

***Interactive comment on “Optimal Output  
Feedback  $H_\infty$  Torque Control of a Wind Turbine  
Rotor using a Parametrically Scheduled Model” by  
Dana Martin et al.***

**Anonymous Referee #1**

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Partial review of manuscript "Optimal Output Feedback  $H_\infty$  Torque Control of a Wind Turbine Rotor using a Parametrically Scheduled Model"

General comments: - Review your overall writing/structuring. Should be improved. - MIMO stands for Multiple-Input Multiple-Output, use capital characters - Subscripts not being an index, should be non-italic. - Search for uses of "will be", "can be". Replace with present tense ("The paper will be organized..." ->"The paper is organized") - Some figures are not nice and/or in high-resolution

0. Abstract Revise complete abstract. Clearly, state the problem, your approach to solve the problem. How you did implement and what the most important results are.

C1

1. Introduction: - Too long first paragraph, shorten this, get to the point more quickly.  
- When formulated ... robust performance. I don't get this sentence, revise. - One such technology ... the control system. I don't get this sentence, revise. - LPV control theory ... wide operating envelope. What do you mean, I don't understand this. Are  $H_\infty$  and  $H_2$  techniques used at the same time? - For this reason ... globally feasible solutions. I don't get this sentence, revise. - Call variable pitch systems -> Variable-Speed Variable-Pitch (VSV) wind turbines. - The controller was ... aerodynamic loads. But the reduced aerodynamic loads were not taken into account during control design, right? What is the cause and consequence of the reduced aerodynamic loads?  
- The two-bladed, downwind... Now you suggest that you will perform your research on two-bladed turbines, but this does not become clear in the rest of the introduction.  
- The contributions of this paper... Sentence is unreadable, rewrite. - The following paper -> this paper - Are the aerodynamic basis functions + linearizations obtained and/or based on the full DOF non-linear plant?

2. Modeling - Introduce this section. What will you be doing in what section? - Which wind turbine (model) do you use in this paper? - Why do you use different symbols ( $Q_a$  and  $\tau_g$ ) for torques? Also  $Q_{xx}$  and  $\tau$  are not indicated in Figure 1. - Maybe introduce a new symbol for  $\phi_r - \phi_g$  - How do you obtain the aerodynamic torque gradients? From data of a real wind turbine? - Definition of  $Q_{HSS}$  is missing - Directly substitute Eq. (6) in (5). - According to my derivation, the state-space system in (5) is incorrect. For example, according to Eq. (3), you miss a  $1/N_g$  for the  $C_d$  term in the (1,1) element. Or (3) is incorrect.

- How do you obtain the partial derivatives? What is your approach? - Why do you only consider 2 to 5 m/s wind? This is just the lower-region of the below-rated region: some wind turbines do not even operate at these wind speeds!

3. Performance vector design - "For this application ... measured scheduling parameter", you stated in your introduction that you would only use output feedback of the generator speed! Also the assumption of 0 error is not really feasible. - Cite Bossanyi

C2

for the drivetrain damper bandpass-filter part. "The Design of Closed Loop Controllers"  
- Remove Eq. 13. - Figure 4: I don't see a low-pass filter behavior in  $z(2)$ . - The design  
of  $z$  ... 3 state system. What do you mean here? - Comment on the results in Figure 5,  
what can be seen? - Complete paragraph "The loop shaping ... and step response",  
should be revised. I don't understand what's going on here.

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I aborted the review, as a lot of things need to be fixed first. Considering the authors listed, I would expect a higher quality than the submitted manuscript.

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