

I appreciate the response to my concerns. In general they were satisfactorily addressed. I do remain uneasy however about the treatment of primary energy in the paper, and some of the mention of my own work. Hopefully these remaining concerns can be addressed prior to eventual publication. The points referred to below are those in the response to my initial review.

1. Point 6. The response to the concern that food is not a form of primary energy is that “*All forms of primary energy depend on other forms of primary energy for their acquisition and distribution.*” I see the point, but if that is the stance taken in this paper, then I think a more clear definition of primary energy needs to be provided. How then is my body fat not a source of primary energy given it depends on food as a primary source of energy for its acquisition? My understanding is that food is not normally considered to be a source of primary energy since it, like my body fat, but unlike coal or sunlight, has its origins within civilization not the natural environment.
2. Points 12 and 13. I remain concerned by the response. A crux of much of the paper is that there is a fixed 2.4% growth rate that applies to the period encompassed by the industrial revolution. My concern is that the 2.4% growth rate for energy consumption would appear to discount the importance of traditional energy sources such as animals, wind and water power, and wood that remained prevalent for much of that earlier period. If early energy consumption was higher than accounted for in the Gruber data set, then this would imply an overall acceleration of growth rates over the total time series, not the fixed value mentioned. It is hard (for me) to believe that the (very high) 2.4% growth is a real feature of civilization for the past 200 years or so if extrapolating back (or even ahead) another 200 years yields unrealistically low or high energy consumption rates for the world as a whole. 2.4% per year translates to a doubling time of about 30 years. I just can't believe that energy consumption was 130,000 times smaller in year 1500 than today, or 1000 times smaller than in year 1800. A lot was going on in the Renaissance, even where primary energy sources were not that different for the most of the world than they were for the early 1800s. To believe that such a rapid rate is fixed, I would hope to see speculation for why a 2.4% growth rate should apply

for the past 200 years, but not for the period prior.

Perhaps a clue is that in the O'Connor and Cleveland 2014 paper mentioned in the response there is an interesting distinction between energy inputs and work done. For example, Figure 16 suggests that for the first 100 years of the industrial revolution, at least in the United States, the primary source of per capita work and growth of work was draught animals. Fossil fuels may have propelled the world in the late 19th and 20th century, but other sources appear to have dominated previously. Perhaps the author can comment on this distinction between inputs and work for calculation of primary energy supplies.

3. Point 14. The statement now included in the paper in reference to my work is “he assumes the apparent proportionality observed between primary energy and GDP observed for the last 40 years holds throughout the Industrial Revolution and before.” This is incorrect. Please correct this as it is a common misconception, not to mention the data don't show this. The constant relationship that is found and extrapolated is for global primary energy and the time integral of global GDP. This is an entirely different thing.