



Declaration of Robert W. Howarth

I write at the request of Prof. Mark Jacobson of Stanford to provide my expert opinion regarding the paper by Clack and others entitled “Evaluation of a proposal for reliable low-cost grid power with 100% wind, water and solar” that was published in 2017 in *PNAS*, doi:1073/pnas.1610381114. (the “Clack Paper”). Also at Prof. Jacobson’s request, I submitted a declaration one year ago on July 20, 2021 on the Clack Paper for the court.

I have been a tenured faculty member at Cornell University, Ithaca, NY, since 1985. Since 1993, I have held an endowed position at Cornell as the *David R. Atkinson Professor of Ecology & Environmental Biology*. I have extensive experience in academic publishing. I am the author or co-author of over 200 papers, and these have been cited by others in the peer-reviewed literature more than 70,000 times. I am the Founding Editor of the academic journal *Biogeochemistry* and served as Editor-in-Chief of that journal from 1983 to 2004. I was also the Editor-in-Chief of the academic journal *Limnology & Oceanography* from 2014 to 2019. And I have recently been appointed Co-Editor-in-Chief of *Ocean-Land-Atmosphere Research*. I served on the Committee on Ethics of the American Society for Limnology & Oceanography from 1992-1998. I served as President-Elect and then President of the Coastal & Estuarine Research Federation from 2005 to 2009, overseeing the publications and ethical issues of that professional society. And I have been a member of the Committee on Publication Ethics (COPE) since 2014. COPE “is a nonprofit organization whose mission is to define best practice in the ethics of scholarly publishing and to assist editors, publishers, etc. to achieve this.” (https://en.wikipedia.org/wiki/Committee_on_Publication_Ethics).

I have previously collaborated with Prof. Jacobson and am a co-author of three published peer-reviewed papers with him (Jacobson et al. 2013, *Energy Policy*; Jacobson et al. 2014, *Energy*; Howarth and Jacobson 2021, *Energy Science & Engineering*).

I am aware of the litigation filed by Prof. Jacobson against Dr. Clack and others associated with the Clack Paper, but I am not a party to the litigation and I had no participation with it other than filing the declaration for the court a year ago. Nor was I associated with the publication of the Clack Paper or the 2015 paper by Prof. Jacobson and others, also published in *PNAS*, that was the subject of the Clack Paper. I have, however, carefully reviewed both of these two papers.

Prof. Jacobson has asked that I address a series of questions regarding the Clack Paper.

1. “Is omitting data or changing the definition of data to the wrong definition an ‘interpretation or judgment of data’ or is it ‘not an interpretation/judgment of data but instead altering the factual definition of data’?”

In my professional opinion, the Clack Paper incorrectly took average values in a table from the Jacobson et al. paper and stated that these were maximum values. Further, the Clack Paper omitted that

the hydropower production estimate in the Jacobson et al. paper included imported Canadian hydropower, and then based on this omission erroneously stated that the estimate of the Jacobson et al. paper was excessively high for hydropower. The Clack Paper then stated that Jacobson et al. had made a “modeling error,” when in fact the Clack Paper was simply mis-stating what Jacobson et al. had presented. The Clack Paper was not making informed “interpretation of judgement of data,” but rather was making changes to the factual definition of the data and omitting information, and then interpreting/judging based on these altered and omitted data.

2. “Is an author who makes a factual mistake in a review of other people's work following due diligence or acting in reckless disregard for the truth or in bad faith?”

Again in my professional experience, and based on decades of involvement with the ethics of scientific publication, I believe that the Clack Paper was reckless. Due diligence would have demanded that Dr. Clack and his coauthors contact Prof. Jacobson for clarification before they submitted their manuscript to *PNAS*. Due diligence would also have required that Dr. Clack and coauthors correct their factual misinterpretation of the Jacobson et al. paper, and do so quickly once they became aware of their error. If they were aware before the paper was published, Dr. Clack and coauthors should have either withdrawn their manuscript or completely revise it so as not to perpetuate their error. If they only became aware of the error after publication in *PNAS*, they should have asked the journal to publish a correction, and perhaps an apology. Further, Prof. Jacobson informs me that one of the authors of the Clack Paper had earlier mentored a student who was a coauthor of the Jacobson et al. paper criticized by the Clack Paper, and that Dr. Clack and his coauthors did not inform this student of their criticism until after acceptance for publication of the Clack Paper. If true, this is highly unprofessional behavior, in my opinion.

3. “Is it standard practice in the sciences for authors of a paper to issue a correction to the paper AFTER publication if a material FACTUAL error is discovered in their paper?”

Yes, professional ethics require authors to publish a correction within a reasonable time after they discover an error with their work.

4. “Is it unethical or ethical for authors of a paper to REFUSE to issue a correction to their paper AFTER publication if a material FACTUAL error is discovered in their paper?”

Again, professional ethics require authors to publish a correction. Refusal to do so is unethical.

I declare under penalty of perjury that the foregoing is true and correct. Executed on 14 September 2021.



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