Review of ”A comparison study on jacket subsctructuresfor offshore wind turbines based on optimization”, manuscript no.: wes-2018-58, by J. Häfele, C.G. Gebhardt, and R. Rolfes

The manuscript addresses the structural optimization problem of jacket substructures for offshore wind turbines. It takes a broader approach than most papers within the field by considering topological variations in the optimization, extending to e.g. number of bays and amount of legs. Additionally, the work includes a more detailed cost function than most optimization papers.

Overall, the topic is worth investigating and important for further improving the design of offshore jacket substructures for wind turbines. The topic is within the scope of Wind Energy Science and the article advances current state-of-the-art. However, I do have some suggestions and comments that should be addressed.

Generally, the modeling section should be more descriptive and the language in especially the result section should be revised.

The choices behind the cost-model should be described in much more detail. Also, the limitations of the cost model should be reflected upon. For instance, local content is a large factor in the current market. Thus, designs can to a certain extent be driven by the locally available production facilities. To name an example, this can affect the number of bays due to crane facilities or painting facilities. While it is fair not to include all the aspects, more important factors should at least be discussed.

The cheapest structures appear to be the simplest structure, i.e. the fewest bays. This is intuitive, as it is well-known that welding and potentially grinding of jacket structures is very expensive. Thus, the motivation for implementing this framework is lacking, as you get the expected result, as you also mention in the paper. However, if sensitivities to different terms of the cost function were presented, much more insight into the design drivers would be given, and this would add significant value to the paper. E.g., how much would you need to lower the production cost, for instance by robot-welding of X-braces, before we get a different optimal design?

Lastly, since the cost model aims to replace the more used ‘overall mass’ model, the overall weight of each of the optimized structures should clearly be stated in the result section. The cheapest four-legged jacket is the lightest four-legged jacket. How about the three-legged? This information is lacking. It would have been very convenient to see a minimization of mass optimization compared to the presented results.

Specific comments:

Page 1

Line 20	You mention that structural optimization is paramount (I do agree, at least in absence of experts) because it provides cost savings “with low effort”. Low effort in execution, yes, but not necessarily in implementation of the method. More focus should be on how easy or difficult it is to implement the proposed optimization method.

Line 21-22	For clarity, I suggest that you directly mention what is meant by ‘intermediate water depths’.
Page 2	
Line 3-4	It is true that thousands of simulations are required for verification, but it should be clarified, that it is not needed during conceptual design phases with or without optimization methods.
Line 19-20	You do not mention decision by design ‘experts’ until page 3, but number of bays and legs are normally correctly decided by experienced designers. Consider restructuring/rephrasing.
Page 3	
Line 30-31	This is an assumption. Pile design can be affected by the design of the substructure.
Page 4	
Line 12	You should mention why the cost function is scaled with log10. If you experienced numerical difficulties without the logarithmic scaling, this should also be mentioned.
Line 21-22	‘The problem incorporates no nonlinear equality constraints’. This sentence can be removed. This is clearly stated in equation 3.
Page 5	
Figure 1	The last sentence in the figure text lacks a ‘respectively’ or should be rephrased.
Section 3.1	It is fair to reduce the design space by always having a mudbrace, but real jacket structures do not always have this. The impact on both the structural response and on the manufacturability/costs of having a mudbrace or not should be mentioned.
Page 6	
Equation (5)	You should mention that the actual weights are presented in section 5.3 or the weights should be listed here.
Page 7	
Section 3.2	Generally, the limitations and assumptions of the equations should be made much more visible. While this part is a large step forward in defining the optimization problem as compared with most previous work, the cost function is still quite simplified.
Equation (10)	You assume that the transport cost is directly dependent on the mass. This is a very large simplification, and effectively makes the additional constraint obsolete at is just an additional factor on C1. I fully realize that it may be too complicated to incorporate many of the governing factors, e.g. crane and vessel availability. However, e.g. deck space occupied by a three- or four-legged jacket is very different, and this can have a significant impact on the transportation and installation costs.
Equation (11) + (12)	I think that there should be a difference in the cost function for an optimization problem, and the actual costs. There is no need to add fixed costs to the optimization problem.

Page 9

Section 3.3.1 — It should be clearer that the Efthymiou SCF's are just one way of determining the SCF's, and they are well-known to be quite unprecise. People that are unfamiliar with fatigue design of offshore structures may believe that this is the standard approach, which is most often not the case.

Page 10

Section 4.1 + 4.2 — Not enough details are given. E.g. what are 'appropriate settings' for fmincon?

Page 14

Table 1 — Can you include the overall mass of the jacket in this table? This is important to compare the results from standard 'mass minimization' to your 'cost minimization'.

It looks like the cheapest jackets are also the lightest jackets. At least, the cheapest 4-legged jacket is the lightest jacket. It could be very interesting to see if the cheapest 3-legged jacket is also the lightest 3-legged jacket.