REVIEW 1

The paper is generally well organized, however as mentioned by the other reviewer, Table 1 and the surrounding text (lines 410-440) would be more appropriately placed in the methods section rather than presented as results.

Moved Table1 and the surrounding text to the methods section (3). This was an oversight in actioning the previous review.

There are some instances of unclear sentence structure that could be improved, for example, lines 40-41, 99-102, 155-156, and 466-468.

All sections listed now clearer for the reader, namely the frequency dynamic response of the platform, atmospheric stability impact on wake losses, platform CAPEX design optimisation, the benefit of the supporting exog(enous) data on results.

REVIEW 2 - General comments – 2nd review

Extensive literature review could be a bit shorten. Presenting the State-of-the-Art is commendable but a complete listing of the options for design optimization and genetic algorithm is maybe not required in introduction of this paper.

Significantly reduced lit review size, especially material not connected to main topic of study (other GAs, historical value etc) merged connected subsections condense section. Size roughly halved now.

Scientific gaps are identified on some topics but are not covered in this study:

- Required improvements of cost models to penalize unusual configurations and their added design costs.
  - The cost model already includes penalties for unfeasible designs. Unusual designs doesn't mean bad or unoptimized. penalty functions can be added to do that or any other discrimination criteria to get filter designs through optimization. but the implemented Genetic algorithm does already that based on the constraints considered.
  - On the cost side, a complexity factor in the fabrication is required and is covered by some studies (Myhr, A., Bjerkseter, C., Ågotnes, A. & Nygaard, T., 2014) which adds a coarse complexity factor (1.2x, 1.5x) to platform costs. This was not considered in this study due to a single platform type and device, and a focus on structural optimisation and not fabrication methods.
    - TODO add more clarity on this in text.
- Common tools normally treat floating platform as rigid bodies and ignore flexibility, which is crucial in structural lifetime analysis
  - For detailed finite element analysis that considers structural stress and deformation, and to check hotspots for fatigue, absolutely this is crucial but is considered in this work as a next step, once a site and platform design has converged.
  - Added section at end of 2.1.2 to justify this.

Methods

Turbulence is source of important aerodynamic loads. Shouldn't they be considered in the load constraints instead of looking at steady wind only?

Absolutely, turbulent loads are a leading cause of fatigue lopading through continual fluctuations, but as RAFT works as a linearised frequency-domain solver, it is not currently possible to implement. "Turbulent wind excitation is currently disabled" - RAFT documentation. The turbulent part is considered in the turbine control terms of the excitation, but the linearised response prevents a full stochastic loading from turbulent wind fields.

RAFT does not generate lengthy turbulent wind simulations, this would be covered in a suitable time-domain tool like OpenFAST, which was not done due to time constraints and the scope of this study: analysing multiple load cases and platform design iterations in a large design optimisation space, and the focus on the economic and time forecasting part of the study. A study on the final design in OpenFAST after full exploration of potential designs would be interesting for future work, and will be stated as such.

Added section to method 3.1.1 around line 247 for justification.

The SIRAMAX model remains extremely obscure to me. What are the exogenous data? What variables are they representing? The only indication is at the end of the section: "They reflect shared macro-economic drivers, such as rebar and copper, and coal …" The physical meaning of this data and their influence on the forecasting method should be more explicit. How do they "support the data for forecasting"? What does it mean 'best performing' exogs? Adding a figure (3) is a good idea but it is not explained. What are the x and y-axis? What does the blue and red colour mean? What does each subplot represent?

The exogenous (Exog) data are monthly time series, of equal shape and granularity to the target predictor (HRC steel prices). They are external to the steel prices themselves, but are linked (such as metals with impact on steel, metal indexes, energy prices, among others) which allow the predictor to build confidence. For example a slow linear trend of an index can give the predictor insight into where future steel prices may go I future years, away from short-term fluctuations.

The exogs are filtered within a floor and ceiling r-quared and p-values, as shown in Fig 3 into a range of data that has significance, but not too much on the data, as too much may influence the predictor. The x-axis shows the publication delay applied to the variable (months), and the y-axis the memory length (how many observations retained in the model). Red and blue bars positive or negative trends, and thicker bars representing better performance.

Added extra text on exogenous around line 304 and after Figure 3 (added above)

The paper explains how the algorithm works but misses its physical meaning, especially these "exogs data". This is confusing for non-experts. Put technical details in an appendix.

Building on the last comment, further details will be added into the appendix including time series of the exog data which shows the relationship between the exog data "greatest hits" and the steel price data use for the predictions.

Economic assessment is clear. Regarding the LCOE calculation, why would we need a steel price forecast over several years when computing the CAPEX for the platforms of our 1GW wind farms? Is the steel bought and the platforms installed over several years? Does the forecast allow to select the most profitable year and target it for buying the entire necessary material?

Yes, the model assumes the steel is purchased in a single year, and a contractual agreement reached with the manufacturer at that time. A model assumption is that all steel for the platforms is purchased in one year, and not spready out over multiple years. To the authors knowledge, this is the normal process. Indexing over multiple years is a possibility to protect against future steel price rises from the manufacturer side, and highlights the need for future price insights, but is not used in this study.

Steel purchasing assumption added to the text line 360

Results

Load Case 6 models extreme conditions: steady 70 m/s wind and large irregular waves. However, turbulent wind at 50 m/s average may create higher aerodynamic and aero hydrodynamic loads. Wind gusts can cause large thrust variations and high tower base bending moments. The paper suffers from testing the design candidates against steady wind only.

I agree with the comment, the lack of analysis on these time-domain events is a factor of the scope of the study and the use of a frequency-domain tool for analysis of the multiple designs. For this case, RAFT is finding an equilibrium around that extreme wind speed value and computes a linearised aerodynamic thrust and damping. The same goes for the wave forces. A 50m/s turbulent wind field could certainly generate higher loads and this is a setback when using RAFT for the analysis. As with the previous comment, these stochastic phenomena present future work in a time-domain tool such as OpenFAST. To analyse the load cases and integration into the genetic algorithm at this stage would present too much computational time and resource.

The limit values for stress and acceleration constrains are still missing. The platform design optimization framework shows clear constraint limitation, such as the short range of Load Case and the absence of turbulent wind for example, which explains why such a reduction in the platform mass can be achieved. That being said, the authors explain that the goal is to find a first design for the economic assessment. Overall, critical discussions are present and insist on the valuable insights of the results.

Limit values for stress and Nacelle acceleration were listed in Table 2 but were listed as constraints as named in the model, these have not been reworded to “Nacelle acceleration” with a limit of 5 degrees, and “Stress” with a limit of 300MPa for clarity. Yes, we agree with the comment on the platform mass reduction. Simplifications were certainly made to accommodate the number of designs and load cases, and as such specific loading events such as gusts and irregular waves are not accounted for due to the linearised wind and wave spectra.

Figure 5 has been vastly improved and its now readable. However, important terms are still not defined despite comments during the first review: seasonal-naïve, sMAPE, bias… Some evaluation statements lack clear reference to the evaluation metric. For example: “the hybrid is the most balanced forecast and show lowest peak error” What does that mean? Where do we see this? Figure 8: Why do we compare against the seasonal naïve and not the hindcast like it was done until there? What are the additional insights of evaluating against such a seasonal naïve?

sMAPE refers to the symmetric mean absolute percentage error, measuring the average relative difference between the observed and forecasted values, treating over and under prediction the same.

The description of the benefits of the hybrid forecast and with the lowest peak error refers to the maximum absolute forecast error over the hindcast period, directly referring to model prediction performance, either for overprediction or underprediction. This is changed in the text to provide a clearer response to the benefits of the hybrid model.

For Fig 8, the seasonal-naïve forecast was in error and has been omitted, the comparison is simply model forecast residual performance, absolute error distribution, and parity against actual data. This has been adjusted.

Seasonal naïve is a benchmarking tool where annual patterns are preserved but was not included in the final manuscript.

The economic assessment shows a valuable insight: the primary driver of economic uncertainties are market factors, and engineering progress offer significant, but limited mitigation.