

## ***Interactive comment on “Skewing angle magnet and coil reduced starting torque in a permanent magnet synchronous generator for a small vertical axis wind turbine” by Priwan Pongwan et al.***

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I have read the paper on the test of skew angles of the magnets and coils of a permanent magnet generator for a small scale vertical axis wind turbine (VAWT).

This paper is interesting, since it is addressing a power range below 10 kW and with the intention to be installed in places where utility scale turbines, might not be installed in for instance remote islands in countries with a weak power grid structure. The authors argue that vertical axis wind turbines will become relevant for large offshore wind farms, but maybe it will be better to argue for the island installation case.

C1

The vertical axis wind turbine being addressed is a combination of a Darrieus (H-type) rotor connected on the same shaft as a Savonius type rotor in order to have a positive starting torque of the turbine. The authors are then addressing the problem of constructing a permanent magnet generator with a sufficient small starting torque to allow the turbine to spin up at a cut-in wind speed of 2 m/s.

The paper is first explaining how a test rig consisting of a motor, torque meter, a test permanent magnet generator, a variable loads and measurements equipment was constructed. Then the construction of the permanent magnet generator is introduced and the test results are presented together with a discussion.

My first overall recommendations are

1) To split the results and the discussion into two different sections in the paper. I think the discussion will be more clear if all results are presented first and then they are discussed in a separate section. 2) The authors have to explain the experimental procedure more clearly in terms of what the rotation speed is during the presented test results. This is especially the case for figure 3 and figure 4. 3) For vertical axis wind turbines there is often a linked relation between the turbine shaft power and both the incoming wind speed as well as the turbine rotation speed. Thus there is often a wind speed vs. rotation speed curve giving the optimal tip speed ratio for a specific turbine rotor. This relation is not clear from figure 7 and 8. Thus it seems that the rotation speed reported in figure 8 are quite high for the turbine rotor. It was not possible to find figure 7 in the reference stated as Suppachai et. al. 2019 and it was therefore hard to check. Please clarify if Suppachai et. al. 2019 is correct. It will be appropriate to provide a description of what the turbine is going to do when it is started at a wind speed of  $v = 2$  m/s. Do you plan to spin up the rotation speed without the electrical load connected and then increase the electrical load at rated rotation speed? Or do you plan to connect a constant electrical load and spin up the turbine with the load connected? It will be good if this is discussed in relation to the start up torque measurements presented in figure 3 and 4.

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A pdf version of the paper is attached with comments and recommendations to improvements and clarifications marked with yellow boxes. I hope this will be a help to implement the overall recommendations.

Best Regards

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Please also note the supplement to this comment:

<https://wes.copernicus.org/preprints/wes-2020-101/wes-2020-101-RC2-supplement.pdf>

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