



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

February 24, 2021

OFFICE OF
AIR AND RADIATION

Mr. Frank Tinker, Ph.D.
P.O. Box 37162
Tucson, AZ 85740

Dear Dr Tinker:

This letter is in response to your Request for Correction (RFC), received by the U.S. Environmental Protection Agency on October 20, 2020, which was assigned RFC# 21001 for tracking purposes. In the RFC letter, you contend that the Information Quality Act's (IQA) general definition of "objectivity" has not been met, specifically "the accuracy of the information itself, in reference to the terms "Greenhouse Effect", "Greenhouse Gas", and related concepts." You request that "correction be made to all documents, electronic or paper based, published by the Agency, that includes the terms "Greenhouse Effect", "Greenhouse Gas", or any related concept. Such correction should address the fact that the Effect has been disproven or the document in question should be removed from public view and replaced with an accurate analysis of Earth's surface temperature." The RFC includes a list of various agency documents containing those terms.

You base your RFC on an assertion that the superposition principle has been misapplied. The EPA has reviewed your stated position and evidence and concludes that the EPA's use of the term(s) in question are fully consistent with EPA's Information Quality Guidelines.

The EPA denies your request for correction for three primary reasons: 1) your submission is inconsistent with the consensus of the scientific community as represented by the major scientific assessments; 2) your hypothesis has not been peer reviewed or otherwise evaluated by independent scientists; and 3) similar to previous claims that the greenhouse effect is somehow inconsistent with thermodynamic laws, there are flaws in your approach, in particular with your misapplication of the "superposition principle" within the Stefan-Boltzmann equation.

On the first issue, EPA gives careful consideration to all the scientific and technical information available. On the topic of climate change, EPA relies primarily on the major assessments of the US Global Change Research Program (USGCRP), the Intergovernmental Panel on Climate Change (IPCC), and the National Academy of Sciences (NAS). The rationale behind this reliance is described in the 2009 Endangerment and Cause or Contribute Findings for Greenhouse Gases under the Section 202(a) of the Clean Air Act (Docket ID No. EPA-HQ-OAR-2009-0171), Section III.A, "The Science on Which the Decisions Are Based." These assessments represent the current state of the science on climate change, comprehensively evaluating the findings of thousands of individual studies in order to convey the consensus conclusions as

demonstrated by the body of scientific literature. These assessments have gone through a rigorous and exacting standard of peer review by the expert community, as well as rigorous levels of U.S. Government review and acceptance. It is EPA's view that the scientific assessments of the IPCC, USGCRP, and the NAS represent the best reference materials for determining the general state of knowledge on the scientific and technical issues before the agency. The IPCC, USGCRP, and NAS assessments have all presented clear, convincing analysis of the Greenhouse Effect, contrary to the claims in your RFC.

On the second issue, it is important to note that the claims in your RFC have not been peer-reviewed in a scientific journal or otherwise evaluated by any independent scientists. Independent peer review is an important first step in presenting new scientific conclusions. Pursuant to the EPA's Information Quality Guidelines, EPA recognizes that if data and analytic results are subjected to formal, independent, external peer review, the information may generally be presumed to be of acceptable objectivity. The Office of Management and Budget's *Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies*, 67 Fed. Reg. 8452 (Feb. 22, 2002) states that the review process used by scientific journals is an example of the type of independent review contemplated.

Finally, there are specific flaws in your claims. Most importantly, the superposition principle is designed to be used only for linear problems. A physics textbook, *Principles of Biophotonics* (Popescu, 2018, <https://iopscience.iop.org/book/978-0-7503-1641-5/chapter/bk978-0-7503-1641-5ch1>) defines this: "This principle states that, for linear systems, the output of a sum of inputs equals the sum of the respective outputs." The Stefan-Boltzmann equation is not linear: it states that the energy radiated by a blackbody scales with temperature to the fourth power ($F = \sigma T^4$). Therefore, contrary to your claim, the superposition principle does not apply for the Stefan-Boltzmann equation.

The use of the Stefan-Boltzmann equation can be demonstrated by analyzing the example provided in the RFC. As the RFC notes, the Earth receives about 240 W/m^2 of solar radiation averaged over the entire surface (after accounting for albedo). Using the Stefan-Boltzmann equation, 240 W/m^2 of radiation applied to a blackbody in a vacuum does yield a temperature of 255K, as the RFC notes. Similarly, we do not disagree that a radiative forcing of 0.065 W/m^2 applied to a blackbody in a vacuum would yield a temperature of 33K. However, when considering a system warmed by both a forcing of 0.065 W/m^2 and a forcing of 240 W/m^2 , the forcings need to be added together before calculating the temperature. The first law of thermodynamics is conservation of energy: that means that the energy that goes into the system has to equal the energy that goes out of the system. Using the method presented in the RFC (namely, adding together the calculated temperatures), the two forcings together would warm the blackbody to 288K. However, the same Stefan-Boltzmann equation can also be used to calculate the radiation emitted by a blackbody given its temperature, and a blackbody at 288K would radiate a total of 390 W/m^2 . 390 W/m^2 is greater than the total of 240.065 W/m^2 that was absorbed by the blackbody: this result contradicts the first law of thermodynamics, which requires that the energy into a system equal the energy emitted by that system. The approach in the RFC is that every additional energy input

would further raise Earth's temperature by substantial quantities. For example, the heat produced by fossil fuel combustion is about 0.028 W/m² globally (Flanner et al., 2009¹): by the method in the RFC, this would further raise Earth's temperature by another 27K.

It is also worthwhile to note that the blackbody argument presented in your RFC is an educational analogy: climate models explicitly calculate energy flows throughout the atmosphere and do not assume the entire planet is a single blackbody. Some of these climate models do explicitly include the contribution of geothermal warming: while the geothermal warming does not make a large direct contribution to surface temperatures, it can matter for aspects of deep ocean circulation (see, e.g., Downes et al. 2016: <https://journals.ametsoc.org/jcli/article/29/16/5689/107089/The-Transient-Response-of-Southern-Ocean>).

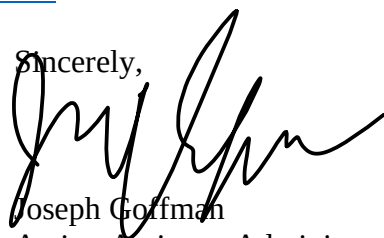
The EPA has previously responded to similar arguments that the Greenhouse Gas effect does not exist in the Response to Comments Volume 3 for the 2009 Greenhouse Gas Endangerment Finding, 3-42 through 3-51 (https://www.epa.gov/sites/production/files/2017-07/documents/rtc_vol_3.pdf). Several of these arguments similarly tried to make thermodynamic arguments that the greenhouse gas effect did not exist, and some similarly made reference to idealized blackbody temperature calculations. These arguments were addressed previously.

In conclusion, the EPA's use of the terms "Greenhouse Effect", "Greenhouse Gas" and related topics and products are consistent with EPA's Information Quality Guidelines.

Your Right to Appeal

If you are dissatisfied with this response, you may submit a Request for Reconsideration (RFR). EPA requests that any such RFR be submitted within 90 days of the date of EPA's response. If you choose to submit a RFR, please send a written request to the EPA Information Quality Guidelines Processing Staff via mail (Enterprise Quality Management Division, Mail Code 2821T, USEPA, 1200 Pennsylvania Avenue, NW, Washington, DC 20460); or electronic mail (quality@epa.gov). If you submit an RFR, please reference the IQG identifier assigned to this original Request for Correction (RFC # 21001). Additional information about how to submit an RFR is listed on the EPA Information Quality Guidelines website at <http://epa.gov/quality/informationguidelines/index.html>.

Sincerely,

A handwritten signature in black ink, appearing to read "Joe Goffman", written over the printed name.

Joseph Goffman
Acting Assistant Administrator

¹ <https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2008gl036465>