

Dear Joe,

Thank you for sending the video. I am in favor of analyzing any new technology very carefully, and of course, all have trade offs, but how the numbers are presented here is extremely misleading.

1. Claim: We have reached near-efficiency limits for solar and wind technologies.

Analysis: This is true! The numbers presented in the video for efficiencies are reasonable and are a result of phenomenal research over the past 30 years. The gains that scientists talk about are in other aspects of the technologies, particularly in lowering manufacturing costs. The video does not mention that unlike solar and wind, batteries are nowhere near where theory says they could be. 5-50x improvements in energy density are possible.

2. Claim: The carbon emissions of renewables are almost entirely negated when you take into account the energy needed to build the technologies in the first place and then dispose of them.

Analysis: Totally false! What Mark refers to, without using these words, is a "life cycle assessment" of a technology. This analysis is an account of all of the energy/carbon inputs of a product over its lifetime. This is common parlance in energy research, and many scientists make their living calculating these numbers. See this link for a life cycle assessment of renewables versus fossil fuels- https://www.nrel.gov/analysis/assets/images/lca_harmng_fig_2.jpg There are carbon costs to solar and wind, but they are about 100 times less than those for gas and coal. In the table below the graphs, you can see that this analysis is an average of many different estimates, and so it reflects a consensus, not just a cherry-picked average.

3. Claim: Solar, wind, and batteries will lead to a surge in mining and hazardous waste.

Analysis: Misleading. Yes, there has been an increase on these fronts, and like with any new technology, we must be thoughtful. However, the construction of renewables generates waste a) once during its lifetime instead of continually (which is why their life cycle assessment numbers are so much better) and the wastes are b) solids, not gasses. Solid waste is waste we can easily recycle. Take lead-acid batteries as an example. 99% of lead in the U.S. is recycled. Scientists are making progress on recycling lithium-ion batteries, and in the future, there will likely be 99% recycling there too. Not only do we not know how to recycle carbon dioxide (my laboratory is working on it), but there is just so much more of it generated due to point a.

4. Claim: Renewable energy development is leading to an increase in child labor.

Analysis: Misleading. Although outside my area of expertise, I find it incredibly hard to believe this problem is something that is unique to the renewables sector.

Finally, remember that "cost" is not a cut-and-dry metric. For example, Mark did not mention the economic costs of increased natural disasters and health care costs that climate change is causing. When these impacts are calculated (hard to estimate, but scientists are trying), the benefits of renewables over fossil fuels are staggering.

Please send this response to your e-mail list to set the record straight. I see the video has millions of views, and it is a sad reflection of the viral era of misinformation we are living in.

All my best,
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