I would like to thank the reviewer for the careful reading of the manuscript and for the constructive and insightful comments. The suggestions have been extremely helpful in identifying areas where the experimental design and presentation can be strengthened. In the revised manuscript, I will address all points raised and extend the experimental framework to improve the rigor and clarity of the study. Detailed responses to each comment are provided below.

Comment 1:
The study uses a residual MLP for fatigue prediction but switches to LightGBM for power prediction. This inconsistency introduces a confounding variable…

Response:
I agree with the reviewer that the use of different surrogate models for fatigue load prediction and electrical power prediction introduces a confounding factor, which makes it difficult to attribute performance differences solely to the input representation.

In the revised manuscript, I will adopt a consistent modelling framework across both tasks. Specifically, a residual multilayer perceptron (ResMLP) architecture will be used for both fatigue load prediction and electrical power prediction. This ensures that differences in predictive performance between input representations can be attributed to the information content of the inputs rather than to differences in model inductive bias.

Comment 2:
The baseline comparison for the raw input relies on models… ignoring spatial topology. A CNN should be employed…

Response:
I thank the reviewer for highlighting this important point. The current manuscript evaluates the full spatial input using models that treat the grid as a flattened feature vector, which does not explicitly exploit spatial structure.

In the revised manuscript, I will introduce a convolutional neural network (CNN) baseline for the raw spatial wind-field representation. This model will operate directly on the 30 × 30 grid inputs and is designed to capture spatial correlations and local structure in the flow field more effectively than fully connected approaches.

The purpose of this addition is to establish a stronger upper-bound baseline for models operating on full spatial inputs. This enables a more rigorous assessment of the extent to which the proposed low-order descriptors retain predictive information relative to models that explicitly exploit spatial topology.

Comment 3:
The claim that the 31 spatial descriptors are sufficient is conflated with the specific inductive biases… validate across diverse regressors…

Response:
I agree that validating the descriptor-based representation across multiple model classes is important to demonstrate that the observed performance is not tied to a specific architecture.

In the revised manuscript, I will evaluate the descriptor-based representation using a range of standard regression models, including linear regression, random forests, and multilayer perceptrons. This will enable a more rigorous assessment of whether the descriptors consistently retain predictive performance across models with different inductive biases.

These additional experiments will clarify whether the proposed descriptors capture intrinsic predictive structure in the data, rather than being tailored to a specific model architecture.

Comment 4:
Lack of comparison with PCA or Autoencoders…

Response:
I thank the reviewer for this suggestion. The current manuscript focuses exclusively on physically motivated descriptors and does not include comparisons with data-driven dimensionality reduction techniques.

In the revised manuscript, I will include a baseline based on principal component analysis (PCA). The dimensionality of the PCA representation will be matched to that of the proposed descriptor set to enable a direct and fair comparison.

This will enable a more rigorous assessment of whether the physically motivated descriptors provide advantages over standard data-driven compression methods in terms of predictive performance and interpretability.

Comment 5:
Reliance on synthetic data… robustness to noise or incomplete data…

Response:
I agree that the use of synthetic data represents a limitation of the current study, particularly with respect to real-world measurement noise, non-stationary inflow conditions, and potential data incompleteness.

In the revised manuscript, I will explicitly acknowledge this limitation and clarify the scope of applicability of the results. Where feasible, I will explore the sensitivity of the

proposed descriptor-based representation to perturbed input conditions, for example through controlled noise injection experiments on the aggregated wind-field inputs.

However, it is important to note that the dataset used in this study is generated from high-fidelity aeroelastic simulations and does not fully capture the complexities of real-world offshore measurements. A comprehensive assessment of robustness under realistic measurement uncertainty is beyond the scope of the present work and represents an important direction for future research.

This clarification will be incorporated into both the discussion and conclusion sections.

Additional Revision to Claims:

In light of the reviewer's comments, I will revise the framing of the main conclusions to ensure that they are fully supported by the extended experimental analysis. Rather than asserting strict sufficiency of the low-order spatial descriptors, the revised manuscript will adopt a more precise and evidence-driven formulation.

Specifically, the conclusions will be updated to reflect the extent to which the descriptor-based representation retains predictive performance relative to full spatial inputs under the considered modelling framework. Where applicable, the revised manuscript will also explicitly identify conditions under which higher-dimensional spatial information provides additional predictive benefit.

This revision ensures that the claims are aligned with the empirical findings and appropriately reflect both the strengths and limitations of the proposed representation.

Once again, I thank the reviewer for the detailed and constructive feedback, which has significantly improved the clarity and rigor of the study.