

Comment on wes-2022-24

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Referee comment on "Wind farm flow control: prospects and challenges" by Johan Meyers et al., Wind Energ. Sci. Discuss., <https://doi.org/10.5194/wes-2022-24-RC2>, 2022

This paper presents a comprehensive overview of wind farm flow control, its current status, as well as challenges for its practical demonstration and commercialization, organized under four key research areas. Although it's always difficult to find a balance between length and depth for such a wide technological field, authors provide an excellent coverage of the most relevant aspects discussed within the community and an extensive list of references.

Some comments are included below for further improvement of the manuscript:

Specific comments:

- Lines-87-88: The sentence "Still, some clear benefits..." could be supported with a reference to section 5.1, where those aspects are further discussed.
- The way of presenting section 2.1, dealing with static wake control aspects, seems to mismatch the approach for the rest of section 2, where aspects of the flow physics are analyzed instead. From section 2.1, it could be inferred that the challenges presented only affect the static controls rather than being related to the (quasi)-steady dynamics of the flow physics (as mentioned in Line-228). Could you please clarify?
- At the end of section 2.2.2, in Line-372, it is stated that the use of LES simulations as a control model is hindered by the large cost and complexity associated. Then, further in the text (Line-382), a related discussion is raised about the relevant factors (minimum resolution, model simplifications) when considering its potential application in real time. Could those factors also be applicable to the offline case initial discussion?
- Line-483: Could you please specify/clarify the exact meaning of "cautious decisions" in this context?
- Section 3.2.
 - The overall challenges for the closed-loop paradigm are mentioned in Lines-488-489, but the rest of the section seems to be at some parts just a description of the state of the art rather than an identification and further development of the corresponding

challenges (e.g. state estimation paragraph). It would be advised to clearly identify the specific challenges addressed.

- Novel optimization routines are identified as a challenge for the closed-loop paradigm (Lines-488-489), but this isn't truly developed in the corresponding paragraph devoted to "robust decision making". Some aspects that are important are listed below, but it is unclear whether authors considered all those aspects as challenges (unresolved issues) or just relevant factors in the selection of the optimization algorithm.
- Section 3.3: For the sake of clarity, could you please explain in more detail in what data-driven workflows (Line-563) consists of as opposed to physics-based workflows (Line-563) and AI-driven workflows (Line-579)? Maybe a diagram or short description would be of help to make the distinction.
- Section 4.4. Does the section only apply to WFFC technology developments performed by OEMs or is it extensive to any other technology provider? If the latter is the case, shouldn't it be considered as a relevant challenge the (standardized) access to information between farm and turbine level and the communication interface of WFFC with turbine control?

Technical corrections:

- Lines-56-57. Reference to Figure 1 seems to be a bit out of place. The content of the figure seems to be more in relation with the discussion in Section 1.2 rather than that at the beginning of Section 1, where the figure is introduced in the text (Lines-56-57).
- Taking into account the different meanings of the term "loading" depending on the discipline, it would be advised to clarify that unless specified otherwise, it refers to structural loading. First use in Line-18.
- The acronym for wind farm flow control (WFFC) is defined in Line-36, but it scarcely appears afterwards throughout the paper despite being one of the most mentioned terms. Authors are encouraged to make use of it in order to lighten the text. Please also note that its first appearance is in Line-33.
- Line-380: Is it meant to say "real-time controller" instead of "real controller"?
- Caption Figure 5 – For the sake of clarity, please specify the type of control scheme depicted (open-loop), in accordance with the explanation in the text.
- Caption Figure 6 – For the sake of clarity, please specify the type of control scheme depicted (closed-loop), in accordance with the explanation in the text.
- Acronyms – LES -> first instance in the text is in Line-170 instead of Line-180.
- Line-506: typo "uses techniques"
- References:
 - Please try to make all references discoverable with either DOI link (if applicable) or direct access link.
 - Reference in Line-1260: is the author properly presented?
 - Some references are missing the publication year: Line-1380, Line-1384.