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Interactive comment on "Design and Analysis of a Wake Steering Controller with Wind Direction Variability" *by* Eric Simley et al.

Anonymous Referee #1

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A good paper with some interesting theoretical treatment of directional uncertainty.

I only have one criticism, in the way the performance improvements are quantified, for example on page 17 line 22, where an improvement of 128% seems dramatic, but is actually only an increase in a change in wake losses. Those changes in wake losses are themselves small, around 1% to 3%, representing an even smaller change in actual energy production. Given the many other uncertainties, not least in the underlying wake model itself, these small changes could easily be 'lost in the noise' in real life. Tables 1 and 2 only report the actual changes, which is not so misleading, so I don't think the dramatic percentage changes in differences should be reported in the text either. Better still would be to report the percentage change in power prodution, rather than the percentage change in the wake losses, even if the numbers won't look as dramatic.

Another comment is about the use of wake steering in one direction only. The justification is that yawing in the other direction increases certain loads. However there are many reasons why it may still be worth steering in both directions (there is as yet no consensus on this point):

- not all loads increase; some will decrease, and they may be more important loads, depending on the turbine design drivers.

- even if loads increase on the yawing (upstream) turbines, this may be compensated by decreases in the same loads when the wind direction changes so that the turbine benefits from wake steering at other turbines.

- the increased loading may not happen if the turbine uses individual pitch control.

It would therefore be interesting in future to extend the analysis to include bi-directional yawing. This introduces additional practical difficulties because of the sudden reversal in desired yaw offset as the wind direction passes the turbine alignment direction. However, to study this properly, non-Gaussian direction changes, driven by synoptic weather patterns for example, may become important.

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