, NRC, and EPA’s TSD appropriately reflect the state of the science and discussed the areas of uncertainty in temperature reconstructions. They fully considered the entire body of evidence, including the kinds of evidence and arguments presented by petitioners. In contrast, petitioners generally have not considered the breadth of evidence on these issues, and they fail to acknowledge the comprehensive treatment of these issues in the

assessment reports. They have instead relied upon a limited selection of information that does not warrant the broad conclusions they draw.

Petitioners’ evidence does not materially change or warrant any less reliance on the other important lines of evidence linking greenhouse gases and climate change: Our basic physical understanding of the effects of changing greenhouse gas concentrations and other factors; the broad, qualitative consistency between observed changes in climate and the computer model simulations of how climate would be expected to change in response to anthropogenic emissions of greenhouse gases (and aerosols); as well as other important evidence of an anthropogenic fingerprint in the observed warming.

b. Validity of the HadCRUT Surface Temperature Record

Petitioners present five major arguments regarding the validity and use of the HadCRUT temperature record. In particular, they claim that: (1) Alleged destruction of raw data for the HadCRUT temperature record renders the scientific data on surface temperature worthless and makes replication of temperature trends impossible; (2) comments within code and log files are evidence of manipulation that “undercuts the credibility of CRU databases;” (3) a report allegedly claims to show that the Russian stations used in the HadCRUT temperature record were selectively chosen to show increased warming; (4) the IPCC improperly relied on Jones *et al.* (1990)²⁷ for its conclusions about the magnitude of the urban heat island effect; and (5) the allegedly faulty HadCRUT temperature record is the primary basis for the conclusion of “unprecedented” warming and the foundation of anthropogenic global warming analyses. In effect petitioners use these claims to contest the existence or amount of recent warming.

As background, monitoring the changes in the Earth’s surface temperature is only one of several key components of studying climate change. Other indicators of climate change include receding glaciers, shrinking Arctic sea ice, and sea level rise, as well as a number of other temperature-sensitive physical and biological changes, such as bird migration patterns and changes in the length of the growing season.

Surface temperature records are built on data collected from thousands of weather stations around the world, as well as sea surface temperature records taken by ships crossing the ocean on different routes, with some data going back more than 100 years. Because the data originates from many international sources, some quality control is required such as checking for and deleting data that are shown to be duplicate, or adjusting to account for inconsistent reporting methodologies. Additionally, these weather stations and their data were not originally intended to be used for long-term climate monitoring, and sometimes adjustments are necessary to avoid confusing a local artificial temperature change (e.g., due to a shift in the elevation of a monitoring station) with large-scale or global temperature patterns.

The three major temperature record developers, CRU, NOAA, and NASA, all use different approaches for these adjustments. The approach by CRU is the only one of the three that relies on a substantial set of manual adjustments globally. NOAA uses an automated algorithm to adjust for discontinuities such as might be expected from station moves, with additional corrections in the U.S. because a large number of stations changed measurement instrumentation as well as the time of day of temperature readings. NASA uses NOAA’s adjustments for the U.S. as an input, but uses an algorithm that identifies urban centers based on satellite observations and adjusts those urban centers to have trends that are consistent with nearby rural stations. In addition, the data are not evenly situated around the planet, and need to be extrapolated and averaged so that areas with many stations are not overrepresented and areas with few stations are not underrepresented. The kinds of adjustments made to the underlying raw data are designed so that the surface temperature analyses reflect as much as possible the actual direction and magnitude of any change in surface temperature and do not reflect other changes, such as changes in measurement devices.

The temperature reconstructions generally do not evaluate the average actual surface temperature, but rather determine the changes in temperature, both regionally and globally. The emphasis on changes in temperature is important, because they are better correlated with large regional changes. For example, two nearby stations—one on top of a mountain and one in the valley—will likely have different absolute temperatures, but are likely to

²⁷ Jones, P.D., P.Y. Groisman, M. Coughlan, N. Plummer, W.-C. Wang, and T.R. Karl (1990). Assessment of urbanization effects in time series of surface air temperature over land. *Nature* 347:169–172.

²⁶ <http://www.ncdc.noaa.gov/sotc/?report=global&year=2009&month=13&submitted=Get+Report#gtemp>.

have similar changes in temperature over time.

CRU also maintains a dataset known as TS3.0, with TS2.1 as an older version. This dataset is different from HadCRUT, and includes various climate metrics and data information not in HadCRUT. TS2.1 is referred to in IPCC AR4 only twice in relation to historical precipitation data. Almost all of the references to global temperatures over time that refer to CRU data refer to the HadCRUT temperature record, and not the TS3.0 or 2.1 datasets.

(i) Raw Data.

Several petitioners claim that CRU has not kept all of the raw data from the surface weather stations, only the adjusted data, e.g. corrected for station moves and measurement changes, and therefore the evidence for warming in the past century is questionable and cannot be independently replicated.

CRU acknowledges that it did not keep a small percent of the raw weather station data collected since the 1980s and that it cannot release other raw data because of agreements with national meteorological organizations. CRU has provided a detailed explanation for its handling of the data, and EPA already addressed this issue at length in Response 2–39 of the RTC. Not retaining a small amount of the raw data does not interfere in a material way with replication or development of independent estimates of global or regional surface temperature history. The vast majority of the raw weather station data is indeed publicly available from the Global Historical Climate Network (GHCN) and other public data sources, contrary to the petitioners' assertions. An independent estimate of global temperatures can be generated, as NASA/GISS, NOAA/NCDC, and other groups have done. The separate NASA and NOAA analyses of global surface temperature records find similar temperature increases and strongly support the conclusion that the HadCRUT surface temperature record accurately reflects the changes in temperature. The UK Independent Climate Change E-Mails Review was able to download raw data and produce global temperature trend results similar to the other analyses in less than two days. In addition, the major conclusions about warming based on the HadCRUT temperature record have remained robust, even as CRU integrated more data and refined its methodologies over two decades.

The petitioners do not provide any global analysis of the available data from temperature stations that yields a different result. Further, they have provided no evidence that an additional

or different analysis using the publicly available temperature data would yield a different result from the warming reflected in the HadCRUT, NOAA and NASA analyses of global surface temperature. It is an unwarranted leap in logic to assume these analyses have no merit because a small percentage of the underlying raw data is no longer in CRU's possession.

(ii) Biased Methods.

Petitioners claim the various methods that CRU used to integrate and adjust the surface temperature data introduce biases in the temperature record that were designed to support the view that global surface temperatures are increasing faster than they actually are. The petitioners refer to this as "manipulation" and cite several CRU e-mails and other documents as support. A couple of fragments of code and a debugging log (*HARRY_READ_ME.txt*) are quoted extensively as support for these claims.

EPA has thoroughly reviewed all of the disclosed CRU e-mails in light of the petitioners' claims, and EPA responds to all of the petitioners arguments in detail in Volume 1 of the RTP document. Here, EPA focuses on two of the most well-known CRU documents:

BRIFFA SEPT98 .PRO and
HARRY_READ_ME.txt.

The code fragment *BRIFFA SEPT98 E.PRO* that includes a comment in the header for the code that states that the code "APPLIES A VERY ARTIFICIAL CORRECTION FOR DECLINE" is over a decade old and appears to be provisional test code. The comments in capital letters are to remind the programmer to replace the temporary fudge factors with more valid adjustments before the code is used for public products. It further appears that the "fudge" factor highlighted by petitioners is not related to the HadCRUT temperature record, but instead refers to the divergence issue discussed above and the unrelated WMO report. The petitioners do not show that the *BRIFFA SEPT98 E.PRO* code has any relationship to the HadCRUT temperature record or that it was actually used for any public final product.

The *HARRY_READ_ME.txt* debugging notes are a record of attempts to update the CRU TS product by merging six years of additional data to an old data set and migrating the code to a new computer system at the same time. The petitioners fail to acknowledge that the CRU TS products are different from the HadCRUT temperature record that is referred to in the assessment reports and the EPA TSD, and they improperly assert that issues with the TS products

directly call into question the HadCRUT temperature record. The file referred to by petitioners does indicate that there were a number of difficult quality control issues that had to be addressed concerning new data, the code written for the updating process, and the old code for producing TS2.1. The full debugging log demonstrates that a number of the identified problems were successfully fixed. Many of the quotes highlighted by petitioners were expressions of frustration that were not related to the quality of the product. A number of the problems were related to inconsistencies involving reported WMO codes used to identify weather stations. These inconsistencies have previously been highlighted in the literature, and the approach to address them as related in the log file was similar to the approaches detailed in previous papers. In sum, the *HARRY_READ_ME.txt* file is focused on issues that do not relate to the HadCRUT temperature record and contains no evidence of any attempts to bias any output data.

(iii) Biased Dataset.

Petitioners claim that CRU scientists selectively chose Russian data stations to create a biased dataset that would show more warming than would the full dataset. To support this argument, they provide a link to a translation (hosted at a blog) of a report written in Russian by the Institute for Economic Analysis in Moscow (Pivovarova, 2009).²⁸

Examination of this document indicates that the Moscow Institute for Economic Analysis temperature record using the full set of Russian stations agrees well after 1955 with the temperature record that the Institute derived from the set of stations used in the HadCRUT temperature record, and that the difference between temperature records derived from the two datasets is mainly in the 1850 to 1950 portion. However, the method used by the Institute for Economic Analysis to compare the two temperature datasets was an improper comparison of apples and oranges (i.e., the HadCRUT temperature record uses a different geographic weighting approach than did the Institute for Economic Analysis, which is more important when the data is sparse as it is before 1955).

Petitioners also do not support their claim that CRU selectively picked stations. EPA has found no evidence in

²⁸ Pivovarova, N. (2009). Institute for Economic Analysis (IEA): How warming is made. The case of Russia. (December 15, 2009). Available at: http://www.iea.ru/article/kioto_order/15.12.2009.pdf; translation at: <http://climateaudit.files.wordpress.com/2009/12/iea1.pdf>. Last accessed on April 26, 2010.

the CRU e-mails or the information provided by petitioners to indicate that stations were chosen by CRU scientists. CRU uses a number of data sources and the petitioners did not assess whether these data sources included the missing Russian stations, or whether the stations met criteria discussed in published papers (see volume 1 of the RTP document).

(iv) Urban Heat Island Corrections.

Petitioners criticize the urban heat island corrections as another alleged example of temperature data manipulation.

This issue is not new. EPA addressed urban heat island issues in responses 2–28 through 2–30 of the RTC document. Referencing Jones *et al.* (1990)²⁹ and other studies, IPCC AR4 concludes that “urban heat island effects are real but local, and have not biased the large-scale trends.” In addition, satellite records are not susceptible to urban heat island effects and globally show similar trends to land-based measurements over their overlapping time period. EPA summarized this information in the TSD. EPA’s specific responses to the petitioners’ arguments are provided in Volume 1 of the RTP document.

(v) Faulty Temperature Record Used by IPCC.

Petitioners claim the allegedly faulty HadCRUT temperature record is the primary or core support for IPCC conclusions on current warming, attribution, and projections of future warming, thus calling into question the fundamental conclusions of IPCC AR4 and EPA’s use of IPCC AR4 as a primary reference to support the Endangerment Finding.

First, for reasons stated above and detailed further in Volume 1 of the RTP document, EPA disagrees with the petitioners’ claims that the HadCRUT temperature record is faulty. Second, as noted previously, multiple independent assessments of climate change science by not only the IPCC but also USGCRP and NRC have concluded that warming of the climate system in recent decades is “unequivocal.” This conclusion is not drawn from any one source of data, but is based on a review of multiple sources of data and information, which includes the HadCRUT temperature record, additional temperature records from other sources, and numerous other independent indicators of global warming (see section 4 of EPA’s TSD).

NOAA and NASA surface temperature records show nearly

identical warming trends to the HadCRUT temperature record, despite different analysis methodologies. Moreover, entirely independent records of lower tropospheric temperature measured by both weather balloons and satellites demonstrate strong agreement with the surface temperature records of all three organizations. The TSD also discussed the following additional indicators of global warming:

- Increasing global ocean heat content (Section 4(f) of the TSD).
- Rising global sea levels (Section 4(f) of the TSD).
- Shrinking glaciers worldwide (Section 4(i) of the TSD).

Changes in biological systems, including poleward and elevational range shifts of flora and fauna; the earlier onset of spring events, migration, and lengthening of the growing season; and changes in abundance of certain species (Section 4(i) of the TSD).

It is this entire body of evidence that supports the conclusion that there is an unambiguous warming trend over the last 100 years, with the greatest warming occurring over the past 30 years. Contrary to petitioners’ claims, the models used to generate projections of future warming described in IPCC AR4 do not directly rely on the HadCRUT or other surface temperature records. These models are driven by physical equations describing the radiative properties and dynamics of the atmosphere and oceans and parameterizations of small-scale processes, not observed temperature data.

In summary, EPA disagrees with the premise of this claim—that the HadCRUT temperature record is faulty—and therefore disagrees that use of the HadCRUT temperature record within IPCC AR4 has somehow corrupted the IPCC’s conclusions. In addition, the petitioners’ claim that the HadCRUT temperature record is such a central thread to the entire IPCC AR4 that this would then invalidate all IPCC AR4 conclusions is unsupported and exaggerated.

c. Validity of NOAA and NASA Temperature Records

A number of petitioners question the validity of NOAA and NASA surface temperature records, raising claims concerning station “drop-out,” flawed or manipulative adjustments to data, and a lack of independence between the three major surface temperature records.

EPA’s response clearly shows that (1) petitioners rely on a questionable, non-peer-reviewed source which contains a number of inaccurate statements and relies on a scientifically flawed analysis;

(2) petitioners demonstrate a fundamental scientific misunderstanding of what issues actually would lead to either a warming or cooling bias in the temperature record; and (3) petitioners fail to acknowledge that climatic records other than land surface temperature records also show clear warming trends.

As background, one of the sources of data for the HadCRUT temperature record is the GHCN, which was developed and is maintained by NOAA. The GCHN dataset is also used by both NOAA and NASA in their surface temperature records. NOAA, NASA, and CRU each calculate global surface temperature trends from a combination of GHCN data and other data sources. Each group performs different adjustments and corrections to the data, and in some cases uses different subsets of the GHCN data or includes other outside datasets.

Petitioners contest certain individual aspects or details of the surface temperature evidence, and in general raise objections that fail to recognize the various approaches used to develop the global surface temperature record. Many of the issues raised by the petitioners are not new, and have been addressed previously within the TSD and RTC document. Some objections fail to recognize that the change in temperature is being evaluated, not the absolute temperature level. Other objections misconstrue the underlying studies cited by the petitioners. In several cases, petitioners object that various adjustments to the raw data have the effect of changing the data, but they fail to consider that adjustments are appropriately performed, for example, to account for circumstances that otherwise would interfere with accurately isolating and determining a real trend in surface temperature. Petitioners fail to address the reasons behind the adjustments and fail to explain or show that the types of adjustments made in developing such datasets from multiple sources of data are not appropriate. Likewise, petitioners fail to account for the valid data-driven reasons that have led to a reduction over time in the number of weather stations used for the surface temperature analysis, fail to explain or show that the reductions have biased the temperature record, and overstate the magnitude of the temperature station reductions in some cases.

Consistency between all three separate surface temperature records (NASA, NOAA, CRU), as well as consistency between the three surface temperature records and other evidence of warming, such as satellite data, ocean

²⁹Jones, P.D., P.Y. Groisman, M. Coughlan, N. Plummer, W.-C. Wang, and T.R. Karl (1990). Assessment of urbanization effects in time series of surface air temperature over land. *Nature* 347:169–172.

temperature data, and physical evidence of the effects of warming, should be seen as confirmation of the evidence of warming. Petitioners appear to assume that all of this evidence must be wrong because they, incorrectly (see above), allege that some of it is.

(i) Station Drop-out.

Petitioners raise a number of issues regarding the alleged “drop-out” of stations after 1990, and the extrapolation of data from “warmer” areas to “colder” areas due to this drop-out or for other reasons. They claim this leads to bias in the global surface temperature record. Volume 1, section 1.4.3.1 of the RTP document addresses these claims in detail, and EPA’s summary of the issue follows.

Many of the petitioners’ arguments rely on a non-peer-reviewed document by D’Aleo and Watts (2010).³⁰ However, the study and the source upon which it relies do not support petitioners’ claims and conclusions. D’Aleo and Watts (2010) provide no evidence that there was a systematic and purposeful “weeding out” process. Peterson and Vose (1997),³¹ the paper describing the GHCN dataset, describes the procedures for updating the GHCN database and explains that there are fewer measuring stations post-1992 than during the 1980s because only three of the data sources were being updated on a regular basis.

The D’Aleo and Watts study assumed that dropping stations at higher latitudes and in colder climates would result in a biased, warmer temperature trend. This unfounded assumption is a misunderstanding of the basic methodology used in analyzing surface temperature data. The surface temperature record sets evaluate the change in temperature over time at the various stations, not the absolute temperature level. The change in temperature over time is what indicates whether warming is occurring, not just the absolute temperature itself; for example, the Arctic region has been experiencing the highest rates of warming in the world, yet average Arctic temperatures are obviously still considerably colder than temperatures in most other world regions where average temperatures may not have increased as much. Petitioners incorrectly assume and do not explain

why dropping these stations would bias the trend in the change in temperature toward greater warmth. In fact, petitioners fail to acknowledge that colder, high latitude areas are the regions of the world where the most warming is occurring, and is expected to continue occurring. If one were to accept this line of the petitioners’ original argument, there should have been concern about a bias towards less warming, not more warming.

Moreover, the D’Aleo and Watts study used simple averages of absolute temperatures at the stations—without, apparently, taking into account their geographic distribution, much less calculating the change in temperature at the stations. This improper methodology is a significant error that undermines the petitioners’ critique of the temperature records.

Furthermore, satellite data is available for the time periods of land-based station “drop-out”, and the satellite temperature record is broadly consistent with surface temperature trends throughout the period when the “drop out” was occurring, confirming that the reduction in the number of data stations has not created a warming bias. Additionally, analyses using only stations with continuous records are almost identical to analyses using only stations which were “dropped” over the decades before the “drop-out”, further undermining the petitioners’ claim that a warming bias was introduced by the station “drop-out”.

(ii) Improper Heat Island Adjustments.

Petitioners assert that the urban heat island adjustments performed by NASA are insufficient or improperly applied, both globally and in the U.S. Southeastern Legal Foundation points to the study Long (2010)³² as support for this assertion. These assertions are addressed in detail in volume 1, section 1.4.3.2 of the RTP document, and EPA’s general response is summarized here.

The Long (2010) study found that the net effect of NOAA adjustments to the raw data led to more warming in rural stations (the NOAA adjustments for the U.S. are also used in developing the NASA temperature record). Neither the petitioners nor Long show, however, that the adjustments to rural stations were inappropriate. (As stated above, adjustments are sometimes necessary to ensure a real, and not artificial,

temperature change is being recorded when, for example, there might be a change in the elevation of the station or the daily timing of temperature readings.) Importantly, Long does not take into account either the changes in the time of observation or the changes in instrumentation at many rural stations, both of which led to temperature discontinuities that must be accounted for (e.g., through adjustments) in order to accurately portray the actual long-term temperature trend.

With respect to the claimed failure to account for the urban heat island effect (where metropolitan areas tend to be warmer than surrounding areas due to built up land surfaces and building materials that retain heat), this issue was raised previously during the public comment period and EPA has addressed this in the RTC document. Response 2–28 of the RTC document makes clear that all of the different surface temperature datasets shown or cited in the TSD account for the urban heat island effect, either directly and/or indirectly. The TSD, citing IPCC (Trenberth *et al.*, 2007), summarized this issue as the following: “ * * * urban heat island effects are real but local, and have not biased the large-scale trends.” Note also that the oceans are warming and that the most rapid land-based warming is occurring in the Arctic, two areas where urban heat island effects are obviously not an issue.

(iii) Data Adjustments.

Petitioners cite the records of some individual stations that they claim show inappropriate manipulation, referring to stations in Australia and New Zealand.

The evidence and arguments about data adjustments in New Zealand do not support the claim that these adjustments were invalid, after taking into account station history and neighboring station records. While there is some evidence that the automated algorithm may have introduced a spurious trend in one station in Australia in the NOAA temperature record (but not in the CRU or NASA temperature records), there was at least one valid reason for adjustment, and there is no evidence that this error in one station biases the large-scale global temperature trends. There is certainly no evidence of “chicanery” involved in these adjustments, as one petitioner claimed.

Petitioners focus on individual stations or limited areas. It is not surprising that data from one station or one region would show a large difference between adjusted and unadjusted data. The important point is that when the stations and regions are combined for a global analysis, these

³⁰ D’Aleo and Watts (2010). Surface Temperature Records: Policy Driven Deception? Available at: http://scienceandpublicpolicy.org/originals/policy_driven_deception.html. Accessed: April 8, 2010.

³¹ Peterson, T. C. and R. S. Vose (1997). An overview of the global historical climatology network temperature data base. *Bull. Am. Met. Soc.*, 78: 2837–2849.

³² Long, E.R. (2010). Contiguous U.S. Temperature Trends Using NCDC Raw and Adjusted Data for One-Per-State Rural and Urban Station Sets. Available at http://scienceandpublicpolicy.org/images/stories/papers/originals/Rate_of_Temp_Change_Raw_and_Adjusted_NCDC_Data.pdf. Accessed April 8, 2010.

kinds of effects are balanced out and do not produce a bias in the overall result. EPA addresses these issues for the specific station data at issue in New Zealand and Australia in greater detail in Volume 1, section 1.4.3.4 of the RTP document.

(iv) Independence of the NOAA and NASA Temperature Records. Some petitioners claim that the NOAA and NASA temperature records are not independent from the HadCRUT temperature record, developed by CRU, because they share some of the same raw data, and thus are assumed to also share some of the same alleged problems. EPA addresses these claims in volume 1, section 1.4.3.5 of the RTP document, and summarizes the response here.

The three major temperature records do rely on a large amount of raw data obtained from GHCN, though the HadCRUT temperature record in particular integrates additional data obtained from other, independent sources. As discussed above and throughout volume 1 of the RTP document, petitioners have not demonstrated any major flaws in the raw data. In addition, the processing of the GHCN data by the three groups is carried out independently from one another; therefore the similarities of the final temperature trends among the three groups provide additional confidence in those independent processing methodologies, and additional confidence in the consistent result that average global temperatures are increasing.

d. Implications of New Studies and Data Submitted by the Petitioners

Several petitioners identify scientific studies most (but not all) of which were published around the time of or shortly after the Administrator's December 2009 Endangerment Finding, as well as data not previously considered as part of the scientific record for the Endangerment Finding. Petitioners argue these studies and data have the potential to alter our understanding of key aspects of the science and therefore warrant reconsideration of the Findings. Petitioners also argue that EPA ignored or misinterpreted scientific data that were significant and available when the Finding was made. These studies and data issues involve:

- Implications of a new study on stratospheric water vapor.
- Implications of material concerning whether carbon dioxide is well-mixed in the atmosphere and whether the airborne fraction of carbon dioxide has changed.

- Implications of new tropical cyclone studies.
- Implications of new data on observational snow cover trends.
- A claim that EPA ignored a satellite dataset.

Though some of these studies are new, they do not raise new issues that had not already been accounted for in the assessment literature used by EPA. Furthermore, petitioners misinterpret the findings of these new studies, make unsupported claims, rely on incomplete and biased analyses, do not acknowledge important results, and, at times, ignore EPA's record. Contrary to the petitioners' claims, the new science cited by the petitioners does not undermine the key findings and conclusions that were reached in the assessment literature and the scientific foundation for the Administrator's Findings. EPA's study-by-study responses to the petitioners' assertions can be found in volume 1, section 1.5 of the RTP document.

2. Issues Raised by EPA's Use of the IPCC AR4 Assessment

The objections raised by petitioners involving EPA's use of IPCC AR4 include (a) claims that recently found errors in IPCC AR4 undermine the IPCC's credibility and therefore EPA's use of IPCC AR4 as a primary reference document to support the Findings; and (b) claims that the IPCC has a policy agenda and is not an objective scientific body. These issues are addressed here and in greater detail in volume 2 of the RTP document.

a. Claims That Errors Undermine the IPCC AR4 Findings and Technical Support for Endangerment

The petitioners allege certain errors and unsupported statements in IPCC AR4 show that the science EPA relied upon is uncertain and/or not credible. Petitioners focus on the errors found regarding the timing of future projected melting of Himalayan glaciers, the percentage of the Netherlands below sea level, and a few more minor issues highlighted in the petitions. Each of these identified and alleged errors in IPCC AR4 has been examined in detail by EPA in Volume 2 of the RTP document; the general response is provided here.

EPA has reviewed these IPCC AR4 issues in the context of the key IPCC AR4 conclusions that were germane to the Administrator's Endangerment Finding. The small number of errors and alleged errors in the IPCC AR4 report are not materially relevant for EPA's Endangerment Finding. Neither of the two errors that are verifiable

(Netherlands sea level and Himalayan glaciers) are relevant to impacts in the United States and neither are part of the basis for the Endangerment Finding. Furthermore, there is no evidence that these two confirmed minor errors are an indication of a more serious problem with the quality and reliability of any other findings and conclusions from the IPCC AR4, including those that are relevant for the Endangerment Finding.

The remaining alleged errors, taken from non-peer-reviewed ("gray") literature, do not appear to be errors according to EPA's review. The IPCC provides guidance on how and when to use gray literature, and petitioners do not demonstrate that the guidance was not followed. Gray literature is not automatically incorrect or suspect, and an examination of the particular gray literature sources demonstrates that the petitioners' allegations regarding these alleged errors are unfounded.

Furthermore, the IPCC AR4 statements at issue have no material relevance to EPA's Findings. Below are brief responses as to why the petitioners' assertions based on these known and alleged errors are unfounded and exaggerated. Additional detail on these issues is contained in Section 2.1, Volume 2 of the RTP document.

(i) Percent of the Netherlands Below Sea Level

The IPCC AR4 erroneously stated that 55 percent of the Netherlands is below sea level, whereas the actual number is only 26 percent. The statistic quoted in the AR4 was inaccurate, and a correction was published by the Netherlands Environmental Assessment Agency. What should have been stated is that 55 percent of the Netherlands is at risk of flooding; 26 percent of the country is below sea level, and 29 percent is susceptible to river flooding. The error originated with the Netherlands Environmental Assessment Agency, not the IPCC. The IPCC published an official erratum (IPCC, 2010b)³³ correcting the mistake, and noted "The sea level statistic was used for background information only, and the updated information remains consistent with the overall conclusions."

EPA does not refer to or rely on this statistic in the Findings and the percentage of the Netherlands below sea level does not pertain to the endangerment of public health and welfare in the United States. This error is very minor and has no impact on the

³³ IPCC (2010b). Fourth Assessment Report: Working Group II Erratum. Intergovernmental Panel on Climate Change (IPCC). 26 Jan. 2010. http://www.ipcc.ch/publications_and_data/ar4/wg2/en/errataserrata-errata.html.

climate science and health and welfare impacts supporting EPA's Endangerment Finding. Furthermore, there is no evidence that this minor error is somehow, as the petitioner would allege, an indication of flawed science and poor quality control practices sweeping across all conclusions of IPCC AR4.

(ii) Himalayan Glacier Projection

Several petitioners state that the IPCC AR4 erred in projecting that glaciers in the Himalayas would disappear by 2035, and that EPA relied on this projection.

The IPCC did inaccurately state the year 2035 in that particular statement. The IPCC issued a correction concerning the melting of Himalayan glaciers (IPCC, 2010c)³⁴ which also found that its general conclusion (provided below) on this issue remains robust and "entirely consistent with the underlying science."

Widespread mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the 21st century, reducing water availability, hydropower potential, and changing seasonality of flows in regions supplied by meltwater from major mountain ranges (e.g., Hindu-Kush, Himalaya, Andes), where more than one-sixth of the world population currently lives.

EPA did not refer to the original IPCC projection in either its TSD or in the Administrator's Endangerment Finding. It does not impact climate change science findings or have any meaningful implication for the issue of endangerment in the United States. Furthermore, Volume 2, section 2.1.3 of the RTP document shows that EPA reviewed the entire discussion of glacial effects in IPCC AR4 and concludes that this single faulty projection does not compromise the IPCC's overall assessment of observed glacier loss, projected glacier loss, and the impacts of glacier loss on water resources in the Himalayas.

(iii) Characterization of Climate Change and Disaster Losses

The Southeastern Legal Foundation asserts that the IPCC AR4 mischaracterized the findings of a study on climate change and historic disaster losses. EPA addresses the specific study at issue in Volume 2, section 2.1.4 of the RTP document and provides its more general response to this study and this issue here.

³⁴ IPCC, 2010c. IPCC Statement on the Melting of Himalayan Glaciers, January 20, 2010. <http://www.ipcc.ch/pdf/presentations/himalaya-statement-20january2010.pdf>.

First, EPA never cited or relied on the study at issue in its TSD. EPA did not discuss the link between climate change and the historic trends in the economic magnitude of disaster losses in the TSD. To support the Endangerment Finding, EPA cited the potential future impacts of climate change on the number and severity of extreme weather events, for which the Southeastern Legal Foundation levels no criticism. There are many different factors influencing the economic losses from a disaster, making it difficult to determine the impact of climate change from historic data on trends in economic disaster loss. Therefore, contrary to petitioners' claims, EPA did not rely on historic trends of economic disaster losses (the subject of the study at issue) to evaluate the likelihood that climate change would lead to an increase in the number or frequency of such weather events. EPA instead focused on the physical and environmental (not the economic) impacts associated with climate change. The Administrator's Endangerment Finding was clear that it was more forward-looking on this issue, stating:

The evidence concerning how human-induced climate change may alter extreme weather events also clearly supports a finding of endangerment, given the serious adverse impacts that can result from such events and the increase in risk, even if small, of the occurrence and intensity of events such as hurricanes and floods. (74 FR 66526)

Furthermore, EPA's review of the particular study at issue in Volume 2, section 2.1.4 of the RTP document shows that IPCC did not mischaracterize this study (e.g., IPCC included the appropriate caveats that were also stated in the underlying study), and that there were valid reasons for IPCC to use the study (e.g., as the most recent study of its kind at the time).

(iv) Validity of Alps, Andes, and African Mountain Snow Impacts

Several petitioners argue that IPCC claims of glacier melt in the Andes, the Alps, and parts of Africa arise from a magazine article and a Master's thesis, and thus should not be viewed as credible. This particular issue is addressed in Volume 2, section 2.1.5 of the RTP document, and EPA's response is summarized here.

First, the extent to which snow and glaciers in the Andes, Alps and parts of Africa are melting or are projected to melt is an issue that is tangential to the Administrator's decision that public health and welfare are endangered within the United States. Second, the petitioners mischaracterize these references within IPCC AR4, as these are actually references to "loss of ice

climbs," not reductions in mountain glaciers. Loss of ice climbs is an indicator of warming over ice-covered areas. EPA acknowledges that these references come from gray literature but these citations are appropriate and within the IPCC's guidelines for use of gray literature. They provide additional evidence consistent with the peer-review-supported conclusion that in most places snowpack is declining and glaciers are melting worldwide. Furthermore, EPA did not rely on these references or refer to "loss of ice climbs" as an indicator of climate change.

(v) Validity of Amazon Rainforest Dieback Projection

Petitioners challenge the IPCC's statement that "[U]p to 40 percent of the Amazonian forests could react drastically to even a slight reduction in precipitation," alleging that it is unsubstantiated gray literature. EPA reviews this issue in Volume 2, section 2.1.6 of the RTP document and provides its general response here.

The IPCC AR4 statement in question about the Amazon appears to have been inadequately referenced but the content of the statement is correct according to the underlying literature. For this statement, the IPCC did cite gray literature³⁵, which itself cited a peer-reviewed study³⁶ and relied on other peer-reviewed literature. It is worth noting that a newspaper that originally reported this alleged problem with the IPCC's representation of this Amazon issue recently reversed itself and printed a correction on June 20, 2010.³⁷ Moreover, this issue is not discussed in the TSD and is of no relevance to the Findings.

(vi) Validity of African Rain-Fed Agriculture Projection

Some petitioners object that a statement in EPA's TSD based on a statement in IPCC AR4 concerning reduction of yields from rain-fed agriculture in some countries in Africa was from gray literature and is therefore not credible. EPA reviews this issue in Volume 2, section 2.1.7 of the RTP document and provides its general response here.

There is no evidence that the IPCC statement in question regarding African

³⁵ Rowell, A. and P.F. Moore (2000). Global Review of Forest Fires. World Wildlife Federation and The World Conservation Union. available at: <http://data.iucn.org/dbtw-wpd/edocs/2000-047.pdf>. (last accessed April 12, 2010).

³⁶ Nepstad, D. C., et al. (1999). Large-scale impoverishment of Amazonian forests by logging and fire. *Nature* 398:505-508.

³⁷ Sunday Times correction. http://www.thesundaytimes.co.uk/sto/news/uk_news/Environment/article322890.ece.

rain-fed agricultural yields is not credible, based on the underlying studies, nor is there any evidence that IPCC authors acted inappropriately by citing the material on which this statement is based. The IPCC statement cites a report³⁸ published by the International Institute for Sustainable Development funded by Canada, U.S. AID, and other public and private institutions. The percent reduction number was obtained from vulnerability studies prepared under the UN Environmental Programme Global Environment Fund and National Communications of three African countries to the UNFCCC. This study was included due to the paucity of peer-reviewed material relating to some parts of the world, particularly Africa. This is consistent with the IPCC's guidance on the use of gray literature. Furthermore, the statement relates to impacts outside the United States, and it did not materially impact the Administrator's determination of endangerment of public health and welfare in the United States.

b. Response to Claims That the IPCC Has a Policy Agenda and is Not Objective and Impartial

Several petitioners raise various arguments to support their allegation that IPCC AR4 is advancing a policy agenda and is not an objective and impartial scientific body, thus questioning EPA's use of IPCC AR4 as a significant reference document to support the Administrator's Findings.

EPA reviews and responds to each of these claims in Volume 2, section 2.2 of the RTP document, and provides the more general responses here. EPA also previously responded to public comments about IPCC's report development procedures in the RTC document (see Volume 1, section 1 and Appendix A, "IPCC Principles and Procedures").

The petitioners submit four objections along with excerpts from the CRU e-mails related to: (1) Authorship and reviewer roles among IPCC personnel; (2) a CRU e-mail allegedly showing that IPCC authors were aware that citing their own papers could be seen as using the IPCC process to advance their own views rather than to present a neutral overview of the science; (3) allegations that the IPCC is a biased organization, including claims that IPCC lead authors encouraged other authors to focus on

policy-prescriptive science; and (4) allegations that IPCC authors forced consensus and altered the contents of the assessment reports to eliminate any suggestion of non-consensus.

After reviewing the petitioners' arguments, EPA finds that the evidence and arguments provided by petitioners do not support their serious allegation that the peer-review and assessment report processes employed by the IPCC were "fundamentally corrupt" and policy prescriptive. The petitioners' arguments, which heavily rely on the selective use and narrow reading of CRU e-mails, as well as some newspaper articles, do not demonstrate that the IPCC peer-review and report development processes were inadequately designed or that they were not properly implemented. These allegations by the petitioners are devoid of any scientific evidence or scientific argument that would cause EPA to find that the key conclusions of IPCC AR4 are inaccurate or that they do not appropriately reflect the degree of scientific consensus on the scientific issues germane to the Administrator's Endangerment Finding. Therefore, petitioners' evidence and arguments do not support changing EPA's position, as stated in the Endangerment Finding, that the assessment literature, including IPCC AR4, represents the "best reference materials for determining the general state of knowledge on the scientific and technical issues before the agency in making an endangerment decision."

Volume 2, section 2.2.3.1 of the RTP document, for example, demonstrates that, contrary to petitioners' assertions, a few scientists that were not named as contributing authors for Chapter 6 of IPCC AR4, Working Group I³⁹ did not contribute significantly to the writing and editorial decisions of that chapter. Given their very limited role in the chapter (e.g., providing input on a single figure), it is entirely reasonable that they were not named contributing authors, who are charged with writing parts of the report. Therefore, EPA finds that there is no basis for the claim that IPCC reviewer and author procedures were circumvented. EPA's review of this issue is consistent with the finding of the Independent Climate Change E-mails Review⁴⁰ which stated, among other things, that "There is no proscription in the IPCC rules to prevent the author team seeking expert advice when and where needed."

Petitioners appear concerned about the contributing author designation because these few scientists were expert

reviewers of the IPCC AR4, and the petitioners believe that the act of providing even a limited amount of information, in addition to their reviewer roles, would have given them undo power to shape the report. This argument is baseless. EPA notes that although the expert review comments are available to the public⁴¹, petitioners did not provide a single example from the comments of these individuals to support their claim of undo influence or abuse of their purported "power" over IPCC AR4 conclusions.

Volume 2, section 2.2.3.2 of the RTP document examines the allegation by petitioners that the frequency with which IPCC authors cite their own studies should be viewed as unacceptable and seen as evidence that IPCC AR4 lacks objectivity. First, it should come as no surprise that for some of these fairly specialized fields of climate change science authors who publish the most on these topics would in turn be selected by IPCC to author chapters on those same topics. EPA finds the frequency with which IPCC authors cite their own peer-reviewed studies to be entirely acceptable and reasonable. Again, petitioners completely fail to show why this underlying cited literature itself is flawed or why the IPCC AR4 conclusions, based on this underlying literature, are flawed. Importantly, one of the CRU e-mails that petitioners use as purported evidence of IPCC authors engaged in foul play to cite their own work actually shows an IPCC coordinating lead author explicitly encouraging his IPCC co-authors to minimize citations to their own work, and to do so only "unless they are absolutely needed."

Volume 2, section 2.2.3.3 of the RTP document examines the petitioners' assertion that IPCC is biased and that IPCC authors worked to produce policy-prescriptive science and to reach preconceived conclusions. Here too, the petitioners do not address any of the IPCC AR4 science directly. Rather, petitioners refer to a selection of CRU e-mails by IPCC authors who wrote to other IPCC co-authors to urge them, for example, to focus on "policy relevant" science. First, "policy relevant" by no means implies "policy prescriptive" or scientifically biased. It is, in fact, policy informative and neutral, in direct contrast to the goal of policy

³⁸ Agoumi, A. (2003). Vulnerability of North African Countries to Climatic Changes. International Institute for Sustainable Development and the Climate Change Knowledge Network. (2003). Available at: http://www.cckn.net/pdf/north_africa.pdf. Accessed April 12, 2010.

³⁹ Jansen et al., 2007.

⁴⁰ Russell, 2010.

⁴¹ Reviewer comments and author responses for draft chapters of IPCC AR4 Working Group I and II volumes (the primary volumes at issue for the Endangerment Finding) are publically available at the following Web sites, respectively: <http://hcl.harvard.edu/collections/ipcc/> and <http://ipcc-wg2.gov/publications/AR4/ar4review.html>.

prescriptive statements. Second, petitioners do not identify how specific information in IPCC AR4 should be considered biased as a result of the private e-mail exchanges. Petitioners do not highlight the specific statements in the IPCC AR4 that are supposedly “policy prescriptive,” never explain what policy agenda was being advanced, and never describe how the CRU e-mails support their claim that the science was actually manipulated in service of this unspecified agenda. The IPCC’s own guidelines⁴² state that its mission is to produce information that is “policy relevant and policy neutral, never policy prescriptive.” There is no evidence provided by petitioners that IPCC authors deviated from this practice.

In another example in Volume 2, section 2.2.3.3 of the RTP document, petitioners claim that a CRU e-mail exchange demonstrates that IPCC authors were colluding to make a strong case about a certain scientific conclusion rather than working to produce neutral science. EPA’s review shows that there is no support for this claim. EPA’s review shows that the CRU e-mails, in their full context, speak for themselves and simply show a small group of scientists working on various alternative ways to present a figure that was comprehensive and offered key contextual information on temperature trends over the past several centuries. Petitioners do not show that these alternatives—which are discussed in the e-mails—are biased, or explain why the option that was selected is not “neutral.” If fact, the e-mail record shows that the alternative selected was the most comprehensive and transparent of the options.

In Volume 2, section 2.2.3.4 of the RTP document, EPA reviews petitioners’ claim that certain IPCC authors kept out some studies with the goal of hiding any non-consensus on key issues. The CRU e-mail exchanges among some IPCC authors are the only pieces of evidence offered by petitioners to support this allegation. EPA’s review of this issue demonstrates that the CRU e-mails simply do not show that the contents of the IPCC chapter in question, let alone the contents of the entire IPCC AR4, were altered to eliminate a suggestion of non-consensus, or IPCC authors actively tried to suppress (or were successful in suppressing) external challenges to consensus. It is not uncommon for scientists to critique the work of others, and the e-mails do not provide evidence that the IPCC authors acted unethically.

Section 2.2.3.4 of the RTP document also addresses the now oft-cited e-mail where an IPCC author states, “I tried hard to balance the needs of the science and the IPCC, which were not always the same.” Petitioners claim this e-mail demonstrates a biased IPCC process. A simple reading of the entire e-mail exchange reveals a different story. In fact, this IPCC author gets complimented from another for his objectivity and even-handedness in handling the challenges of working on IPCC AR4. This IPCC author also expressed frustration with the time spent away from doing new science, which is not the primary job of an IPCC chapter author or of the IPCC in general; the primary role of the IPCC is to assess existing science already published in the literature, *i.e.*, in this author’s words, “the needs of the science and the IPCC” are not always the same. In context, it is clear that the needs of the IPCC in this case are the requirements of doing assessments of existing literature rather than producing “original and substantive” work. EPA’s review demonstrates that when the e-mails are read in their full context, it is clear that the authors of these e-mails sought to convey the science accurately and address disagreements in a fair and even-handed way. Again, petitioners have selectively picked excerpts from these e-mails to make assertions attacking the underlying science of the Endangerment Finding, but these assertions simply have no support.

3. Process and Other Issues Raised by the Petitioners

The process and other issues raised by the petitioners include claims that (a) the USGCRP and the NRC are not separate and independent assessments from IPCC; (b) EPA’s process to develop the scientific support for the Findings is flawed; (c) there are improper peer-review processes in the underlying scientific literature used by the major assessments; and (d) certain scientists did not adhere to Freedom of Information Act requests. Each of these issues is addressed below and in more detail in Volume 3 of the RTP document.

a. Claims That the Assessments by the USGCRP and NRC Are Not Separate and Independent Assessments

Two petitioners argue that the assessment reports upon which EPA relied are not from three separate, independent groups. They claim that the USGCRP and NRC assessment reports are not separate and independent because they are based on the findings of IPCC AR4. Petitioners

claim the USGCRP and NRC reports regularly cite and rely on data, resources, and conclusions in the IPCC reports, contradicting arguments that all three of the assessments are separate and independent. The petitioners argue that because of this the USGCRP and NRC assessments must be flawed in the same way that IPCC AR4 is purported to be flawed by the petitioners. Volume 3, section 3.2 of the RTP document addresses this claim and EPA summarizes its response here.

EPA finds no merit to this argument. The organizational and personnel differences, and the detailed and robust report development procedures employed by the IPCC, USGCRP, and NRC demonstrate that these assessment reports are separate and independent. Petitioners’ claims to the contrary are insufficient and unsubstantiated.

The similarity of the conclusions among the assessment reports from the three bodies, for example, provides evidence of the strength of the science in that it consistently points different scientific reviewers in the same direction. The fact that each of these bodies referenced many of the same studies and IPCC AR4 or arrived at consistent conclusions is not evidence that these reports are not independent assessments of the available science related to climate change. The test of separation and independence is not whether an assessment reaches a different result or conclusion, it is whether independent discretion and judgment were exercised. To assert, as the petitioners do, that consistency of results represents a weakness rather than a strength of the underlying science is an unwarranted argument that assumes fundamental flaws in the IPCC and a resulting grand ripple effect across all the major assessments used by EPA. EPA discusses above and further demonstrates throughout the RTP document that there is no material or reliable basis to question the validity and credibility of the body of science underlying the Administrator’s Endangerment Finding, including the IPCC AR4 conclusions and its underlying studies, and therefore EPA rejects the premise of this argument.

Furthermore, the USGCRP, the IPCC, and NRC have their own, separate report development procedures. These separate processes have already been described in the TSD and in the RTC document, Volume 1. The differences in the organizations, the groups of scientists who developed the assessments, and scope of the assessments produced by each body is discussed in detail in Volume 1 of the RTC document.

⁴² IPCC, 2010c.

- The IPCC, created in 1988 by the United Nations Environment Programme and the World Meteorological Organization (WMO), is open to all member countries of the United Nations and the WMO. At regular intervals, the IPCC prepares comprehensive assessments of scientific, technical, and socio-economic information relevant for the understanding of human-induced climate change, potential impacts of climate change, and options for mitigation and adaptation all at global and regional scales. The most recent assessment—the AR4—included thousands of scientists from all over the world, who participated on a voluntary basis as authors, contributors, and reviewers (IPCC, 2007a). While many federal and nonfederal scientists from the United States were involved in the development of the AR4, the United States is just one of 194 countries that contribute to the assessments.

- The USGCRP is part of the United States Executive Branch. Thirteen departments and agencies participate in the USGCRP, including EPA. A critical role of the interagency program is to coordinate research and integrate and synthesize information to achieve results that no single agency, or small group of agencies, could attain. Between 2004 and 2009, the USGCRP produced 21 synthesis and assessment reports on a wide range of topics (e.g., temperature trends in the lower atmosphere; weather and climate extremes in a changing climate; and the effects of climate change on agriculture, land resources, water resources, and biodiversity). The USGCRP assessment reports are developed to enhance understanding of natural and human-induced changes in the Earth's global environmental system; to monitor, understand, and predict global change in the United States; and to provide a sound scientific basis for national and international decision-making. Each of these reports had a unique team of authors, drawn from relevant disciplines. Many authors were federal scientists, and in some cases, nonfederal scientists contributed their expertise to the process. While some of the USGCRP authors participated in the development of the IPCC AR4, most did not.

- The NRC is an independent scientific organization that is not affiliated with either the IPCC or USGCRP. As described in Appendix C of Volume 1 of the RTC document, the NRC:

enlist(s) the nation's foremost scientists, engineers, health professionals, and other experts to address the scientific and technical aspects of society's most pressing problems.

Each year, more than 6,000 of these experts are selected to serve on hundreds of study committees that are convened to answer specific sets of questions. All serve without pay. Federal agencies are the primary financial sponsors of the Academies' work. Additional studies are funded by state agencies, foundations, other private sponsors, and the National Academies endowment. The Academies provide independent advice; the external sponsors have no control over the conduct of a study once the statement of task and budget are finalized. Study committees gather information from many sources in public meetings but they carry out their deliberations in private in order to avoid political, special interest, and sponsor influence.

Ten NRC reports are cited in the Endangerment Finding and TSD. Each of these reports has a unique author committee, selected based on their areas of expertise. While some of the NRC study committee members have participated in either the IPCC or USGCRP report development processes, many have not.

The USGCRP and NRC reports on which EPA relied were the result of an objective review and assessment of the scientific literature available at the time of their development (including any previously published assessments), related to the effects of greenhouse gas emissions on the climate system and the impacts of these changes on ecosystems and society. The organizations conducting the reviews were distinct and separate, and neither organization had control or supervision over the other. The groups of scientists involved in the reviews overlapped to some degree, but significant numbers of scientists were involved with one but not other reports. In all cases, personnel at NRC who supervised the review and preparation of the final reports were different from those who performed these functions for USGCRP.

Like the IPCC, the USGCRP and NRC provide public opportunities to provide input and comment during report development (see RTC document, Volume 1). In addition, the NRC reports undergo a rigorous, independent external review by experts whose comments are provided anonymously to the committee members.

Separate and apart from the issue of the independence of these assessment reports, the petitioners provide no information to demonstrate that the key scientific conclusions of the IPCC, USGCRP, and NRC are wrong or that EPA erred in relying upon them. The specific science issues raised by petitioners are discussed throughout this Decision and in the RTP document. Thus, whether or not the various assessment reports are separate and

independent, EPA reasonably relied upon them as reflecting the current state of the science and the degree of broad consensus within the science community on these issues.

Bolstering the case that the IPCC, USGCRP and NRC assessments available at the time of the final Endangerment Finding in December 2009 were robust and appropriate for EPA to use, the May 2010 assessment of the NRC, "Advancing the Science of Climate Change," states that its major scientific conclusion is "consistent with the conclusions" of those previous assessments. Note also that this May 2010 NRC assessment was able to incorporate scientific literature published since EPA completed its scientific record to finalize the 2009 Endangerment Finding.

b. Approaches and Processes Used To Develop the Scientific Support for the Findings

Several petitioners object to the process and approach EPA used in developing the scientific support for the Endangerment Finding. One of these specific arguments is new whereby the petitioners allege that EPA ignored public concerns about the implications of the e-mails involving scientists at the CRU, and instead "plowed ahead with compromised data, undermining its core conclusions in the process." EPA discusses and responds to this issue in section (i) below and in section 3.1.2 of the RTP document. The petitioners also raise issues that EPA already responded to in Volume 1 of the RTC document. Some of the concerns submitted are supported with "new information" and some are not. In (ii) below, EPA summarizes the response to the claim that EPA did not independently judge the underlying science, and in (iii) below EPA concludes that the Agency did not violate the Information Quality Act (IQA, or the Data Quality Act), as alleged by petitioners. Section 3.1.3 of the RTP document more fully responds to these three allegations and other related concerns raised by the petitioners regarding the process and approach EPA used in developing the scientific support for the Endangerment Finding.

(i) Issues Regarding Consideration of the CRU E-mails

The sole new argument raised by petitioners regarding the approach and process EPA used into develop the Findings is that EPA ignored public concerns about the implications of the e-mails involving scientists at CRU, and instead "plowed ahead with compromised data, undermining its core

conclusions in the process.” EPA responds to this issue in Volume 3, section 3.1.2 of the RTP document and summarizes its response here.

Prior to finalizing the Endangerment Finding, EPA carefully reviewed many of the CRU e-mails, and determined that many of the issues raised therein had also been raised through the public comments on the proposed Findings. EPA reviewed the underlying scientific issues that were presented to EPA at the time (see, for example, RTC Volume 2). Based on that initial review, EPA concluded that the fundamental conclusions of the assessment literature remained sound as to the state of the science on greenhouse gases and climate change. EPA did not inappropriately “plow ahead;” EPA assessed the issues raised by commenters and the CRU e-mails in light of our comprehensive review of climate science and all of the objections to the science raised by commenters, and concluded that our review of the science and the conclusions based on it were sound.

Petitioners have now raised more specific concerns with respect to the CRU e-mails. EPA has reviewed all of the CRU e-mails, and our responses to the particular science issues raised by petitioners in light of these e-mails are provided in other sections of this Decision and in the RTP document. As discussed there, petitioners have routinely misunderstood or mischaracterized the scientific issues, drawn faulty scientific conclusions, resorted to hyperbole, impugned the ethics of climate scientists in general, characterized actions as “falsification” and “manipulation” with no basis or support, and placed an inordinate reliance on blogs, news stories, and literature that is often neither peer reviewed nor accurately summarized in their petitions. Petitioners often “cherry-pick” language that creates the suggestion or appearance of impropriety, without looking deeper into the issues or providing corroborating evidence that improper action actually occurred.

(ii) Claims That EPA Did Not Independently Judge the Underlying Science

Several petitioners argue that the Administrator did not independently judge the primary scientific literature and data. Instead, they claim that she improperly relied on summary scientific reports produced by third parties or “foreign entities.” This is not a new issue brought to EPA, but was raised and addressed during the public comment period. Section III.A of the Findings responds to comments that

EPA should have conducted its own independent assessment of the primary scientific literature and not relied on scientific reports produced by third parties such as the USGCRP, NRC or IPCC. See also Volume 1 of RTC document, particularly Response 1–1.

It is useful to describe the process EPA followed in exercising its scientific judgment in making the Endangerment Finding. EPA did not passively and uncritically accept a scientific judgment and finding of endangerment supplied to it by outsiders. Instead, EPA evaluated all of the scientific information before it, determined the current state of the science on greenhouse gases, the extent to which they cause climate change, how climate change can impact public health and public welfare, and the degree of scientific consensus on this science. EPA applied this science to the legal criteria for determining endangerment, *i.e.*, whether greenhouse gases cause, or contribute to, air pollution that may reasonably be anticipated to endanger public health or welfare. EPA did this after presenting its scientific views before the public for comment and evaluating and considering all comments received, as well as documenting responses to all significant public comments (see volumes 1–11 of the RTC document). EPA properly and carefully exercised its own judgment in all matters related to the Endangerment Finding.

The core of petitioners’ objection is that they do not agree with important parts of the scientific information upon which EPA relied. They frame this as a failure of EPA to exercise its own judgment, or as EPA ceding to an outside body its responsibility to exercise independent judgment. It is clear from the record for the Findings that EPA exercised its own judgment and did not cede its authority or judgment to anyone. The fact that petitioners disagree with the information EPA relied upon and EPA’s conclusions is not evidence of a lack of exercise of discretion or judgment.

EPA relied on the existing assessment reports of the USGCRP, IPCC, and NRC as a primary source for determining the current state of the science relating to greenhouse gases and climate change, and for determining the degree of scientific consensus on these issues. EPA’s view then and now is that these assessment reports represent the best primary references to provide the scientific underpinnings to inform the Administrator’s judgment regarding endangerment. These assessment reports provide exactly the kind of information that is required, *i.e.*, they

demonstrate how greenhouse gases are affecting the climate now, are projected to affect climate in the future, and how these current and projected climate changes impact public health and welfare. These assessment reports also bring together and synthesize the numerous individual studies in the scientific literature to draw overarching conclusions about the state of the science. Finally, each of these assessment reports go through rigorous and transparent peer-review processes, such that the conclusions carry significant weight in a way that is typically not possible for one individual study in a scientific journal. EPA’s review of the objections raised by petitioners to the process and the substance of the various assessment reports does not support changing this view.

The petitioners appear to imply that EPA would have drawn different conclusions had it conducted its own separate assessment. After examining the breadth and quality of the USGCRP, IPCC, and NRC assessments, EPA disagrees. These reports already reflect the body of underlying scientific literature that EPA itself would have had to synthesize had it decided to conduct yet another assessment, independent from USGCRP, IPCC and NRC. These assessments have been reviewed and formally accepted by, commissioned by, and in some cases authored by U.S. government agencies and individual government scientists. By relying on the assessment literature, EPA is benefitting from the confidence and strength of an entire federal research enterprise. There is no reason to think that these assessments do not represent the best primary source material to determine the state of science on the relevant issues.

Petitioners disagree with some of the conclusions of the assessment literature and believe that not all scientific points of view were fully considered therein. However, there was a robust public comment process on EPA’s proposed Endangerment Finding, which provided an opportunity for the public to evaluate and comment on EPA’s preliminary scientific conclusions. Many commenters provided literature and/or arguments to support their views and EPA reviewed such literature and arguments in the Agency’s responses. EPA’s final judgment was based on EPA’s evaluation of both the assessment literature and the additional information and views provided through public comment. EPA has no reason to believe that putting this significant body of work aside and attempting to develop a new and separate assessment would

provide any better scientific basis for making the endangerment decision.

(iii) Claims That EPA Violated the Information Quality Act

EPA already provided a detailed response to arguments of alleged IQA violations in RTC Volume 1. The petitioners now make essentially the same general argument that EPA's use of third-party assessment reports violates the IQA. EPA notes that the petitioners are re-raising this issue in the petitions for reconsideration because they believe that the CRU e-mails show that "IPCC authors deleted information and hid behind foreign laws to avoid disclosure of key data" and that EPA would not have been able to obtain the data anyway. EPA responds to allegations involving the behavior of CRU scientists, including the allegation that data was destroyed, in (c) below, Volume 1 of the RTP document and Sections 3.3 and 3.4 of the RTP document. As stated in these sections, the evidence submitted by the petitioners in the form of the CRU e-mails does not support their allegation that data were destroyed. Therefore, the "new" information presented by the petitioners does not call into question the overall integrity of the science, nor does it call into question the process EPA used in developing the Findings. As noted in RTC Volume 1, the IQA requires that an agency issue guidelines regarding data quality and ensure their implementation. EPA complied with the IQA by issuing its *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility and Integrity of Information Disseminated by the Environmental Protection Agency* (U.S. EPA, 2002)⁴³ and has acted consistently with these guidelines in developing the Findings. As stated in RTC Volume 1, EPA's use of the assessment literature "is consistent with these guidelines because we thoroughly reviewed and evaluated the author selection, report preparation, expert review, public review, information quality, and approval procedures of IPCC, USGCRP/CCSP, and NRC to ensure the information adhered to a basic standard of quality, including objectivity, utility, and integrity."

The CRU e-mails cited by the petitioners do not undermine this view. EPA's responses on the science issues raised by petitioners concerning these e-mails are discussed in detail in several

other sections of this Decision as well as in the RTP document. As our detailed responses show, petitioners' science-based claims do not support the conclusion that the IPCC or other assessment reports were biased, inaccurate, or scientifically incorrect.

c. Freedom of Information Act Issues

Several petitioners claim that the CRU e-mails provide evidence that leading climate scientists deliberately withheld key data and computer codes and attempted to obstruct or avoid UK Freedom of Information (FOI) and U.S. Freedom of Information Act (FOIA) requests from "climate skeptics." These claims are addressed in Volume 3, section 3.4 of the RTP document and EPA's response is summarized here.

EPA's review of the CRU e-mails indicates that in many cases, the data at issue were in fact released by the scientists, including data concerning a human "fingerprint" in the tropics, data underlying the HadCRUT temperature record, and data concerning historic temperature reconstructions. In addition, significant data were publicly available. Petitioners have not explained or shown why the amount of data and other information that was available was not adequate for researchers to replicate or otherwise evaluate key findings, or to conduct other research. In addition, there was a robust and public process to submit, review, and publicly respond to comments on the scientific issues involved in all parts of the IPCC AR4. Petitioners do not rely on science or science based arguments to support their claim that the assessment report resulting from this robust process should not be relied upon by EPA. Instead, they rely on unsupported conclusions drawn from e-mails concerning a FOI request for personal communications between various scientists, where it appears that the appropriate University FOI officers had determined that these e-mails were exempt from release. This evidence does not support petitioners' claims that the IPCC AR4 should not be considered as part of the scientific basis for the Endangerment Finding.

EPA agrees with the results of the various investigations, which found that the scientists at issue conducted their research with scientific integrity and rigor, the research utilized methods which are fair and satisfactory, and that their actions were consistent with the common practice in climate research at that time. EPA also agrees with the recommendations of the Independent Climate Change E-mails Review supporting greater transparency in the future in this area of climate research.

Petitioners' evidence, however, does not support their conclusions that the research produced by these scientists was suspect, flawed, or biased, or that IPCC AR4 or other assessment reports were suspect, flawed, or biased. Their evidence does not support the conclusion that the science at issue should not be relied upon by EPA.

EPA has reviewed the petitioners' claims and the e-mails and finds that in many cases, the petitioners make overly broad generalizations based on suggestions of inappropriate actions that are not supported by the evidence provided by the petitioners. Regarding the quote from the UK Information Commissioner's Office, the recent inquiry by the UK House of Commons Science and Technology Committee (2010)⁴⁴ concluded that this statement was the personal opinion of the Deputy Information Commissioner and was not based on the results of a formal government investigation.

EPA finds that most of the language in the CRU e-mails that petitioners allege shows impropriety is taken out of context. Petitioners do not provide corroborating evidence that improper action actually occurred, let alone evidence that any alleged improper action led to biased or inaccurate science that was ultimately used by EPA to support the Findings. Based on our review of the e-mails, the authors were dismayed at what they viewed as frivolous requests that were wasting their time, not that the requestors were going to uncover "fraud" or "wrongdoing" with regard to their research, as has been alleged by the petitioners.

EPA finds from its review that the e-mail authors expressed significant frustration at repeated requests for specific explanations and computer codes when the basic data had already been made available and the methodology for replicating particular studies had already been published in the literature. This type of approach was considered to be common practice at the time, as the UK House of Commons Science and Technology Committee (2010)⁴⁵ also found in their analysis of the CRU e-mails: "In the context of the sharing of data and methodologies, we consider that Professor Jones's actions

⁴⁴ UK Parliamentary (2010). House of Commons, Science and Technology Memoranda. Available at: <http://www.publications.parliament.uk/pa/cm200910/cmselect/cmsctech/memo/climatedata/contents.htm>.

⁴⁵ UK Parliamentary (2010). House of Commons, Science and Technology Memoranda. Available at: <http://www.publications.parliament.uk/pa/cm200910/cmselect/cmsctech/memo/climatedata/contents.htm>.

⁴³ U.S. EPA (2002). *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by the Environmental Protection Agency*. Washington, DC: U.S. Environmental Protection Agency. EPA/260/R-02/008.

were in line with common practice in the climate science community. It is not standard practice in climate science to publish the raw data and the computer code in academic papers." EPA finds that the petitioners' evidence does not provide a basis to question the scientific integrity or conclusions of the climate change research conducted by CRU researchers.

d. Integrity of Peer-Reviewed Literature

Several petitioners claim that the CRU e-mails provide evidence that leading climate scientists engaged in actions to suppress dissenting views about anthropogenic global warming. Specifically, petitioners claim that these scientists unfairly gave favorable reviews of each other's manuscripts while providing negative reviews of manuscripts authored by "climate skeptics," made efforts to unfairly expedite publication of their responses to papers by "climate skeptics," conspired to remove editors of prominent journals that had published dissenting views of climate change, and boycotted the journals in reprisal. The petitioners argue that the cumulative effect of these alleged actions with regard to peer-reviewed literature has been to create an artificial consensus about anthropogenic climate change that has "tainted [climate change literature] in favor of desired papers." Some petitioners conclude that EPA has lost the basis for its Findings because the Agency assumed a "legitimate, objective 'consensus' regarding anthropogenic global warming" existed among scientists and disregarded any contrary views or contrary evidence. EPA responds to these claims in Volume 3, section 3.3 and summarizes its response here.

Petitioners' claims are not based on scientific analysis or arguments, and their evidence does not support changing or revising EPA's use of the major assessments of peer-reviewed literature or the overall scientific conclusions about climate change reached from the thousands of papers considered in the assessments. The objections raised by the petitioners have not called into question or changed EPA's conclusion that the science supporting the Endangerment Findings is robust, compelling, and has been appropriately characterized by EPA.

EPA disagrees with the petitioners' argument that the Findings were based on a false consensus regarding anthropogenic climate change, and that EPA disregarded contrary views or evidence including those not represented in the peer-reviewed literature. For reasons stated throughout

this Decision and section 3.3 of the RTP document, EPA's view is that the state of the science has been carefully and appropriately characterized by EPA and properly interpreted by the Administrator in the Endangerment Finding.

Many diverging viewpoints and a variety of findings are represented in the scientific literature on climate change. The assessment reports routinely identified the degree of certainty around any conclusion and recognized the existence of ongoing debate within the scientific community on all of these issues, as is the norm in all science endeavors. The Administrator's Endangerment Finding relied on a careful consideration of the full weight of scientific evidence and a thorough review of hundreds of thousands of public comments, which contained many different opinions and interpretations of the science. Therefore, to claim, as the petitioners do, that these e-mails demonstrate that EPA did not take into account any dissenting views on the subject of climate change science is a gross mischaracterization of the total record that supports the Administrator's Findings.

The petitioners rely upon some CRU e-mails (typically taken out of context), a small number of papers, and both actual and alleged events regarding scientific journals to claim that leading climate scientists conspired to keep dissenting views of climate change out of the broad body of peer-reviewed literature and create an artificial consensus about anthropogenic climate change. In all cases presented by the petitioners it appears the scientists involved were making their scientific objections known, and were basing their objections on the science and not on assumptions or speculation. The evidence presented by petitioners does not support their claims of bias, either for the specific papers and individuals at issue, or for the much broader and sweeping challenges made concerning the integrity of all peer-reviewed climate literature.

For the few papers at issue, the petitioners do not argue based on scientific merits, and instead assume that the few papers they cite received unjustified unfavorable reviews and were unfairly rejected for publication without providing supporting evidence. Petitioners do not address the possibility that these papers were scientifically inadequate and that the scientists were justified in recommending that they not be published. EPA notes that there is no evidence presented beyond these few papers of the claimed general effort to

manipulate the peer-reviewed journal publication process.

The evidence provided by the petitioners also does not show that the scientists engaged in improper behavior or sabotage of the two journals that are discussed in the e-mails, or their editors, nor is there evidence to conclude that any action on the part of these scientists involved in the e-mail correspondence resulted in the replacement of the journal editors. Our review of the full discussion of the e-mails indicates, again, that petitioners have exaggerated the significance of actual or purported events in an attempt to cast doubt on the underlying science and the processes relied upon to produce the science.

F. Petitioners' Arguments Do Not Meet the Standard for Reconsideration

As discussed above, petitioners must demonstrate that their objections are of central relevance to the outcome of the underlying decision, and must demonstrate either that it was impracticable to raise the objections during the public comment period or that the grounds for raising such objections arose after the close of the comment period (but within the time specified for judicial review). The above analysis shows that science-based and other objections discussed in this Section III and the accompanying support document are not of central relevance to the Administrator's decision on endangerment and thus reconsideration is properly denied.

An objection is of central relevance if it provides substantial support for the argument that the underlying decision should be revised. As shown above, none of the petitioners' arguments related to climate science and data issues, issues raised by EPA's use of IPCC AR4, and process issues provide substantial support for the argument that the Administrator's Endangerment Finding should be revised. The petitioners' arguments and evidence are inadequate, generally unscientific, and do not show that the underlying science supporting the Endangerment Finding is flawed, misinterpreted by EPA, or inappropriately applied by EPA. Importantly, petitioners' claims and the information they submit do not change or undermine our understanding of how human emissions of greenhouse gases cause climate change and how human-induced climate change generates risks and impacts to public health and welfare. The information provided by petitioners does not change any of the scientific conclusions that underlie the Administrator's Findings, nor do the petitions lower the degrees of

confidence associated with each of these major scientific conclusions.

A petition for reconsideration cannot merely cite to new information and claim that is sufficient to require initiating a reconsideration process, attendant with the same procedures as the original decision. Mere allegations that information is of central relevance will not suffice. New information, even new information related to an agency decision, does not by itself warrant undermining the finality of agency decision making. To justify reconsideration a petitioner must show why the new information demonstrates that the agency's decision should be changed.

Petitioners fail to do this. The core defect in petitioners' arguments is that these arguments are not based on consideration of the body of scientific evidence. Petitioners fail to address the breadth and depth of the scientific evidence and instead rely on an assumption of inaccuracy in the science that they extend even to the body of science that is not directly addressed by information they provide or by arguments they make. Petitioners routinely take private e-mail communications out of context and assert they are "smoking gun" evidence of wrongdoing and scientific manipulation of data. In contrast, EPA's careful examination of the e-mails and their full context shows that the petitioners' claims are exaggerated and are not a material or reliable basis to question the validity and credibility of the body of science underlying the Administrator's Endangerment Finding or the Administrator's decision process articulated in the Findings themselves. Petitioners' assumptions and subjective assertions regarding what the e-mails purport to show about the state of climate change science are woefully inadequate pieces of evidence to challenge the voluminous and well documented body of science that is the technical foundation of the Administrator's Endangerment Finding.

Petitioners' objections that a limited number of factual mistakes now identified in the IPCC AR4, as well as other claimed mistakes, call into question the climate science supporting the Administrator's Endangerment Finding, are similarly flawed. The two factual mistakes in IPCC AR4 confirmed by EPA's review are tangential and minor and do not change the key IPCC AR4 conclusions that are central to the Administrator's Endangerment Finding.

Finally, as shown above, regarding objections based on allegedly new scientific studies and data, EPA's review of these claims shows that in many

cases the issues raised by the petitioners are not new, but were in fact considered prior to issuing the Endangerment Finding. In other cases, the petitioners have misinterpreted or misrepresented the meaning and significance of recent scientific literature, findings, and data. Finally, there are instances where the petitioners have failed to acknowledge other new studies in making their arguments. Thus, petitioners have failed to demonstrate that their objections related to climate science and data issues, issues raised by EPA's use of IPCC AR4, and process issues provide substantial support for the argument that the Administrator's decision on endangerment should be revised.

Moreover, regarding many of their objections, petitioners also fail to demonstrate that it was impracticable to raise the objections during the public comment period or that the grounds for raising such objections arose after the close of the comment period (but within the time specified for judicial review). In many but not all cases EPA has identified instances where petitioners fail to base an objection on such new information. Given the volume of individualized comments and objections, EPA is identifying some of the types of situations where the objection, or grounds for the objection, raised by a petitioner does not satisfy this requirement for reconsideration. Several types of objections are premised on studies and other information that were available before the close of the comment period. In some cases petitioners basically repeat or raise the same arguments that were raised and responded to in the rulemaking. In other cases, petitioners raise allegedly new grounds, such as CRU e-mails, that they claim should cause EPA to reconsider a prior comment, or that justifies petitioners' raising a new issue for the first time in the reconsideration petition. But as explained above and throughout this Denial and supporting documents, the allegedly new information is not of central relevance, and therefore, EPA essentially is left with arguments that either were made previously during the comment period, or could have been raised during the comment period. Thus, many of the petitioners' objections not only are not of central relevance, but they also fail to meet the temporal requirement for a petition for reconsideration.

IV. Other Issues

In this section, EPA responds to various objections to the Endangerment Finding based on concerns raised with respect to the impact of stationary source permitting requirements, the

relationship of the Findings to NHTSA's recent CAFE rule, the effects of the Findings and subsequent rulemakings on states and businesses, the need for a Formal Rulemaking Process, and EPA's justification for its exercise of discretion in making the Endangerment Finding.

A. *The Tailoring Rule/Impacts of PSD and Title V Permitting Are Not of Central Relevance to the Findings*

Several petitioners raise objections based on EPA's proposed rule to tailor the Prevention of Significant Deterioration (PSD) and title V permit programs for greenhouse gases. Proposed Prevention of Significant Deterioration (PSD) and Title V Greenhouse Gas Tailoring Rule, 74 FR 55292 (Oct. 27, 2009) (Proposed Tailoring Rule).⁴⁶ Specifically, petitioners argue that EPA's statements in the Proposed Tailoring Rule demonstrate that the Findings are contrary to law and/or arbitrary and capricious. Because the Proposed Tailoring Rule was issued after the close of the comment period, but before the period for judicial review ran, petitioners argue that it presents reasons for EPA to reconsider the Findings in general.

Petitioners argue that the Proposed Tailoring Rule is of central relevance to the Findings because it involves the PSD and title V permitting requirements that flow as an inevitable result of the Findings, and the impacts of such permitting are relevant to the Findings. *e.g.*, SLF 5th Supp. at 15; Ohio Coal Assn. at 4. They point to the fact that the Tailoring Rule was proposed, and comments thereon were received, after the close of the comment period for the Findings, and request that EPA grant reconsideration and re-open the Findings docket "to allow the public to comment on the implications of the Tailoring Rule[sic] to the form and content of the Endangerment Finding," SLF 5th Supp. at 15, and to "further explore the extent to which implementation of the Endangerment Finding is practically impossible * * * since impossibility calls into question all justification for the Endangerment Finding." Ohio Coal Assn. at 4.

At least one petitioner points to the alleged implementation problems identified in the Proposed Tailoring Rule and comments received thereon as a basis for reconsidering the appropriateness of the Findings. Ohio Coal Assn. at 6–9. The petitioner argues

⁴⁶ The Final Prevention of Significant Deterioration (PSD) and Title V Greenhouse Gas Tailoring Rule was signed on May 13, 2010, and published June 3, 2010. 75 FR 31514 (June 3, 2010).

that despite statements in the final Findings that EPA did not consider, and indeed could not have considered, policy concerns about the repercussions of impact of the finding when making the endangerment finding, EPA did “give credence and expression” and “did in fact consider the widespread and economically crippling” PSD permitting implementation issues. Ohio Coal Supp. at 15, 18. Therefore, the petitioner continues, new information about EPA’s ability to tailor the PSD program justifies granting reconsideration. Specifically, the petitioner cites to comments filed by state permitting authorities that they allege call into question the approach EPA proposed in the Tailoring Rule to address the negative impacts that EPA acknowledges “would inexorably flow from the Endangerment Finding—that is, triggering the PSD and Title V permitting requirements at the low applicability levels provided under the Clean Air Act.” Ohio Coal Supp. at 16–18. They claim that statements made by state permitting agencies about the ability of the proposal to address state law concerns, and the remaining burden even at the higher thresholds all undermine EPA’s claim that it can fashion a reasonable and common-sense solution to the perceived problem. Thus, petitioners conclude, the “most viable and sensible option” would be instead for EPA to withdraw the Findings until the impacts of the PSD and title V permitting programs can be fully assessed and resolved. Ohio Coal Assn. at 8; Ohio Coal Supp. at 22.

Another petitioner provides slightly different reasons for claiming the Proposed Tailoring Rule necessitates granting reconsideration and re-opening the Findings for comment.⁴⁷ This petitioner argues that the Proposed Tailoring Rule reflects an acknowledgement by EPA that regulating GHG under the CAA is absurd. Chamber at 3. The petitioner also argues that new information demonstrates that some of the public health and welfare effects from stationary source emission reductions that EPA expected when issuing the Findings will be legally unavailable. *Id.* at 9–10. The petitioner alleges that EPA recognized the “ill-fit” between

pollutants like greenhouse gases, which become well-mixed in the atmosphere and cause global problems, and the existing structure of the CAA. The petitioner further claims that it was because of this ill-fit that EPA crafted the Tailoring Rule in order to avoid the absurd result of trying to regulate GHGs under part of the CAA. Petitioner’s suggested solution is for EPA to reconsider the Findings in light of EPA’s recognition that regulation of GHGs under the CAA is “absurd.” In so doing, the petitioner reiterates comments it, and others, submitted during the public comment period arguing that EPA retains discretion under *Massachusetts* to consider, among other things, the impacts of an endangerment finding when deciding whether to issue an endangerment findings. Chamber at 10–12.

More specifically, the petitioners argue that the Supreme Court decision did not address the issue of whether GHGs could be regulated under the CAA consistent with Congress’ intent and without triggering absurd results. Chamber at 11. Rather, they contend, the Supreme Court decision was about the narrow issue of whether GHGs were air pollutants under CAA section 202(a). Chamber at 11. Some petitioners argue that EPA should have informed the Supreme Court of the impact of a positive endangerment finding under CAA section 202(a) on stationary source permitting, and the fact that it may require EPA to resort to the absurdity doctrine; if EPA had, they continue, the Court may have issued a different opinion. CEI Supp. at 4–5. Another petitioner argues that the Supreme Court left open the option of EPA declining to make an endangerment finding, and that in making its decision EPA must adhere to the customary mode of statutory interpretation in *Chevron v. NRDC*, 467 U.S. 837 (1984), considering all relevant statutory language, legislative history and absurd results that may apply when regulating GHGs under the CAA. Chamber at 12.

Based on this alleged premise, the petition then turns to EPA’s statements in the Proposed Tailoring Rule concerning the potential absurd results that could result from applying the statutory permitting thresholds of 100 and 250 tons per year (tpy) to GHGs, and the additional administrative impossibility that would result from applying these statutory thresholds immediately when GHGs are regulated under CAA section 202(a). Petitioner submits additional evidence it alleges demonstrates the absurdity of regulating GHGs from stationary sources: (1) The PSD program is designed to address

pollutants with localized impacts in specific geographic areas (e.g., the NAAQS), and not global pollutants like GHGs; (2) the statutory thresholds would require burdensome, expensive, individualized emissions controls at hundreds of thousands of small emissions sources, contrary to Congressional intent; and (3) the application of permitting to GHGs would jeopardize economic growth, which would be particularly absurd in the current economic situation. Chamber at 15–17.

Thus, according to this and other petitioners, EPA must reconsider the Findings in light of the absurd results that would result from GHGs being regulated pollutants under the PSD and title V permitting programs. See, e.g., Chamber at 18; CEI Supp. at 5. Specifically, petitioners argue that the absurdity doctrine demands that EPA consider whether regulating GHGs under the CAA as a whole is absurd or not, but that EPA completely ignored this possibility when developing the Findings. Rather than relying on the absurd results doctrine to merely “tailor” the PSD and title V permitting programs, petitioners argue that EPA should rely on it to avoid creating the permitting program dilemma in the first place, or at the very least take comment on that option. Chamber at 18–19; CEI Supp. at 5. At least one petitioner contends that case law regarding the absurd results doctrine requires adopting the narrowest, most restrictive interpretation of the statute, and that there may be an interpretation that authorizes EPA to avoid making the endangerment finding in the first place, not one that merely addresses the PSD and title V statutory thresholds (e.g., by interpreting “emissions” or “major emitting facility” narrowly). Chamber at 18–19. Petitioners argue that given EPA’s failure to consider this alternative, coupled with the alleged acknowledgement that the CAA motor vehicle rules are not necessary to achieve public health and welfare advantages in light of the NHTSA CAFE rule (see below), EPA must reconsider the Findings. See, e.g., Chamber at 23.

Finally, other petitioners argue that the Proposed Tailoring Rule itself is illegal, pointing to numerous industry comments filed on the proposal. They contend that since the Tailoring Rule is illegal, it is “a patently unconstitutional attempt by the Executive Branch to unilaterally amend a statute.” SLF 5th Supp. at 16. In summary, they conclude that since EPA cannot regulate GHGs under the CAA without ignoring part of the statute, it cannot regulate GHGs in a manner consistent with the CAA and

⁴⁷ This petitioner also stated in its petition that if EPA had neither “granted the petition nor contacted the [petitioner] to establish a mutually agreeable schedule for reconsideration by April 14, 2010, such inaction will be deemed a denial of the petition.” Chamber at 1. No EPA action, or inaction, other than this Decision and supporting material constitutes a denial of the petitions. See, e.g., Final LDVR, 75 FR at 25402; EPA’s Combined Opposition to Remand (filed April 29, 2010 in DC Cir. No. 09–1322).

any attempt to do so is beyond EPA's legal authority, arbitrary and capricious, and an abuse of discretion. *Id.* at 17–19. The petitioners also contend that EPA's Endangerment Finding is arbitrary and capricious and an abuse of discretion because, they allege, it is climatically pointless as well. They state that rather than undertake a course of illegal action, especially one that they allege does not have any detectable effect, EPA should start over and reconsider the Findings. *Id.*

EPA is denying the petitions for reconsideration that raise objections based on the Proposed Tailoring Rule because these objections are not of central relevance to the outcome of the final Findings and/or could have been raised during the public comment period.

These objections are not of central relevance to the Findings for three primary reasons discussed in more detail below. First, as EPA noted in the Findings, the impact of regulations that may flow from a positive endangerment finding, even if absurd, is not a relevant consideration to the science based question of whether air pollution may reasonably be anticipated to endanger public health or welfare. *See*, 74 FR at 66501, 66515–16; RTC volume 11 at 4–5. Thus, EPA disagrees with a fundamental basis for petitioners' objections based on the Proposed Tailoring Rule—*i.e.*, that EPA could or must decline to issue an endangerment finding under CAA section 202(a), regardless of the scientific evidence relevant to determining endangerment, based on concerns with implementing stationary source permitting. Second, even if the absurd results doctrine could influence EPA's interpretation of CAA section 202(a) after the Supreme Court's decision in *Massachusetts*, EPA's approach to resolving the absurdity is reasonable because it focuses narrowly on that part of the CAA where the absurdity originates while giving effect to other statutory provisions, in order to balance the goal of improving public health and the environment with the goal of avoiding absurd results. Third, EPA disagrees with the petitioners who argue that because EPA is relying on the absurd results doctrine as a result of the Findings, the Findings themselves must therefore be illegal. Reliance on a doctrine of administrative law when interpreting a statute is not an indication of the illegality of agency action; indeed, it shows just the opposite. By applying, *inter alia*, the doctrines of absurd results and administrative necessity, EPA has been able to issue effective regulations addressing greenhouse gases while

avoiding the absurd results that could arise from immediately applying the statutory thresholds for PSD and title V to greenhouse gases. Thus, petitioners' objections do not provide substantial support for the argument that the final Findings should be revised.

More specifically, EPA stated the following in the Findings in response to comments urging EPA to delay making an endangerment finding based on, among other things, concerns about the impact of the PSD program:

“EPA agrees with the commenters who argue that the Supreme Court decision held that EPA is limited to consideration of science when undertaking an endangerment finding, and that EPA cannot delay issuing a finding due to policy concerns if the science is sufficiently certain (as it is here). The Supreme Court stated that “EPA can avoid taking further action only if it determines that greenhouse gases do not contribute to climate change or if it provides some reasonable explanation as to why it cannot or will not exercise its discretion to determine whether they do” 549 U.S. at 533. Some commenters point to this last provision, arguing that the policy reasons they provide are a “reasonable explanation” for not moving forward at this time. However, this ignores other language in the decision that clearly indicates that the Court interprets the statute to allow for the consideration only of science. For example, in rejecting the policy concerns expressed by EPA in its 2003 denial of the rulemaking petition, the Court noted that “it is evident [the policy considerations] have nothing to do with whether greenhouse gas emissions contribute to climate change. Still less do they amount to a reasoned justification for declining to form a *scientific judgment*. *Id.* at 533–34 (emphasis added).

Moreover, the Court also held that “[t]he statutory question is whether sufficient information exists to make an endangerment finding” *Id.* at 534. Taken as a whole, the Supreme Court's decision clearly indicates that policy reasons do not justify the Administrator avoiding taking further action on the question here” (74 FR 66501, December 15, 2009).

Furthermore, EPA noted the following when responding to comments arguing that EPA should consider the impact of regulating GHGs when determining whether they endanger public health and welfare:

“At their core, these comments are not about whether commenters believe greenhouse gases may reasonably be anticipated to endanger public health or welfare, but rather about commenters' dissatisfaction with the decisions that Congress made regarding the *response* to any endangerment finding that EPA makes under CAA section 202(a). * * *

What these comments object to is that Congress has already made some decisions about next steps after a finding of endangerment, and the commenters are

displeased with the results. But if this is the case, commenters should take up their concerns with Congress, not EPA. EPA's charge is to issue new motor vehicle standards under CAA section 202(a) applicable to emissions of air pollutants that cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare. It is not to find that there is no endangerment in order to avoid issuing those standards, and dealing with any additional regulatory impact.

Indeed, commenters' argument would insert policy considerations into the endangerment decision, an approach already rejected by the Supreme Court. First, as discussed in Section I.B of these Findings, in *Massachusetts v. EPA*, the court clearly indicated that the Administrator's decision must be a “scientific judgment.” 549 U.S. at 534. She must base her decision about endangerment on the science, and not on policy considerations about the repercussions or impact of such a finding” 74 FR at 66515; December 15, 2009).

Thus, petitioners are wrong in their claim that either EPA statements in the Proposed Tailoring Rule, or comments received thereon, regarding potential implementation difficulties in the PSD or title V permitting programs are legally relevant at all, let alone of central relevance, to EPA's Endangerment Findings.⁴⁸ The agency's statements in the Findings that it “does not believe that the impact of regulation under the CAA as a whole * * * will lead to the panoply of adverse consequences that commenters predict,” and that “EPA has and will continue to take a measured approach to address greenhouse gas emissions” do not mean that EPA gave “credence and expression to one key negative impact” as one petitioner alleges. Ohio Coal Supp. at 15. These statements, which immediately follow EPA's explanation of how the Administrator must look at the science and not policy consideration, are merely EPA's response to the dire predictions submitted by commenters. EPA did not and could not consider such impacts in making its science based judgment on endangerment.

EPA further disagrees with the arguments that it must grant

⁴⁸ We note that EPA has addressed the concerns about the approach set forth in the Proposed Tailoring Rule raised by state permitting authorities. In response to the very comments raised by petitioners here, as well as other comments, EPA revised its approach for implementing its tailoring rule approach to allow for faster state adoption of the solution. Final Prevention of Significant Deterioration (PSD) and Title V Greenhouse Gas Tailoring Rule 75 FR at 31518, 31579–84 (June 3, 2010) (Final Tailoring Rule). Moreover, EPA also finalized applicability thresholds that are higher than those proposed, and otherwise refined the phase-in of permitting for GHGs to better accommodate the workload. *Id.* at 31523–25.

reconsideration and reopen the Findings because since the close of the comment period EPA has recognized that the Findings would lead to the LDVR, which triggers the PSD and title V requirements, which in turn would give rise to “absurd results” in the permitting provisions applicable to some stationary sources. The fact that the impacts from PSD and title V permitting may be absurd does not mean that EPA can reinterpret section 202(a) to allow the consideration of those absurd results, and then find no endangerment or avoid making a determination on endangerment.

What petitioners fail to analyze is how, given the overwhelming science supporting the endangerment finding (see above), EPA could decline to issue the Findings because of policy/implementation concerns unrelated to the science and unrelated to the question of whether there is endangerment, and not violate the Supreme Court’s decision in *Massachusetts v. EPA*. As discussed above, EPA disagrees with petitioners who argue that “*Massachusetts* requires EPA to carefully consider [the absurdity doctrine] implications for the Agency’s overall statutory interpretation.” Chamber at 13. The Supreme Court was clear that GHG fit within the definition of “air pollutant” under the CAA, and that when considering the question of endangerment the Administrator may consider only the science. EPA “must ground its reasons for action or inaction in the statute,” and the statutory endangerment provision in section 202(a) required that EPA’s “exercise of judgment must relate to whether an air pollutant ‘cause[s], or contribute[s] to, endangerment.” This was a “direction to exercise discretion within defined statutory limits,” and the Court explicitly rejected EPA’s authority to exercise its judgment for policy reasons not related to “compl[iance] with this clear statutory command.”

Massachusetts at 532–533. Petitioners would have us ignore the clear mandate of the Court’s decision on the premise that if the case had been argued differently, the Court would have rendered a different opinion. EPA reasonably followed the instructions from the Supreme Court as provided in *Massachusetts*.

Even if EPA had the authority and could reconsider its statutory authority under CAA section 202(a) in light of the absurdity doctrine, rather than follow petitioners’ implied approach, EPA would follow the approach set out in the Final Tailoring Rule—a narrow solution that focuses on that part of the CAA where the absurdity originates.

EPA’s approach balances the goal of improving public health and the environment by tackling air pollution problems with the goal of avoiding absurd results.⁴⁹ Petitioners would apply the absurd results doctrine too broadly, undertaking a sweeping approach that negates any and all regulation of GHGs under the CAA in order to avoid problems that have arisen in specific programs. EPA’s targeted use of the absurd results doctrine in the Tailoring Rule is the better approach to reconciling all its obligations under the CAA. EPA has interpreted the statute as a whole, and interpreted it in a manner that does not allow difficulties in one program to nullify the various other Congressional provisions that may be relevant to climate change under the CAA.

Applying the Chevron two step test, EPA must, at Step 1, determine Congressional intent. *Chevron U.S.A. v. NRDC*, 467 U.S. 837 (1984). Under the absurd results doctrine “the literal meaning of statutory requirements should not be considered to indicate Congressional intent if that literal meaning would produce a result that is senseless or that is otherwise inconsistent with—and especially one that undermines—underlying congressional purpose.” Final Tailoring Rule, 75 FR at 31517. Looking at section 202(a) of the CAA, congressional intent appears clear, under *Chevron* Step 1, that Congress intended the Administrator to regulate emissions of air pollutants from new motor vehicles if the Administrator found that such emissions cause or contribute to air pollution which endangered public health or welfare. The Supreme Court stated that “[i]f EPA makes a finding of endangerment, the Clean Air Act requires the agency to regulate emissions of the deleterious pollutant from new motor vehicles.” *Massachusetts* at 533. Moreover, the

⁴⁹ In response to objections which are based in part on allegations that EPA must reconsider its final decision because new evidence allegedly shows that the LDVR will not get meaningful reductions, EPA has already stated in the final Findings that it does not need to find that any attendant regulations flowing from an endangerment finding would “fruitfully attack” or prevent at least a substantial part of the danger in order to find endangerment. 74 FR at 66507–08.

Moreover, contrary to one petitioner’s implied allegation, EPA did not consider the benefits resulting from stationary source emissions reductions when issuing the Findings, and the petitioner did not point to any evidence that EPA did base the Findings on such considerations. Finally, to the extent petitioners are arguing that EPA should reevaluate its approach to absurd results because there is little environment or public health benefit from the LDVR which followed the Findings, EPA disagrees. See Section IV.B responding to comments regarding NHTSA rules.

Supreme Court has held that when making the endangerment finding the Administrator must look only at the science. There are no absurd results in the specific actions under section 202(a) of either issuing an endangerment finding itself or in issuing standards applicable to GHG emissions from new motor vehicles. The absurd results stem from the contents of other statutory provisions, the PSD and Title V provisions discussed in the Tailoring Rule, not section 202(a). Even for those provisions, in the Final Tailoring Rule EPA specifically determined that the PSD and title V provisions indicate a clear congressional intent to cover at least the largest sources of GHGs under these programs. *Id.* at 31517. Taking all of these facts together, EPA’s approach to utilization of the absurdity doctrine gives the greatest effect to the various provisions of the CAA and the overall congressional intent under the CAA, by minimizing the scope of limitation on statutory provisions in the application of the absurd results doctrine.

As EPA discussed in the Tailoring Rule:

“[i]n determining and implementing congressional intent, it is important that the statutory provisions at issue be considered together—(1) The obligation to make a determination on endangerment and contribution under CAA section 202(a); (2) if affirmative endangerment/cause or contribute findings are made, the obligation to promulgate standards applicable to the emissions of any such air pollutant from new motor vehicles or new motor vehicle engines under CAA section 202(a); and (3) the PSD and title V applicability provisions. The most appropriate reading, and certainly a reasonable reading, is that we are required to take the action we have taken, that is to issue the findings, promulgate the LDVR, and promulgate the Tailoring Rule. Our approach gives effect to as much of Congress’s intent for each of these provisions, and the CAA as whole, as possible.

With respect to the endangerment/cause or contribute findings under CAA section 202(a), congressional intent is clear that, as we stated in making the Findings and the Supreme Court held in *Massachusetts v. EPA*, we are precluded from considering factors other than the science based factors relevant to determining the health and welfare effects of the air pollution in question. Accordingly, as discussed above, EPA determined that the Agency was precluded from deferring or foregoing the findings due to concern over impacts on stationary sources affected by PSD or title V requirements. See 74 FR at 66496, 66500–01 (“Taken as a whole, the Supreme Court’s decision clearly indicates that policy reasons do not justify the Administrator avoiding taking further action on the questions here.”); see also *Massachusetts v. EPA*, 549 U.S. at 533; see also (74 FR 66515–16, December 9, 2009) (The Administrator “must base her decision about endangerment on the science,

and not on the policy considerations about the repercussions or impact of such a finding.”). Moreover, as EPA also noted, “EPA has the ability to fashion a reasonable and common-sense approach to address greenhouse gas emissions and climate change. 74 FR at 66516.” (75 FR 31574, June 3, 2010)(footnote omitted).⁵⁰

The petitioners merely continue to disagree with EPA’s interpretation of the Supreme Court decision and question EPA’s ability to address permitting concerns, rather than provide anything new in their petitions on this topic.

To the extent the petitioners are requesting that EPA reconsider and defer or forego issuance of the Findings to avoid causing an absurd result from implementation of the separate PSD and title V programs until such time as EPA could fully implement these programs without an absurd result, underlying this claim is the assumption that this approach would allow EPA to avoid the “absurd results” that are discussed in the Tailoring Rule, which states:

“* * * there is no basis at this point to determine that streamlining will ultimately allow full compliance with the PSD and title V requirements. Rather, it is possible that EPA may conclude that none of the available streamlining techniques will allow all GHG sources at the statutory thresholds to comply with PSD and title V requirements in a manner that does not impose undue costs on the sources or undue administrative burdens on the permitting authorities. Under these circumstances, EPA may then permanently exclude GHG source categories from PSD or title V applicability under the absurd results doctrine. Moreover, it may well take many years before EPA is in a position to come to a conclusion about the extent to which streamlining will be effective and therefore be able to come to a conclusion as to whether any source categories should be permanently excluded from PSD or title V applicability. In our rulemaking today, we describe what actions we expect to take in the first 6 years after PSD and title V are triggered for GHG sources, and we may well be in a situation in which we continue to evaluate streamlining measures and PSD and title V applicability to GHG sources after this 6-year period.

Accordingly, deferring the endangerment/ cause or contribute findings and LDVR until such time that PSD and title V streamlining would allow full implementation of these programs at the statutory limits would serve only to delay the benefits of the LDVR, as well as the benefits that come from phasing in implementation of the PSD program to cover larger sources first. It would rely on an assumption that is unfounded at this point, that is, that such full compliance will be required at some point in the future. Delaying

the emissions benefits of the LDVR and the related emissions benefits from partial implementation of the PSD program fails to implement Congress’ intent that the endangerment/cause or contribute findings “shall” lead to emissions standards for new motor vehicles contributing to the endangerment, and related emissions controls for the same air pollutant under the PSD program. EPA need not determine at this time what approach would be appropriate if there was a determination that full compliance with PSD and title V would in fact occur at some point in the future. In this case, absent such a determination, it would be improper to rely on speculation of such a future possibility as a basis under section 202(a) to defer or forego issuance of the LDVR on the grounds that EPA should defer or forego the LDVR to avoid causing an absurd result. Likewise there is no basis to defer proceeding at this time with the streamlining of the PSD and title V programs.

With respect to the PSD and title V applicability requirements, as we discuss elsewhere, we believe that Congress expressed a clear intent to apply PSD and title V to GHG sources and that the phase-in approach incorporated in the Tailoring Rule is fully appropriate. Proceeding now with the endangerment/contribution findings and LDVR, even if phasing-in of the PSD and title V programs is required, is consistent with our interpretation of the PSD and title V applicability requirements. Delaying the endangerment/contribution findings or LDVR, and thereby delaying the triggering of PSD and title V requirements for GHG sources, would lead to the loss of a practicable opportunity to implement the PSD and title V requirements in important part, and thereby lead to the loss of important benefits. As discussed elsewhere, promulgating the LDVR and applying the PSD and title V requirements to the largest GHG sources, as we do in this Tailoring Rule, is practicable because the sources that would be affected by the initial implementation steps we promulgate in this rule are able to bear the costs and the permitting authorities are able to bear the associated administrative burdens. Promulgating the LDVR now provides important advantages because the sources that would be affected by the initial steps are responsible for most of the GHG emissions from stationary sources.

It should also be noted that as discussed elsewhere in this rulemaking, our ability to develop appropriate streamlining techniques for PSD and title V requirements is best done within the context of actual implementation of the permitting programs, and not in isolation of them. That is, because the great majority of GHG sources have not been subject to PSD and title V requirements, we will need to rely on the early experience in implementing the permitting requirements for the very large sources that initially will be subject to those requirements in order to develop streamlining techniques for smaller sources. It is the real world experience gained from this initial phase that will allow EPA to develop any further modifications that might be necessary. This would not and could not occur if the LDVR were delayed indefinitely or permanently, so that PSD and

title V requirements were not triggered. It is unrealistic to expect that delaying action until a future tailoring rule could resolve all of the problems identified in this rulemaking, absent any real world implementation experience.

At its core, commenters’ argument is that EPA should delay (if not forego altogether) doing anything to address GHG emissions and the problems they cause until it can do so in a way that does not cause any implementation challenges, even if that delay results in continued endangerment to public health and welfare. EPA does not take such a myopic view of its duties and responsibilities under the CAA. Congress wrote the CAA to, among other things, promote the public health and welfare and the productive capacity of the population. CAA § 101(b)(1). EPA’s path forward does just this. Thus, proceeding with the endangerment/cause or contribute findings, the LDVR, and with PSD and title V through the phase-in approach of the Tailoring Rule maximizes the ability of EPA to achieve the Congressional goals underlying CAA sections 202(a) and the PSD and title V provisions, and the overarching CAA goal of protecting public health and welfare. Congress called for EPA (1) to determine whether emissions from new motor vehicles contribute to air pollution that endangers, (2) if that the determination is affirmative, to issue emissions standards for new motor vehicles to address the endangerment, and (3) to implement the PSD and Title V program to address similar emissions in their permitting program as another tool to address the air pollutant at issue. Delaying both the LDVR and PSD/title V implementation, as commenters have called for, would run directly counter to these Congressional expectations. Commenters’ calls for deferral or foregoing of the findings or LDVR are generally phrased in a conclusory fashion, and do not demonstrate how EPA could take the required CAA actions concerning GHGs while remaining within the requirements of each of the various CAA provisions, and achieving the overall goals of the CAA. As such the comments do not provide a valid basis for the deferral of agency action they suggest.” (75 FR 31575–56; June 3, 2010).

As explained above, EPA is resolving the absurdity caused by the statutory thresholds in the PSD and title V permitting programs not by avoiding an endangerment finding or avoiding all regulation under the CAA, but rather by interpreting the statute in a way that gives effect to the greatest extent possible to both section 202(a) and the applicable permitting provisions. This gives the greatest effect possible to the congressional intent about addressing air pollutant problems that endanger public health and welfare, while also focusing the permitting programs, at least initially, on large stationary sources. EPA’s targeted use of the absurd results doctrine in the Tailoring Rule is a reasonable approach to reconcile the various statutory obligations under the CAA at issue here.

⁵⁰This reasonable and common-sense approach includes the kind of step by step approach that includes regulation of GHG emissions from new motor vehicles, as described by Justice Stevens in *Massachusetts*, when discussing the issue of standing. Id. at 524.

EPA also disagrees with petitioners who argue either implicitly or explicitly that EPA has admitted, through its invocation of the absurd results doctrine in the Proposed Tailoring Rule, that it cannot regulate GHGs under the CAA without violating the statute. While, in the Tailoring Rule, EPA has noted that applying the statutory thresholds in the PSD and title V programs to greenhouse gases immediately for all sources would present problems, and may indeed lead to absurd results even in the long run, EPA did not and does not take the position that all regulation of GHGs under the CAA leads to absurd results or is illegal. In fact, just the opposite is true. EPA has issued reasonable, effective GHG emissions standards for light duty vehicles, and has announced plans for further GHG emissions standards for later model year light-duty vehicles. EPA also plans to propose the same for heavy-duty motor vehicles. Moreover, by applying, *inter alia*, the doctrines of absurd results and administrative necessity, EPA has been able to avoid the absurd results that could arise from applying the statutory thresholds for PSD and title V to greenhouse gases.⁵¹ The concept behind the absurd results doctrine is that an agency can (if not must) ignore the literal meaning of a statute in order to effectuate congressional intent. That is exactly what EPA's approach does—ignore only the statutory thresholds for PSD and title V in order to effectuate congressional intent under the CAA as a whole. EPA's reliance on one or more doctrines of administrative law when interpreting the statute is not evidence of the illegality of EPA's actions; rather it is evidence of the reasonable approach EPA took to interpreting and implementing the statute.

Finally, EPA is also denying the petitions because, while the Tailoring Rule was proposed after the close of the comment period for the Findings, EPA discussed the impact of applying the PSD and title V statutory thresholds to GHGs, and the potential need to tailor those programs as appropriate, in the July 2008 ANPR. 73 FR 44354, 44497–514, 44503 (“we have identified two

legal doctrines that may provide EPA with discretion to tailor the PSD program to GHGs: Absurd results and administrative necessity.”), 44512 (discussing same legal theories in context of title V). Indeed, EPA received comments from some of the same entities that are petitioning for reconsideration now regarding the Agency's position about its ability to craft a reasonable approach to addressing GHGs under the CAA, including the CAA permitting programs. See, e.g., Comments submitted by Marlo Lewis for the Competitive Enterprise Institute (EPA–HQ–OAR–2009–0171–2898.1). Thus, while EPA itself may have elaborated regarding the potential for absurd results from GHG permitting at the statutory thresholds in the Proposed Tailoring Rule, the issue was not raised for the first time in the Tailoring Rule; it had already been raised in the ANPR, and there was nothing preventing petitioners from commenting on the issue in their comments on the proposed Findings (as indeed some did). Commenters on the proposed Findings also argued that the Supreme Court was unaware of the impacts of the permitting programs when deciding *Massachusetts*. RTC Volume 11 at 5. Thus, objections based on the need to apply the absurd results doctrine to the PSD and title V programs, and on arguments related to how EPA defended its actions in *Massachusetts*, could have been (and indeed were) raised during the comment period on the Findings and are not appropriately raised in petitions for reconsideration.

B. NHTSA Rule

The Chamber of Commerce raised objections based on the authority of the National Highway Traffic Safety Administration (NHTSA) to issue Corporate Average Fuel Economy (CAFE) standards for new motor vehicles. Specifically, the Chamber argued that the federal government must choose between two alternative regulatory approaches: Seeking to regulate GHG emissions using NHTSA's authority, under EPCA as revised by EISA or, alternatively, regulating such emissions on authority of Title II of the CAA. According to the Chamber, NHTSA has recently acknowledged it has adequate legal authority under EPCA and EISA to regulate greenhouse gas emissions, independent from EPA's authority under CAA section 202(a), therefore EPA must reconsider the Endangerment Finding because it cannot claim to generate the public health benefits from CAA mobile source GHG emissions reductions. The

Chamber argues that according to EPA, the Endangerment Finding, standing alone, produces no current public health or welfare benefits but will instead produce such benefits in the future, but only if it effectively serves as a precondition for the regulation of GHG emissions from new motor vehicles or some other category of emission sources. Thus, the Chamber concludes, EPA has justified the Endangerment Finding as a means to the end of new motor vehicle regulation.

The Chamber claims that this core rationale for EPA's Endangerment Finding and regulatory program can no longer bear scrutiny. It argues that if EPA affirmatively wishes to pursue an Endangerment Finding to regulate emissions from new motor vehicles, it must explain what it can add to a NHTSA-only rulemaking. According to the Chamber, EPA may not rely on a presumed need for motor vehicle regulations that could be accomplished through NHTSA regulations alone. (Chamber, 19–23)

Petitioner claims that EPA issued and justified the Endangerment Finding based on the need for emissions reductions from EPA regulation of new motor vehicles, and the expectation that such EPA regulation would achieve the expected emissions reductions. That argument mischaracterizes EPA's position.

Consistent with the statutory language, legislative history and Supreme Court case law, EPA determined whether atmospheric concentrations of greenhouse gases are reasonably anticipated to endanger public health or welfare, and based that determination on the scientific and other evidence relevant to the issues of endangerment. As EPA made clear, CAA section 202(a) limited the issues EPA could consider in making a determination concerning endangerment, and they did not include consideration of the degree of reductions that would reasonably be achieved by regulations to control emissions from new motor vehicles. EPA clearly stated that:

“As the Supreme Court made clear in *Massachusetts v. EPA*, EPA's judgment in making the endangerment and contribution findings is constrained by the statute, and EPA is to decide these issues based solely on the scientific and other evidence relevant to that decision. EPA may not “rest[] on reasoning divorced from the statutory text,” and instead EPA's exercise of judgment must relate to whether an air pollutant causes or contributes to air pollution that endangers. *Massachusetts v. EPA*, 549 U.S. at 532. As the Supreme Court noted, EPA must “exercise discretion within defined statutory limits.” *Id.* at 533. EPA's belief one way or

⁵¹ Contrary to one petitioner's argument, EPA did not craft the Tailoring Rule in response to the global nature of greenhouse gas concentrations and climate change. Rather, it is the much higher amounts at which greenhouse gases are emitted by stationary sources, compared to existing criteria and other regulated air pollutants, that necessitated EPA's reasonable approach to permitting. The absurdity that EPA was trying to avoid was permitting stationary sources much smaller than Congress intended when writing the permitting provisions of the CAA. The global nature of greenhouse gases and climate change was not the reason for the Tailoring Rule.

the other regarding whether regulation of greenhouse gases from new motor vehicles would be "effective" is irrelevant in making the endangerment and contribution decisions before EPA. *Id.* Instead "[t]he statutory question is whether sufficient information exists to make an endangerment finding" *Id.* at 534.

The effectiveness of a potential future control strategy is not relevant to deciding whether air pollution levels in the atmosphere endanger. It is also not relevant to deciding whether emissions of greenhouse gases from new motor vehicles contribute to such air pollution. Commenters argue that Congress implicitly imposed a third requirement, that the future control strategy have a certain degree of effectiveness in reducing the endangerment before EPA could make the affirmative findings that would authorize such regulation. There is no statutory text that supports such an interpretation, and the Supreme Court makes it clear that EPA has no discretion to read this kind of additional factor into CAA section 202(a)'s endangerment and contribution criteria. In fact, the Supreme Court rejected similar arguments that EPA had the discretion to consider various other factors besides endangerment and contribution in deciding whether to deny a petition. *Massachusetts v. EPA*, 549 U.S. at 532-35." (74 FR 66496, 66507-8; December 15, 2009).

This excerpt was in response to comments arguing that EPA should take into account the emissions impacts of EPA's then upcoming rule to control emissions of greenhouse gases from light-duty vehicles and trucks, and consider that the CAFE standards issued by NHTSA would effectively achieve the same reductions. *Id.* at 66501, 66507. Just as the effectiveness of future motor vehicle regulations was not relevant to determining endangerment, EPA made it clear that CAA section 202(a) did not allow EPA to consider issues such as future adaptation and mitigation, which reflected how society responded to the issue of endangerment, not whether endangerment existed. *Id.* at 66512-514.

Thus, it is clear that EPA did not justify or base its Endangerment Finding on either the need for emissions reductions from EPA regulations of new motor vehicles, or the expectation that such an EPA regulation would achieve emissions reductions. EPA rejected suggestions during the rulemaking that EPA refrain from issuing and Endangerment Finding because NHTSA has the authority to issue CAFE standards that also reduce greenhouse gases, as discussed above. The Chamber is raising basically the same issue raised in the rulemaking, and has presented no reason that would support any different response. EPA is rejecting Chamber's request for the same reasons it rejected

these same kinds of requests in the rulemaking.

It is also clear that it was eminently practicable for the Chamber to raise this issue in the comment period. As described above, various commenters pointed to NHTSA's separate authority, and argued that NHTSA would effectively achieve the same reductions as EPA, undermining the basis for EPA's Endangerment Finding. *Id.* at 66507. Also see 66544, in the context of the Contribution Finding. The Chamber raises the same kind of objection here, and could have raised it during the comment period. While they point to a subsequent statement by NHTSA indicating that NHTSA's statutory authority is separate from EPA's, that is not new or different information concerning NHTSA's authority and does not change the nature of the Chamber's objection. Their failure to raise their objection in a timely manner is another reason to reject their request to reconsider on these grounds.

As part of their argument, the Chamber claims that EPA must explain what it can add to a NHTSA-only rulemaking. This is one part of the argument raised above, and is rejected for the same reasons. As with the arguments discussed above, the Chamber could have raised this argument during the comment period, and the failure to do so is another reason to reject their request to reconsider on these grounds.

In any case, EPA has explained in detail how the recently issued regulations under CAA section 202(a) to control emission of greenhouse gases from light-duty vehicles and trucks differ from NHTSA's CAFE program for the same vehicles, and why it was important for EPA to issue its rule. In the final rule issuing greenhouse gas emissions standards for new motor vehicles, EPA responded to comments that it should delay issuance of the motor vehicle standards until a later time, to avoid concerns over stationary source permitting impacts. EPA stated:

"[The Supreme Court in *Massachusetts*] stated that under section 202(a), "[i]f EPA makes [the endangerment and cause or contribute findings], the Clean Air Act requires the agency to regulate emissions of the deleterious pollutant." 549 U.S. at 534. As discussed above, EPA has made the two findings on contribution and endangerment. 74 FR 66496 (December 15, 2009). Thus, EPA is required to issue standards applicable to emissions of this air pollutant from new motor vehicles.

The Court properly noted that EPA retained "significant latitude" as to the "timing * * * and coordination of its regulations with those of other agencies" (*id.*). However it has now been nearly three

years since the Court issued its opinion, and the time for delay has passed. In the absence of these final standards, there would be three separate Federal and State regimes independently regulating light-duty vehicles to increase fuel economy and reduce GHG emissions: NHTSA's CAFE standards, EPA's GHG standards, and the GHG standards applicable in California and other states adopting the California standards. This joint EPA-NHTSA program will allow automakers to meet all of these requirements with a single national fleet because California has indicated that it will accept compliance with EPA's GHG standards as compliance with California's GHG standards. 74 FR at 49460. California has not indicated that it would accept NHTSA's CAFE standards by themselves. Without EPA's vehicle GHG standards, the states will not offer the Federal program as an alternative compliance option to automakers and the benefits of a harmonized national program will be lost. California and several other states have expressed strong concern that, without comparable Federal vehicle GHG standards, the states will not offer the Federal program as an alternative compliance option to automakers. Letter dated February 23, 2010 from Commissioners of California, Maine, New Mexico, Oregon and Washington to Senators Harry Reid and Mitch McConnell (Docket EPA-HQ-OAR-2009-0472-11400). The automobile industry also strongly supports issuance of these rules to allow implementation of the national program and avoid "a myriad of problems for the auto industry in terms of product planning, vehicle distribution, adverse economic impacts and, most importantly, adverse consequences for their dealers and customers." Letter dated March 17, 2010 from Alliance of Automobile Manufacturers to Senators Harry Reid and Mitch McConnell, and Representatives Nancy Pelosi and John Boehner (Docket EPA-HQ-OAR-2009-0472-11368). Thus, without EPA's GHG standards as part of a Federal harmonized program, important GHG reductions as well as benefits to the automakers and to consumers would be lost. In addition, delaying the rule would impose significant burdens and uncertainty on automakers, who are already well into planning for production of MY 2012 vehicles, relying on the ability to produce a single national fleet. Delaying the issuance of this final rule would very seriously disrupt the industry's plans" (75 FR 25314, 25402; May 7, 2010).

EPA also noted that the greenhouse gas standards issued by EPA achieved greater overall reductions in greenhouse gases than NHTSA's CAFE standards. *Id.* at n.165, 25402; also see 25397, 25549-50. Thus, EPA has explained in full the reasons for refusing to delay issuance of EPA's motor vehicle emissions standards, and what EPA's rule adds to NHTSA's CAFE rule. As noted above, these issues are not relevant to the issues EPA considers in making a determination on endangerment under CAA section 202(a).

C. Other Issues

1. Effects of the Findings and Subsequent Rulemakings on States and Businesses

Many of the petitioners provide detailed information regarding the impact that they allege would flow from the Findings; these discussions are in addition to arguments based on the Proposed Tailoring Rule (see Section IV.A of this Notice for the response to the arguments based on the Proposed Tailoring Rule). For example, the State of Texas, in addition to providing information regarding efforts the State has made to address GHGs, details harm it predicted could occur to the State through allegedly adverse impacts to its farming and ranching, mineral interest revenue stream, and oil and gas sector. Texas at 5–7, 32–34. The State also discusses what it describes as the “fallout” from the Findings. *Id.* at 34–38. More specifically, the State of Texas discusses resolutions and bills that have been introduced in the U.S. House of Representatives and the U.S. Senate, comments from the Small Business Administration’s Office of Advocacy on the Proposed Tailoring Rule,⁵² and various inquiries into, or statements about, the CRU e-mails and IPCC.

The State of Virginia, while not providing any additional information regarding the alleged impacts of the Findings, states that “EPA’s remote finding of endangerment to health and welfare fail to consider and properly weigh the offsetting harms to health and welfare necessarily flowing from economically destructive regulation.” Virginia at 3.

The petitioners’ information regarding the impact to petitioners and others often follows sections of the petitions in which petitioners raise allegedly new concerns with the science underlying the Findings. The information regarding the impact from the Findings is most often provided in order to emphasize to EPA the necessity of reconsidering the Findings based on those earlier concerns.⁵³ See, e.g., Texas at 35 (“In light of these * * * concerns * * * the Administrator’s improper handling of the scientific assessment process takes on an even greater meaning.”); Letter from WV Coal Assn. at 1 (“EPA’s findings would have a grave impact on

⁵² The State of Texas stated that this letter was provided to the endangerment docket (EPA–HQ–OAR–2009–0171), but it was actually submitted to the docket for the Proposed Tailoring Rule (EPA–HQ–OAR–2009–0571).

⁵³ Petitioners also provide this information in the context of requesting an administrative stay of the Findings from EPA. See Section II for a discussion of EPA’s denial of these stay requests.

our industry and the thousands of West Virginians who depend on the production and use of our high quality coal everyday * * *. This makes it all the more important that EPA suspend its decision and reconsider it in light of these important new developments.”).

The objections based either explicitly or implicitly on EPA’s decision to not consider the impacts of greenhouse gas regulations when making the Findings could have been, and indeed were, raised during the public comment period on the Findings. Thus, they are not properly raised in CAA section 307(d) petition for reconsideration and are therefore denied.

Moreover, as discussed elsewhere in this Decision and supporting material, this information is essentially irrelevant to the scientific based questions before EPA when making the endangerment and contribution findings. EPA already explained in the Findings how the potential impacts from the regulations that may follow an endangerment finding are not proper considerations when determining whether GHGs may reasonably be anticipated to endanger public health or welfare. See generally, 74 FR at 66515–16; see also *id.* at 66515 (The Administrator “must base her decision about endangerment on the science, and not on policy considerations about the repercussions or impact of such a finding.”); *id.* at 66516 (“Therefore, it is reasonable to interpret the endangerment test as not requiring the consideration of the impacts of implementing the statute in the event of an endangerment finding as part of the endangerment finding itself.”).

Finally, as detailed elsewhere in this Decision and RTP document, the CRU e-mails and other scientific information provided by the petitioners do not call into question the underlying science, EPA’s reliance on it, or the Administrator’s final determination.

2. A Formal Rulemaking Process Is Not Required

One petitioner discusses why EPA should not only reconsider the Findings, but also utilize the formal rulemaking process in the reconsideration proceedings. Peabody Energy at IX–9 to IX–18. Essentially, the petitioner believes that the questions raised by the CRU e-mails and errors in IPCC AR4 are so serious that EPA’s responsibilities to address them can be discharged only through granting reconsideration, and undertaking a formal rulemaking process. More specifically, the petitioner states that “[a]n on-the-record proceeding is necessary to rectify the substantial flaws

in the process that EPA has employed, flaws that stem from the abuses infecting the studies on which the Endangerment Finding is principally based.” Peabody Energy at IX–9.

In support of its argument, petitioner first notes that while EPA may not be required by the CAA to undertake an on-the-record proceeding, nothing prohibits EPA from undertaking more process than is required by statute. *Id.* at IX–9 to IX–10. The petitioner then argues that case law and “other authoritative guidance,” specifically guidance from the Administrative Conference of the United States (ACUS), “make clear than an evidentiary hearing” on the petitions for reconsideration is warranted. *Id.* at IX–10. The petitioner contends that a formal evidentiary hearing will fix EPA’s record, which they claim is “wholly inadequate” and cannot justify finding endangerment to public health.⁵⁴ More specifically, they claim that a “responsive thrust and parry” about the science underlying the Administrator’s decision, including “secondary sources” such as the IPCC, should occur and that the informal rulemaking proceeding EPA undertook does not allow for this. Peabody Energy at IX–16.

Comments suggesting that EPA undertake a formal rulemaking process, not only could have been raised, but were raised, during the comment period for the Findings. 74 FR at 66504–05, 66510–12. Thus, they are not appropriately raised in petitions for reconsideration. Please see the above portions of the Findings, RTC Volume 1, and Section III of this Decision for further discussion on why EPA’s denial of the request for formal hearing in the Findings, and the agency’s continued reliance on the assessment reports, is reasonable.

To the extent that the petitioners are re-raising these comments in light of the CRU e-mails and IPCC developments, and asking for EPA to reconsider its prior denial of the request for a formal rulemaking hearing, for the reasons explained elsewhere in this Decision and supporting materials, these materials do not necessitate EPA granting reconsideration, let alone initiating the exceedingly rare process of a formal, on-the-record rulemaking. When all is said and done, the CRU e-mails and IPCC errors do not call into question the science supporting the Administrator’s decision. They surely do not rise to the level of “extremely

⁵⁴ EPA responds to the argument regarding the public health finding in section IV.B.I of the Findings and Volume 5 of the RTC document.

compelling circumstances” that petitioner argues would justify a court dictating that EPA undertake formal rulemaking procedures. Peabody Energy at IX–10.

Petitioner argues that while EPA is not required by the CAA to follow a formal rulemaking process, EPA has the authority to convene such a hearing and nothing in the CAA should be read to “limit EPA’s discretion in deciding whether to do so.” Peabody Energy at IX–9. n. 494. The petition also notes that EPA is equipped to undertake such a hearing, citing the existing procedures for adjudications, 40 CFR 22.3(a). While EPA may have the discretion to provide more process than the minimum required by CAA section 307(d), EPA notes that the petition does not discuss how a formal on-the-record hearing process would fit within the informal rulemaking proceedings mandated by the CAA. See 74 FR at 66505 (noting that original request also did not discuss how a formal hearing would fit with CAA requirements). Nor does it discuss how the 40 CFR part 22 regulations, which are entitled “Consolidated Rules of Practice Governing the Administrative Assessment of Civil Penalties and Revocation/Termination or Suspension of Permits” and cover administrative adjudicatory proceedings for specifically delineated civil penalty or permit actions, would authorize the type of hearing petitioner suggests, or even how they would work assuming EPA chose to apply them as suggested by petitioner.

The cases cited by petitioner stand for the unsurprising proposition that some circumstances justify more or different procedures than others. But they do not, as petitioner alleges, lead to the inevitable conclusion that the only reasonable recourse for EPA is to undertake a formal rulemaking process.⁵⁵ Indeed, that would be a

⁵⁵ The extremely compelling circumstances found by courts in the cases cited by petitioners do not exist here. See *People of the State of Illinois v. United States*, 666 F.2d 1066, 1082–83 (7th Cir. 1981) (court relied upon a combination of unique factors including that the Interstate Commerce Commission had allowed cross-examination on some information in an adjudicatory proceeding, but not other similar information, and the cross-examination had been found to be “critical to achieving an accurate determination of the facts.”); *National Wildlife Federation v. Marsh*, 721 F.2d 767, (11th Cir. 1983) (the court merely required the Army Corps of Engineers to follow its own longstanding internal procedures when issuing a permit). EPA also notes that two of the cases the petitioner cites for the proposition that “cross examination is the most effective way to ascertain the truth,” Peabody at IX–15, are criminal cases, therefore it is not surprising that cross-examination was at issue. The third, discussed above, involved a decision in which the agency had already decided to allow cross-examination. *People*, 666 at 1083.

departure “from the very basic tenet of administrative law that agencies should be free to fashion their own rules of procedure.” *Vermont Yankee Nuclear Power Corp. v. NRDC*, 435 U.S. 519, 544 (1978). In *Vermont Yankee* the Supreme Court rejected an argument similar to that being made by petitioner here—that the issues before the agency were so complex and important that they necessitated more process, including cross-examination, even if such procedures were beyond the minimum required. *Id.* at 539–49. Also see *Kennecott*, 684 F.2d at 1020 fn 33.

To the extent that petitioner argues that EPA’s record is inadequate if it does not include the “thrust and parry” of a formal rulemaking hearing, with cross examination, EPA disagrees. Congress clearly indicated that the robust informal rulemaking procedures of CAA section 307(d) are appropriate for the myriad complex issues that EPA must address when issuing particular CAA rules. Nothing that petitioners have provided call into question EPA’s decision to follow the clear direction provided in section 307(d).

Indeed, the robust informal rulemaking requirements of section 307(d) of the CAA ensure adequate and appropriate notice and comment for CAA decisions. See generally 74 FR 66500–05 (discussing the public involvement in development of the Findings, including EPA’s careful review and response to more than 380,000 public comments). Moreover, the section 307(d) reconsideration process provides ample opportunity for petitioners, and any other interested party, to submit to EPA for consideration new information which they believe is of central relevance to the Administrator’s final decision, and hence necessitates reconsideration of that decision. Other than continuing to disagree with EPA’s denial of the original request for a formal rulemaking, and continuing to state its opinion that the science and regulatory impact from an endangerment finding demands more process, petitioner has not demonstrated why the clearly applicable procedures of section 307(d) are inadequate, let alone why only the rarely-used formal rulemaking process is the only reasonable path forward. Petitioners have submitted over 500 pages of reconsideration petitions, as well as attachments consisting of hundreds of pages that contain information including dozens of studies, more than 300 pages of computer code, and more than 1000 e-mails. Peabody Energy and other petitioners have had a full opportunity, both in the underlying rulemaking and in the reconsideration

process, to submit whatever information or evidence they want concerning the variety of scientific and other issues of concern to them, such as those identified at Peabody IX–12. EPA’s lengthy and detailed Denial, including this document and the RTP document, carefully examines each objection raised and explains why each objection is untimely and/or not of central relevance. The CAA reconsideration process provides ample opportunity for interested parties to present new information to EPA, and for EPA to examine that information. Petitioner has not identified what cross examination it thinks is required to “ensure that results reached by EPA reflect scientific truths”. For example, do they envision cross examination of all of the authors of the thousands of studies discussed in the rulemaking, or discussed in an assessment report? Cross examination of every author and other participant in an assessment report? Cross examination of agency scientists? And for all of these, on what subjects and issues? The administrative record includes the assessment reports and their integration of the science within areas of climate research and across various areas of climate research, as well as EPA’s TSD and additional reports and studies provided by commenters. The proposed and final Findings also included the Administrator’s judgments and conclusions on all of this evidence. Petitioners have failed to explain what facts they would like cross examination on, what witnesses they envision cross examining, and how any such examination would add in any way, much less a practical way, to the ability they already have, through submission of comments and petitions to reconsider, to attack and contest at length any and all of these parts of the informal rulemaking record. They have failed to demonstrate how their broad, general assertions of a better process would actually work as a practical way to better ensure the scientific integrity of the record before the Agency. It is quite reasonable for EPA to rely on the robust and in-depth informal rulemaking procedures followed in this rulemaking, as mandated by Congress, rather than embark on the rarely-used formal rulemaking pathway.

As discussed in the final Findings, the ACUS guidelines are non-binding recommendations regarding “important circumstances tending to suggest the desirability of such procedural devices”. 1 U.S.C. 305.76–3(1). EPA notes that the ACUS recommendations cited by petitioner are not specifically for the formal rulemaking proceedings

suggested by petitioner. Rather, they are more general, for “[h]earing argument and other oral presentation, when the presiding agency official or officials may ask questions, including questions submitted by interested persons.” 1 U.S.C. 305.76–3(1)(f). The CAA requires a hearing and opportunity for oral presentation, CAA section 307(d)(5), and EPA held two hearings during which interested parties could present their arguments and information and EPA could ask questions. Thus, EPA has already undertaken procedures similar to those recommended by the ACUS.

Last, part of the recommendation of the ACUS not raised by petitioner is the following:

An agency should employ any of the devices specified in paragraph 1 or permit cross-examination only to the extent that it believes that the anticipated costs (including those related to increasing the time involved and the deployment of additional agency resources) are offset by anticipated gains in the quality of the rule and the extent to which the rulemaking procedure will be perceived as having been fair.
1 U.S.C. 305.76–3(3).

For all the reasons stated above, in the final Findings, and elsewhere in this document and supporting material, EPA does not believe that the potential for gains in the quality of the Administrator’s decision, if any, would offset the costs, both in terms of agency resources and delay. Moreover, the section 307(d) rulemaking process is quite fair, providing adequate opportunity for everyone, and not just parties who could afford to participate in a formal hearing, to present their views. Contrary to petitioner’s argument, it resulted in a record that is both scientifically sound and adequate.

For all the foregoing reasons, the request to reconsider its prior decision and undertake a formal rulemaking, evidentiary hearing process, is denied.

3. Discretion in Making an Endangerment Finding

Peabody Energy argues that whatever discretion EPA may have in making an Endangerment Finding, it must justify and defend the specific findings of endangerment it actually made. More specifically, Peabody Energy argues that EPA did not assess the danger as low risk/high magnitude. It found instead both a high risk and high magnitude of harm, citing the following quotes from the Findings—“[t]he scientific evidence is compelling that elevated concentrations of heat-trapping greenhouse gases are the root cause of recently observed climate change” and “[m]ost of the observed increase in global average temperatures since the

mid-20th century is very likely due to the observed increase in anthropogenic GHG concentrations,” with “very likely” defined as 90–99% probability. Thus, they conclude, EPA must now defend its high risk/high harm conclusion, even if arguendo it had discretion to make a lower finding of endangerment.

Peabody Energy argues that this distinction between the Endangerment Finding that EPA might be authorized to make and the Endangerment Finding it actually made is crucial in light of the CRU material. Peabody contends that even if EPA might still be able to make an Endangerment Finding of some kind (a fact that Peabody does not concede), that would not justify the Endangerment Finding that EPA actually made and would not form a sufficient basis to allow EPA to deny the petitions for reconsideration. Peabody argues that the regulation that EPA ultimately proposes must be guided by the nature and extent of the endangerment that EPA has found, because a high risk/high magnitude endangerment finding might justify one level of regulation, while a different finding might justify a different level. Thus, Peabody Energy claims the question that EPA must answer at the endangerment phase is not just “endangerment, yes or no?,” but specifically what type of endangerment. In that context, Peabody Energy argues that the revelations in the CRU material mean that EPA must reconsider its Endangerment Finding no matter what level of legal discretion the Agency has. Peabody Energy at IX–6 to 9.

Peabody Energy vastly oversimplifies the basis for EPA’s Endangerment Finding, characterizing it as a simple “high risk/high magnitude” decision. With respect to existence of climate changes and attribution to anthropogenic emissions of greenhouse gases, the Administrator concluded that: the scientific evidence linking human emissions and resulting elevated atmospheric concentrations of the six well-mixed greenhouse gases to observed global and regional temperature increases and other climate changes to be sufficiently robust and compelling.
74 FR at 66523.

Based on this, the Administrator considered a wide variety of categories of public health and welfare that could be affected by the climate changes. The Administrator:

considered the state of the science on how human emissions and the resulting elevated atmospheric concentrations of well mixed greenhouse gases may affect each of the major risk categories, i.e., those that are described in the TSD, which include human health, air quality, food production and agriculture, forestry, water resources, sea

level rise and coastal areas, the energy sector, infrastructure and settlements, and ecosystems and wildlife. The Administrator understands that the nature and potential severity of impacts can vary across these different elements of public health and welfare, and that they can vary by region, as well as over time.

Id at 66509.

For each of these categories the Administrator took into account the varying degree of certainty of an impact as well as the potential magnitude of an impact. She considered both beneficial as well as adverse impacts. Id at 66524–537. There was no simple “high risk/high magnitude” paradigm. Instead, the Administrator was aware that:

because human-induced climate change has the potential to be far reaching and multi-dimensional, not all risks and potential impacts can be characterized with a uniform level of quantification or understanding, nor can they be characterized with uniform metrics. Given this variety in not only the nature and potential magnitude of risks and impacts, but also in our ability to characterize, quantify and project into the future such impacts, the Administrator must use her judgment to weigh the threat in each of the risk categories, weigh the potential benefits where relevant, and ultimately judge whether these risks and benefits, when viewed in total, are judged to be endangerment to public health and/or welfare.

Id at 66523–24.

Instead of the simple approach described by Peabody Energy, the Administrator properly exercised her judgment by taking into consideration the complexity and breadth of the range of risks and harms presented by the evidence.

In this context, Peabody Energy and other petitioners focus their arguments and claims almost exclusively on the question of the existence of climate change and its attribution to anthropogenic emissions of greenhouse gases. After considering their claims, EPA is denying the petitions to reconsider for the reasons described above. They have not provided substantial support for the argument that the Endangerment Finding should be revised, and EPA continues to find that the “scientific evidence linking human emissions and resulting elevated atmospheric concentrations of the six well-mixed greenhouse gases to observed global and regional temperature increases and other climate changes to be sufficiently robust and compelling.”

In sum, contrary to Peabody Energy’s assertion EPA did not employ a simplified “high risk/high magnitude” paradigm in making the Endangerment Finding. Instead the Administrator

carefully and comprehensively considered the recognized broad range of varying risks and harms across multiple sectors of public health and welfare. In addition, EPA is not now changing its Endangerment Finding or using its discretion under section 202(a)

to base it on a “lower finding of endangerment”.

V. Conclusion

For all of the reasons discussed above and in the accompanying RTP document, the petitions to reconsider the Endangerment and Cause or Contribute Findings for Greenhouse

Gases under Section 202(a) of the Clean Air Act are denied, as are the petitions for an administrative stay.

Dated: July 29, 2010.

Lisa P. Jackson,
Administrator.

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EPA's Response to the Petitions to Reconsider the Endangerment and Cause or Contribute Findings for Greenhouse Gases under Section 202(a) of the Clean Air Act

Volume 2: Issues Raised by Petitioners on EPA's Use of IPCC

**U.S. Environmental Protection Agency
Office of Atmospheric Programs
Climate Change Division
Washington, D.C.**

ACRONYMS

°C	degrees Celsius
°F	degrees Fahrenheit
AIRS	Atmospheric Infrared Sounder
AMS	American Meteorological Society
AOGCM	Atmosphere-Ocean General Circulation Models
AR4	IPCC Fourth Assessment Report
BOM	Australian Bureau of Meteorology
CH ₄	methane
cm	centimeter
CCSP	U.S. Climate Change Science Program
CDIAC	Carbon Dioxide Information Analysis Center
CMIP	Coupled Model Intercomparison Project
CO ₂	carbon dioxide
CRU	Climatic Research Unit
EPA	U.S. Environmental Protection Agency
FOIA	Freedom of Information Act
GHCN	Global Historical Climatology Network
GHG	greenhouse gases
GISS	Goddard Institute for Space Studies (NASA)
GSL	Global Snow Laboratory (Rutgers University)
IAC	InterAcademy Council
IEA	Institute of Economic Analysis
IISD	International Institute for Sustainable Development
IJC	International Journal of Climatology
IPCC	Intergovernmental Panel on Climate Change
IQA	Information Quality Act
LIA	Little Ice Age
MET	United Kingdom Meteorological Office
MWP	Medieval Warm Period
NASA	National Aeronautics and Space Administration
NCAR	National Center for Atmospheric Research
NCDC	National Climatic Data Center
NIWA	National Institute of Water & Atmospheric Research
NMS	National Meteorological Station
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NSIDC	U.S. National and Snow and Ice Data Center
ORNL	Oak Ridge National Laboratory
PBL	Netherlands Environmental Assessment Agency
RMS	Risk Management Solutions
RTC	Response to Comments
RTP	Response to Petitions
SAB	Scientific Advisory Board
SALR	saturated adiabatic lapse rate
TSD	Technical Support Document

UAH	University of Alabama–Huntsville
UCAR	University Corporation for Atmospheric Research
UHI	urban heat island
UK	United Kingdom
USGCRP	U.S. Global Change Research Program
USHCN	United States Historical Climatology Network
W/m ²	watts per meter squared
WMO	World Meteorological Organization
WWR	World Weather Reports

2.0 Issues Raised by Petitioners on EPA's Use of IPCC

2.1 Claims That IPCC Errors Undermine IPCC Findings and Technical Support for Endangerment

2.1.1 Overview

Several petitioners (Peabody Energy, the State of Texas, the Coalition for Responsible Regulation, the Competitive Enterprise Institute, the Ohio Coal Association, and the Southeastern Legal Foundation) contend that alleged errors and/or unsupported findings in IPCC reports demonstrate that the science on which the Administrator relied for the Endangerment Finding is uncertain and/or not credible. We have examined each specific instance of error, alleged error, and/or alleged unsupported statement in the voluminous IPCC report and we find that the evidence cited by petitioners does not support this conclusion.

In reviewing the information provided by petitioners, EPA has determined that most—if not all—of the alleged errors and/or unsupported statements highlighted by petitioners are not relevant, not truly erroneous or unsupported, and/or inconsequential to the Administrator's Finding. In many cases, the petitioners' interpretation of both the alleged error (or alleged unsupported statement) and its implications is not supported by the evidence provided. Clearly, the charge that there are or might be errors or unsupported statements in the IPCC's Fourth Assessment Report (AR4) is serious, and we agree with petitioners that such claims merit thorough review. EPA has done such a review; we find that the documented errors in the AR4 are not significant, and do not call into question the fundamental and broad evidence on which the Endangerment Finding rests. Moreover, the occurrence of the few documented errors in a study the size of the IPCC report is not unexpected and does not call into question the credibility of the entire report and all of its findings.

The Netherlands Environmental Assessment Agency (PBL) conducted its own independent assessment of the regional chapters (9 through 16) in Working Group II's contribution to the AR4, where many of the errors, alleged errors, and/or alleged unsupported statements have been identified. The report *Assessing an IPCC Assessment* (PBL, 2010a) finds "no significant errors" in summary conclusions, though it notes that "provenance of summary statements needs to become more transparent in future reports."

PBL (2010a) also states that "examples of negative impacts dominate at summary level," indicating that the IPCC selected a "risk-oriented" approach in communicating to policymakers. The report states:

The PBL subscribes to the importance of an approach that highlights what may go wrong under unmitigated climate change, but Working Group II Report lacked a clear explanation of the choice of approach and its consequences. Alternatively, it could be argued that policymakers should be presented with a complete picture in the Summary for Policymakers, not just with negative examples (without suggesting that potential positive effects cancel out potential effects).

While we cited the IPCC Working Group II Summary for Policymakers in the Endangerment Technical Support Document (TSD), we relied most heavily on information from the full chapters in the Working Group II report, specifically Chapter 14 on North America, as well as other assessment literature such as the U.S. Global Change Research Program (USGCRP) assessment *Global Climate Change Impacts in the United States* (Karl et al., 2009). The Administrator considered both the positive and negative effects of climate change, as the Endangerment Finding states (Section I.A.):

The Administrator is using her judgment, based on existing science, to weigh the threat for each of the identifiable risks, to weigh the potential benefits where relevant, and ultimately to assess whether these risks and effects, when viewed in total, endanger public health or welfare.

In addition, the Administrator found endangerment based on impacts in the United States alone, with international impacts providing some supporting information, as the Endangerment Finding states (Section III.D):

EPA is not considering international effects to determine whether the health and welfare of the public in a foreign country is endangered. Instead, EPA's consideration of international effects for purposes of determining endangerment is limited to how those international effects impact the health and welfare of the U.S. population.

The Administrator looked first at impacts in the United States itself, and determined that these impacts are reasonably anticipated to endanger the public health and the welfare of the U.S. population. That remains the Administrator's position, and by itself supports her determination of endangerment.

Despite its few criticisms of the IPCC, PBL (2010a) concludes:

Our findings do not contradict the main conclusions of the IPCC on impacts, adaptation and vulnerability related to climate change. There is ample observation evidence of natural systems being influenced by climate change on regional levels. The negative impacts under unmitigated climate change pose substantial risks to most parts of the world, with risks increasing at higher global average temperatures.

This conclusion is very consistent with the conclusion the Administrator reached in the Endangerment Finding, after weighing the balance of evidence.

This section responds to the major arguments of the petitioners on the significance of alleged errors and/or unsupported statements in the IPCC reports, and assesses the implications of these errors and/or unsupported statements for the credibility and reliability of the major findings and conclusions of the IPCC and other assessment literature.

2.1.2 Accuracy of Statement on Percent of the Netherlands Below Sea Level

Comment (2-1):

Peabody Energy and the State of Texas contend that the IPCC erroneously stated (in Working Group II's contribution to the AR4) that 55% of the Netherlands is below sea level, whereas the actual number is much lower according to Dutch materials (26%).

Response (2-1):

The statistic quoted in the IPCC AR4 is inaccurate. When this error was identified, PBL (2010b) published a correction:

In the 2007 IPCC report by the Working Group 2 (Climate change 2007: Impacts, Adaptation and Vulnerability) a mistake has entered the text that was supplied by the Netherlands Environmental Assessment Agency, regarding the risks of flooding for the Netherlands. In the chapter on Europe, on page 547, it says that 55 per cent of the Netherlands is below sea level ('The Netherlands is an example of a country highly susceptible to both sea level rise and river flooding because 55% of its territory is below sea level'). This should have read that 55 per cent of the Netherlands is at risk of flooding; 26 per cent of the country is below sea level, and 29 per cent is susceptible to river flooding. Examples of the latter are the near floodings, in the mid-1990s, of areas along the rivers Meuse and Waal – areas that are well above sea level.

The IPCC agrees that this statistic is incorrect in the AR4, and also notes that the same mistake was made by other reputable groups (Reuters, 2010). For example, the IPCC—in a written statement provided to Reuters—indicated that a report from the Dutch Ministry of Transport had stated “‘about 60%’ of the country is below sea level,” and referred to a European Commission study saying “about half” (Reuters, 2010). As noted by the IPCC statement, the error was not made by authors of the AR4, but originated with PBL, which supplied the text. To correct the mistake, the IPCC published an official erratum (IPCC, 2010d):

2) Page 547. Section 12.2.3. Line 20: Delete “below sea level” and replace with “at risk flooding”.

The IPCC was further quoted as saying (Reuters, 2010): “The sea level statistic was used for background information only, and the updated information remains consistent with the overall conclusions.”

In its independent report *Assessing an IPCC Assessment* (PBL, 2010a), PBL, which was responsible for the error, states:

We acknowledge that this error was not the fault of the IPCC (Coordinating) Lead Authors or Co-Chairs. The error was made by a Contributing Author from the PBL, and the (Coordinating) Lead Authors [of the IPCC] are not to blame for relying on Dutch information provided by a Dutch agency.

EPA concludes that this error is minor and inconsequential to the Administrator's Endangerment Finding. EPA does not refer to or rely on this statistic in the Endangerment Finding or supporting documents, and this information does not pertain to endangerment of public health and welfare in the United States in any meaningful way. It does not call into question the integrity of the IPCC, and it has no impact on the scientific support for EPA's Endangerment Finding. Furthermore, as the error pertains to a statistic outside the United States, it is not relevant to the Endangerment Finding. As noted in Subsection 2.1.1, the Endangerment Finding states (Section III.D): "The Administrator looked first at impacts in the United States itself, and determined that these impacts are reasonably anticipated to endanger the public health and the welfare of the U.S. population. That remains the Administrator's position, and by itself supports her determination of endangerment."

2.1.3 Validity of Himalayan Glacier Projection

Comment (2-2):

Several petitioners (the Coalition for Responsible Regulation, the Competitive Enterprise Institute, the Ohio Coal Association, Peabody Energy, the Southeastern Legal Foundation, and the State of Texas) state that the IPCC erred in including a projection that glaciers in the Himalayas would disappear by 2035, and they claim EPA relied on this projection in the Endangerment Finding. Petitioners argue that this error undermines the credibility of the IPCC reports. The Ohio Coal Association writes: "The Agency no longer has a basis for unquestioned confidence that the IPCC reports present a fair, unbiased, and accurate assessment of climate science." Peabody states the error: "...undercuts EPA's conclusion that the IPCC review process was 'rigorous' and shows how reliance on the IPCC led to errors in EPA's Endangerment Finding."

Response (2-2):

The IPCC has issued a correction pertaining to this projection for the melting of Himalayan glaciers (IPCC, 2010f):

The Synthesis Report, the concluding document of the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (page 49) stated: "Climate change is expected to exacerbate current stresses on water resources from population growth and economic and land-use change, including urbanization. On a regional scale, mountain snow pack, glaciers and small ice caps play a crucial role in freshwater availability. Widespread mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the 21st century, reducing water availability, hydropower potential, and changing seasonality of flows in regions supplied by meltwater from major mountain ranges (e.g. Hindu-Kush, Himalaya, Andes), where more than one-sixth of the world population currently lives."

This conclusion is robust, appropriate, and entirely consistent with the underlying science and the broader IPCC assessment. It has, however, recently come to our attention that a paragraph in the 938-page Working Group II contribution to the underlying assessment refers to poorly substantiated estimates of rate of recession and date for the disappearance of Himalayan glaciers. In drafting the paragraph in question, the clear and well-

established standards of evidence, required by the IPCC procedures, were not applied properly.

The Chair, Vice-Chairs, and Co-chairs of the IPCC regret the poor application of well-established IPCC procedures in this instance. This episode demonstrates that the quality of the assessment depends on absolute adherence to the IPCC standards, including thorough review of “the quality and validity of each source before incorporating results from the source into an IPCC Report”. We reaffirm our strong commitment to ensuring this level of performance.

First, as described in Response 2-3 below, this error concerns a single study, out of many that support the IPCC’s conclusions regarding glacier recession. Second, EPA does not refer to this projection in the Endangerment Finding or supporting material. We acknowledge that the TSD mentions Himalayan glaciers; Table 16.1 of Section 16(b) (“Overview of International Impacts”), highlighting “examples” of international impacts, states (U.S. EPA, 2009):

Glacier melt in the Himalayas is projected to increase flooding and rock avalanches from destabilized slopes and to affect water resources within the next two to three decades. This will be followed by decreased river flows as the glaciers recede.

This statement is entirely consistent with the IPCC’s statement in its Synthesis Report (on page 49) (IPCC, 2007b), cited above, which the IPCC notes is “robust, appropriate, and entirely consistent with the underlying science and the broader IPCC assessment.” EPA did not refer to a rate of recession or a timeframe in which the Himalayan glaciers would be gone.

This error represents one lapse in the deliberate preparation and review of a multi-volume assessment containing thousands of pages of findings and conclusions. Despite petitioners’ claims to the contrary, the timing of glacier recession in the Himalayas has no impact on the scientific support for EPA’s Endangerment Finding. As noted in Section 2.1.1, the Endangerment Finding states (Section III.D):

The Administrator looked first at impacts in the United States itself, and determined that these impacts are reasonably anticipated to endanger the public health and the welfare of the U.S. population. That remains the Administrator’s position, and by itself supports her determination of endangerment.

After careful review, the facts do not substantiate the petitioners’ assertion that this error undercuts EPA’s conclusion that the IPCC review process was ‘rigorous’ or that reliance on the IPCC, among other assessments, led to errors in EPA’s Endangerment Finding.

Comment (2-3):

The Southeastern Legal Foundation questions the IPCC claim that the conclusions regarding Himalayan glaciers presented in the AR4 Synthesis Report are “robust, appropriate, and entirely consistent with the underlying science and the broader IPCC assessment” despite the erroneous projection. The Southeastern Legal Foundation states: “The IPCC has now grudgingly retracted

the claim of imminent Himalayan glacier melt, though it claims the overall conclusions regarding glacial melt are robust. How their conclusions can be fake but accurate is not evident.”

Response (2-3):

Southeastern Legal Foundation is referring to the following conclusions in the IPCC’s 2007 Synthesis Report (IPCC, 2007b, page 49):

Climate change is expected to exacerbate current stresses on water resources from population growth and economic and land-use change, including urbanization. On a regional scale, mountain snow pack, glaciers and small ice caps play a crucial role in freshwater availability. Widespread mass losses from glaciers and reductions in snow cover over recent decades are projected to accelerate throughout the 21st century, reducing water availability, hydropower potential, and changing seasonality of flows in regions supplied by meltwater from major mountain ranges (e.g. Hindu-Kush, Himalaya, Andes), where more than one-sixth of the world population currently lives.

EPA has reviewed the complete discussion of this issue in the AR4, in the Synthesis Report, and in the contributions of Working Groups I (IPCC, 2007e) and II (IPCC, 2007g). The IPCC cites numerous studies that document Himalaya and other Asian glacier trends, projections, and impacts. For example, it references the following findings from a range of studies supporting its conclusion:

- Glaciers in the Asian high mountains have generally shrunk at varying rates (from Su and Shi, 2002; Ren et al., 2004; Solomina et al., 2004; Dyurgerov and Meier, 2005)—in IPCC Working Group I Chapter 4 (Lemke et al., 2007).
- The entire Hindu-Kush-Himalaya ice mass has decreased in the last two decades. Water supply in areas fed by glacial meltwater from the Hindu Kush and Himalayas, on which hundreds of millions of people in China and India depend, will be negatively affected (Barnett et al., 2005)—in IPCC Working Group II Chapter 3 (Kundzewicz et al., 2007).
- The Himalayan glacier Gangotri receded at an average rate of 7.3 meters every year from 1842 to 1935; from 1985 to 2001, it receded at a rate of 23 meters per year (Hasnain, 2002)—in IPCC Working Group II Chapter 10 (Cruz et al., 2007).
- Reductions in the mass of a sample of Northern Hemisphere glaciers (including several in Asia) of up to 60% are projected by 2050 (Schneeberger et al., 2003)—in IPCC Working Group II Chapter 3 (Kundzewicz et al., 2007).
- Rapid melting of glaciers can lead to flooding of rivers and the formation of glacial meltwater lakes, which may pose a serious risk of outburst floods (Coudrain et al., 2005)—in IPCC Working Group II Chapter 3 (Kundzewicz et al., 2007).

Thus, EPA finds that the single faulty projection highlighted by petitioners does not compromise the IPCC’s overall assessment of observed glacier loss, projected glacier loss, and the impacts of glacier loss on water resources in the Himalayas. Numerous studies document a general decline in Himalayan glacier mass, project substantial future declines, and discuss the impacts of these

changes on water resources and society, which is consistent with the conclusions drawn by the IPCC. The petitioner's claim implies that the IPCC conclusion in the Synthesis Report depends upon a single study, without which we are uncertain as to the fate and timing of Himalayan glacier melt. The full discussion of this issue by the IPCC clearly demonstrates that the petitioners' argument is flawed and that the IPCC's conclusions are well-supported by the scientific literature.

2.1.4 Characterization of Climate Change and Disaster Losses

Comment (2-4):

Some petitioners raise concerns with certain aspects of the IPCC's treatment of climate change and natural disasters. The Southeastern Legal Foundation asserts that the IPCC mischaracterized the findings of a non-peer-reviewed study (Muir-Wood et al., 2006) on climate change and disaster losses. It states that the IPCC reported that global warming was causing an increase in losses from weather disasters of 2% per year, even after controlling for economic growth, citing the Muir-Wood study even though that study had actually found no trend. Along with the Southeastern Legal Foundation, the Competitive Enterprise Institute refers to an article in the *Sunday Times* (Leake, 2010b) indicating that the IPCC wrongly linked climate change to natural disasters. Southeastern Legal Foundation finds:

The EPA Endangerment Finding relies heavily on the assertion that AGW [anthropogenic global warming] will cause extreme weather events to become more frequent and more severe and thus constitute a danger to human health and welfare—an essential element of the Finding. To support this assertion the Finding in turn relies heavily on the IPCC's reports on weather disasters.

Response (2-4):

To support the Endangerment Finding, EPA cited the potential impacts of climate change on the number and/or severity of certain extreme weather events, for which the Southeastern Legal Foundation levels no specific criticism. The TSD did not discuss the link between climate change and the historical trends in the economic magnitude of disaster losses. In responding to public comments on the issue (e.g., see Responses 7-5 and 7-38 in the Response to Comments [RTC] document), EPA acknowledged that many factors influence the economic losses caused by disasters which make it difficult to use historical data on trends in economic disaster loss to determine the impact of climate change on the losses from weather events in the past. Further, the Endangerment Finding is clear that the Administrator's decision was based on the physical and environmental impacts associated with climate change, and how they can affect the characteristics of weather events, not the link between climate change and disaster losses. As the Endangerment Finding states (Section I.A):

The evidence concerning how human induced climate change may alter extreme weather events also clearly supports a finding of endangerment, given the serious adverse impacts that can result from such events and the increase in risk, even if small, of the occurrence and intensity of events such as hurricanes and floods.

With respect to the Muir-Wood study, we neither cited nor relied upon it in our discussion of extreme events. In fact, our only specific reference to this study in the record for the Endangerment Finding is in Response 1-15 in the RTC documents, which addressed criticism of the IPCC's use of gray literature. The technical aspects of this study were not discussed because EPA did not focus on the relationship between climate change and the economic magnitude of disaster losses as underlying support for the Endangerment Finding. We note that the TSD did include a figure (TSD Figure 14.1) showing information on several factors, including one portion (panel e) on observed U.S. hurricane economic damages compared to a measure of Atlantic hurricane intensity. This figure was taken from the chapter on North America from Working Group II's contribution to the AR4 (Field et al., 2007, Figure 14.1); the TSD provides no commentary on the hurricane economic damages portion (panel e).

The controversy surrounding the relationship between climate change and economic losses from disasters did arise in public comments (e.g., see comments 7-5 and 7-38 in the RTC document), to which EPA provided measured, balanced responses consistent with the assessment literature. In comment 7-38, for example, the commenter argued that increasing raw damage totals associated with tropical storm (or hurricane) damage in coastal communities are not the result of climate change, but rather are caused by changes in coastal population, the wealth of the population, inflation, and poor sediment management practices. EPA responded:

EPA agrees that the interaction of a series of drivers adversely impacts coastal areas and can contribute to tropical storm damage totals. These drivers include changes in coastal population, wealth of the population, inflation, and sediment management practices.

EPA's response then focused on the physical impacts of climate change that suggest increased risk to the public from severe weather events, pointing to the following findings from the assessment literature:

- Superimposed on accelerated sea level rise, the present storm and wave climatology and storm surge frequency distributions suggest more severe coastal flooding and erosion hazards (Nicholls et al., 2007).
- Higher sea level provides an elevated base for storm surges to build upon and diminishes the rate at which low-lying areas drain, thereby increasing the risk of flooding from rainstorms (CCSP, 2009a).
- Apart from nonclimatic events such as tsunamis, extreme sea levels occur mainly in the form of storm surges generated by tropical or extra-tropical cyclones. There is evidence for an increase in extreme high sea level since 1975 based upon an analysis of 99th percentiles of hourly sea level at 141 stations over the globe (Bindoff et al., 2007).

We also noted: "USGCRP concludes that future increases in losses will be attributable to climate change with high confidence as climate change increases the frequency and intensity of many types of extreme weather (Karl et al., 2009)." EPA agrees with this conclusion regarding losses in the future—if climate change causes an increase in the frequency or intensity of certain severe weather events, then it follows that climate change could lead to increased losses compared with what would occur without the increase in those severe weather events. However,

EPA did not focus on historical trends in the magnitude of economic disaster losses to evaluate the likelihood that climate change would lead to an increase in the number or frequency of such weather events. For that reason, the charge that the IPCC mischaracterized reports on the implications of such historical trends does not materially affect the basis for EPA's Endangerment Finding.

For its part, the IPCC responded to the allegation that it mischaracterized the Muir-Wood study on climate change and disaster losses with an official statement (IPCC, 2010e). The IPCC stated, among other things, that the *Sunday Times* article cited by Southeastern Legal Foundation and the Competitive Enterprise Institute:

Incorrectly assumes that a brief section on trends in economic losses from climate-related disasters is everything the IPCC Fourth Assessment Report (2007) has to say about changes in extremes and disasters. In fact, the Fourth Assessment Report reaches many important conclusions, at many locations in the report, about the role of climate change in extreme events. The assessment addresses both observations of past changes and projections of future changes in sectors ranging from heat waves and precipitation to wildfires. Each of these is a careful assessment of the available evidence, with a thorough consideration of the confidence with which each conclusion can be drawn.

To summarize, petitioners do not properly characterize the information on which EPA relied in making the Endangerment Finding. Petitioners also mischaracterize the statements of the IPCC. The IPCC reasonably characterized the links between climate change and the projected increase in frequency and severity of severe weather events. The IPCC discussed the various types of evidence supporting this view, which include but are clearly not limited to consideration of the evidence for and against the ability to identify a climate change impact from the trend in economic magnitude of disaster losses, and the IPCC caveated its discussion of this issue. To support the Endangerment Finding, EPA cited the physical and environmental factors indicating that climate change would lead to an increase in frequency and severity of certain severe weather events. Only in response to public comments did EPA discuss what can be determined from analyses of past trends in disaster losses. Accordingly, EPA did not rely on a linkage between climate change and the economic magnitude of disaster losses to support the Endangerment Finding, and petitioners' arguments do not undermine the reasoning supporting EPA's Endangerment Finding.

Our response to a petitioner's specific claims regarding the Muir-Wood study is provided in Response 2-5, below.

Comment (2-5):

Southeastern Legal Foundation writes:

The IPCC reported that global warming was causing an increase in losses from weather disasters of 2% per year, even after controlling for economic growth, citing a non-peer reviewed study by Robert Muir-Wood. Yet the IPCC mischaracterized the study, which actually found no trend and expressly eschewed the proposition for which it was cited.

Muir-Wood *et al.* expressly caveated that the exceptionally strong hurricane seasons in 2004 and 2005 accounted for almost all of the 2% increase from 1970-2005.

Response (2-5):

First, while the version of the Muir-Wood *et al.* (2006) paper cited in the IPCC was not yet peer-reviewed, a subsequent version of this work was peer-reviewed and accepted for publication just weeks after the cutoff for inclusion in the IPCC, according to a statement by Risk Management Solutions (RMS), where Robert Muir-Wood is employed as a chief research officer. In a frequently asked questions document posted on its website (RMS, 2010), RMS states:

The research was conducted during the first half of 2006 and the full paper summarizing the results was peer reviewed and accepted for publication in November 2006. This was a few weeks outside of the cut-off date for the IPCC 4th Assessment Report in October, which is why an earlier summary version of the paper—written for a scientific workshop held in May 2006 and published in the conference proceedings in October 2006—was referenced (the IPCC can only cite published material). Despite not being able to reference it, the IPCC was aware of the full report and that it had been accepted for publication before the 4th Assessment Report was finalized.

While the paper was completed and accepted for publication in November 2006, delays in publication meant that it did not officially appear as a book chapter until 2008.

Second, the same frequently asked questions document (RMS, 2010) indicates that the IPCC did not mischaracterize the results of the paper:

RMS believes the IPCC fairly referenced its paper, with suitable caveats around the results, highlighting the factors influencing the relationship that had been discovered between time and increased catastrophe costs. We believe it was appropriate to include the RMS paper in the report because, at that time, it was the only paper addressing global multi-peril catastrophe losses over time that had been normalized for changes in the values and exposure at risk.

Thus, we find the study to be valid. As discussed in Response 1-15 of the RTC document, the use of non-peer-reviewed literature is allowed under IPCC procedures. In this case, the paper was clearly a reasonable reference and was ultimately peer-reviewed. We further find the petitioner's discussion of the caveats in the Muir-Wood paper to be potentially misleading. The petitioner claims that "the IPCC mischaracterized the study" and states in the next sentence that "Muir-Wood *et al.* expressly caveated that the exceptionally strong hurricane seasons in 2004 and 2005 accounted for almost all of the 2% increase from 1970-2005." This could give the impression that the IPCC does not provide such caveats. An examination of the discussion in Working Group II's contribution to the IPCC AR4, however, reveals that it also caveats the 2% increase, stating (Rosenzweig *et al.*, 2007): "The significance of the upward trend is influenced by the losses in the USA and the Caribbean in 2004 and 2005 and is arguably biased by the relative wealth of the USA, particularly relative to India."

Comment (2-6):

Background: Southeastern Legal Foundation cites the following IPCC expert reviewer comment (IPCC, 2006c), which was submitted while the Working Group II report was in preparation and pertains to the IPCC's characterization of climate change and disaster losses and the Muir-Wood et al. (2006) study:

I think this is inappropriate. It leads the reader into interpreting recent events in a particular way without providing supporting information. This suggestion, that the losses in 2004 and 2005 draw Pielke's results into question, needs to be supported with a reference or a solid in-chapter assessment. What does Pielke think about this? (Francis Zwiers, Canadian Centre for Climate Modelling and Analysis)

According to Roger Pielke Jr. (Pielke, 2010a), a professor of environmental studies at the University of Colorado, the expert reviewer, Zwiers, is referring to this passage in the AR4 (Rosenzweig et al., 2007):

A previous normalisation of losses, undertaken for U.S. hurricanes by Pielke and Landsea (1998) and U.S. floods (Pielke et al., 2002) included normalising the economic losses for changes in wealth and population so as to express losses in constant dollars. These previous national U.S. assessments, as well as those for normalised Cuban hurricane losses (Pielke et al., 2003), did not show any significant upward trend in losses over time, but this was before the remarkable hurricane losses of 2004 and 2005.

The IPCC writing team responded to the Zwiers comment with the following: "I believe Pielke agrees that adding 2004 and 2005 has the potential to change his earlier conclusions – at least about the absence of a trend in US Cat losses" (IPCC, 2006c).

Comment: The Southeastern Legal Foundation claims that "The IPCC knew from the comments of reviewers that their use of the [Muir-Wood] study was wrong before the report was published." Citing a blog post from Roger Pielke Jr., Southeastern Legal Foundation suggests the IPCC fabricated its response to the expert reviewer, Zwiers:

The IPCC reviewer had asked "What does Pielke think about this?" The answer given was a fabrication, according to Pielke, Jr. As he commented on his blog, "[N]ot only did the IPCC AR4 WGII egregiously misrepresent the science of disasters and climate change, but when questions were raised about that section by at least one expert reviewer, it simply made up a misleading and false response about my views."

Response (2-6):

It is unfortunate that Dr. Pielke found that his views were misrepresented by the IPCC. EPA cannot speculate how or why this happened. Dr. Pielke had the opportunity to comment on the IPCC's draft treatment of these issues as a reviewer, but did not. (He is officially listed as an IPCC Working Group II expert reviewer for the United States in Appendix III of the IPCC AR4 Working Group II report (IPCC, 2007f).

The representative for the IPCC's author team wrote "I believe Pielke agrees," which suggests a possible honest misunderstanding of Dr. Pielke's views. This incident certainly does not support the petitioner's contention that the IPCC "knew" that its use of the Muir-Wood study was wrong. In fact, as discussed in the previous response (2-5), it is not at all clear that the study was wrong or was used inappropriately by the IPCC in any way.

At the time the Muir-Wood et al. study was completed in 2006, it was the only global analysis we are aware of that included 2004 and 2005 data. While it is true that Pielke Jr.'s remarks from the Seventh Annual Roger Revelle Commemorative Lecture contained an analysis of normalized Atlantic hurricane damages through 2005 and were published in *Oceanography* (Pielke, 2006), those remarks were not assessed by the IPCC, likely because they were presented as a lecture rather than a scientific study. Much of the scientific content of Dr. Pielke's talk was subsequently peer-reviewed and published in 2008 (Pielke et al., 2008), but this was well after the IPCC deadline for inclusion in the AR4. Furthermore, whereas Dr. Pielke's 2006 analysis in *Oceanography* limited its focus to Atlantic hurricanes, the Muir-Wood analysis was multi-hazard and global.

Thus, while the IPCC may have made mistaken assumptions about Dr. Pielke's views, its reliance on the Muir-Wood et al. (2006) study was reasonable, as that study contained the latest and most relevant published global analysis.

Comment (2-7):

The Southeastern Legal Foundation states that EPA's Response 1-15 (in Volume 1 of the RTC document, concerning the use of non-peer-reviewed literature) did not respond to the substance of the comment concerning the IPCC's and Climate Change Science Program's (CCSP's) misrepresentation of the literature and the central underlying point that there was no legitimate evidence that manmade climate change was causing an increase in weather disasters.

The Southeastern Legal Foundation notes: "This comment showed that both the IPCC and especially the CCSP had fraudulently asserted that AGW was causing increased frequency and severity of extreme weather events." It provides the following excerpt from the comment (3303):

In 2007 the IPCC released its Fourth Assessment Report and it relied on the single non-peer reviewed Muir-Wood (2006) [9] study cherry-picked from the Hohenkammer workshop as the single study to highlight in its review of this topic. [12] The same critique of the Stern report's reliance on this Muir-Wood study above applies to the IPCC's reliance on it as well. Further, the IPCC included a graph [13] attempting to show how closely temperature anomalies match up with disaster losses, using a scaling of the axes to suggest a relationship where none has been shown in the peer-reviewed literature. Again it relies on Muir-Wood (2005). Coincidentally, Robert Muir-Wood, of Risk Management Solutions, Inc., was an author of the chapter of the IPCC report that selectively highlighted his own non-peer reviewed work.

The US Climate Change Science Program systematically and repeatedly misrepresented the science of disasters and climate change. First, the CCSP US extremes report [14] miscited several of Roger Peilke's papers in support of claims that they did not make and

relied on Mills 2005 as the definitive source on this topic. [16] The disasters and climate change section of this CCSP report is also a fact checker's nightmare. Second the CCSP draft Synthesis report and final Synthesis report [15] relied on non-peer reviewed work by Evan Mills and ignored relevant peer reviewed research showing different results (in fact all peer reviewed research points in the same direction on this subject). Coincidentally, Evan Mills was an author of the CCSP Synthesis Report that highlights his own non-peer reviewed work. Mills also apparently consults for companies with an interest in climate policies, and yet this was not disclosed by the CCSP.

It then cites EPA's response (RTC 1-15):

The commenter describes two pieces of literature that were referenced by IPCC but not published in peer reviewed journals: 1) a natural catastrophes report by Munich Re (2000) that was cited in IPCC Third Assessment Report (IPCC, 2001), and 2) a paper on trends in weather-related catastrophes by Muir-Wood et al. (2006). The identification of only two examples out of the thousands of references cited in the IPCC (2000) and (2007) reports provides more support for the rigor of the IPCC process. Further, these specific studies were neither the central nor sole evidence used in forming the broader conclusions of the IPCC; such broader conclusions are based on multiple lines of evidence and peer-reviewed literature.

On the basis of EPA's response, the Southeastern Legal Foundation concludes:

It is a very peculiar logic that treats proof of what appears to be scientific fraud as demonstrating "the rigor of the IPCC's process." No response whatsoever is made to the substance of the comment concerning the CCSP's misrepresentation of the literature and the central underlying point that there was no legitimate evidence that manmade climate change was causing an increase in weather disasters. The question naturally arises as to why the EPA avoided these points. One of the lead authors of the CCSP report so vigorously attacked in Comment 3303 is Thomas Wilbanks, of the DOE Oak Ridge National Laboratory. The same Thomas Wilbanks was a Federal expert reviewer for the TSD. TSD p. 2. Thus, the EPA ignored and avoided the substance of a comment that pointed out that a report of which one of its expert reviewers was a lead author had "systematically and repeatedly misrepresented the science of disasters and climate change."

Response (2-7):

First, EPA's RTC document, Volume 1, covers EPA's "General Approach to the Science and Other Technical Issues," not the substantive issues pertaining to climate change and disaster losses. Those issues are discussed in RTC Volume 7, "Water Resources, Coastal Areas, and Ecosystems and Wildlife." Specifically, RTC 7-38 address substantive issues pertaining to climate change and disaster losses raised by commenters (as does RTC 7-5) as discussed in Response 2-4 above. Accordingly, EPA's commentary on the Muir-Wood literature in Volume 1 focuses on process issues, and the scientific issues are addressed in Volume 7.

Furthermore, as we indicate in Response 2-5 above, a subsequent version of Muir-Wood et al. (2006) was, in fact, peer-reviewed and accepted for publication just weeks after the IPCC cutoff according to RMS. Irrespective of the peer review issue, we reiterate our conclusion from RTC 1-15: "...these specific studies were neither the central nor sole evidence used in forming the broader conclusions of the IPCC; such broader conclusions are based on multiple lines of evidence and peer-reviewed literature." The magnitude of observed disaster losses from extreme events in general, and the Muir-Wood study in particular, were not central to EPA's Endangerment Finding.

We discuss allegations that the IPCC misrepresented the literature on observed climate change and disaster losses in Response 2-5. With respect to the "graph [13, IPCC Supplementary Material Figure SM1.1, Working Group II AR4, 2007] attempting to show how closely temperature anomalies match up with disaster losses" referred to in the cited comment (3303) above, we note that said graph was not cited or relied upon in the Endangerment Finding and, furthermore, that it did not appear in the main IPCC Working Group II report but in supplementary material. We acknowledge this graph is controversial. RMS, for example, stated the following in its frequently asked questions document pertaining to climate change and disaster losses (RMS, 2010):

A graph showing averaged global temperature and averaged catastrophe loss since 1970 was included in supplementary material rather than the IPCC report itself and was not itself published. RMS believes that the graph could be misinterpreted and should not have been included in these materials.

Despite this statement, the inclusion of one controversial graph in supplementary material does not compromise the IPCC's credibility or legitimacy.

The charges that CCSP (and hence USGCRP) miscited and misrepresented Roger Pielke Jr.'s work, over-relied on the work of Evan Mills, and ignored some other studies on the issue of climate change and disaster loss are difficult to assess as they were made in blog posts (of Roger Pielke Jr. (Pielke, 2010b)), represent the perspective of one individual (Roger Pielke Jr.), and have not been published in any official capacity (e.g., in the peer-reviewed literature). However, they do not materially affect the basis for EPA's Endangerment Finding. Dr. Pielke himself stated: "...I am of the view that the Obama Administration is perfectly justified in advancing the [Endangerment] finding" (Pielke, 2010b). As we state in Response 2-4, EPA did not focus on historical trends in the magnitude of economic disaster losses to evaluate the likelihood that climate change would lead to an increase in the number or frequency of extreme weather events. Furthermore, in RTC 7-5 we cite the CCSP (2008) statement acknowledging that the relative contribution of climate change and socioeconomic vulnerability (to weather and climate extremes) to observed increases in disaster costs are "subject to debate."

Finally, the fact that Robert Muir-Wood and Evan Mills were selected as authors for chapters in the IPCC and CCSP, respectively, and may have cited their own work does not delegitimize these assessments or their findings. Rather, it is only appropriate that leading experts on these topics—familiar with the range of literature—would be asked to assist in these assessments. Petitioners provide no evidence to support the allegation that Evan Mills' work was

compromised or biased; speculating that he “apparently” does consulting for companies “with an interest in climate policies” is innuendo, not proof.

Lastly, the fact that Thomas Wilbanks was an expert reviewer for EPA’s TSD (U.S. EPA, 2009) and was lead author of a report that the petitioner alleges “systematically and repeatedly misrepresented the science of disasters and climate change” is irrelevant. As we state in Response 2-4, EPA did not discuss observed climate change and disaster losses in the TSD. Thus, though we discuss some of CCSP’s conclusions in RTC 7-5 and 7-38 that focus on the challenges in linking observed climate change and disaster losses, CCSP’s treatment of this issue was not and is not materially relevant to the Endangerment Finding. Furthermore, the petitioner does not present evidence Wilbanks played any role in the presentation of material on this issue. Thus, the charge that EPA “ignored and avoided” the substance of the comment on disasters and climate change because of Wilbanks is unsupported and false. EPA relied on a team of federal experts to ensure that EPA was correctly synthesizing the existing assessment literature in the TSD. As RTC 1-10 states:

...the purpose of the federal expert review was to ensure that the TSD accurately summarized the conclusions and associated uncertainties from the assessment reports. The federal experts were ideal candidates because they have contributed significantly to the body of climate change literature and played active roles in IPCC and CCSP—therefore making them experts on various aspects of climate science and very familiar with the underlying literature and state of the science. Furthermore, the federal climate change experts represent a range of technical specialties that span the range of topics covered in the TSD and covered by the range of topics that the Administrator needed to consider. In addition, the federal experts were not involved with developing the TSD or Findings in any way other than their review roles.

Petitioners are making a very serious accusation—that “what appears to be scientific fraud” occurred—without providing supporting scientific evidence. Instead, they mischaracterize EPA’s actions in claiming that disaster losses are central to the Endangerment Finding when they clearly are not. They mischaracterize EPA’s treatment of comments on the proposed Endangerment Finding by implying that we did not address the issues surrounding disaster losses, when the issue is clearly addressed in the appropriate volume of the RTC. And they impugn the integrity of several scientists, on the basis of speculation not evidence, seemingly for no other reason than that they disagree with the conclusions of the assessment literature.

2.1.5 Validity of Alps, Andes, and African Mountain Snow Impacts

Comment (2-8):

Several petitioners (the Competitive Enterprise Institute, the Ohio Coal Association, Peabody Energy, the State of Texas, and the Southeastern Legal Foundation) argue that claims of glacier melt in the Andes, the Alps, and parts of Africa arise from anecdotal comments in a magazine article and a master thesis. They challenge the IPCC’s use of this non-peer-reviewed literature, suggesting the findings may be suspect. The Southeastern Legal Foundation states: “The EPA should reconsider its reliance on the IPCC’s reporting now that the IPCC’s conclusion has been shown to be so poorly supported.”

Response (2-8):

The citations referred to by petitioners regarding the reduction of mountain ice in the Andes, Alps, and Africa are actually references to “loss of ice climbs,” not assessments of mountain glacier retreat. Loss of ice climbs is an example of the observed effects of warming on the ice-covered areas of the Earth. In this context, these citations are appropriate and within the IPCC’s guidelines on the use of so-called gray literature. They provide additional evidence consistent with the well-supported peer-review conclusions that snowpack is declining in many places and that glaciers are melting worldwide. Note that we respond to petitioners’ broader claims regarding the IPCC’s use of gray literature in Subsection 2.2.4.4.

Furthermore, as the finding in question pertains to indicators outside the United States, the petitioners’ claims are not relevant to the Endangerment Finding. As noted in Subsection 2.1.1, the Endangerment Finding states (Section III.D): “The Administrator looked first at impacts in the United States itself, and determined that these impacts are reasonably anticipated to endanger the public health and the welfare of the U.S. population. That remains the Administrator’s position, and by itself supports her determination of endangerment.”

EPA did not rely on these specific references or refer to “loss of ice climbs” as an indicator of climate change. Our primary focus was on the implications of climate change for the United States, and we relied on peer-reviewed literature to assess these impacts. We did not refer to this specific issue in either the TSD or the Endangerment Finding, and we did not include any discussion on “loss of ice climbs.” The TSD does include discussion of mountain glacier retreat, based on peer-reviewed literature, which the petitioners do not critique.

2.1.6 Validity of Amazon Rainforest Dieback Projection

Comment (2-9):

Several petitioners (the Competitive Enterprise Institute, the Ohio Coal Association, Peabody Energy, the State of Texas, the Southeastern Legal Foundation) challenge the IPCC’s statement that “[U]p to 40% of the Amazonian forests could react drastically to even a slight reduction in precipitation,” alleging that it arises from gray literature and cannot be substantiated. The Southeastern Legal Foundation states that the source for the IPCC’s statement, Nepstad et al. (1999) from the journal *Nature*, “does not support the IPCC’s assertion”. Peabody states that “the *Nature* article does not contain the 40% figure” and “the provenance of the IPCC’s striking ‘40%’ figure is uncertain.” The Competitive Enterprise Institute finds that “the IPCC claim that the findings in AR4 are based on peer reviewed science is false.”

Response (2-9):

First, we note that this issue is not discussed anywhere in the TSD or Endangerment Finding, and is thus of little relevance to the Finding. Second, while we agree that the IPCC cited gray literature in this case—i.e., Rowell and Moore (2000), a report of the World Wildlife Federation—we note that the underlying studies supporting the Rowell and Moore report are, in fact, peer-reviewed.

In response to the publicity surrounding this purportedly unsubstantiated finding in the IPCC AR4, Daniel Nepstad—a senior scientist at Woods Hole Research Center and author of the study (Nepstad et al., 1999) that contained the finding referred to by Rowell and Moore—issued a statement on this matter. In the statement, he noted that the citations listed in the Rowell and Moore report were incomplete but that the AR4’s statement on Amazon forest susceptibility to rainfall reduction was correct. Here is the relevant excerpt from his statement (Nepstad, 2010):

The IPCC statement on the Amazon is correct, but the citations listed in the Rowell and Moore report were incomplete. (The authors of this report interviewed several researchers, including the author of this note, and had originally cited the IPAM website where the statement was made that 30 to 40% of the forests of the Amazon were susceptible to small changes in rainfall). Our 1999 article (Nepstad et al. 1999) estimated that 630,000 km² of forests were severely drought stressed in 1998, as Rowell and Moore correctly state, but this forest area is only 15% of the total area of forest in the Brazilian Amazon. In another article published in *Nature*, in 1994, we used less conservative assumptions to estimate that approximately half of the forests of the Amazon depleted large portions of their available soil moisture during seasonal or episodic drought (Nepstad et al. 1994). After the Rowell and Moore report was released in 2000, and prior to the publication of the IPCC AR4, new evidence of the full extent of severe drought in the Amazon was available. In 2004, we estimated that half of the forest area of the Amazon Basin had either fallen below, or was very close to, the critical level of soil moisture below which trees begin to die in 1998. This estimate incorporated new rainfall data and results from an experimental reduction of rainfall in an Amazon forest that we had conducted with funding from the US National Science Foundation (Nepstad et al. 2004). Field evidence of the soil moisture critical threshold is presented in Nepstad et al. 2007.

Specifically, we note that the Nepstad et al. (2004) study states: “Increases in ET [evapo-transpiration] of only 15% or similar reductions in rainfall can lead to severe soil moisture deficits over roughly half of the Amazon.” This statement certainly is consistent with the statement “Up to 40% of the Amazonian forests could react drastically to even a slight reduction in precipitation” in the IPCC AR4.

Nepstad’s 2010 statement in response to this controversy reached the following conclusion (Nepstad, 2010):

In sum, the IPCC statement on the Amazon was correct. The report that is cited in support of the IPCC statement (Rowell and Moore 2000) omitted some citations in support of the 40% value statement.

Similarly, in its report *Assessing an IPCC Assessment*, PBL (2010a) identified a problem with the IPCC’s referencing of this finding, but not the finding itself. It states:

More adequate peer-reviewed, scientific journal literature would have been available to support this statement, such as Cox et al. (2000; 2004) (C6). This minor comment has no consequences for the IPCC conclusions in the various Summaries for Policymakers.

Finally, the United Kingdom's *Sunday Times* newspaper, which reported the alleged problem with the IPCC's representation of this issue on January 31, 2010 (Sunday Times, 2010), has subsequently reversed itself, arriving at the same conclusion as Nepstad. Consequently, it removed the article from its website and printed a correction on June 20, 2010 (Sunday Times, 2010), which stated in part:

The article "UN climate panel shamed by bogus rainforest claim" (News, Jan 31) stated that the 2007 Intergovernmental Panel on Climate Change (IPCC) report had included an "unsubstantiated claim" that up to 40% of the Amazon rainforest could be sensitive to future changes in rainfall. The IPCC had referenced the claim to a report prepared for the World Wildlife Fund (WWF) by Andrew Rowell and Peter Moore, whom the article described as "green campaigners" with "little scientific expertise." The article also stated that the authors' research had been based on a scientific paper that dealt with the impact of human activity rather than climate change.

In fact, the IPCC's Amazon statement is supported by peer-reviewed scientific evidence. In the case of the WWF report, the figure had, in error, not been referenced, but was based on research by the respected Amazon Environmental Research Institute (IPAM) which did relate to the impact of climate change. We also understand and accept that Mr Rowell is an experienced environmental journalist and that Dr Moore is an expert in forest management, and apologise for any suggestion to the contrary.

To summarize, contrary to the assertions of the petitioners, though the IPCC may have not adequately referenced the Amazon finding, the basis for its statement originated from and is supported by peer-reviewed literature. Furthermore, as this finding is specific to the Amazon region, petitioners' claims are not relevant to the Endangerment Finding. As noted in Subsection 2.1.1, the Endangerment Finding states (Section III.D): "The Administrator looked first at impacts in the United States itself, and determined that these impacts are reasonably anticipated to endanger the public health and the welfare of the U.S. population. That remains the Administrator's position, and by itself supports her determination of endangerment."

For further discussion on petitioners' broader claims regarding the IPCC's use of gray literature, please refer to Subsection 2.2.4.4.

2.1.7 Validity of African Rain-Fed Agriculture Projection

The comments and responses in this section refer to the following statement pertaining to crop yields in Africa from Chapter 9 of Working Group II's contribution to the IPCC AR4 (Boko et al., 2007):

In other countries [of Africa] additional risks that could be exacerbated by climate change include greater erosion, deficiencies in yields from rain-fed agriculture of up to 50% during the 2000-2020 period, and reductions in the crop growth period (Agoumi, 2003).

A version of this statement appeared in the IPCC's AR4 Synthesis Report (IPCC, 2007b):

By 2020, in some countries, yields from rain-fed agriculture could be reduced by up to 50%. Agricultural production, including access to food, in many African countries is projected to be severely compromised. This would further adversely affect food security and exacerbate malnutrition.

A similar statement also appeared in the IPCC's AR4 Working Group II Summary for Policymakers (IPCC, 2007c):

Agricultural production, including access to food, in many African countries and regions is projected to be severely compromised by climate variability and change. The area suitable for agriculture, the length of growing seasons and yield potential, particularly along the margins of semi-arid and arid areas, are expected to decrease. This would further adversely affect food security and exacerbate malnutrition in the continent. In some countries, yields from rain-fed agriculture could be reduced by up to 50% by 2020.

The same statement (from IPCC, 2007c) was incorporated into EPA's TSD (U.S. EPA, 2009) within Table 16.1: "Examples of Key Regional Impacts as Identified by IPCC."

Comment (2-10):

The Competitive Enterprise Institute, the Ohio Coal Association, Peabody Energy, and the Southeastern Legal Foundation take issue with a statement in Section 16(b) of the TSD that: "In some countries, yields from rain-fed agriculture could be reduced by up to 50% by 2020." They claim the statement originated from gray literature in the IPCC AR4 and is therefore illegitimate. Southeastern Legal Foundation concludes: "The African Crop Yields claim stands as another example of the IPCC making a claim of imminent disaster that inappropriately relied on non-peer-reviewed literature..."

Response (2-10):

The IPCC statement cites a report by Dr. Ali Agoumi, a climate expert from Morocco (Agoumi, 2003) that was published by the International Institute for Sustainable Development (IISD) and funded by the government of Canada, the U.S. Agency for International Development, and other public and private institutions. Based on EPA's review of the report, it appears that the 50% number was not obtained from the peer-reviewed literature but rather from "vulnerability studies on three North African countries (Algeria, Morocco and Tunisia) with respect to climatic changes." These vulnerability studies were prepared under the U.N. Environment Programme Global Environment Fund and included in the National Communications of these three countries to the U.N. Framework Convention on Climate Change (Ministry of Territory Development and Environment, 2001, Kingdom of Morocco, 2001 and Republic of Tunisia, 2001).

In response to publicity regarding this purportedly unsubstantiated statement in the IPCC report, Dr. Coleen Vogel, a contributing lead author of the IPCC chapter on Africa impacts, described the context in which Dr. Agoumi's research was used. She explained that Agoumi's report received rigorous scrutiny by her fellow authors and was thoroughly discussed during development of the chapter (Kretzmann, 2010). She explained that the decision to include this (gray literature) study was based on the paucity of peer-reviewed material relating to some parts

of the world, particularly Africa, and the desire of the authors of the report to provide balanced information. The process described by Dr. Vogel is consistent with the IPCC's guidance on the use of gray literature, as previously described in Volume 1 of the RTC document and further discussed in Subsection 2.2.4.4 of this Response to Petitions (RTP) document.

Finally, we note that this statement relates to impacts outside the United States, and it did not materially impact the determination of endangerment of public health and welfare in the United States. As noted in Subsection 2.1.1, the Endangerment Finding states (Section III.D): "The Administrator looked first at impacts in the United States itself, and determined that these impacts are reasonably anticipated to endanger the public health and the welfare of the U.S. population. That remains the Administrator's position, and by itself supports her determination of endangerment."

Comment (2-11):

Referring to an analysis published by Ben Pile, co-editor of the blog climateresistance.org (on the blog of Roger Pielke, Jr.) (Pile, 2010), the Southeastern Legal Foundation states that the primary reference supporting the IPCC's statement on African crop yields "Vulnerability of North African Countries to Climatic Changes" (Agoumi, 2003) was from IISD, an advocacy group.

Regarding the IISD reference, Peabody Energy states:

Thus, the EPA based its findings on the IPCC WGII report, which based its findings on a report [the IISD report] published by an organization with a declared political interest in climate change that based its findings from an assessment of other non-peer reviewed national studies. This is not the way EPA science should be carried out.

Response (2-11):

The implication that the credibility of IPCC's statement on African crop yields is diminished because the IPCC's source (Agoumi, 2003) for the statement was published by an advocacy organization or an organization with a "declared political interest in climate change" is unsupported. The organization in question is IISD, which describes itself as follows:

The International Institute for Sustainable Development contributes to sustainable development by advancing policy recommendations on international trade and investment, economic policy, climate change, measurement and indicators, and natural resource management. By using Internet communications, we report on international negotiations and broker knowledge gained through collaborative projects with global partners, resulting in more rigorous research, capacity building in developing countries and better dialogue between North and South.

IISD's vision is better living for all—sustainably; its mission is to champion innovation, enabling societies to live sustainably. IISD receives operating grant support from the Government of Canada, provided through the Canadian International Development Agency (CIDA) and Environment Canada, and from the Province of Manitoba. The institute receives project funding from the Government of Canada, the Province of

Manitoba, other national governments, United Nations agencies, foundations and the private sector. IISD is registered as a charitable organization in Canada and has 501(c)(3) status in the United States.

We find no reason to question the credibility and legitimacy of information produced by this organization on the basis of either its mission or funding sources. Moreover, neither the Southeastern Legal Foundation nor Peabody Energy provide any support for the implication that work by an organization such as IISD is automatically suspect or flawed.

Finally, Peabody Energy's statement that EPA's findings are based on this material is incorrect. As noted in Subsection 2.1.1, the Endangerment Finding states (Section III.D): "The Administrator looked first at impacts in the United States itself, and determined that these impacts are reasonably anticipated to endanger the public health and the welfare of the U.S. population. That remains the Administrator's position, and by itself supports her determination of endangerment."

We discuss the legitimacy of the science and underlying references for the African crop yields statement in Response 2-12.

Comment (2-12):

The Southeastern Legal Foundation alleges that EPA uncritically adopted the IPCC's "faulty conclusion" with respect to crop yields. It refers to a blog by writer/commentator Richard North (North, 2010) to conclude the Agoumi (2003) reference cited by the IPCC on the issue of rain-fed agricultural yields in Africa relies on studies that "do not support the proposition for which they are cited."

Relying on Richard North's blog, the Southeastern Legal Foundation summarizes the vulnerability studies cited by Agoumi (2003) from the National Communications of Morocco, Tunisia, and Algeria. The Southeastern Legal Foundation notes that the Morocco National Communication "lends some support [to the Agoumi reference], saying that by 2020 during drought conditions cereal yields would decline up to 50%" but that "the data apply to cereal yields only, not crops in general as is implied by the IPCC." The Southeastern Legal Foundation further states that "Algeria's report said their yields would double, and be trimmed only slightly by 'climate change'" and "Tunisia's submission concluded the picture was mixed, but they could have an increase in rain and agricultural production."

Response (2-12):

The IPCC's statement on rain-fed agriculture in Northern Africa is not "faulty" and the Southeastern Legal Foundation presents no evidence that it was included uncritically in EPA's TSD. Furthermore, the Southeastern Legal Foundation's portrayal of findings on climate and crop yields from the National Communications of Morocco, Tunisia, and Algeria derived from Richard North's blog is not complete. When all of the information in these National Communications is considered, we find there is broad support for Agoumi's (2003) statements on North African rain-fed agriculture, which are:

- “Some of the key statistics regarding water, soil, urban areas and coastal zones are outlined below. . . . Decreasing rain-based agricultural yields with grain yields reduced by up to 50 percent in periods of drought.”
- “Studies on the future of vital agriculture in the region have shown the following risks, which are linked to climate change: . . . deficient yields from rain-based agriculture of up to 50 percent during the 2000–2020 period.”

PBL, in its report *Assessing an IPCC Assessment* (PBL, 2010a), makes the following important point with respect to IPCC’s statement on rain-fed agriculture in Africa:

This statement is not directly a statement on climate change, but on climate variability: in individual years, droughts can cause up to 50% in yield reductions. The implicit message here is that when droughts would become more frequent due to climate change, more years with up to 50% in yield reductions would occur. The statement could easily mislead readers into thinking that average annual yields could be reduced by up to 50% due to climate change. In the Summary for Policymakers of the Working Group II Report, the paragraph that contains this statement starts with a sentence introducing the notion of climate variability, which puts the statement more into context.

It is possible that petitioners misinterpreted the IPCC’s statement as suggesting that the IPCC’s projection was on the basis of climate change alone, given the Southeastern Legal Foundation’s assertion, for example, that IPCC was projecting “imminent disaster.” While we agree with PBL that the IPCC’s statement could easily mislead readers without the proper context, we note that, before quoting the IPCC’s projection on rain-fed agriculture, EPA’s TSD includes the statement “Agricultural production, including access to food, in many African countries and regions is projected to be severely compromised by **climate variability** [emphasis added] and change.” Therefore, EPA provided the proper context for the IPCC’s conclusion.

With respect to the basis for the conclusion itself, the following excerpts from the three countries’ National Communication reports on the issues of climate variability and change, precipitation, and crop yields provide broad support for the Agoumi (2003) statements along with accompanying discussion:

- The National Communication of Morocco states (Kingdom of Morocco, 2001):

The development of climate scenarios for Morocco according to IPCC methodology reveals the following results: . . .

- A trend towards a decrease in average annual rainfall volume by about 4% in 2020 compared to 2000 levels. . . .
- An increase in the frequency and intensity of droughts in the south and the east of the country.

The first quantitative estimate of possible CC [climate change] impacts on water resources in 2020 points to the fact that there would be an average and general decrease in water resources (in the order of 10 to 15 %...).

The study of CC [climate change] impacts on agriculture (dominated by cereal cultivation) in 2020 unfolds the following results: A decrease in cereal yields by 50% in dry years and 10% in normal years.

As the Southeastern Legal Foundation admits, the numbers from Morocco's National Communication lend support to the statement in Agoumi (2003) that "studies on the future of vital agriculture in the region have shown the following risks, which are linked to climate change: . . . deficient yields from rain-based agriculture of up to 50 per cent during the 2000–2020 period."

Richard North's contention (North, 2010, as referred to by the Southeastern Legal Foundation) that "the data apply to cereal yields only, not crops in general as is implied by the IPCC" is arguable considering that Morocco's National Communication indicates that agriculture is "dominated by cereal cultivation." Thus, it is not unreasonable to use cereal cultivation as a proxy for all of agriculture in this cereal-crop-dominated region.

- The National Communication of Algeria (Ministry of Territory Development and Environment, 2001) states:¹

Because of global warming, we must brace ourselves for chronic climate instability and greater frequency of droughts and floods. Droughts damage soils and floods destroy ground cover and contribute to the erosion of soils. With longer spans of time between dry and wet spells comes an even greater impact due to erosion. The southern regions of the country will be most directly impacted by increased temperatures and will be subject to the numerous consequences of accelerated desertification. The increased risk of drought presents the greatest challenge as a result of climate change. The Intergovernmental Panel on Climate Change (IPCC) expect that the desert regions will extend northward in the Maghreb.

The above text provides a clear qualitative description of the risks climate change pose to agriculture in Algeria. In addition, this information from the National Communication of Algeria provides quantitative output from a model known as CROPWAT, which estimates changes in crop yields using climate change projections obtained from two general circulation models. The National Communication of Algeria reports:

... one can consider an average reduction in the output cereal of about 5.5 to 6.8%, corresponding mainly to instances of climate change [in 2020](Ministry of Territory Development and Environment, 2001)

¹ The excerpt that follows was professionally translated from French.

When considering these quantitative cereal yield changes, it is very important to note that these percentages refer to changes in cereal yields resulting primarily from climate change alone and not *climate variability and change* combined. The climate and hence precipitation variability in northern Africa can be quite large. For example, in the report *Assessing an IPCC Assessment* (PBL, 2010a), PBL states "...the [IPCC] authors made plausible that, due to current climate variability, the yields in Algeria, Morocco and Tunisia have been varying annually, including yield reductions of nearly 70% in individual years, in the period between 2000 and 2006."

In other words, if these yield reductions resulting from greenhouse gas-induced climate change were superimposed on the yield reductions that might occur during a particularly dry period arising from the region's characteristic precipitation variability, they would be higher and comparable with the results from the Morocco National Communication.

Finally, the Southeastern Legal Foundation's reference to the Algeria National Communication's projections for net increases in cereal projections in 2020 (relative to prior decades) is irrelevant and misleading. These increases are related not to climate variability and change but to changing agricultural practices and technology. Algeria's National Communication makes clear that the effect of climate change on cereal yields is projected to be negative.

- The National Communication of Tunisia states (Republic of Tunisia, 2001):

...Tunisia is in a hydrous stress situation close to a shortage, sharpened by a high anthropic pressure. So minor they be, the Climate Changes can so, result in harmful consequences on water resources, on ecosystems depending of water, and on the different economic activities that need large quantities of water such as agriculture and tourism.

By modifying the evaporation and precipitation rate, the global warming will probably affect the hydrous climate balance and therefore the Tunisian water resources. In this way, if the intensification of the evaporation can lead to a possible important increase of the rain falls, it might not be sufficient to offset the decrease of the sweet water resources. Moreover, due to the global warming, the rain situation can be characterized by a bigger frequency of rains resulting from torrential storms and downpours, disappearing generally in streaming waters rather than be absorbed by the soils.

This information in the Tunesian National Communication does not provide any quantitative estimates of climate variability and/or change on rain-fed agriculture, but the clear qualitative implication is that climate changes—both drought and heavy precipitation events—will stress agriculture in Tunisia. We, therefore, find that the Southeastern Legal Foundation's statement that "Tunisia's submission concluded the picture was mixed, but they could have an increase in rain and agricultural production" is an overly optimistic interpretation of clearly expressed negative impacts.

Overall, these three National Communications (Morocco, Algeria, and Tunisia) provide qualitative support for the fact the climate change will likely stress rain-fed agriculture in northern Africa, consistent with the portrayal of Agoumi (2003) and the IPCC. The National Communication of Morocco presents quantitative information consistent with what is reported by Agoumi (2003) and the IPCC (and hence the TSD), while the National Communication of Algeria provides quantitative information that is consistent with these sources when factoring in precipitation variability in addition to climate change. The National Communication of Tunisia does not provide quantitative information.

Our view of the literature behind Agoumi (2003) provides considerable evidence that the scientific basis for the IPCC's conclusion is legitimate. The PBL assessment of the IPCC notes that "...additional explanations could have provided further foundations for the statement, had they been included in [IPCC's Working Group II] Chapter 9." We concur, but the Southeastern Legal Foundation conclusion that "...there is no support for the IPCC's dramatic pronouncement on African crop yields" is significantly overstated.

Comment (2-13):

The Southeastern Legal Foundation provides the following reaction to the African rain-fed agriculture projection, which appeared in the *Sunday Times* (Leake, 2010a) and comes from former IPCC chair Robert Watson: "Any such projection [pertaining to African crop yields] should be based on peer-reviewed literature from computer modeling of how agricultural yields would respond to climate change. I can see no such data supporting the IPCC report."

Response (2-13):

Watson may not have appreciated that peer-reviewed modeling studies of climate change impacts on agriculture in parts of Africa are limited. As the IPCC's AR4 WGI report states (Christensen et al., 2007): "Several climate change projections based on RCM (regional climate model) simulations are available for southern Africa, but are much scarcer for other regions." Accordingly, as we discuss in Subsection 2.2.4.4 of this RTP document, the IPCC references gray literature in these circumstances. We also note in Response 2-10 that these studies are not central to the TSD or the Endangerment Finding. Finally, though we discuss some additional modeling studies pertinent to Africa in RTP 2-15, those modeling studies (Parry et al., 2005 and Hulme et al., 2001) were conducted at the global and continental scales and contain limited results pertinent to northern Africa specifically.

Comment (2-14):

The Southeastern Legal Foundation states that EPA ignored contrary peer-reviewed literature and submits literature that the Sahel is greening (from *National Geographic* and several studies) in contrast to "IPCC horror stories" (projecting reductions in rain-fed agriculture).

Response (2-14):

EPA is aware of the literature cited by the petitioner that suggests greening in parts of the Sahara and Sahel (e.g., Seaquist, et al., 2009; Anyamba, and Tucker, 2005; Hutchinson et al., 2005; Olsson et al., 2005). The issue raised by petitioners is not new and was raised and responded to through the public comment process (see Response 2-73 in Volume 2 of the RTC document). Thus, these objections do not meet the test in Clean Air Act (CAA) Section 307(d)(7)(B) that it be impracticable to raise the objection during the public comment period or the reasons for the

objection arose between June 24, 2009, and February 16, 2010. Nonetheless, we have reviewed these arguments and respond once again.

The fact that precipitation has increased recently in this region, as we note in our TSD in Section 4(d), does not mean that a combination of climate variability and change could not substantially reduce rain-fed agriculture in the future. The climate in this region is highly variable and while it has been relatively wet over the past decade or so, severe drought impacted the region for several decades from the 1960s to the 1990s and dry patterns could return to the region. As one of the studies (Nicholson, 2005) cited by the petitioner states: “The fluctuations between ‘wet’ and ‘dry’ in the Sahel/Soudan zones are extreme even on decadal and multi-decadal time scales.” Therefore, if the current wet period reverses to a dry period, the impacts of rain-fed agriculture on the region could be profound, especially when considering the potential enhancement of the drying from human-induced warming (i.e., climate change).

Finally, we note that the literature presented relates to impacts outside the United States, and it did not materially impact the determination of endangerment of public health and welfare in the United States. As noted in Subsection 2.1.1, the Endangerment Finding states (Section III.D): “The Administrator looked first at impacts in the United States itself, and determined that these impacts are reasonably anticipated to endanger the public health and the welfare of the U.S. population. That remains the Administrator’s position, and by itself supports her determination of endangerment.”

Comment (2-15):

The Southeastern Legal Foundation suggests that the IPCC ignored literature that drew different conclusions on the issue of rain-fed agriculture projections in Africa, specifically referring to two studies: Parry et al., 2005 and Hulme et al., 2001. The Southeastern Legal Foundation states: “Both Parry’s own paper and Hulme’s paper were known to and available to Professor Parry [co-chair of IPCC Working Group II] in composing the WGII Report and the Synthesis Report. Yet, Parry’s WGII report ignored his own paper and that of Hulme, which did not predict disaster, and instead relied on one that did, the Agoumi paper, even though it did so incorrectly and improperly and was not peer-reviewed.” The Southeastern Legal Foundation further notes that Hulme et al. (2001) were careful to note uncertainties in understanding African climate change, and implies that the IPCC was not as careful.

Response (2-15):

We have reviewed these papers (Parry et al., 2005, and Hulme et al., 2001) and find that, while not directly comparable with Agoumi (2003), they do not contradict that source. We also find, contrary to the Southeastern Legal Foundation’s assertion, that both of these studies were in fact cited by the IPCC, although not always in the same section or context as Agoumi (2003).

The Parry et al. (2005) study reports the results of a series of research projects that aimed to evaluate the implications of climate change for food production and risk of hunger. The analysis in this study is performed at global and continental scales rather than the regional scale. This is likely why it is not discussed in Chapter 5 of Working Group II’s contribution to the AR4 (Easterling et al., 2007), where Agoumi (2003) is cited in a section focusing on regional impacts in Africa (specifically on Morocco, Algeria, and Tunisia). The Parry et al. (2005) study is cited

multiple times in Chapter 5 of Working Group II's contribution ("Food, Fiber, and Forest Products," Easterling et al., 2007), which provides a global perspective. Therefore, Parry did not "ignore his own paper" as stated by the Southeastern Legal Foundation.

One of the primary conclusions of Parry et al. is that "the region of greatest risk [of losses in food production, and hunger due to climate change] is Africa." Parry et al. (2005) provide specific cereal yield projections for the 2020s and 2080s resulting from different GHG emission scenarios. They state for the globe: "By the 2020s, small changes in cereal yield are evident in all scenarios, but these fluctuations are within historical variations." For the 2080s, Parry et al. (2005) provide projections specific to Africa – but not northern Africa specifically, stating that climate change could reduce cereal yields by up to 30%. Importantly, the changes in cereal yield projected for the 2020s and 2080s are driven by GHG-induced climate change and likely do not fully capture interannual precipitation variability which can result in large yield reductions during dry periods, as the IPCC (Christensen et al., 2007) states: "...there is less confidence in the ability of the AOGCMs (atmosphere-ocean general circulation models) to generate interannual variability in the SSTs (sea surface temperatures) of the type known to affect African rainfall, as evidenced by the fact that very few AOGCMs produce droughts comparable in magnitude to the Sahel droughts of the 1970s and 1980s." Given the different scopes of the two analyses, it is misleading to state that the Parry et al. projections are inconsistent with the Agoumi (2003) yield projections.

The Hulme et al. (2001) study, which reviews observed (1900–2000) and possible future (2000–2100) continent-wide changes in temperature and rainfall over Africa, is also not ignored by the IPCC, contrary to the assertion of the petitioner. In fact, it is cited twice in IPCC's Working Group II Chapter 9 on Africa (Boko et al., 2007):

- Hulme et al. (2001) is cited in a statement about the complexity of African climatology: "Other factors that complicate African climatology include dust aerosol concentrations and sea-surface temperature anomalies, which are particularly important in the Sahel region (Hulme et al., 2001; Prospero and Lamb, 2003) and southern Africa (Reason, 2002), deforestation in the equatorial region (Semazzi and Song, 2001; Bounoua et al., 2002)..."
- Hulme et al. (2001) is also cited in a statement pertaining to uncertainties in precipitation projections in the western Sahel (Boko et al., 2007): "For the western Sahel (10 to 18°N, 17.5°W to 20°E), there are still discrepancies between the models: some projecting a significant drying (e.g., Hulme et al., 2001; Jenkins et al., 2005) and others simulating a progressive wetting with an expansion of vegetation into the Sahara (Brovkin, 2002; Maynard et al., 2002; Claussen et al., 2003; Wang et al., 2004; Haarsma et al., 2005; Kanga et al., 2005; Hoerling et al., 2006)."

These examples demonstrate that the IPCC both cited Hulme et al. (2001) and transparently discussed the complexity of Africa's climate and the uncertainty in African climate projections. This treatment is appropriate and reasonable, contrary to the petitioner's implication.

Even in light of the complexities and uncertainties, Hulme et al. (2001) state that a “warming climate will nevertheless place additional stresses on water resources [in Africa], whether or not future rainfall is significantly altered” and they project reduced precipitation over Tunisia. Hulme et al. (2001) do not, however, provide projections for changes in cereal yields (from changes in rain-fed agriculture), so their results cannot be compared directly with Agoumi (2003) or its supporting documents (discussed in Response 2-12).

Overall, the IPCC does not ignore either the Parry et al. (2005) or Hulme et al. (2001) studies. The findings of these studies, while not directly comparable with Agoumi (2003), are broadly consistent. Hulme et al. (2001) project increased drying over northern Africa while Parry et al. (2005) project an increased risk of reduced cereal yields over all of Africa. The petitioner’s claim that IPCC was not careful or acted inappropriately in this regard is not confirmed by careful review of the material.

2.1.8 Summary

The small number of real or alleged errors in the IPCC report is not materially relevant for EPA’s Endangerment Finding. Neither of the two errors that are verifiable (the percentage of the Netherlands below sea level and the projections for Himalayan glaciers) is relevant to the United States and neither is contained within EPA’s endangerment record. Although it is unfortunate when any error occurs, two errors in a nearly 3,000-page study are not evidence of a complete breakdown of the IPCC’s review process, contrary to petitioners’ suggestions.

The remaining alleged errors or unsupported statements have not been shown to be erroneous and can be traced to findings in the gray literature from which they were derived. As discussed further in Subsection 2.2.4.4 in this volume and previously in Volume 1 of the RTC, the IPCC provides guidance on how and when to use gray literature, and petitioners do not demonstrate that the guidance was not followed. There is no de facto assumption that all gray literature is incorrect or suspect, and an examination of the instances raised by petitioners demonstrates that the specific allegations of petitioners are unfounded. Furthermore, the statements at issue drawn from the gray literature have no material relevance to conclusions supporting EPA’s Findings, as explained in RTP Subsection 2.1.1.

In conclusion, the evidence cited by petitioners does not undermine the overall credibility and reliability of the scientific conclusions relied upon and underlying EPA’s Endangerment Finding.

2.2 Claims That the IPCC Has a Policy Agenda and Is Not Objective and Impartial

2.2.1 Overview

Several petitioners argue that the e-mails from the University of East Anglia's Climatic Research Unit (CRU), and other information that has arisen since publication of the Endangerment Finding, show that a select group of influential authors who wrote, contributed to, or reviewed parts of IPCC assessment reports (or the studies on which the assessment reports were based) were not objective and impartial while developing the reports. Several petitioners also argue that the CRU e-mails confirm that the IPCC and some of its authors and reviewers have a policy agenda and are tailoring the science to suit that agenda. The petitioners allege that the e-mails show that the peer-review and report development processes employed by the IPCC are "fundamentally corrupt," lack scientific integrity, are policy prescriptive, and do not yield "true" consensus conclusions regarding the state of the science. The petitioners request that EPA reconsider its reliance on the IPCC assessment reports that were used as the basis for the Endangerment Finding.

As discussed in detail below, after reviewing the petitioners' arguments, EPA finds that the evidence and arguments provided by petitioners do not support their conclusion that the peer-review and assessment report processes employed by the IPCC were "fundamentally corrupt" and policy prescriptive. Further, the petitioners' arguments, which for the most part rely on selective use of the CRU e-mails, misinterpretations of the e-mails, and quotations from press articles, do not show that either the IPCC peer-review and report development processes were inadequately designed or that they were not implemented properly. We note that several of the petitioners' arguments are not new; many of these comments were submitted and responded to in the process of developing the Findings.

2.2.2 Background

Several petitioners criticize the IPCC's report development and peer-review procedures. We respond specifically to each allegation in the sections that follow. EPA received similar comments during notice and comment on the Endangerment Findings. In Volume 1 of the RTC document, we responded in detail to these comments, describing the IPCC's report development and peer-review procedures. However, to provide context for evaluating the merit of these more recent allegations, in this background section we revisit the structure and procedures employed by the IPCC in developing their reports.

In response to the allegations raised against it, the IPCC released the following statement in December 2009 describing their report development process from beginning to end (IPCC, 2010a).

The assessment process begins with a Scoping Meeting attended by scientific experts whose task it is to outline the report. The IPCC Bureau selects the experts attending the Scoping Meeting after an open call for nominations to Governments and IPCC observer organizations. The Bureau consists of experts elected by an IPCC Plenary composed of all WMO and UNEP member nations. The outline is then approved by Working Group

Sessions and endorsed by the Plenary. A call for nominations of authors for the report is sent out to Governments and observer organizations. The individual Working Group Bureaus select the authors for respective contributions to the Assessment Report, ensuring that the composition of the author teams reflects a range of views, scientific expertise and geographical diversity. Over the ensuing 3-4 years, writing teams collaborate on drafting chapters – including four Lead Author meetings, plus chapter meetings as necessary. The author teams prepare two externally reviewed drafts and then a final version of their respective chapters. All chapters undergo a rigorous writing and open review process to ensure consideration of all relevant scientific information from established journals with robust peer review processes or from other sources which have undergone robust and independent peer review. Additional procedures are provided for information found in sources that have not been published or peer-reviewed. In these cases, authors and chapter teams should critically assess and review the quality and validity of each source before incorporating results.

The First Order Draft is subject to a formal Expert Review, where any expert is encouraged to comment on all aspects of the draft, including, but not limited to, issues of interpretation, missed literature, and presentation. Author teams must make a written response, explaining how they responded to each comment in developing the next draft. A Second Order Draft is compiled based on the comments received during the Expert Review. This draft undergoes a second combined formal Expert and Government Review. Author teams have to react to the second round of review comments as well and prepare the final draft, taking into account all the comments received. The entire review process is overseen by a team of 2-3 independent Review Editors for each chapter, whose role is limited to overseeing the reviews, ensuring the thoroughness of the responses. All the AR4 review comments and responses by the author teams are available online (IPCC, 2006a).

In parallel, the Summary for Policymakers and the Technical Summary are prepared by authors selected from chapter writing teams. The Summary for Policymakers and the Technical Summary undergo a formal Expert and Government Review and are revised based on the review comments. Again, 2-3 Review Editors oversee the review process for the Technical Summary. The Summary for Policymakers is then distributed to the Governments for final comment. The Summary for Policymakers undergoes a line-by-line approval process by Governments during a multi-day meeting. The Governments must reach consensus before text is approved. After the Working Group Session approves the Summary for Policymakers, the IPCC Plenary then accepts the entire underlying Report (including the individual chapters and Technical Summary).

To ensure objectivity, transparency, and information quality, the IPCC's report development procedures (IPCC, 1999) clearly describe the roles and responsibilities of coordinating lead authors, lead authors, contributing authors, expert reviewers, and review editors in report development. It states:

1. LEAD AUTHORS

Function:

To be responsible for the production of designated sections addressing items of the work program on the basis of the best scientific, technical and socio-economic information available.

Comment:

Lead Authors will typically work as small groups which have responsibility for ensuring that the various components of their sections are brought together on time, are of uniformly high quality and conform to any overall standards of style set for the document as a whole.

The task of Lead Authors is a demanding one and in recognition of this the names of Lead Authors will appear prominently in the final Report. During the final stages of Report preparation, when the workload is often particularly heavy and when Lead Authors are heavily dependent upon each other to read and edit material, and to agree to changes promptly, it is essential that the work should be accorded the highest priority.

The essence of the Lead Authors' task is synthesis of material drawn from available literature as defined in Section 4.2.3. Lead Authors, in conjunction with Review Editors, are also required to take account of expert and government review comments when revising text. Lead Authors may not necessarily write original text themselves, but they must have the proven ability to develop text that is scientifically, technically and socio-economically sound and that faithfully represents, to the extent that this is possible, contributions by a wide variety of experts. The ability to work to deadlines is also a necessary practical requirement. Lead Authors are required to record in the Report views which cannot be reconciled with a consensus view but which are nonetheless scientifically or technically valid.

Lead Authors may convene meetings with Contributing Authors, as appropriate, in the preparations of their sections or to discuss expert or government review comments and to suggest any workshops or expert meetings in their relevant areas to the Working Group/Task Force Bureau Co-Chairs. The names of all Lead Authors will be acknowledged in the Reports.

2. COORDINATING LEAD AUTHORS

Function:

To take overall responsibility for coordinating major sections of a Report

Comment:

Coordinating Lead Authors will be Lead Authors with the added responsibility of ensuring that major sections of the Report are completed to a high standard, are collated and delivered to the Working Group/Task Force Bureau Co-Chairs in a timely manner and conform to any overall standards of style set for the document.

Coordinating Lead Authors will play a leading role in ensuring that any crosscutting scientific or technical issues which may involve several sections of a Report are addressed in a complete and coherent manner and reflect the latest information available.

The skills and resources required of Coordinating Lead Authors are those required of Lead Authors with the additional organizational skills needed to coordinate a section of a Report. The names of all Coordinating Lead Authors will be acknowledged in the Reports.

3. CONTRIBUTING AUTHORS

Function:

To prepare technical information in the form of text, graphs or data for assimilation by the Lead Authors into the draft section.

Comment:

Input from a wide range of contributors is a key element in the success of IPCC assessments, and the names of all contributors will be acknowledged in the Reports. Contributions are sometimes solicited by Lead Authors but unprompted contributions are encouraged.

Contributions should be supported as far as possible with references from the peer reviewed and internationally available literature, and with copies of any unpublished material cited; clear indications of how to access the latter should be included in the contributions. For material available in electronic format only, the location where such material may be accessed should be cited. Contributed material may be edited, merged and if necessary, amended, in the course of developing the overall draft text.

4. EXPERT REVIEWERS

Function:

To comment on the accuracy and completeness of the scientific/technical/socio-economic content and the overall scientific/technical/socio-economic balance of the drafts.

Comment:

Expert reviewers will comment on the text according to their own knowledge and experience. They may be nominated by Governments, national and international organizations, Working Group/Task Force Bureau, Lead Authors and Contributing Authors.

5. REVIEW EDITORS

Function:

Review Editors will assist the Working Group/Task Force Bureau in identifying reviewers for the expert review process, ensure that all substantive expert and government review comments are afforded appropriate consideration, advise lead authors on how to handle contentious/controversial issues and ensure genuine controversies are reflected adequately in the text of the Report.

Comment:

There will be one or two Review Editors per chapter (including their executive summaries) and per technical summary. In order to carry out these tasks, Review Editors will need to have a broad understanding of the wider scientific and technical issues being addressed. The workload will be particularly heavy during the final stages of the Report preparation. This includes attending those meetings where writing teams are considering

the results of the two review rounds. Review Editors are not actively engaged in drafting Reports and cannot serve as reviewers of those chapters of which they are Authors. Review Editors can be members of a Working Group/Task Force Bureau or outside experts agreed by the Working Group/Task Force Bureau. Although responsibility for the final text remains with the Lead Authors, Review Editors will need to ensure that where significant differences of opinion on scientific issues remain, such differences are described in an annex to the Report. Review Editors must submit a written report to the Working Group Sessions or the Panel and where appropriate, will be requested to attend Sessions of the Working Group and of the IPCC to communicate their findings from the review process and to assist in finalizing the Summary for Policymakers, Overview Chapters of Methodology Reports and Synthesis Reports. The names of all Review Editors will be acknowledged in the Reports.

In implementing these procedures across the three working groups of the IPCC's AR4, 1,250 scientists (450 lead authors and more than 800 contributing authors) from 130 countries served as authors and more than 2,500 experts provided over 90,000 review comments. Many petitioners specifically critique the practices employed by IPCC Working Group I, for which there were 152 lead authors and 26 review editors from 32 countries, in which 6,000 peer-reviewed publications were cited, for which 625 experts from 42 countries provided over 30,000 review comments, and for which the Summary for Policymakers was approved line by line by 113 countries. Furthermore, the petitioners specifically critique the practices employed by Chapter 6 (Jansen et al., 2007) authors and reviewers of Working Group I, which had two coordinating authors and 14 lead authors from 12 countries, 33 contributing authors from nine countries, and two review editors who oversaw the handling of more than 2,900 comments from the rounds of expert and governmental review. The petitioners also critique the practices employed by Chapter 9 (Hegerl et al., 2007) authors and reviewers of Working Group I, which had two coordinating authors and seven lead authors from nine countries, 44 contributing authors from 12 countries, and three review editors who oversaw the handling of about 2,600 comments from the rounds of expert and governmental review.

The IPCC processes have been developed for the express purpose of ensuring integrity and avoiding any possibility of bias in the conclusions drawn from the scientific literature. The level of detail and clarity of the requirements—especially concerning report review, the specific responsibilities of review editors to assess the quality of author responses to comment, and the transparency of the record of comments and responses—provide the foundation for ensuring that the reports are credible and sound.

The IPCC's peer-review and report development processes are very important components of the overall integrity, quality, transparency, and objectivity of its reports. As stated in the TSD (U.S. EPA, 2009) for the Endangerment Finding, EPA relied on the assessment literature because:

they 1) are very recent and represent the current state of knowledge on GHG emissions, climate change science, vulnerabilities, and potential impacts; 2) have assessed numerous individual, peer-reviewed studies in order to draw general conclusions about the state of science; 3) have been reviewed and formally accepted, commissioned, or in some cases

authored by U.S. government agencies and individual government scientists; and 4) they reflect and convey the consensus conclusions of expert authors.

Finally, we note the following recent IPCC statement regarding their report development process:

The IPCC procedures, which are regularly reviewed and amended by the IPCC members, have served the international community effectively for over 20 years. The conclusions of the IPCC assessment reports, and especially the Fourth Assessment Report, are as solid as careful science can make them. They reflect the current state of knowledge about one of the most complex and important of all topics -- climate change science (IPCC, 2010b).

2.2.3 Responses to Arguably New Objections Raised by the Petitioners

The petitioners submit four arguably “new” objections along with excerpts from the CRU e-mails related to: 1) authorship and reviewer roles among IPCC personnel; 2) an e-mail allegedly showing that IPCC authors were aware that citing their own papers could be seen as using the IPCC process to advance their own views rather than to present a neutral overview of the science; 3) allegations that the IPCC is a biased organization, including claims that IPCC lead authors encouraged other authors to focus on policy-prescriptive science; and 4) allegations that IPCC authors forced consensus and altered the contents of the assessment reports to eliminate any suggestion of non-consensus. We respond to each of these allegations in the subsections below.

2.2.3.1 Allegations of Inappropriate Authorship and Reviewer Roles Among IPCC Personnel

Comment (2-16):

Peabody Energy argues that the CRU e-mails show inappropriate authorship roles in the development of Chapter 6 (“Paleoclimate”) of Working Group I’s contribution to AR4 (Jansen et al., 2007). The petitioner alleges that Michael Mann (Penn State) and Thomas Crowley (University of Edinburgh) contributed significantly to the development of the chapter, but were not listed as contributing authors. In addition, the petitioner alleges that Mann and Crowley were inappropriately given the opportunity to comment on drafts of the chapter outside the formal review process, thereby compromising their objectivity as reviewers and introducing bias to the chapter development process.

Response (2-16):

EPA has reviewed the petitioners’ submissions and finds that the evidence and arguments they provide do not support the conclusions they draw. The content of the e-mails does not show that Michael Mann or Thomas Crowley contributed substantially to the writing or key development decisions of Chapter 6 (Jansen et al., 2007), or that they introduced any bias. Chapter 6 assesses paleoclimatic data and knowledge of how the climate system changes over inter-annual to millennial time scales and how well these variations can be simulated with climate models.

- On December 23, 2004, Michael Mann wrote to Keith Briffa (Chapter 6 lead author) and stated, “Thanks again for your phone call, and the (informal) opportunity to help out where I can. I’m perfectly happy in that role (as an informal contributor and a formal reviewer, for example), if you and Peck, for example, are both comfortable with that.”² He also sent some website links regarding arguments that some have made against his work. In a follow-up e-mail that same day³, Mann again writes to Briffa, stating “I went ahead and tried to make some constructive comments on what you sent...Let me say I think it’s shaping up very nicely--looks like it should be a significant improvement on the ‘01 report. You’ve handled the various controversies and points of dispute delicately and adeptly...I made a dozen or so minor comments--please make use of them as you see fit...Thanks again for including me in and giving me an opportunity to comment.”⁴

These e-mails show that Mann served as an informal contributor on a preliminary draft of Chapter 6 (Jansen et. al, 2007), and the IPCC’s response to comments document for Chapter 6 confirm that Mann was also a formal reviewer (IPCC, 2006a). The petitioners allege that Mann could not have objectively reviewed the chapter if he also provided information for its development, but these e-mails do not show that Mann “significantly contributed” to the development of this chapter. In fact, the evidence provided by the petitioner indicates that Mann participated at most in a limited way as an informal contributor, providing a small amount of information, such as Web links, to the authors. This level of involvement would not warrant being listed as a contributing author, as Mann was involved neither with assessing the underlying literature nor with writing text for the chapter. The IPCC does not require informal contributors of this nature to be acknowledged as authors in the final report. There is no basis to conclude that listing him as an author would have changed the content or conclusions of the chapter in any way. There is also no basis to conclude that his comments were biased or lacked objectivity, or that the resulting chapter was biased or lacked objectivity. The fact that Mann provided the Chapter 6 authors with a limited amount of information does not mean that his objectivity was compromised during the formal review process. Petitioners appear to conclude otherwise, but nothing they provide supports drawing such a broad conclusion. Finally, we note that the petitioner does not provide any examples of Mann’s review comments on this chapter that they claim demonstrate bias or lack of objectivity.

- Several e-mails from June and July of 2005 (e-mail files 1122300990.txt⁵, 1121869083.txt⁶, and 111886641.txt)⁷ show that Thomas Crowley was consulted by Keith Briffa and Jonathan Overpeck (Chapter 6 coordinating lead author) regarding a medieval warming figure that Crowley had been developing, which Briffa and Overpeck

³ E-mail file 1102956436.txt, (December 13, 2004), page 763, line 13 of PDF version entitled: CRU Emails 1996-2009.pdf

³ E-mail file 1103828684.txt, (December 23, 2004), page 771, line 37 of PDF version entitled: CRU Emails 1996-2009.pdf

⁴ E-mail file 1103828684.txt, (December 23, 2004), page 771, line 37 of PDF version entitled: CRU Emails 1996-2009.pdf

⁵ E-mail file 1122300990.txt, (July 25,2005), page 952, line 33 of PDF version entitled: CRU Emails 1996-2009.pdf

⁶ E-mail file 1121869083.txt, (July 20,2005), page 916, line 42 of PDF version entitled: CRU Emails 1996-2009.pdf

⁷ E-mail file 1118866419.txt, (June 15,2005), page 889, line 32 of PDF version entitled: CRU Emails 1996-2009.pdf

were possibly interested in using for Chapter 6. There is no evidence in the e-mails that Crowley helped write or develop the chapter in any other capacity. In fact, the e-mails simply document an interaction between the lead authors and Crowley, in which the authors are seeking clarification regarding a particular figure. Such inquiries are completely appropriate and in no way compromise the objectivity and credibility of that chapter's development. It appears that Crowley provided useful background and advice on the use of his figure, and the e-mails provide no support that he contributed significant text or had any editorial power over the chapter.

Given the technical nature of this field of climate science, it is reasonable and expected that IPCC authors might require detail or clarification regarding some of the underlying studies. Therefore they might need to consult the authors of specific studies to better understand how the results were achieved or to ask questions regarding how the data were applied, as was the case in this situation. Petitioners have not explained how the mere fact that this type of correspondence occurred between Crowley and Briffa/Overpeck lead to the conclusion that bias was introduced to the chapter development process. The evidence provided by the petitioner does not support this argument.

- In the same set of e-mails, Crowley also states, "I am not sure whether it is wise to add me to the CA [contributing author] list, just because the reviewer is supposed to be impartial and a CA loses that appearance of impartiality if he has now been included as a CA - may want to check with Susan S. on this one to be sure - still happy to provide advice." The petitioner alleges that Crowley's e-mail signifies that he knew of the risk of compromising objectivity and did so anyway by both contributing significantly to the chapter's development and being an expert reviewer. The evidence provided by the petitioner does not show that Crowley participated in any manner beyond having a limited role in answering questions concerning a figure he had developed, or that his doing so compromised his objectivity as a reviewer. The petitioners do not, for example, provide any examples of his review comments on this chapter that they claim demonstrate bias or lack of objectivity. As stated above, IPCC does not require informal contributors to be acknowledged in the final report. The petitioners' evidence does not show that Crowley's informal contribution and correspondence with the Chapter 6 authors led to improper and erroneous changes or conclusions in the report. Furthermore, after the exchange of these e-mails, Overpeck wrote: "Thanks for moving this forward and making sure we do it right (i.e., without any bias, or perception of bias)".⁸ This demonstrates that the coordinating lead author understood IPCC's guidelines, ensured that they were properly implemented, and therefore avoided any lack of or lapse in objectivity.

The petitioner draws broad conclusions from these e-mails about the intentions of the authors and the content of the IPCC chapters, in an attempt to discredit overall the chapter development and review processes of the IPCC, and implicitly the IPCC reports themselves. However, the e-mails cited show that Mann and Crowley had very limited, informal roles in the chapter and the

⁸ E-mail file 1121869083.txt, (July 20, 2005), page 918, line 8 of PDF version entitled: CRU Emails 1996-2009.pdf

e-mails provide no evidence to support assertions of bias or a lack of objectivity. The interactions that occurred are allowable under IPCC procedures, and petitioners have not demonstrated that the events in question changed the content or conclusions of the chapter in any way.

The Muir Russell investigative panel summarized information Briffa gave them on this issue, describing Briffa as having said (Russell, 2010):

There is no proscription in the IPCC rules to prevent the author team seeking expert advice when and where needed. The Technical Support Unit (TSU) and the CLAs of Chapter 6 agree that the author team was allowed to seek such advice. Copies of communications from both CLAs (Jansen and Overpeck) and the IPCC WG1 TSU are provided by Briffa (and published on the website) to provide support to Briffa's claim that his actions did not contravene IPCC procedures.

Even if the petitioner's allegations that Mann and Crowley "significantly contributed" to the development of Chapter 6 were true—which we do not believe to be the case—and even if this contribution were atypical, this does not lead to the conclusion that the scientific integrity of the conclusions from the chapter was compromised. The evidence provided by petitioners does not indicate errors or significant changes that resulted from involvement of these persons, and does not demonstrate that the final product was either inaccurate or lacked impartiality, nor does the petitioner to any such result. We find that Chapter 6 was developed in an objective manner, is accurate, and represents the best available scientific information.

Comment (2-17):

Peabody Energy argues that the CRU e-mails show that IPCC lead authors "viewed their work as advocacy, rather than scientific analysis, which could be marshaled against opponents." In support of this argument, the petitioner provides a February 2005 e-mail from Michael Mann to Phil Jones, which states "I saw the paleo draft (actually I saw an early version, and sent Keith some minor comments). It looks very good at present--will be interesting to see how they deal w/ the contrarian criticisms--there will be many. I'm hoping they'll stand firm (I believe they will--I think the chapter has the right sort of personalities for that)."

Response (2-17):

The petitioner's interpretation of the e-mail statement is unfounded. The e-mail from Michael Mann⁹ describes his reaction to a preliminary draft of a Medieval Warm Period (MWP) section of Chapter 6 ("Palaeoclimate") of Working Group I's contribution to the AR4 (Jansen et al., 2007). First, it is important to note that Michael Mann and Phil Jones were neither lead nor contributing authors for Chapter 6, as the petitioner implies. Therefore, any allegations that Mann and Jones used their authorship authority to advocate against critics of Chapter 6's findings are unfounded. For our response to allegations that Michael Mann had a significant role in the development of Chapter 6, please see Response 2-16 in this section. Moreover, the e-mail does not support the petitioner's allegation that Mann and Jones were viewing their work as "advocacy" to use "against opponents." Rather, Mann is simply stating his opinion regarding

⁹ E-mail file 1107454306.txt, (Feb. 3, 2005), page 821, line 44 of PDF version entitled: CRU Emails 1996-2009.pdf

how the paleoclimate chapter should be written and that he looked forward to seeing how the Chapter 6 authors dealt with criticisms. At no point does Mann suggest that the scientific findings be manipulated to support a pre-determined view. It is clear that he is merely expressing his hope for how the authors will respond to comments they (not Mann) are tasked with addressing.

Comment (2-18):

The State of Texas argues that the IPCC scientists who wrote the CRU e-mails “wielded tremendous authority over the IPCC.” In support of their argument, the petitioners state, “For example, AR4 cites Dr. Jones’s work 38 times in 21 chapters of two Working Groups, Mann is cited 27 times in 7 chapters of two Working Groups, Briffa is cited 23 times in 9 chapters of two Working Groups, Wigley is cited 66 times in 18 chapters of all three Working Groups, Overpeck is cited 15 times in 5 chapters of two Working Groups, Osborn is cited 30 times in 10 chapters of two Working Groups, Trenberth is cited 58 times in 18 chapters of two Working Groups, and Santer is cited 26 times in 8 chapters of two Working Groups, just to name a few.” The petitioner goes on to argue that “Thus, to the extent their objectivity, impartiality, truthfulness, and scientific integrity are compromised or in doubt, so too is the objectivity, impartiality, truthfulness, and scientific integrity of the IPCC report, the CRU temperature data, the NOAA [National Oceanic and Atmospheric Administration] temperature data, and other scientific research that is shown to have relied on their compromised research.”

Response (2-18):

Many of the scientists who wrote the CRU e-mails were and still are important figures in the field of climate change science. It is important to note that the statistics provided by the petitioner regarding how frequently the studies of these scientists (e.g., Phil Jones and Michael Mann) were cited in AR4 are neither surprising nor unreasonable. The IPCC AR4 (IPCC, 2007a) cited over 18,000 peer-reviewed studies. Therefore these statistics (e.g., “Wigley is cited 66 times in 18 chapters of all three Working Groups, Overpeck is cited 15 times in 5 chapters of two Working Groups”) do not support the petitioner’s allegation that these studies were cited too frequently and that these scientists therefore “wielded tremendous authority over the IPCC.” These scientists are some of the most well-published climate scientists in the world, and their work was synthesized across the three Working Group reports of the AR4. We conclude that these facts by themselves demonstrate nothing other than the fact that the IPCC, as intended, is assessing available, peer-reviewed literature. The simple fact that these individuals are well-published and that their studies are cited in AR4 does not imply “tremendous authority.” The petitioner provided no additional evidence to support their allegation.

As explained in Section 2.2.2 (Background) of this Volume, over 1,250 scientists from 130 countries served as authors for the AR4. It was these hundreds of authors who had the authority to assess the available literature, summarize the state of the science, and reference the studies in the AR4. The IPCC has robust procedures to ensure that the assessment reports are objective, unbiased, and represent the state of the science regarding climate change. These procedures include processes to ensure that no one individual or group of individuals exerts disproportionate influence in developing any piece of the assessment reports. Further, as addressed in the specific responses in Section 2.2.3.1 of this Volume, the evidence provided by the petitioners does not show that these procedures were flawed or improperly implemented. For more information on

these procedures, please see Volume 1, Section 1, of the RTC document and this section (2.2) of the RTP document.

The mere fact that someone is frequently cited is also not evidence for the petitioners' argument. The petitioner must also demonstrate that the referenced literature is biased or flawed, which they have not done, as compared to the straightforward view that the studies produced by these scientists are very robust and of high quality. The petitioner is making allegations without giving due regard for the content of the actual science, which we thoroughly reviewed in the Endangerment Finding's RTC documents and again in the response to both the new and previously submitted comments of the petitioners.

Please see the Denial and Volume 1 of the RTP document for our response to specific allegations regarding what the CRU e-mails mean for the objectivity and integrity of the IPCC assessments, the CRU temperature data, the NOAA temperature data, and other research that is based on this information.

Comment (2-19):

Peabody Energy argues that "An IPCC chapter author should not peer review journal articles that he intends to include in his chapter because of the clear conflict of interest. The chapter author is supposed to be providing a neutral summary of the science, not advancing his own view of the science. If the chapter author reviews papers that are then included in his chapter, he could be seen as advancing his own agenda both in his review of the paper and its selection for inclusion in the IPCC report." To support their argument, the petitioner provides a July 2005 e-mail from Phil Jones to John Christy that states, "I am reviewing a couple of papers on extremes, so that I can refer to them in the chapter for AR4. Somewhat circular, but I kept to my usual standards"¹⁰. The petitioner goes on to state that "Jones reviewed papers so that he could get them published and therefore could refer to them in AR4 Chapter 3. The petitioner concludes that "this is indeed 'circular' and violates his supposed neutrality both as an AR4 author and as a reviewer of the paper." As additional support, Peabody Energy references another e-mail dated May 20, 2005, from Phil Jones to Michael Mann regarding Jones' review of a temperature reconstruction paper for *Climatic Change*.¹¹ The petitioner states: "One wonders just how unbiased Jones' review of this paper really was, particularly in light of Jones' admission that he applied less than stringent review standards to papers that he favored."

Response (2-19):

First, we find it unconvincing and unclear why, according to the petitioner, an author of an IPCC chapter should not serve as a peer reviewer of a journal paper that in turn may be incorporated into that IPCC chapter. Thus, we disagree with the petitioner's allegations that Phil Jones introduced bias and reviewed these papers unobjectively in an effort to advance his own views of the science. Jones did not appoint himself to review the papers for the journals, but was selected

¹⁰ E-mail file 1120593115.txt, (July 5, 2005), page 906, lines 21-22 of the PDF version entitled: CRU Emails 1996-2009.pdf

¹¹ E-mail file 1116611126.txt, (May 20, 2005), page 882, line 45 of the PDF version entitled: CRU Emails 1996-2009.pdf

by an independent editor to be a reviewer based on his experience and expertise related to climate science. Since Jones is well-published and a prominent paleoclimate scientist, it is reasonable and logical to conclude that the editor who chose him was aware of his work on the AR4 and judged that it was not an inherent conflict of interest. In addition, Jones would not have been the only reviewer for those studies. Typically, between two and four independent experts are selected to review manuscripts. Therefore, Jones would not have had the authority or power to coerce or bias the process to “advance his own agenda.” The petitioner is inferring that Jones was trying to do this, but provides no evidence that Jones’ actions resulted in papers being unjustly published when they should not have been, or papers being unjustly cited in the AR4 when they should not have been.

The petitioner’s claim that an e-mail between Jones and Mann represents an “admission that he [Jones] applied less than stringent review standards to papers that he favored” is also unsupported by evidence. Rather, the petitioner misinterprets and misrepresents Jones’ e-mail to Michael Mann regarding Jones’ review of a temperature reconstruction paper for *Climatic Change*. This e-mail sent on May 20, 2005, reads:

Mike,
Just reviewed Caspar’s [Amman, of the National Center for Atmospheric Research] paper with Wahl [Eugene Wahl of the National Climatic Data Center] for *Climatic Change*. Looks pretty good. Almost reproduced your series and shows where MM [Steve McIntyre, formerly of Northwest Exploration Co., and Ross McKittrick of the University of Guelph] have gone wrong. Should keep them quiet for a while. Also they release all the data and the R software. Presume you know all about this. Should make Keith’s life in Ch 6 easy! Also, confidentially for a few weeks, Christy and Spencer [John Christy and Roy Spencer of the University of Alabama in Huntsville] have admitted at the Chicago CCSP meeting that their 2LT record is wrong!! They used the wrong sign for the diurnal correction! Series now warms - not quite as much as the surface but within error bands. Between you and me, we’ll be going with RSS in Ch 3 and there will be no discrepancy with the surface and the models. Should make Ch 3 a doddle now! Keep quiet about this until Bern at least. Can tell you more then. RSS (Carl Mears and Frank Wentz) found the mistake! The skeptic pillars are tumbling!
Cheers Phil¹²

Despite the allegations by the petitioner, this e-mail shows no indication that Jones’ review of the Ammann and Wahl paper for *Climatic Change* was biased or that he did not employ rigorous standards of objectivity and neutrality in evaluating the merits of the studies. The e-mail simply indicates that Jones approved of the findings by the authors and that he found the results to have important implications regarding the validity of temperature reconstructions. The petitioner is significantly skewing the meaning of these e-mails and misrepresenting what Jones said to infer improper conduct in his review of the paper.

¹² E-mail file 1116611126.txt, (May 20, 2005), page 882, lines 6-15 of the PDF version entitled: CRU Emails 1996-2009.pdf

Finally, the evidence provided by Peabody Energy does not support their allegation that Jones was biased or failed to objectively assess the available literature for the AR4 as a result of having reviewed these papers. From our review of the evidence, we conclude only that Jones reviewed the studies and that he was also an author for Chapter 3 (“Observations: Surface and Atmospheric Climate Change”) of Working Group I’s contribution to the AR4 (Trenberth et al., 2007). For that chapter, over 65 authors from 16 countries were tasked with reviewing and assessing the best available science regarding observed climate change and distilling this information into key messages that capture the state of knowledge. Once again, Jones would not have had the authority or power to coerce or bias the process to “advance his own agenda” by developing conclusions that do not represent the state of the science. Chapter 3, like all of the AR4, went through multiple rounds of expert and government review, in which more than 3,400 comments were received and addressed, to ensure that the conclusions accurately represent and summarize the best available science. The large number of authors, the multiple rounds of expert and government reviews, and the detailed approval process are all deliberate procedures developed by the IPCC to ensure that the reports maximize objectivity, credibility, and quality. See Section III.A of the Findings, Volume 1 of the RTC document and Section 2.2.2 (Background) of the RTP document for more information on the IPCC’s report development procedures.

2.2.3.2 Allegations That Citing One’s Own Papers Compromises Objectivity

Comment (2-20):

Peabody Energy states that IPCC authors cited their own papers extensively in the AR4, which invalidates the purpose of these assessment reports, which are designed to objectively look across the literature and convey the state of the science. The petitioner cites an e-mail by Jonathan Overpeck from June 2005¹³ as evidence that allegedly “reveals that the IPCC authors were aware that citing their own papers could be seen as using the IPCC process to advance their own views rather than to present a neutral overview of the science.” The petitioner further provides a statistic regarding the frequency at which the authors of Chapter 9 of Working Group I of AR4 cited their own papers: “About 40% of the papers cited in Chapter 9 were written by Chapter 9 authors.”

Response (2-20):

It should come as no surprise that many papers by Chapter 9 authors were cited in the chapter. IPCC authors are chosen in part based on their expertise on a particular subject and the degree to which they have published recent, high-quality papers in the field. Moreover, in some areas (e.g., medieval warming period analysis, ocean acidification), there can be limited studies outside the research published by particular scientists, including IPCC authors, on which to base summaries of the science. Contrary to the petitioner’s allegations, this does not mean that IPCC authors were not providing neutral and objective summaries of the science. In fact, the petitioner provides no evidence that the practice of citing one’s own papers led to biased conclusions in the AR4. Given the rigor of the IPCC review process, described in Section 2.2.2 (Background) of this Volume, it is indeed highly unlikely that an author’s improper citation of his or her own work would escape notice.

¹³ E-mail file 1120014836.txt, (June 28, 2005), page 900, line 32 of the PDF version entitled: CRU Emails 1996-2009.pdf

Moreover, the e-mail from Jonathan Overpeck (coordinating lead author of Chapter 6 of Working Group I's contribution to the AR4), does not support the petitioner's assumption of misconduct, and instead shows that Overpeck was encouraging the authors of that chapter to *minimize* citing their own papers to the extent possible, and to only do so when "absolutely necessary." Overpeck's awareness that the authors "citing their own papers could be seen as using the IPCC process to advance their own views rather than to present a neutral overview of the science" does not mean that such citation actually was for the alleged improper purpose—especially when the e-mail demonstrates that Overpeck intentionally took steps to avoid impropriety, or even the appearance of impropriety. The evidence provided by petitioners does not show that the authors cited their own studies in order to advance their own policy views; in fact, it shows they were cautioned to avoid citing their own studies except where absolutely necessary and appropriate. The full text of Overpeck's e-mail is provided here:

Hi all - thanks Fortunat and Stefan for more debate on the 1470. Sounds like the final decision is up to Eystein, but I can guess the way he's thinking. With regard to refs - remember that our goal is to cut the number of references significantly. Since this is an assessment and not a review, we can delete all but the most recent and comprehensive references. I don't like cutting out the original refs any more than you, but we just don't have room, and its more important to have text than exhaustive references. Our colleagues will hopefully understand, and if they don't then they need to do an ego check. It's more important that we make an impact with policy makers rather than with citation indices. Does this make sense? In any case, please help make sure we trim the total references DOWN in number by a significant number. This is not happening [to] the degree it should. Also, please not[e] that in the US, the US Congress is questioning whether it is ethical for IPCC authors to be using the IPCC to champion their own work/opinions. Obviously, this is wrong and scary, but if our goal is to get policy makers (liberal and conservative alike) to take our chapter seriously, it will only hurt our effort if we cite too many of our own papers (perception is often reality). PLEASE do not cite anything that is not absolutely needed, and please do not cite your papers unless they are absolutely needed. Common sense, but it isn't happening. Please be more critical with your citations so we save needed space, and also so we don't get perceived as self serving or worse. Again, we can debate this if anyone thinks I've gone off the deep end.

Thanks, peck

PS - this is not to say anything critical of the refs Fortunat is suggesting - we must cite the most relevant papers, and we must be as up to date as possible.¹⁴

Regarding the statistics submitted, the petitioner has not provided any evidence that the Chapter 9 authors cited their own studies more frequently than would be appropriate given the number of peer-reviewed and published studies on this particular climate science topic (understanding and attributing climate change in the case of Chapter 9), and the statistics alone, without context, prove nothing. More than 50 authors from 15 different countries contributed to the development of Chapter 9. Given the large number of perspectives and the wide-ranging expertise of this group, it is not surprising that 40% of the papers were written by the chapter's authors. Contrary

¹⁴ E-mail file 1120014836.txt, (June 28, 2005), page 901, line 13 of the PDF version entitled: CRU Emails 1996-2009.pdf

to the petitioner's allegations, and consistent with the IPCC's report development guidelines as described in Volume 1 of the RTC document, the statistics provided by the petitioner show that the most qualified and experienced personnel contributed to the development of this chapter. When read in full, Overpeck's email clearly shows that he was taking deliberate actions to ensure that the science was presented in an objective and unbiased manner.

We note that the petitioners do not provide or reference any studies that they say should have been included instead. Importantly, petitioners again fail to show how the allegedly irregular practice that they challenge resulted in conclusions that are inaccurate or contrary to the consensus science.

2.2.3.3 Allegations That IPCC Is Biased

Comment (2-21):

The Competitive Enterprise Institute, the Southeastern Legal Foundation, the State of Texas, and the Ohio Coal Association argue that Jonathan Overpeck, the coordinating lead author for Chapter 6 ("Palaeoclimate") of Working Group I's contribution to the AR4, encouraged contributing authors to focus on findings that are most policy relevant (thereby, according to the petitioners, "supporting preconceived" assessments of the science), and that he did not encourage open and neutral presentations of the science. The petitioners draw this conclusion from an e-mail written by Overpeck and Eystein Jansen (the other coordinating lead author) to the lead and contributing authors for Chapter 6, which states, "With respect to text, try hard to get it down to size, and to ensure that it is FOCUSED on only that science which is policy relevant. ALL TEXT should support an Exec Summary Bullet"¹⁵.

¹⁵ E-mail file 1121392136.txt, (July 14, 2005), Page 912, Line 35 of PDF version entitled: CRU Emails 1996-2009.pdf.

Response (2-21):

The Overpeck/Jansen e-mail to Chapter 6 authors indicates that he encouraged them to focus on the findings that are most policy relevant. However, “policy relevant and compelling” does not mean or imply “policy prescriptive,” as alleged by the petitioners. “Policy relevant” means the neutral and objective presentation of scientific, technical, and socio-economic factors that are relevant to the issues or policies that policymakers care about. This is to be contrasted with other issues that are less relevant to policymakers and thus less appropriate for these types of assessment reports, which aim to objectively and thoroughly synthesize scientific information to support development of informed policies. “Policy relevant” is completely different from “policy prescriptive,” which refers to the presentation of scientific information with the aim of advancing a particular public policy agenda.

The e-mail from Overpeck and Jansen does not support petitioners’ conclusion that they were being policy prescriptive. There is no indication that authors were encouraged to limit their contributions only to findings that supported a particular policy agenda. Rather, it shows the opposite: they were encouraged to avoid this and to provide policy relevant information that would be of use to policymakers as they consider the various possible policies. We further note that the petitioners do not identify information in Chapter 9 that is “policy prescriptive,” or provide any information on what policies Overpeck and Jansen were purportedly advancing.

As the IPCC clearly states on its website regarding its mission statement, the organization reviews and assesses the most recent scientific information to produce assessment reports that are “policy relevant and policy neutral, never policy prescriptive” (IPCC, 2010c). The petitioners’ evidence does not show that the IPCC failed to execute this very important principle. The petitioners’ allegations and implications do not call into question the integrity of these IPCC authors. Finally, we note (as described in Volume 1 of the RTC document) that the official expert and government reviews of the summary for policymakers for each working group (IPCC, 2007c, 2007d, 2007h) further ensure that the reports are *not* policy prescriptive.

Comment (2-22):

Peabody Energy argues that the contents of several CRU e-mails from August 2005¹⁶ between Jonathan Overpeck, Tim Osborn, and Keith Briffa show that the authors for Chapter 6 of Working Group I’s contribution to the AR4 (Jansen et al., 2007) were focusing not on the presentation of “neutral science” but rather on “presenting a strong case.”

Response (2-22):

The full content of the e-mails at issue is important for understanding what the authors were actually saying.

¹⁶ E-mail file 1123268256.txt, (August 5, 2005), page 963, line 29 of PDF version entitled: CRU Emails 1996-2009.pdf; e-mail file 1123513957.txt, (August 8, 2005), page 964, line 25 of PDF version entitled: CRU Emails 1996-2009.pdf

E-mail from Overpeck to Osborn and Briffa on Monday, August 5, 2005

Hi Tim and Keith - Hope you're not going to kill me, but I was talking with Susan Solomon today, and she impressed me with the need to make several points if we can. One issue (other to come in a subsequent email) is whether we can extend the MWP box figure to include the 15th century. I don't read the blogs that regularly, but I guess the skeptics are making hay of their being a global warm event around 1450AD. I agree w/ Susan that it is our obligation to weigh in on issues like this, so.... can we extend the fig to extend up to 1500AD? Sorry about this, Tim. Of course we need it yesterday. Thanks x10**6 best, peck¹⁷

E-mail from Osborn and Briffa to Overpeck on Monday, August 8, 2005

Hi Peck, there is a period around 1400 AD when the proxy records we've used in this MWP figure do indicate a warm period - and all records show positive anomalies at the same time. Thus it couldn't/shouldn't be dismissed in the same way as the MWP, as a period of disparate regional behaviour, albeit with more records showing warming than cooling. For 1400, all indicate warming but with smaller magnitude than the 20th century. If the figure were extended to cover the 15th century, then it would also seem necessary to extend it to the present so that the 1400 period could be compared with the 20th century. I've attached 3 versions of the figure. 850-1350 as originally sent. 850-1500 showing warm anomaly in 1400, but cannot tell how warm relative to present-day. 850-2000 showing 1400 was not as anomalous as present-day. Take your pick, Peck! Cheers Tim and Keith¹⁸

E-mail from Overpeck to Osborn and Briffa on Monday, August 8, 2005

Hi Tim - Decisions, decisions... thanks so much for taking the initiative. I think - for the reason you state, we should go for the one that includes the 20th century. We make clear that these are not reconstructed temp, but normalized anomalies - this keeps us out of some trouble. But, I think the main message is that we're looking at this issue from every angle. And, we're letting others see the issue from every angle. It adds punch. this means that the MWP box needs to talk about the period around 1400 - can you make sure that's on Keith's radar screen. I believe that historians talk about the Medieval Period going to at least 1450, so what the heck... I you can adjust the caption to work, and then send both it and the final fig to Øyvind, me and Eystein that would be good - make sure Keith is ok with it all first, too. Thanks Tim! Best, Peck¹⁹

These e-mails describe a conversation between the three scientists in which they are deciding the most appropriate timeframe for a particular set of graphics depicting normalized temperature anomalies. From our review, the context for the e-mails in question is that Susan Solomon (of NOAA, and serving as the co-chair of IPCC Working Group I) wanted to ensure that the views

¹⁷ E-mail file 1123268256.txt, (August 5, 2005), page 963, line 29 of PDF version entitled: CRU Emails 1996-2009.pdf.

¹⁸ E-mail file 1123513957.txt, (August 8, 2005), page 964, line 25 of PDF version entitled: CRU Emails 1996-2009.pdf.

¹⁹ E-mail file 1123513957.txt, (August 8, 2005), page 964, line 43 of PDF version entitled: CRU Emails 1996-2009.pdf.

of various climate change scientists were addressed in AR4. She was clearly trying to acknowledge and respond to their concerns, even to the point of reading blogs to better understand their arguments when there was no peer-reviewed literature articulating their points. In response, Jonathan Overpeck, Tim Osborn, and Keith Briffa discussed a number of options for presenting their data on normalized temperature anomalies: first extending the timeline to 1500 A.D. to address the concerns with data around 1450 A.D., then extending the timeline to the present day to provide even more context for these early data. They discussed and ultimately decided to modify the graphic to depict the relationship of the MWP to the 20th century because that approach would provide important context for understanding current temperature trends, it would be “looking at this issue from every angle. And, we’re letting others see the issue from every angle.” There is no evidence of bias in this decision. Their presentation of various options for the graphic demonstrates their commitment to considering alternative viewpoints and thoroughness in assessing the science. The e-mails speak for themselves and show no inappropriate behavior among these individuals. We disagree with the petitioner that these e-mails indicate that the scientists were trying to present science that is not neutral or were motivated by a desire to present a “strong case” rather than to present the best science. We further note that this graphic went through expert and governmental review and was deemed appropriate for inclusion in the IPCC chapter. The petitioner provided no additional evidence beyond the text of the e-mails to further justify this allegation.

Thus, these e-mails do nothing more than indicate that three scientists were trying to present a figure that was comprehensive and offered key contextual information on temperature trends over the past several centuries. There is nothing inappropriate or biased about that, and the petitioner has not provided evidence suggesting that there was. When examined in their full context, the e-mails do not indicate any wrongdoing by the three scientists or support the petitioner’s claims.

Comment (2-23):

In support of their argument that the IPCC is a politicized and biased organization, the Competitive Enterprise Institute provided a quote from the Environment Minister of India in which he responds to the incorrect IPCC conclusion of disappearing glaciers by announcing that India is forming its own independent climate change review panel that will not depend on IPCC reports. The Minister stated that “There is a fine line between climate science and climate evangelism. I am all for climate science but not for climate evangelism. I think people misused the IPCC report” (Indo-Asian News Service, 2010).

Response (2-23):

See Subsection 2.1.3 in this Volume of the RTP document for EPA’s responses regarding the validity of the IPCC’s Himalayan glacier projection and our conclusion that this error does not undermine the IPCC’s broader findings and the technical support for endangerment.

With respect to the implications of the statements from the Indian Environment Minister, Jairam Ramesh, they clearly show that he disagreed with the specific IPCC Himalayan glacier projection that has been identified as being an error. His statement indicates that he thought that the projection was inappropriately developed based on inconclusive science. As described in Subsection 2.1.3, the IPCC’s overall assessment of observed glacier loss, projected glacier loss,

and the impacts of glacier loss on water resources in the Himalayas was not compromised by this single faulty projection. Numerous studies cited by the IPCC document a general decline in Himalayan glacier mass, project substantial future declines, and discuss the impacts of these changes on water resources and society, which is consistent with the conclusions drawn by the IPCC.

The evidence provided by the petitioner appears to mischaracterize the Minister's position. The Minister did not make any statements that support the petitioner's allegation that the IPCC is biased or politicized. Rather, the Minister expressed his disapproval of the incorrect glacier projections and stated that India needed to perform its own research related to this issue and other climate change impacts in the country. Specifically, the Minister stated (Indo-Asian News Service, 2010):

I respect the IPCC. At the same time India is a large country... we can't depend only on IPCC. So we have launched the Indian Network on Comprehensive Climate Change Assessment... It's got 125 research institutions from across the country. We will have international collaborations. It's a kind of an Indian IPCC and not a rival to the IPCC. We will do our own assessment.

It is not uncommon for countries to undertake their own climate change assessments, and it is misleading for the petitioner to imply that the Minister's statements represent a lack of faith in the IPCC. Finally, even if the statements by the Minister were to be stretched and interpreted as a comment about the IPCC as a politicized organization, it would be the view of one representative of one country and would not represent the official position of the 194 countries that participate in the IPCC. The fact that another country chooses to complement the IPCC with another assessment process has no implications for the Endangerment Finding. For example, the United States has its own climate change science assessment process that is administered by the USGCRP, and this body has provided excellent and robust information.

Comment (2-24):

The Competitive Enterprise Institute and Ohio Coal Association argue that the IPCC is "not a scientific organization," that people in the organization realize it is not, and that the IPCC is a political "organization that reviews and reports science that support its goals." In support of their argument, the petitioner provided a quote from *The Guardian* (a UK newspaper) which in turn quoted Anton Imeson, a former IPCC Working Group II author:

The Nobel prize was for peace not science ... government employees will use it to negotiate changes and a redistribution of resources. It is not a scientific analysis of climate change... For the media, the IPCC assessments have become an icon for something they are not. To make sure that it does not happen again, the IPCC should change its name and become part of something else. The IPCC should have never allowed itself to be branded as a scientific organization.

Response (2-24):

The quote provided by the petitioner comes from a newspaper article in *The Guardian* (Adam and Goldenberg, 2010), not a scientific journal or a comprehensive review of the IPCC. Imeson

was one of 10 lead authors for Chapter 1 (“Assessment of Observed Changes and Responses in Natural and Managed Systems”) of Working Group II’s contribution to the AR4 (Rosenzweig et al., 2007). He is presenting an opinion, not a scientific evaluation, and is one of more than 1,250 authors from 130 countries that wrote the AR4 with him. It appears that Imeson is concerned about potential policy implications of the IPCC reports, namely that governments may use the IPCC reports to “redistribute resources.” He does not provide a specific scientific critique, but rather a critique of how governments and the media characterize the IPCC reports and government policy direction.

The evidence provided by the petitioner does not show that Imeson’s views are shared by other IPCC authors. To evaluate the merits and credibility of Imeson’s statements, one must look at the principles governing the IPCC’s work, and the organization’s established procedures for the preparation, review, acceptance, adoption, approval, and publication of the assessment reports. In addition, it is also important to assess how these principles and procedures were implemented in developing the AR4. EPA has conducted such assessments; they are described in detail in Section III.A of the Findings; Volume 1, Sections 1 and 5, of the RTC document; Appendix A of Volume 1 of the RTC document; and this section of the RTP document. Ultimately, one author’s sentiments about how the IPCC’s key findings may be used do not provide us with evidence indicating wrong-doing.

Comment (2-25):

The Southeastern Legal Foundation and the State of Texas argue that since the comment period closed, it has been revealed in the press that the chairman of the IPCC, Rajendra K. Pachauri, has multiple potential conflicts of interest. As support for their argument, the petitioners reference a *Daily Telegraph* (UK newspaper) article published on December 20, 2009, titled “Questions over business deals of UN climate change guru Dr. Rajendra Pachauri” (Booker and North, 2009). The article, along with several other newspaper blogs and articles referenced by the petitioners, allege that Pachauri’s connections with various corporations, along with consulting services provided to some of these companies, have generated conflicts of interest and resulted in biased and compromised IPCC reports. The Southeastern Legal Foundation further states:

It is remarkable how only very recently has the staggering scale of Dr Pachauri’s links to so many of these concerns come to light, inevitably raising questions as to how the world’s leading “climate official” can also be personally involved in so many organizations which stand to benefit from the IPCC’s recommendations.

Similarly, the State of Texas argues:

Pachauri’s conflicts of interest weaken the Endangerment Finding. Dr. Pachauri’s conflicts of interest indicate that the IPCC is being led toward a conclusion that climate change is a dire threat to the planet that must be reversed; a conclusion that would enrich Dr. Pachauri and the entities that employ him. Consequently, EPA has relied on an assessment that ensures bias and imbalance, a result that EPA claims to want to avoid.

Response (2-25):

Rajendra Pachauri is the elected, unpaid chairman of the IPCC. The IPCC chairmanship requires expertise and experience in climate change science and policy. The chairperson is elected based on this level of expertise and experience. As a result, it is difficult to imagine that a qualified candidate would not have connections and interactions with various academic, science, political, and business communities. Having such connections is not, in and of itself, evidence of conflict of interest in the development of the assessment reports. The petitioners insinuate that Pachauri's professional connections with various companies constitute conflicts of interest, yet they did not provide any evidence that Pachauri's outside activities generated conflicts of interest or violated any ethics rules of the World Meteorological Organization or the U.N. Environment Programme. In fact, in the interest of transparency, Dr. Pachauri has made available his tax returns and details regarding the honorariums and payments from his consulting activities. Further, it appears that the auditing firm KPMG examined his personal finances and found that all such payments were made to The Energy and Resources Institute, an Indian non-governmental organization chaired by Dr. Pachauri (Harvey, 2010).

Most importantly, the petitioners' argument that these consulting activities led to biased, imbalanced, and compromised IPCC assessments is completely unsupported by evidence. The petitioners do not provide a single example of a scientific conclusion that was somehow influenced by Dr. Pachauri's alleged conflicts of interest. The Endangerment Finding must and does rest on strong science, not innuendo and speculation of the sort provided by the petitioners. See Sections 2.2.2 and 2.2.3 in this volume of the RTP document, which address our view that the IPCC's procedures are sufficient to ensure that no one individual—including the IPCC chairman—or group of individuals can exert disproportionate influence in developing any piece of the assessment reports. The IPCC has robust procedures to ensure that the assessment reports are objective, are unbiased, and represent the state of the science regarding climate change. Thus, EPA has no reason to conclude, and there is no evidence to suggest, that Pachauri's professional connections influenced the IPCC reports in any way.

Comment (2-26):

The State of Texas argues that EPA's RTC document insufficiently addressed comments on the Administrator's consideration of studies that disagreed with the assessment literature. Specifically, the petitioner stated:

In response to public comments suggesting that the Administrator should have included studies that disagreed with the Endangerment Finding, EPA notes that "IPCC, USGCRP/CCSP [the U.S. Global Change Research Program/Climate Change Science Program], and NRC [National Research Council] make considerable effort to ensure that their assessment reports reflect a balance of perspectives regarding the state of the science." To support that response, EPA quotes a National Academies report noting that the NRC screens all "provisional committee members . . . in writing and in a confidential group discussion about possible conflicts of interest.... [N]o individual can be appointed to serve (or continue to serve) on a committee of the institution used in the development of reports if the individual has a conflict of interest that is relevant to the functions to be performed." Thus, EPA identifies the National Academies' prohibition on conflicts of interest as a means of ensuring that the Endangerment Finding is balanced and unbiased.

Response (2-26):

We responded to this issue in Response 1-2 of Volume 1 of the RTC document, and we find that our response to public comments on this issue was sufficient, detailed, and responsive. The petitioner misrepresents EPA's actual response, which we provide again here to put the petitioner's allegation in perspective.

Comment (1-2):

A number of commenters (3324.1, 3394.1, 3429.1, 3440.1, 3481.1, 3533.1, 3579.1, 3596.1, 3707.1, 3747.1, 3764.1, 3915, 4509, 5716, 8624, 10197, 10948, and 11335) argue that the Administrator did not reference any documents in her decision-making process that offered alternative views on the scientific basis for causes of climate change. Commenters recommend that EPA provide a more complete discussion of global warming science by using information outside the assessment literature, including studies that do not support its conclusions and studies submitted to the docket through the public comment period for the Proposed Findings.

Response (1-2):

We disagree that the Administrator did not consider alternative views on climate change science and impacts. Such a contention incorrectly implies that all individual studies reviewed and incorporated into the assessments of U.S. Global Change Research Program (USGCRP), U.S. Climate Change Science Program (CCSP), Intergovernmental Panel on Climate Change (IPCC), and National Research Council (NRC) support uniform conclusions on the different elements of greenhouse gas (GHG) and climate change science, and that the many thousands of studies reviewed and reflected in these major assessment works represent a narrow view of GHG and climate change science. In fact, these assessment reports look at the range of the scientific literature without "cherry-picking" and it is EPA's conclusion that by placing primary reliance on the major assessment reports, we have ensured that the determinations are based on reports that have considered and weighed all views. EPA relied on the major peer-reviewed assessment reports in developing the TSD (U.S. EPA, 2009) precisely to avoid an over-reliance on and narrow consideration of individual studies and to ensure that the Administrator's decision would be based on a comprehensive assessment of the scientific literature. EPA has determined that the approach taken provided the high level of transparency and consistency outlined by EPA's *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility and Integrity of Information Disseminated by the Environmental Protection Agency*.

Regarding the recommendation that EPA provide a more comprehensive discussion and consideration of global warming science and literature that is representative of "alternative views," we have done this through our review of comments and literature submitted, the associated revision of the TSD, and the development of the eleven volumes of the Response to Comments document. See Section III.A. of the Findings, "The Science on Which the Decisions Are Based," for our response to comments on the use of the assessment literature and previous responses in this section regarding our treatment of new and additional scientific literature provided through the public comment

process. For EPA's responses to comments and literature provided on specific climate science issues in the TSD, please refer to the appropriate Response to Comment volumes.

Finally, we note that IPCC, USGCRP/CCSP, and NRC make considerable effort to ensure that their assessment reports reflect a balance of perspectives regarding the state of the science. We note that the CCSP report *Guidelines for Producing CCSP Synthesis and Assessment Products* state that the reports should "identify disparate views that have significant scientific or technical support" (CCSP, 2004). We refer commenters to Appendix B of this volume for the full listing of these *Guidelines*. Further, NRC (National Academies, 2006) report development procedures state that:

[C]areful steps are taken to convene [report development] committees that meet the following criteria:

An appropriate range of expertise for the task. The committee must include experts with the specific expertise and experience needed to address the study's statement of task. One of the strengths of the National Academies is the tradition of bringing together recognized experts from diverse disciplines and backgrounds who might not otherwise collaborate. These diverse groups are encouraged to conceive new ways of thinking about a problem.

A balance of perspectives. Having the right expertise is not sufficient for success. It is also essential to evaluate the overall composition of the committee in terms of different experiences and perspectives. The goal is to ensure that the relevant points of view are, in the National Academies' judgment, reasonably balanced so that the committee can carry out its charge objectively and credibly.

Screened for conflicts of interest. All provisional committee members are screened in writing and in a confidential group discussion about possible conflicts of interest. For this purpose, a "conflict of interest" means any financial or other interest which conflicts with the service of the individual because it could significantly impair the individual's objectivity or could create an unfair competitive advantage for any person or organization. The term "conflict of interest" means something more than individual bias. There must be an interest, ordinarily financial, that could be directly affected by the work of the committee. Except for those rare situations in which the National Academies determine that a conflict of interest is unavoidable and promptly and publicly disclose the conflict of interest, no individual can be appointed to serve (or continue to serve) on a committee of the institution used in the development of reports if the individual has a conflict of interest that is relevant to the functions to be performed."

We refer commenters to Appendix C of this volume for more information on NRC report development process. In addition, please see response to comments below regarding the IPCC report development process and procedures for ensuring a balance of perspectives.

Petitioners reference only a small part of our response in their allegations. Our full response and the record for the Endangerment Finding demonstrate that the Administrator thoroughly

considered a range of studies, including those that disagree with the conclusions of the assessment literature.

2.2.3.4 Allegations That IPCC Lead Authors Forced Consensus and Suppressed Dissenting Views

Comment (2-27):

The Southeastern Legal Foundation, the State of Texas, Peabody Energy, the Competitive Enterprise Institute, and the Ohio Coal Association argue that the CRU e-mails (in particular an e-mail from Phil Jones to Michael Mann expressing their disapproval of two new studies authored by Stephen McIntyre and Ross McKittrick) reveal that the contents of the IPCC reports, in this case Chapter 3 of the AR4 Working Group I report (Trenberth et al., 2007), were altered to eliminate any suggestion of non-consensus on key issues. Petitioners claim that this occurred so as to support a specific policy agenda, and that dissenting views were not given appropriate attention and consideration. The petitioners also argue that a group of authors have actively tried to suppress external challenges to consensus.

Response (2-27):

Although the petitioners draw broad conclusions of unethical and biased conduct from the e-mail between Phil Jones and Michael Mann, this e-mail does not show that the two IPCC authors acted unethically, or that they took any actions to suppress dissenting views, as alleged by the petitioners. The e-mail at issue was sent on July 8, 2008, and states:

Mike,

Only have it in the pdf form. FYI ONLY - don't pass on. Relevant paras are the last 2 in section 4 on p13. As I said it is worded carefully due to Adrian knowing Eugenia for years. He knows they're wrong, but he succumbed to her almost pleading with him to tone it down as it might affect her proposals in the future ! I didn't say any of this, so be careful how you use it - if at all. Keep quiet also that you have the pdf. The attachment is a very good paper - I've been pushing Adrian over the last weeks to get it submitted to JGR or J. Climate. The main results are great for CRU and also for ERA-40. The basic message is clear - you have to put enough surface and sonde obs into a model to produce Reanalyses. The jumps when the data input change stand out so clearly. NCEP does many odd things also around sea ice and over snow and ice. The other paper by MM is just garbage - as you knew. De Freitas again. Pielke is also losing all credibility as well by replying to the mad Finn as well - frequently as I see it. I can't see either of these papers being in the next IPCC report. Kevin and I will keep them out somehow - even if we have to redefine what the peer-review literature is!

Cheers Phil²⁰

The e-mail shows that Phil Jones strongly disapproved of the quality of the two studies²¹ and that he did not deem them to be of sufficient quality and credibility for inclusion in an IPCC

²⁰ E-mail file 1089318616.txt, (July 8, 2008), Page 720, Line 46 of PDF version entitled: CRU Emails 1996-2009.pdf

²¹ The paper Jones refers to by "MM" was McKittrick and Michaels (2004). It is not clear what the second paper is, however it was possibly De Laat and Maurellis (2006).

assessment report. In addition, both of the papers were in fact included in the IPCC assessment report. The “MM” study (McKittrick and Michaels, 2004) is referenced in the IPCC chapter, and assuming that the second study Jones referred to is De Laat and Maurellis (2006), that was included as well. This disproves the allegations of the petitioners that this e-mail is evidence that dissenting views were suppressed or that the IPCC assessment report was biased by such efforts. For example, these two studies are discussed in Chapter 3 (Trenberth et al., 2007):

McKittrick and Michaels (2004) and De Laat and Maurellis (2006) attempted to demonstrate that geographical patterns of warming trends over land are strongly correlated with geographical patterns of industrial and socioeconomic development, implying that urbanization and related land surface changes have caused much of the observed warming.

Thus, the events surrounding the citation of the McKittrick and Michaels (2004) and De Laat and Maurellis (2006) studies provide stronger support for the proposition that the IPCC assessed and cited critical literature than for the petitioners’ view that these events demonstrate that the IPCC is biased.

The e-mail between Jones and Mann, which is the only evidence offered by petitioners to support this allegation, simply does not show that either 1) the contents of this chapter, let alone all of the IPCC assessment reports, were altered to eliminate a suggestion of nonconsensus, or 2) IPCC authors actively tried to suppress external challenges to consensus. It is not uncommon for scientists to disagree with the work of others, and this e-mail does not provide evidence that Phil Jones or any other IPCC author acted unethically or took actions to suppress dissenting views, notwithstanding the loose talk in the e-mail.

Our conclusion regarding this e-mail is consistent with the findings of the Independent Climate Change E-mails Review investigation, which concluded “that it is not uncommon for strongly opposed and robustly expressed positions to be taken up in heavily contested areas of science. We take the view that such behaviour does not in general threaten the integrity of peer review or publication.” The final report of the investigation also stated that the panel has “not found any direct evidence to support the allegation that members of CRU [in this case Phil Jones] misused their position on IPCC to seek to prevent the publication of opposing ideas”(Russell, 2010). On this issue, Brian Hoskins, one of three review editors for Chapter 3, provided statements to the Independent Climate Change E-mails Review that were summarized in the panel’s report as stating (Russell, 2010):

Hoskins confirmed that Las [lead authors], working individually and as small groups, were responsible for the collation and primary assessment of material relevant to the topics for which they were responsible. The CLAs [convening lead authors] led the plenary meetings of the writing team prior to production of each of the drafts, led the process of overall collation of the Chapter material and the production of the initial drafts of the First and Second Draft Reports and the Final Draft Report of the Chapter. These drafts were discussed and agreed during plenary meetings of the whole writing team.

There were a very large number of comments from reviewers, of which a majority were from a relatively small group. The Review Editors made sure that they were all given proper consideration, and that they were either responded to by a change in the text or by an adequate reason for omission that was recorded in the author responses to expert and governmental review comments. Hoskins, as a Review Editor, took part in the Chapter 3 plenary discussions and ensured that conflicting views were addressed.

Led by the two CLAs, Jones and Trenberth, the writing team for Chapter 3 was assiduous in dealing with comments. Hoskins was very impressed by Jones' attention to detail, and the rigor of the Chapter 3 process.

The levels of confidence and uncertainty reflected in the drafts were based on the consensus of a group of CLAs and LAs who were chosen for their expertise and experience in relevant fields. Irrespective of whether a paper is published in a peer reviewed journal, it is the responsibility of the whole team to assess whether a paper's conclusions are robust and to justify whether its arguments should carry weight in the assessment. These decisions for each draft were taken in plenary sessions of the whole team. Hoskins said that it is inconceivable that a paper making significant claims relevant to the work of IPCC and the Chapter 3 team would not be considered by the team as a whole. The basis for rejecting one of the papers that is a focus of the allegation is included in IPCC records. Decisions about the inclusion of the MM2004 [McKittrick and Michaels] paper would have been taken by the whole team. Jones' voice would have been one amongst many.

The petitioners do not present scientific evidence or argument showing that the IPCC assessment is inaccurate or that it does not appropriately reflect the degree of scientific consensus on the issues discussed. The petitioner's broad conclusion that this is the case is unsupported by evidence or arguments on the science and assessment literature itself. Finally, we note that the science regarding this issue was raised in the comment period for the Endangerment Finding and responded to in Response 2-29 of the RTC document. Response 2-29 states:

"In the case of de Laat and Maurellis (2006) and an earlier paper by McKittrick and Michaels (2004), IPCC (Trenberth et al., 2007) assessed these papers and noted that the locations of greatest socioeconomic development coincided with those most warmed by atmospheric circulation changes, which are not limited to urban areas but rather have large-scale coherence. When this is taken into account, IPCC concludes that the correlation of warming with industrial and socioeconomic development ceases to be statistically significant."

Comment (2-28):

The Southeastern Legal Foundation argues:

The so-called “science” of global warming has been conducted in an ideologically charged environment, such that any possibility of giving due regard to dissenting views was foreclosed at the outset. Thus, the conclusions of organizing bodies, especially IPCC, cannot be said to reflect scientific “consensus” in any meaningful sense of that word. Instead, they reflect a political movement that has commandeered science to the service of its agenda. This is “post-normal science”: the long-dreaded arrival of deconstructionism to the natural sciences, according to which scientific quality is determined not by its fidelity to truth, but by its fidelity to the political agenda. A leading climate scientist and contributor to the IPCC, Mike Hulme, has called the IPCC “a classic example” of “post normal science.”

The petitioner further asserts:

Post-normal science was defined by Eva Kunseler, in her paper “Towards a new paradigm of Science” as follows: A new concept of science was introduced by Funtowicz and Ravetz during the 1990s...The concept of post-normal science goes beyond the traditional assumptions that science is both certain and value-free...The exercise of scholarly activities is defined by the dominance of goal orientation where scientific goals are controlled by political or societal actors...Scientists’ integrity lies not in disinterestedness but in their behaviour as stakeholders.”(Kunseler, 2007)

Response (2-28):

We first note that this allegation that the IPCC’s work does not represent objective scientific assessment but is motivated by a political agenda is not new. The petitioner is rehashing an argument previously submitted during public comment on the proposed endangerment finding. We responded to numerous comments received regarding the scientific integrity and objectivity of the IPCC’s processes in developing its assessment reports in Volume 1, Section 1, of the RTC document.

We note that the evidence submitted by the petitioner—consisting of a newspaper op-ed by Mike Hulme in *The Guardian* (Hulme, 2007) and the definition of “post-normal science” from a non-peer-reviewed essay by Eva Kunseler (Kunseler, 2007)—are not new; they were both developed in 2007. Therefore, it was not impracticable to raise the objection during the public comment period and the reasons for the objection did not arise between June 24, 2009, and February 16, 2010. The petitioner could have raised this comment during the comment period on the proposed Endangerment Finding. The petitioner has not shown why it would have been impractical to do so.

In addition, the evidence does not support the petitioner’s allegation that the science behind climate change has been developed in a biased and “ideologically charged environment.” The petitioner mischaracterizes Hulme’s discussion of post-normal science and defines what he meant by “post-normal science” with the use of an unrelated paper by Eva Kunseler that has

nothing to do with climate change. This is an excerpt of the relevant part of Hulme's op-ed in *The Guardian* newspaper:

That science is an unfolding process of discovery is fairly self-evident. The more we seem to know, the more questions we seem to need answering. Some avenues of scientific inquiry may close off, but many new ones open up. We know a lot more about climate change now than 17 years ago when the first IPCC scientific assessment was published. And no doubt in another 17 years our knowledge of how the climate system works and the impact that humans have made on it will be significantly different to today. Yet it is important that on big questions such as climate change scientists make an assessment of what they know at key moments when policy or other collective decisions need to be made. Today is such a time. But our portrayal of the risks of climate change will always be provisional, subject to change as our understanding advances. Having challenges to this unfolding process of discovery is essential for science to thrive, as long as those challenges play by the methodological rule book that science has painstakingly written over many generations of experience.

The other important characteristic of scientific knowledge - its openness to change as it rubs up against society - is rather harder to handle. Philosophers and practitioners of science have identified this particular mode of scientific activity as one that occurs where the stakes are high, uncertainties large and decisions urgent, and where values are embedded in the way science is done and spoken. It has been labelled "post-normal" science. Climate change seems to fall in this category. Disputes in post-normal science focus as often on the process of science - who gets funded, who evaluates quality, who has the ear of policy - as on the facts of science.

Hulme's discussion of post-normal science presents his opinion about how societal values and policy decisions intersect with the practice of science. His statement does not say or imply that post-normal science means that "a political movement [has] commandeered science to the service of its agenda," nor does he state that climate change is a "classic example of post-normal science." In contrast, Hulme stresses that science is a "process of discovery" that thrives on challenges that "play by the methodological rule book that science has painstakingly written over many generations of experience." This is clearly not a statement about science being controlled by politics, nor a statement that politics have prevented climate change scientists from giving "due regard to dissenting views," as the petitioner asserts.

Even if Hulme did claim an overly "ideologically charged environment," this would only represent the opinion of one person among numerous scientific fields comprising an immense number of scientists, institutions, assessment bodies, and governmental organizations. This evidence, presented as a conclusion with no supporting evidence and with no scientific explanation of the errors that resulted, would not come close to undermining the credibility and quality of the findings of the assessment literature. As described in this volume, and Volume 1 of the RTC document for the Endangerment Finding, the assessment literature upon which EPA based the Endangerment Finding has robust processes and procedures to ensure that the best available scientific information is reviewed and assessed, with checks and balances included to

produce high-quality, unbiased reports. We respond to specific objections raised by petitioners regarding the implementation of the IPCC procedures throughout Section 2.2 of this volume.

We also note that we considered and responded to multiple perspectives and views of climate science in the RTC document for the Endangerment Finding, and considered and responded again to the various perspectives of the petitioners here in the RTP document and in the Denial. As discussed extensively in our responses, the IPCC and the USGCRP also considered alternative views in their assessment processes. See Volume 1 of the RTC document and Section 2.2.2 (Background) of this Volume of the RTP document for a discussion of these report development processes.

We have reviewed the petitioner's arguments and materials and do not find that they support the allegations that the IPCC was co-opted by politics and biased against dissenting views. The balance of the scientific literature represented in the assessment reports on climate change, of which the IPCC is one, clearly supports the Administrator's findings.

Comment (2-29):

The Ohio Coal Association and the Coalition for Responsible Regulation argue that the CRU e-mails "demonstrate that climate scientists felt pressured to present a unified front - and an agreed-upon narrative of global warming - even when there was not one." Both petitioners reference an e-mail from Keith Briffa to Michael Mann which states: "I tried hard to balance the needs of the science and the IPCC, which were not always the same." Also, as evidence to support their argument, the Coalition for Responsible Regulation provides a letter to the IPCC from Christopher Landsea, a former IPCC author, in which he states that he could not "in good faith continue to contribute to a process that I view as both being motivated by preconceived agendas and being scientifically unsound" (Landsea, 2005).

Response (2-29):

Seeing the entire content of the e-mails cited by the petitioner is important to place the first issue raised by petitioners in context:

E-mail from Mann to Briffa on Sunday, April 29, 2007

Keith, just a quick note to let you know I've had a chance to read over the key bits on last millennium in the final version of the chapter, and I think you did a great job. obviously, this was one of the most (if not the most) contentious areas in the entire report, and you found a way to (in my view) convey the the[sic] science accurately, but in a way that I believe I will be immune to criticisms of bias or neglect--you dealt w/ all of the controversies, but in a very even-handed and fair way. bravo! I hope you have an opportunity to relax a bit now. Looking forward to buying you a beer next time we have an opportunity :) mike²²

E-mail from Briffa to Mann on Sunday, April 29, 2007

Mike your words are a real boost to me at the moment. I found myself questioning the whole process and being often frustrated at the formulaic way things had to be done -

²² E-mail file 1177890796.txt, (April 29, 2007) page 1310, line 44 of PDF version entitled: CRU Emails 1996-2009.pdf

often wasting time and going down dead ends. I really thank you for taking the time to say these kind words. I tried hard to balance the needs of the science and the IPCC, which were not always the same. I worried that you might think I gave the impression of not supporting you well enough while trying to report on the issues and uncertainties. Much had to be removed and I was particularly unhappy that I could not get the statement into the SPM [Statement for Policymakers] regarding the AR4 reinforcement of the results and conclusions of the TAR [Third Assessment Report]. I tried my best but we were basically railroaded by Susan. I am happy to pass the mantle on to someone else next time. I feel I have basically produced nothing original or substantive of my own since this whole process started. I am at this moment, having to work on the ENV submission to the forthcoming UK Research Assessment exercise, again instead of actually doing some useful research! Anyway thanks again Mike.... really appreciated when it comes from you
very best wishes
Keith²³

These two e-mails were written after the release of the Working Group I report of AR4 (IPCC, 2007e). Michael Mann writes an e-mail showing his approval of the final version of Chapter 6 (“Paleoclimate”) of Working Group I report (Jansen et al., 2007) and to congratulate Briffa on the accomplishment. Keith Briffa responds to show his appreciation for Mann’s e-mail; he explains some of the challenges and difficulties he encountered while finalizing the chapter and getting it through the ultimate stages of review. As stated in Section 2.2.2 (Background) and Response 2-16 above, Chapter 6 had two convening authors and 14 lead authors from 12 countries, 33 contributing authors from nine countries, and two review editors who oversaw the handling of more than 2,900 comments from the rounds of expert and governmental review. It is perfectly understandable and reasonable that Briffa, who was one of the 14 lead authors, would have been frustrated by some of the challenges in examining all of the available scientific literature on topics related to paleoclimate (whether or not it agrees with the dominant paradigms and whether or not it has yet stood the test of time compared to other studies that have considered the topic), putting that literature in context through a process of assessment, distilling the information into key messages that capture the state of knowledge at the time of the assessment, addressing all of the expert and government reviews, and developing key points for the summary for policymakers. Briffa’s e-mail does not support the petitioner’s allegation that he “felt pressured to present a unified front - and an agreed-upon narrative of global warming - even when there was not one.” The petitioner is taking Briffa’s statement that he “tried hard to balance the needs of the science and the IPCC, which were not always the same” completely out of context and making unsupported allegations. Although he describes some frustrations with the challenges of the IPCC’s rigorous and robust report development procedures, Briffa’s e-mail does not indicate that he was not satisfied with the final version, that he did not agree with the conclusions, nor that he felt pressured in any way to “present a unified front.”

The e-mails in question also reveal that the process of scientific assessment is personally and professionally challenging because scientists who volunteer their time are taken away from their

²³ E-mail file 1177890796.txt, (April 29, 2007) page 1310, line 24 of PDF version entitled: CRU Emails 1996-2009.pdf

own research and must sideline their own personal views of what should and should not be included in the reports. In fact, Michael Mann compliments Keith Briffa's objectivity and even-handedness in handling the challenges. Briffa also clearly expresses frustration with the time spent away from doing new science, which is not the primary job of an IPCC chapter author or of the IPCC in general. The primary role of the IPCC is to assess existing science already published in the literature, i.e., in Briffa's words, "the needs of the science and the IPCC" are not always the same. In context, it is clear that the needs of the IPCC in this case are the "formulaic way things had to be done" and the need to do assessments of existing literature rather than producing "original and substantive" work or "useful research." It appears original research would be what Briffa is referring to as the needs of the science. When the e-mails are read in their full context, it is clear that the authors of these e-mails sought to convey the science accurately and address all the controversies in a fair and even-handed way. Again, petitioners appear to have selectively picked excerpts from emails.

We note that the Landsea letter provided by the Coalition for Responsible Regulation is not new. As stated in the link of the letter provided by the petitioner (Taylor, 2005), Landsea wrote this letter in January 2005. Therefore, it was not impracticable to raise the objection during the public comment period and the reasons for the objection did not arise between June 24, 2009, and February 16, 2010. The petitioner could have raised this comment during the comment period on the proposed Endangerment Finding. The Coalition for Responsible Regulation has not shown why it would have been impracticable to do so, especially given the fact that the public has been aware that EPA might rely on the IPCC assessments since the July 2008 Advance Notice of Proposed Rulemaking.

Despite this, we will respond briefly to the petitioner's allegations. Christopher Landsea served as a contributing author for the IPCC Second and Third Assessment Reports (IPCC 1995, IPCC 2001), but chose not to participate in AR4. In the initial planning stages of the AR4, Landsea wrote this letter to the IPCC expressing his disapproval with IPCC procedures. Specifically, Landsea disapproved of the fact that Kevin Trenberth, an IPCC lead author for the TAR, purportedly used his position to "promulgate to the media and general public his own opinion that the busy 2004 hurricane season was caused by global warming, which is in direct opposition to research written in the field and is counter to conclusions in the TAR [Third Assessment Report]." Landsea went on to state that "As the IPCC leadership has seen no wrong in Dr. Trenberth's actions and have retained him as a Lead Author for the AR4, I have decided to no longer participate in the IPCC AR4." This letter shows that Landsea disagreed with Trenberth regarding a particular aspect of the attribution of hurricanes to climate change and that Landsea did not approve of Trenberth representing the IPCC when discussing his views about the issue.

This impact of climate change on hurricane activity is a very dynamic issue. There are still significant uncertainties in the underlying climate science, so it not surprising that two scientists would disagree regarding the attribution of the 2004 hurricane season to climate change effects. However, the contents of the letter do not "demonstrate that climate scientists felt pressured to present a unified front - and an agreed-upon narrative of global warming - even when there was not one," as alleged by the petitioner. Landsea was not taking issue with the content of the IPCC reports, but with how Trenberth discussed certain issues during the period between the Third and Fourth Assessment Reports. The fact that Landsea disapproved of how Trenberth represented

the IPCC in discussing a specific scientific issue at a press conference preceding development of the AR4 provides absolutely no support for petitioners' claim that the conclusions reached in AR4 are incorrect or biased, or that they were developed in a way that pressured scientists into presenting "a united front." The petitioners did not provide any evidence to support that conclusion.

We also note that the discussion in AR4 of uncertainties associated with the impact of climate change on hurricane activity reflected the ongoing debate and alternative views on the issues. EPA also clearly described the uncertainties related to hurricane activity and climate change in the TSD and again in Volumes 2 and 4 of the RTC document for the Endangerment Finding. Finally, our response to allegations involving the IPCC's characterization of climate change and disaster losses can be found in Subsection 2.1.4 of this volume of the RTP document.

2.2.4 Responses to Allegations Based on Information That Is Not New

The petitioners submitted four objections concerning: 1) the collaborations among IPCC authors, 2) the general IPCC peer review process, 3) the alleged manipulation of dates and deadlines for accepting literature, and 4) the IPCC's use of gray literature. EPA has reviewed the petitioners' submissions and finds that it was not impracticable to raise the objection during the public comment period and that the reasons for the objection did not arise between June 24, 2009, and February 16, 2010. The IPCC AR4 has been public since early 2007, and petitioners could have raised these comments during the comment period on the proposed Endangerment Finding. Although, in most cases, the petitioners provide excerpts from the CRU e-mails in support of their assertions, EPA's review has determined that this evidence does not support their allegations, and that the vast majority of the information submitted by petitioners on these topics was available well before the comment period for the Endangerment Finding. Petitioners have not shown why it would have been impracticable for them to raise these issues then, especially given the fact that the public has been aware that EPA relied, in part, on the IPCC assessments since the July 2008 ANPR. Indeed, some of these same points were already raised, and responded to, in the RTC.

Despite the fact that these objections fail to meet the criteria for a petition for reconsideration, we briefly explain why, contrary to petitioners' allegation, they fail to call into question the overall integrity or validity of the IPCC AR4. As noted above, very similar comments questioning the appropriateness of IPCC author and reviewer roles were submitted and responded to during the development of the Findings (see Volume 1 of the RTC document).

2.2.4.1 Allegations of Inappropriate Collaborations Among IPCC Authors

Comment (2-30):

The State of Texas, Peabody Energy, and the Coalition for Responsible Regulation contend that the CRU e-mails show that IPCC authors and reviewers are close associates who frequently collaborate on projects and studies, and claim that such collaborations create conflicts of interest (for example, when one person authors an IPCC chapter and another serves as an official reviewer). Peabody Energy argues that the Wegman Report, *Social Network Analysis of Authorship in Temperature Reconstruction*, confirms that IPCC scientists are closely networked

with each other and dominate their field. The petitioner references testimony given by Edward J. Wegman (George Mason University) to Congress (Wegman, 2006) in arguing that “the paleoclimate field is dominated by interlinked scientists who no longer produce research that has the desired degree of independence.”

Based on this report, Peabody Energy provides a detailed example of the small paleoclimate research community and how these scientists frequently co-author papers together, review each other’s papers, and collaborate in other ways that generate conflicts of interest. Specifically, the petitioner, in referring to Chapter 9 (“Understanding and Attributing Climate Change”) of Working Group I’s contribution to the AR4 (Hegerl et al., 2007), provides a series of statistics that were also provided to EPA during the public comment period (these statistics are provided below) and argues that EPA did not respond to these specific issues in the RTC document:

- Forty of the 53 authors of this chapter co-authored papers with each other.
- More than half of the contributing authors co-authored papers with lead authors or coordinating lead authors.
- The review editor of the chapter contributed to 13 papers cited in the chapter and had co-authored these papers with 10 other authors of Chapter 9.
- Of the published papers in Chapter 9:
 - 94 were authored by two or more of that chapter’s authors.
 - One cited paper had six chapter authors.
 - Five cited papers had five chapter authors.
 - 26 papers had three chapter authors, including six papers written entirely by chapter authors.
 - 50 of the cited papers listed two chapter authors each, and 10 of these papers were written entirely by chapter authors.

Response (2-30):

Neither the facts nor the evidence provided support the petitioners’ claim that the collaborations among climate researchers led to conflicts of interest and bias, or that these collaborations interfered with their ability to be objective and impartial. Some climate science fields (e.g., paleoclimatology) are highly specialized and are the focus of only a limited number of researchers. In such fields, scientists who have at one point in the past collaborated on work can be called on to review each other’s work. This practice is common in a variety of scientific areas with a relatively limited number of researchers, not just these specific climate science fields. It is actually the most robust practice of ensuring scientific credibility, because the reviewing scientists are the true experts who know the material and are most capable of fulfilling the review role. Petitioners’ conclusions of impropriety or bias are not supported by the mere fact that authors know each other and have collaborated.

We respond to Peabody Energy’s statistics regarding Chapter 9 in Subsection 2.2.3.2 of this volume of the RTP document. Given the limited number of researchers in this particular area, the statistics regarding author and reviewer roles in Chapter 9 of Working Group I’s contribution

to the AR4 (Hegerl et al., 2007) are not surprising and do not indicate, as alleged by the petitioner, that there were “built-in conflicts of interest that had the potential for undermining the reliability of the reports.” Rather, these statistics show that the most qualified and experienced authors and reviewers were involved in developing that particular chapter. EPA carefully reviewed and responded to these statistics regarding collaborations among IPCC authors in Volume 1 of the RTC document.

Furthermore, all scientific papers have to abide by strict ethical, conflict of interest, and scientific integrity/quality rules. The evidence provided by the petitioners does not show that these rules have been broken, that the peer-review system has been compromised, or that the assessment literature did not consider a range of perspectives in summarizing the state of the science. Essentially, the petitioners’ argument can be boiled down to the view that if scientists work together and know each other, something improper is probably happening. This is an unwarranted and unjustified view of professional relationships, based on pure speculation.

Finally, we note that Peabody Energy does not provide any evidence to support its allegation that the past collaborations of these authors and reviewers actually led to “less than fully independent and rigorous” assessments of the science. The petitioner provided limited and unsubstantiated critiques of the science presented in Chapter 9, which we address in Volume 1 of this RTP document. Peabody Energy also provides no scientific argument or analysis indicating that the research produced by these scientists or the IPCC chapter at issue was in any way biased or less than scientifically rigorous.

2.2.4.2 Allegations Regarding Insufficient Peer Review Processes for the IPCC

Comment (2-31):

Peabody Energy claims that the IPCC’s peer review process is less robust and credible than the processes employed by scientific journals because IPCC lead and contributing authors are the ones who decide whether to accept or reject critical reviews. The petitioner argues that the IPCC’s process is flawed because there is no neutral scientist, who was not involved in the writing, to ensure that the reviews are judged objectively.

Response (2-31):

First, we note that the petitioner provides no new information to substantiate their allegation, and that Peabody Energy’s argument regarding the rigor of the IPCC’s peer review does not accurately describe the actual review process used by the IPCC. As described above in Subsection 2.2.2 (Background) of this volume, lead and contributing authors are indeed tasked with initially responding to comments; however, independent and objective review editors (i.e., editors not involved in the writing of the chapter) are assigned to each chapter to ensure that each comment is addressed properly and accurately. Furthermore, the contributing authors are not allowed to simply reject critical reviews without documenting their rationale. The IPCC carefully documented all comments received on the first and second order drafts of each chapter of each working group. These comments and responses are, and have always been, publically available (IPCC, 2006a for Working Group I and IPCC, 2005 for Working Group II).

In addition, it would be illogical and inappropriate for the IPCC, as suggested by the petitioner, to allow only unrelated parties to respond to comments on chapters that they did not write. What the petitioner seems to believe would be appropriate—allowing unrelated people to respond to comments on the draft documents, as opposed to having the authors respond and revise their drafts—makes absolutely no sense and is not common in any scientific discipline because the unrelated parties would not possess the experience and context necessary to properly understand and respond to the comments. We therefore disagree with the petitioner’s argument that the IPCC’s peer review procedures are less rigorous than the processes employed by scientific journals. Petitioners provide no evidence that the IPCC authors inappropriately influenced the response to comments process or that review editors failed to perform their role in ensuring that all comments were properly addressed. The mere allegations and conclusory claims made by the petitioner are insufficient to support the broad conclusion they draw. Finally, we note that the petitioner did not provide examples of other peer review processes that they deemed to be more robust and credible than those procedures employed by the IPCC.

2.2.4.3 Allegations That IPCC Authors Manipulated Deadlines for New Literature

Comment (2-32):

Peabody Energy argues that the IPCC manipulated dates and deadlines for receipt of new literature to provide additional evidence in substantiating its conclusions regarding 20th-century warming. Specifically, the petitioner provides an example of two papers (both by Caspar Ammann and Eugene Wahl) on long-term temperature reconstructions, one of which was allegedly allowed to be referenced by IPCC authors in the AR4 only because, the petitioners claim, the IPCC manipulated the deadline for receipt of literature.

Response (2-32):

The evidence provided by Peabody Energy does not demonstrate that the IPCC, specifically the lead author of Chapter 6 of Working Group I’s contribution to the AR4 (Jansen et al., 2007), manipulated the deadline for receipt of new literature for the purpose of including the two papers by Ammann and Wahl (Ammann and Wahl, 2007; Wahl and Ammann, 2007). We note that the IPCC AR4 has been public since early 2007, and petitioners could have raised these objections during the comment period on the proposed Endangerment Finding. Petitioners have not shown why it would have been impractical for them to do so. The only part of their argument that is “new” (i.e., has arisen since the close of the comment period on June 23, 2009) is an e-mail between Wahl and Ammann, which is a very minor part of their overall interaction. The e-mail only shows that Wahl and Ammann were making final proofing edits in September 2007. The e-mail stated:

Hi Phil:

There were inevitably a few things that needed to be changed in the final version of the WA paper, such as the reference to the GRL paper that was not published (replaced by the AW paper here), two or three additional pointers to the AW paper, changed references of a Mann/Rutherford/Wahl/Ammann paper from 2005 to 2007, and a some other very minor grammatical/structural things. I tried to keep all of this to the barest minimum possible, while still providing a good reference structure. I imagine that MM [Ross McKittrick and Pat Michaels] will make the biggest issue about the very existence

of the AW paper, and then the referencing of it in WA; but that was simply something we could not do without, and indeed AW does a good job of contextualizing the whole matter. Steve Schneider seemed well satisfied with the entire matter, including its intellectual defensibility (sp?) and I think his confidence is warranted. That said, any other thoughts/musings you have are quite welcome.
Peace, Gene²⁴

As stated by the petitioner, the deadline for receipt of new literature was changed during the development of the Working Group I report. The deadline was originally December 2005 and was changed to July 24, 2006. When the coordinating lead authors for Working Group I extended the deadline for receipt of new literature, they provided the following justification (IPCC, 2006b):

To ensure clarity and transparency in determining how such material might be included in the final Working Group I report, the following guidelines will be used by Lead Authors in considering such suggestions. In preparing the final draft of the IPCC Working Group I report, Lead Authors may include scientific papers published in 2006 where, in their judgment, doing so would advance the goal of achieving a balance of scientific views in addressing reviewer comments.

The authors of Chapter 6 followed this guidance and included the Wahl and Ammann (2007) study. We note that the Wahl and Ammann paper was accepted into *Climatic Change* on March 1, 2006, which means that at that point, the paper had passed peer review and the editor had agreed with the reviewers regarding its merit for publication. Thus, although the citation for the paper is in 2007, the acceptance date met the IPCC's revised deadline of July 24, 2006, for receipt of new literature that was established by AR4 lead authors. It appears that the same authors' other paper, Ammann and Wahl (2007), was not accepted for publication in time to meet the extended deadline for receipt of new literature, and we note that it is therefore not referenced in Chapter 6 of the AR4.

The petitioner alleges impropriety because the IPCC referenced Wahl and Ammann (2007), even though some of the underlying statistical analysis for that study, which was eventually published in Amman and Wahl (2007), had not been accepted for publication by the extended deadline. There are two flaws with petitioner's arguments. First, in the event that any of the expert reviewers for Chapter 6 expressed concern regarding the Wahl and Ammann (2007) paper, they would have had the opportunity to request any supplemental information necessary for reviewing the credibility of the Wahl and Ammann results. Second, the Ammann and Wahl paper went through peer review and was eventually published in *Climatic Change* in 2007, in the same issue as Wahl and Ammann (2007). The petitioners do not claim or demonstrate that the methods or results described in the Ammann and Wahl paper were incorrect or flawed. They simply allege that a decision to change deadlines slightly is "manipulation," even if no scientific flaw or challenge is raised against the literature affected by the date change.

²⁴ E-mail file 1189722851.txt, (September 12, 2007), page 1357, line 6 of PDF version entitled: CRU Emails 1996-2009.pdf

Moreover, contrary to the petitioner's argument, the evidence provided by the petitioner does not indicate that the deadline was inappropriately extended to accommodate the inclusion of these papers in AR4. On this issue, the Independent Climate Change E-mails Review found that:

Taking into account the evidence of the Review Editor [for Chapter 6, i.e. John Mitchell], IPCC papers [documentation of IPCC responses to comments], the statement from the CLA [Jonathan Overpeck], and the importance of the issues raised by M&M2003 [McIntyre and McKittrick], we consider it to be reasonable that work that might throw further light on these issues and to ensure that assessments were as up to date as possible should be included. We do not consider therefore that these were exceptional unwarranted efforts to defend a particular position, but reasonable attempts to use up to date information that might resolve an issue. They appear to be consistent with IPCC principles and to reflect a concern for objectivity (Russell, 2010).

There was a general decision to allow extension of the deadline for the entire Working Group, and the chapter authors applied this guidance and extended the deadline for scientific studies relevant to that chapter. The fact that it was extended does not show it was extended because of these specific papers. In addition, petitioners have not shown that the extension altered the results of the report or the appropriateness of EPA's relying on it. First, inclusion of the peer-reviewed study represents one very small part in the deliberate preparation and review of a multi-volume assessment containing several thousands of pages of findings and conclusions. Second, Chapter 6 relied upon a number of long-term temperature reconstructions for its conclusions, including the findings of NRC's 2006 report (NRC, 2006) on surface temperature reconstructions. The NRC findings were fully consistent with the conclusions of the Ammann and Wahl papers. The papers in question provided additional, but not the only, evidence concerning the validity of using long-term proxy temperature reconstructions to compare historical and current climates. Indeed, and perhaps most importantly, the petitioner has provided no evidence showing that the conclusions of the Ammann and Wahl paper were mistaken or incorrect, or that the conclusions by themselves changed the findings of Chapter 6. Third, we note the statements that John Mitchell, one of two Chapter 6 review editors for Chapter 6, provided to the Independent Climate Change E-mails Review regarding how in-press material was handled and how decisions about the text of successive drafts were made. He commented as follows:

I was not aware of the debate about whether the Wahl and Ammann paper had or had not met the deadline for the 2nd order draft for chapter 6, until after the event. The concentration on specific deadlines however misses the larger point. It must be recognized that if only published sources were used, the report would be two years old by the time of publication. In a fast-moving area such as climate change research, assessments could be significantly behind the times if important, but as yet unpublished, new results could not be used. The assessments for policymakers could also therefore be behind the times...

In earlier assessments, there had been a relatively liberal regime in using unpublished material provided that there was a sound basis for regarding it as rigorous or reliable, although priority was always given to finding published sources. In AR4 however, the

regime was tightened significantly, so that such material was only to be used under exceptional circumstances, but the use of unpublished material was not prohibited. Hockey-stick issues were regarded at the time as sufficiently important to justify using new data. The dilemma between using only published material and being out of date, or using more recent unpublished material was increased in AR4 as the latest publication date was about 12 months earlier than in the process than in the previous assessment (Russell, 2010).

2.2.4.4 Allegations Regarding the IPCC's Use of Gray Literature

Comment (2-33):

The Coalition for Responsible Regulation, Peabody Energy, the Southeastern Legal Foundation, and the State of Texas argue that the IPCC's use of non-peer-reviewed literature (e.g., reports they claim are developed by environmental advocacy groups) in the AR4 calls into question the quality and objectivity of these pieces of literature and contradicts EPA's assertion that the IPCC is based on peer-reviewed science. The petitioners provide examples of gray literature sources that were used by the IPCC in AR4.

Response (2-33):

First, we note that the petitioners provided no new information in support of their allegations. As stated above, the petitioners are simply rehashing a comment that was submitted and responded to in the development of the Findings. Therefore, we find that their allegations were not impracticable to raise the objection during the public comment period and the reasons for the objection did not arise between June 24, 2009, and February 16, 2010. The IPCC AR4 has been public since early 2007, and petitioners could have raised these comments during the comment period on the proposed Endangerment Finding. Petitioners have not shown why it would have been impracticable for them to raise these issues then, especially given the fact that the public has been aware that EPA relied, in part, on the IPCC assessments since the July 2008 ANPR.

The IPCC relied on and referenced a very limited number of non-peer-reviewed sources in developing AR4. The IPCC's report development procedures recognized and allowed for the limited use of non-peer-reviewed literature where this was necessary and appropriate. Indeed, neither the IPCC nor EPA ever stated that the assessment reports relied *exclusively* on peer-reviewed material. For EPA's responses showing how the limited use of gray literature documents did not undermine the IPCC's scientific findings and the technical support for endangerment, please see Section 2.1 of this volume, including Responses 2-8, 2-9, and 2-10.

Looking across the thousands of scientific studies reviewed, assessed, and referenced by the IPCC in the AR4, it is clear that the number of non-peer-reviewed documents was dwarfed by the number of peer-reviewed references (estimated by the IPCC to be approximately 18,000). The IPCC, as clearly described in Volume 1 of the RTC document, has specific procedures to ensure that any non-peer-reviewed materials are sufficiently robust and credible in the context in which they were cited. While there are a very few instances in which erroneous conclusions were developed from the gray literature sources (see Section 2.1 of this RTP document for more detail on our responses to these issues), the overall process is exceedingly robust. Furthermore,

the few errors in this regard are trivial when viewed against the backdrop of the IPCC's multi-volume assessment containing several thousand pages of findings and conclusions. The few errors do not affect the climate change science findings or have any material or meaningful implication for the determination of endangerment to public health and welfare in the United States. The examples of gray literature provided by the petitioners were not cited by EPA in describing the key IPCC conclusions that EPA relied on in developing the TSD (U.S. EPA, 2009). The examples provided by the petitioners are cited in chapters of the Working Group II and III AR4 reports when describing climate change impacts in other world regions, which was not a focus of the TSD.

Comment (2-34):

Peabody Energy claims that the IPCC Working Group II “frequently used a citation method that did not candidly reveal an underlying affiliation with an environmental advocacy group.” For example, the petitioner claims that in many instances the IPCC report “referred only to the name of the author when the work was actually sponsored by an interest group” such as the World Wildlife Fund. Peabody concludes that “It is unclear whether these sponsored works provide independent, objective, and peer-reviewed science that should be the basis for AR4, or whether they advance the environmental agenda of their sponsor. It is also unclear whether these sources were independently verified by IPCC authors and contributors.”

Response (2-34):

First, we note that the IPCC's citation method for the AR4 is not new and that this information has been known since the assessment report was released in 2007 (IPCC, 2007a). Therefore, the petitioner's arguments were not impracticable to raise during the public comment period and the reasons for the objection did not arise between June 24, 2009, and February 16, 2010. The petitioner could have raised this comment during the comment period on the proposed Endangerment Finding. Peabody Energy has not shown why it would have been impractical to do so. Despite this, we respond below to the merits of their argument.

The petitioner alleges that the IPCC employed a parenthetical citation method in the text of the chapters that hid information showing that references were developed by environmental non-government organizations. In fact, the IPCC employed a common citation method for the thousands of studies that are referenced among the more than 3,000 pages in AR4. This format consists of listing the author's names first for each entry in the references section, and mentioning the publisher and/or organization (e.g., World Wildlife Fund) toward the end of the reference. Parenthetical citations, for each reference in the text of a chapter, list the author(s)' name(s) and the year of publication. This citation methodology is consistent with many established citation guidelines, including those developed by the Modern Language Association, the American Psychological Association, and the University of Chicago.

The evidence provided by the petitioner does not show that the IPCC hid the fact that some of the reports it cited were developed by non-government organizations like the World Wildlife Fund. The petitioner seems to suggest that the IPCC should have included the names of the non-government organizations in the parenthetical citations for these literature sources. However, this practice is contrary to the well-established conventions and styles that are commonly used in all disciplines of science and literature. Special treatment for these literature sources would be

inappropriate and unreasonable, and the petitioner's only justification for such an approach is the speculation that this literature might have been created to "advance the environmental agenda of their sponsor." Again, the IPCC included the names of the organizations in the full reference for each report in the references section at the end of each chapter. The IPCC did not hide the publisher or sponsoring organization's name.

For our response to the petitioner's argument that "It is unclear whether these sponsored works provide independent, objective, and peer-reviewed science that should be the basis for AR4, or whether they advance the environmental agenda of their sponsor," please see Section 2.1 of this volume, including Responses 2-8, 2-9, and 2-10.

Finally, the procedures employed by the IPCC in evaluating sources of gray literature are described in Section 1 and Appendix A of Volume 1 of the RTC document. The petitioner has provided no evidence suggesting that the reports developed by environmental non-government organizations were not evaluated by AR4 authors according to the IPCC's procedures.

2.2.5 Summary

The evidence provided by the petitioners does not support their allegations that the IPCC's peer review and report development processes are designed inappropriately, or that they were inappropriately implemented in the development of the AR4. Specifically, the evidence provided by the petitioners and all of the information in the record for the Endangerment Finding shows that, contrary to the claims of the petitioners:

- It was proper to not list certain scientists as contributing authors as they did not contribute significantly to the writing and editorial decisions in developing any AR4 chapter, including Chapter 6 of Working Group I's contribution (Jansen et al., 2007), and therefore did not compromise their objectivity during the peer-review process.
- IPCC authors did not cite their own studies more frequently than what was acceptable and reasonable.
- IPCC authors were not directed to focus on policy-prescriptive conclusions, but rather implemented IPCC guidelines by presenting policy-relevant and neutral findings.
- IPCC authors did not alter the content of reports to eliminate suggestions of nonconsensus.
- Collaborations among IPCC authors and reviewers prior to the development of AR4 did not compromise objectivity or generate conflicts of interest.
- The IPCC's peer-review processes are appropriate and adequate, and were properly implemented.
- IPCC authors did not manipulate deadlines for receipt of new literature.

- The IPCC’s very limited use of gray literature does not call into question the quality and objectivity of the assessment reports.

Petitioners do not present scientific evidence or argument showing that the Chapters of assessment report at issue are inaccurate or that they do not appropriately reflect the range of scientific evidence and the degree of scientific consensus on the scientific issues discussed. The evidence they present does not support the broad assertion that this is the case. They do not present credible scientific evidence or arguments on the science itself to support their claims. Therefore, petitioners’ evidence and arguments do not support changing our position, as stated in the Endangerment Finding, that the assessment literature, including the IPCC AR4, represents the “best reference materials for determining the general state of knowledge on the scientific and technical issues before the agency in making an endangerment decision.”

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