Earth Syst. Dynam. Discuss.,
https://doi.org/10.5194/esd-2017-117-RC2, 2018

Earth System Dynamics
Discussions

Interactive comment on "The Role of Bioenergy and Carbon Capture and Storage (BECCS) in the Case of Delayed Climate Policy — Insights from Cost-Risk Analysis" *by* Jana Mintenig et al.

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Received and published: 26 February 2018

This article analyzes the impact of BECCS in light of delayed climate policy under CRA using the integrated assessment model MIND. The results, main insights and conclusions of the analysis does not seem to differ from usual CEA analyses and I wonder what the additional insights from using CRA really are. The conclusions the article draws are basically that i) BECCS allows more flexibility (avoids corner solutions), and ii) has a moderating effect on welfare loss because it allows a smoother transition. This seems all very well known already and could be regarded as almost trivial (you add a relatively cheap option that allows negative emissions, so what else would you expect?). The same conclusions have been made with CEA analyses many times already. Perhaps the analysis could be made more interesting if not only climate risk

is considered in the analysis, but also the risk of using BECCS itself. The latter is discussed, but not taken into account in the analysis.

Furthermore, I have some reservations regarding some of the results and assumptions of the model. Especially I do not understand why there are no renewables in the baseline up to 2080 (Fig 3a and 3b) – as currently about 20% of the global energy mix is already based on non-fossil fuels according to the IEA Energy Outlook 2017 (based on Mtoe, see p. 79). Where is the wind, solar, and hydro in the results? I also do not understand very good why first fossil fuel use decreases and then increases again in the mitigation scenarios (see Fig 3c and 3d). Finally, an important mitigation option in almost all IAMs is to increase energy efficiency, but here, there seems to be no additional improvements in energy efficiency in the mitigation scenarios. Finally, why is TNF (I guess total non-fossil, which probably means nuclear?) in mitigation scenarios the same as in baseline scenarios?

Other remarks: According to model set-up, the change in emissions is limited to 13% annually. If the restriction is indeed applied like this in the model, it would be impossible to achieve net negative emissions (if emissions are close to zero, in fact hardly any reductions are possible anymore). Why not restrict absolute reductions instead of relative reductions?

I guess I do not see a fundamental difference using CRA and using CEA with different likelihoods of achieving the target. Isn't a discussion about how much risk we are willing to take similar to the discussion on the likelihood with which we want to achieve the target? Any CEA study is under a certain assumption as to the likelihood with which a target is achieved.

In some places, more careful wording is needed: P2, line 3-5: other options than what? And I do not really agree as to whether this is an open question, as practically all 2 degree scenarios in the IPCC report assume a large share of BECCS. And the target is now well below 2 degree instead of 2C.

P3, line 2-3: Here, I don't understand the sentence, which is of critical importance as it gives the main research question. Now, it is still unclear what the precise research question actually is.

P6, line 15: I disagree here, most IAMs do model the energy sector; only the very simple cost-benefit type of IAMs do not model the energy sector explicitly. All other IAMs (GCAM, MESSAGE, WITCH, IMAGE, REMIND etc) do so to my knowedge.

P10, line 7: Here it is important to add the probability with which the target is to be achieved.

P12, line 26: "When comparing (c) and (d) it can be seen that gross emissions are lower when comparing (c) and (d)" -> not sure what you are trying to say here.

P13, line 7-8: Here a reference is made to Van Vuuren et al. (2013), stating that they predict net negative emissions after 2070. Van Vuuren et al definitely do not make predictions, but provide illustrative emissions pathways. I would also refer to more recent work, as summarized by the latest IPCC report which clearly shows the need for negative emissions as well (see Van Vuuren et al 2017 in Nature Energy Vol. 2 for a good overview on negative emissions in IPCC).

The delay scenarios seem to be very extreme: completely waiting with climate policy globally and then suddenly universal action. Why not use the Shared Policy Assumptions (SPAs) here, which imply more gradual action? This could affect results strongly, as with gradual implementation already some investment in renewables would take place.

In the beginning of the conclusions, the authors argue that one of the innovations is using negative emission technologies in integrated assessment of climate targets. I would argue this is not an innovation, since practically all 2 degree scenarios in the IPCC database incorporate such technologies already.

It is concluded that for "both scenarios, and in contrast to CEA, mitigation costs de-

crease and risks increase with delay". This should be formulated more carefully, I think. By definition, mitigation costs increase if you add certain restrictions and the same target has to be achieved. I think here, it is meant that not only delay is added, but also a less stringent climate target is achieved (or, in other words, a higher chance of overshoot – called here "transgression" – is allowed).

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