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Earth System Dynamics
Discussions

Interactive comment on "Can Limits to Growth in the Renewable Energy Sector be Inferred by Curve Fitting to Historical Data?" *by* Kristoffer Rypdal

Anonymous Referee #2

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This manuscript critically evaluates an important finding of Hansen et al Limits to growth in the renewable energy sector. Renewable and Sustainable Energy Reviews 70,759-774, 2017. Specifically it considers whether the conclusion that wind and solar installation is on a logistic or exponential trajectory. Via some primer information on statistical significance and model selection, it concludes that Hansen et al were incorrect to argue that a logistic and so saturating trajectory best characterises wind and solar deployment.

The manuscript's methods and results are robust. My comments are relatively minor and focus on some of the framing of the research. The paper could be significantly and easily improved with regards some of the claims and context for the research. There is a question regarding the significance of the manuscript as at its core the manuscript

takes a specific issue with a particular study. A revised version could serve as the basis for a broader tutorial type article to engage 'consumers' of studies about energy capacities and strategies with the Hansen et al 2017 article as an example case study.

Specific comments:

P1 "It is generally recognised that economic growth in most sectors finally will have to come to an end due to the constraints imposed by planetary boundaries and that we need a new paradigm in Earth System science that integrates the physical, biological, economic, social and cultural forces (Donges et al., 2017)."

The author cites a single 2017 published paper. This opening statement must be softened, or further defended.

P1 "Without a massive deployment of carbon capture and storage (CCS), the target of global warming below 2âŮę C from preindustrial temperatures requires radical reduction of coal in electricity production over next decades (IPCC, 2014)."

CCS is one possible Negative Emissions Technologies (NET). There are others and there are proposed mixes in which CCS and the more speculative technologies will not play a large part. See another Hansen publication: Hansen et al 2017 ESD 10.5194/esd-8-577-2017.

P2 "Most integrated assessment models (IAMs) used in IPCC (2014) include optimistic assumptions on implementation of CCS"

All the 2°C scenarios involve NETs of some sort. This may be large scale afforestation and soil management not just CCS.

P2 "This type of scientific controversy is rooted in intellectual bias and/or lack of knowledge, and by logical necessity; a considerable fraction of the published results must be false. This is a serious problem for energy science and for our society. "

This is an editorial judgement, but I do not think such statements are necessary. It is not

necessary to elude to bias or ignorance. It is sufficient to highlight the wide difference in scenarios and pathways to avoid dangerous climate change that are being offered. It is not necessary as to speculate what drives them.

P2 “Consumption of hydropower and traditional bioenergy are considerably larger at present, but their growth potential is almost exhausted. For hydro this is true in the developed world, while some developing countries still have large unexploited resources.”

This statement required evidential support.

P4 It is tempting to interpret Fig. 1(a) in support of the exponential model, since the additional data point does not change this model much, but this fitting method does not let the fitted models allow the “natural” multiplicative variability which characterises an expanding economy. The fitting method applied in Fig. 1(b), on the other hand, lets the models accept this variability, and therefore the additional data point does not require a significant change of the parameters of either model.

AND

P9 “It is generally recognised, however, that variables describing the volume of an expanding market is much more adequately described by models of the type Eq. (3) or (6). This means that the estimation of the model 10 errors (the uncertainty in the model coefficients) must be based on those stochastic models.”

This is an important assumption. Supporting evidence is required that wind and solar deployments are driven by the important factors of an expanding economy and that such economies are more adequately described as proposed.

P12 “The orange curve is an exponential fit, and the blue curve a fit by a second-order polynomial. “ The curve in Fig 4b is red not orange.

P13 “Some readers of the peer-reviewed literature, in particular those with strongly biased views against the future of renewables, will embrace “results” like those presented by Hansen et al. (2017), and accept them as proven scientific facts. This is of course

unfortunate for the advancement of energy science.”

It is not necessary to speculate as to the beliefs or intentions of people who may or may not read other published research.

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