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Setting the record straight about wind's lifecycle emissions and return on energy invested

admin October 11, 2013

One of the common myths deployed by opponents of clean energy is that wind energy's environmental benefits are significantly reduced by the energy and carbon expended on manufacturing and installing wind turbines. Fortunately, the National Renewable Energy Laboratory recently compiled the results of all peer-reviewed publications on lifecycle emissions for different energy sources. Unsurprisingly, **wind energy fared far better than all conventional sources of energy, and better than nearly all other renewable sources of energy. Including all lifecycle emissions factors, wind energy's emissions are a few percent of the emissions of fossil-fueled energy sources**, as indicated in the chart below. As usual, attacks on clean energy do not hold up to scrutiny.

As a result, you can imagine how shocked I was to see that the lifecycle emissions myth had made its way into a sidebar in the most recent edition of Scientific American, which incorrectly proclaimed that wind energy "takes up to 12 years" "to 'break even' with coal power on the greenhouse scorecard." Fortunately, after a brief discussion of the relevant peer-reviewed sources, the author quickly and graciously fixed the error and posted a clarification to the online piece that will also run in the forthcoming print edition.

Facts: 1

Myths: 0

Nevertheless, to ward off the further spread of this myth, it is instructive to dig into the sources that led to the confusion in this instance. The source for the initial claim is a 2012 journal article by respected climate scientists that confusingly indicates that wind's break-even period with coal does range from less than one year to 12 years. As support for that claim, that article in turn referenced a 2009 article that analyzed all published data on the net energy return of wind energy. That article's abstract explains that, across the 119 wind turbines and 50 studies that it analyzed, the average energy return on investment (EROI) for wind plants is 25.2, i.e. the wind turbine would produce more than 25 times the amount of energy that went into manufacturing and installing it. That figure obviously runs counter to the claim of a 12-year payback.

I took a closer look at the 2009 study to figure out why, and found two major flaws. First, the 2009 study only looked at wind turbines with a nameplate capacity lower than 750 kW. For reference, the average wind turbine being installed in the U.S. today has a nameplate capacity of almost 2,000 kW, and nearly all utility-scale wind turbines in the U.S. and around the world have capacities greater than 750 kW. As the study notes, the EROI significantly increases as turbines get larger, with the study noting that even at 750 kW the EROI is around 40. As a result, the study's results greatly underestimate the EROI of nearly all wind turbines installed today, and the study's 25.2 EROI average, which already strongly contradicted the "up to 12 years" claim, is itself too low.

Digging deeper into the raw data, I finally found what appears to be the source for the 12-year claim. Of the 119 wind turbines included in the 2009 analysis, the lowest EROI (1) was for an experimental 3-kW wind turbine from 1983! Thus, **in a game of "telephone" through two journal**

articles into a Scientific American article, the net energy return for an experimental wind turbine from 1983 that is 1/1000th the size of utility-scale wind turbines being installed today was passed off as representative for modern wind turbines.

As noted above, the author of the Scientific American article was apologetic and immediately went to work correcting the error when this was pointed out. Nevertheless, correcting myths once they begin to spread is difficult, particularly when they are picked up by those with an agenda. Even with the clarification, Scientific American still has an article entitled "Renewable Energy's Hidden Costs," which still claims that wind farms take "take from less than one year up to 12 years" to break even with coal, with an asterisk noting that "This sentence was edited after publication to note the low-end estimate for wind energy's greenhouse payback time, which is more reflective of modern wind turbines," and still has text and a chart that confusingly make it sound like wind energy consumes massive quantities of metals, which one only discovers is not the case by, again, digging into the data to find that wind energy's metal use per energy produced is roughly comparable to that of today's fossil and nuclear energy sources. While a discerning reader can sort through all of that information and arrive at the truth, it is very easy for someone with an agenda and low ethical standards to use the article to make misleading and outright false claims against wind energy.

Alas, the battle of truth against myth is never easy.