We thank reviewer 2 for taking the time to review our manuscript and provide comments. The point-by-point response and associated actions, if any, are as follows. The original reviewer 2 comments are in black whereas the responses to them are in red. Line numbers under the “Action category” highlight updates in the revised manuscript.

Point 1)
The study is one of many within a growing field, that is numerical simulations of large scale deployments of wind turbines. It is therefore a bit surprising to notice that the authors are referring to rather small turbines, 3MW turbine from Vestas. With a hub height of 84 m.
The state of the art for the win energy industry seems to have passed this some time ago. The systems are simply much bigger now.

This is raising the question if the algorithm proposed in the paper will work for systems with 10-15 MW (or even bigger) turbines and much higher hub heights.

Response: The choice of turbines used in our study were set by the WRF simulations that we wanted to test the Standard and KEBA approach against. These simulations, performed independently by Miller et al 2015 (lines 142 - 144), were chosen since they highlighted the counter - intuitive relationship between the deployment’s generation and windspeed over the complete diurnal range at the regional scale. At the time Miller et al 2015 was performed, 3 - 3.5 MW turbines with an 80 to 90 m hub-height we considered to be representative of the typical onshore turbines in the United States (US DOE 2015).

KEBA performance against WRF and Standard approach when modern wind turbines with larger capacities and higher-hub heights is expected to be similar to that reported in the current manuscript. KEBA has been used for a reevaluation of Offshore German Bight wind energy resource potential (Agora Energiewende (2020). In this study, 12 MW turbines with a hub-height of ~150m were used. The study showed that KEBA estimates of the German Bight’s technical potential were in closer agreement with WRF than the Standard approach, much like the current study. By and large KEBA estimates of capacity factors were found to be within 15% of the WRF over the entire range of simulated deployment scenarios. Thus, KE removal effects remain relevant even when larger and taller turbines are assumed.

Action:
This is similar to a comment by reviewer 1 and the text has been updated accordingly. See response to reviewer 1 for details of revision.

Point 2)

Along the same line of reasoning: it is also a bit surprising to see that more than half the references are from 2015 or earlier. With only 2 from 2022.

Response: While it is true that there is a growing body of studies that use WRF to study large scale deployments of wind turbines, a significant number of them use WRF only as a source of high resolution wind speed data. Therefore they do not account for the impact of atmospheric - turbine interactions on wind speeds and capacity factors. Within the comparison framework defined in this analysis, these studies would be represent variations of the Standard approach. Therefore, including more recent studies that employ the Standard approach would not make an insightful addition to our analysis.

Further, in our literature review we found that studies after 2015 that use both WRF and a parameterisation scheme to evaluate large wind turbine deployments focus more on Offshore locations. This makes sense because the energy density offshore is much higher than that available offshore. We have not included these in our discussion since we focus on an Onshore location and the comparison would not be meaningful.

Lastly, studies that we have included in our analysis, though dated, are still highly relevant in wind resource assessment and energy scenario analysis. Their relevance is underscored, in part, by the request from a previous reviewer to include Jacobson et 2012 and Marvel et al 2012 in our discussion (See response to reviewer 1 for details). These and the other resource evaluation studies included in our analysis continue to be cited in more recent publications (Mckenna et al 2022, Jung et al 2022). Therefore, though dated, these studies are highly relevant for our discussion and more generally within the area of regional wind energy resource estimation.

Action:
None

Point 3)

In the study the production is calculated for a period of four and a half summer months. It is stated that this period is climatologically representative for the region. There is no quantitative argument for this conclusion.

Response: This is similar to a comment by reviewer 1. See reviewer 1 for detailed response.

Action:
This is similar to a comment by reviewer 1 and the text has been updated accordingly. See response to reviewer 1 for details of revision.

Why is the winter period not relevant for a study where one main point is that there are differences between day and night conditions due to diurnal fluctuations in static stability and convection?

As stated above, the choice of time period to evaluate in our study was set mainly by the period over which the WRF simulations were available. We agree that further analyses could include the winter season as well.

Action:
None

Point 4)

We don't get an explanation for choosing an area of 112.000 km2, app. half the size of Kansas.

Response: Similar to the case with choice of wind turbines, the choice of the deployment area is also set by Miller et al 2015 . This area is similar to that assumed in Lopez at al 2012 and Brown et al 2016, with whom we compare our results. As highlighted in Lopez at al 2012 and Brown et al 2016, this land area represents the area that is expected to be available in Kansas for wind turbine deployment after social, technical and ecological exclusions have been made.

We will add clarification in addition to the lines 147 - 148 in the original version of the manuscript.

Action:
Updated Methods section text to include the following line: (160-161) It should be noted that the Miller et al. (2015) simulations set the choice of parameter values in Table 1 and the turbine type (Fig 1b) used here.

The authors are stating that the electricity production of their wind farms is 3 to 5 times the total energy consumption in Kansas in 2018.

Response: The comparison between KEBA/WRF estimates in our study and Kansas's total 2018 energy consumption is meant to highlight that the technical wind energy potential of Kansas is considerable despite the impacts of atmospheric - turbine generation on wind speeds and capacity factors.

Action:
None

Point 5)

Obviously big wind mill farms have to be constructed in such a way that the individual turbines

don't interact too much with the neighbors. Therefore, one needs a method to make reliable estimates.
And with a tight economy for the wind energy market is it not then necessary that the final electricity production is known as precisely as possible? And can the KEBA approach then compete with the "WRF" approach?

Response: We do not recommend KEBA as substitute model for WRF, rather as a more physically representative alternative for technical potential estimation to the Standard approach. In our study, WRF is used as the benchmark to compare KEBA and Standard approach against.

Action:
None

Some of the choices made in paper regarding for instance boundary payer heights must in all cases be adjusted to the local geography and climate

Response: We will update the text include the reviewer's comment .

Action:
Updated text in lines 195 - 196: "the values of these parameters are specific for our analysis and may need to be adjusted for application elsewhere"

References:

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8. Jung, C. and Schindler, D.: Development of onshore wind turbine fleet counteracts climate change-induced reduction in global capacity factor, Nature Energy, 7, 608–619, https://doi.org/10.1038/s41560-022-01056-z, 2022