



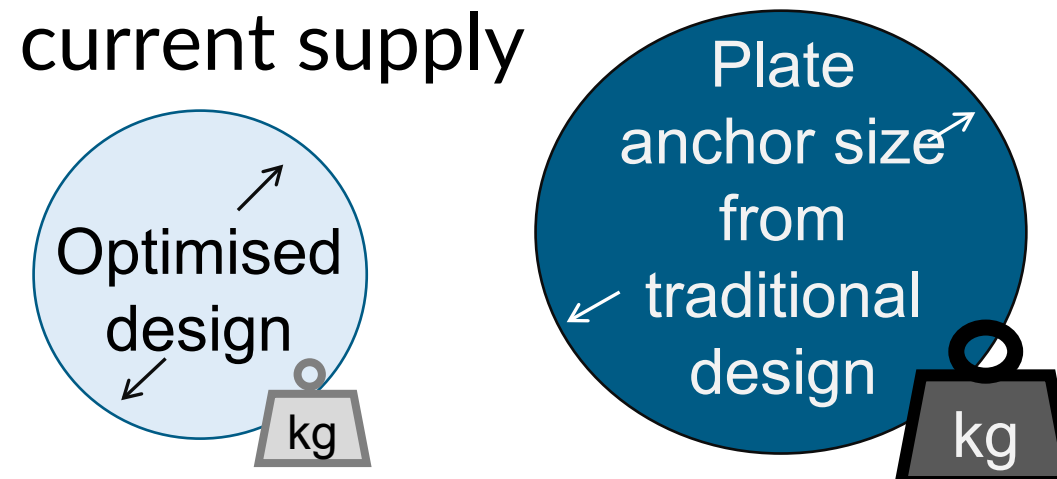
NextGen Anchor Design

Harnessing whole-life seabed evolution modelling using probabilistic surrogates

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Novelty & Timeliness

- Anchor optimisation is critically needed to reduce overall demand & improve floating ORE infrastructure efficiencies^[1].
- To achieve the UK's 2050 floating offshore wind targets, around 2,000 to 4,500 anchors will need to be installed per year^[2]. This is a 10 to 15× increase over current rates^[2] which far exceeds current supply chain capacity.
- NextGen Anchor Design unlocks the design of smaller anchors, with quantified probabilities of failure, leading to significant material and cost savings in anchor manufacture, installation and future decommissioning.



Methodology

- NextGen Anchor Design provides a novel fully probabilistic framework for anchor design (Fig 2). It will include:
 - A surrogate model to rapidly generate many realisations of anchor loading history as a function of environmental conditions (winds and waves).
 - A whole-life seabed evolution model^[3,4] to track temporally varying seabed properties that affect anchor capacity as a function of anchor loading history.

Generation of training dataset & creation of probabilistic surrogate model

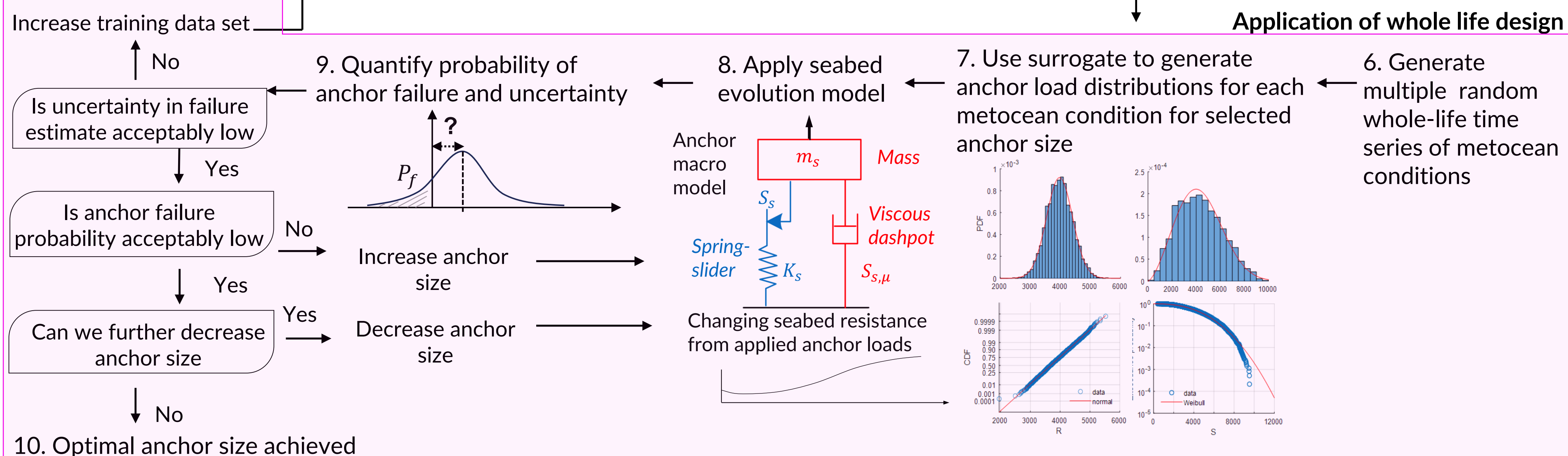
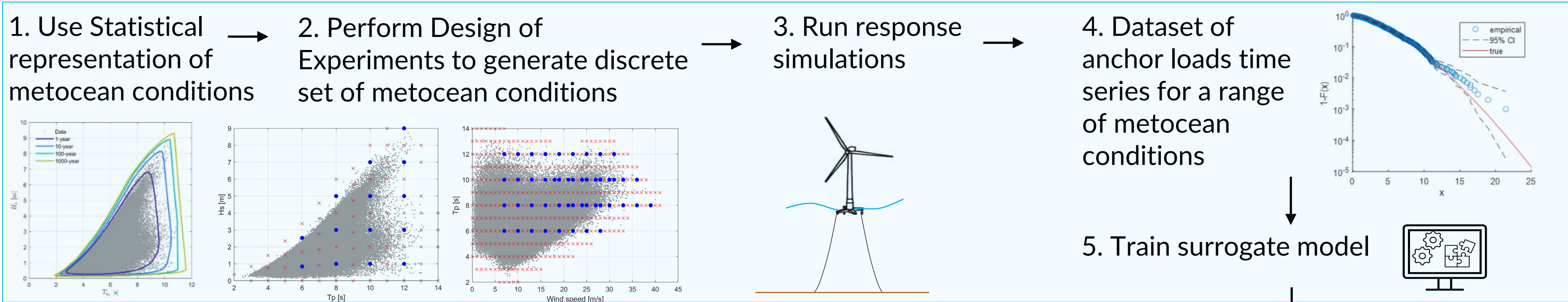
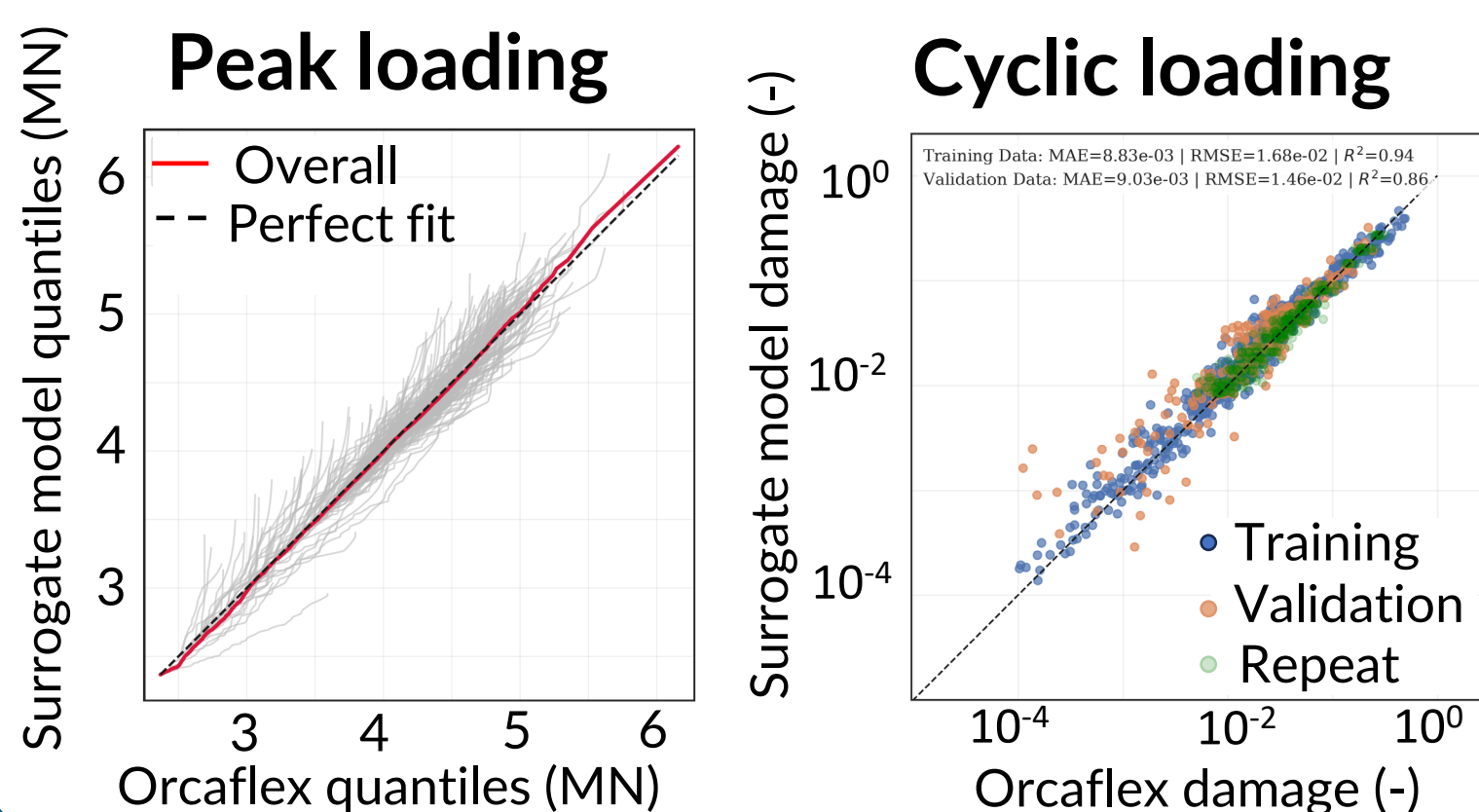


Figure 2. NextGen Anchor Design's fully probabilistic design framework

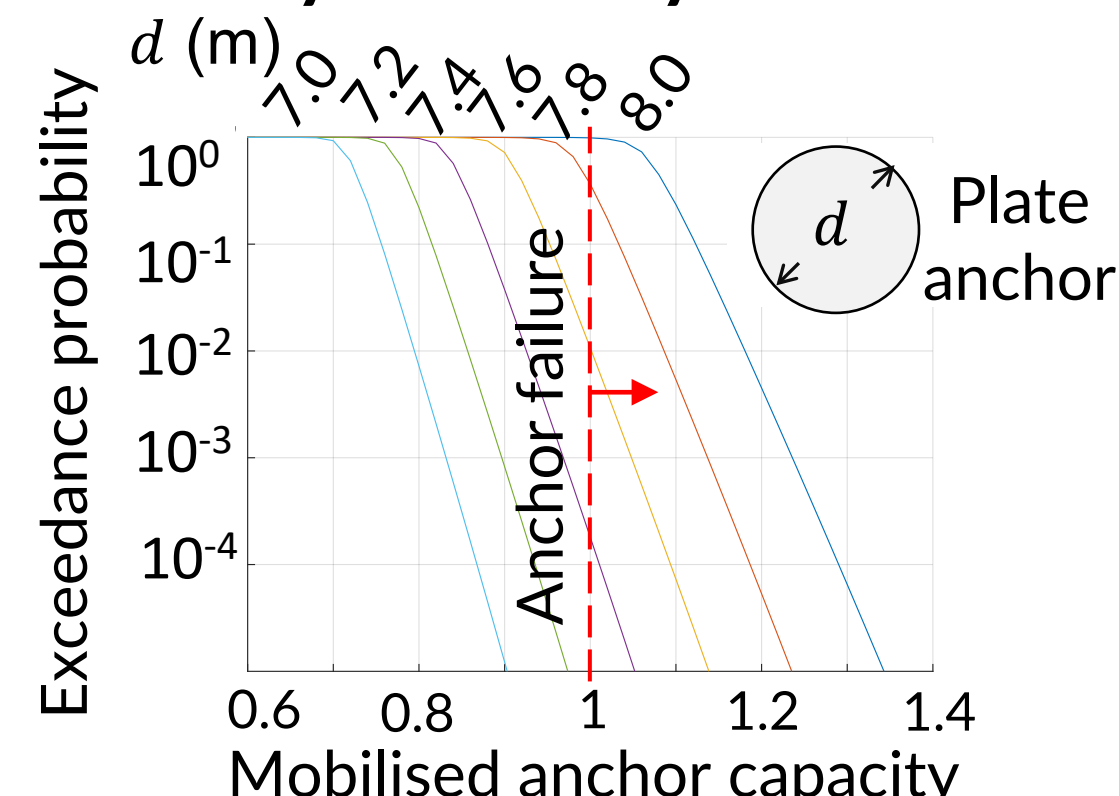
Probabilistic surrogate model performance



Read more:

Mackay, Pillai, Kwa (2026) Development of a probabilistic surrogate model for loads on an embedded plate anchor. Part 1: Short-term extreme loads & Part 2: Cyclic loads, OMAE Tokyo.
 Kwa, Mackay, Pillai, (2026) Linking Environmental Conditions to Cyclic and Peak Anchor Loads for a 15 MW Floating Offshore Wind Turbine, OMAE Tokyo.

Anchor failure probability over 20-year lifetime



[1] supergen-ore.net/uploads/resources/Final-version-Supergen-ORE-Hub-2040-ORE-Outlook-report.pdf, [2] doi.org/10.1016/j.oceaneng.2023.114327, [3] doi.org/10.1115/OMAE2022-81101, [4] doi.org/10.1016/j.apor.2023.103671

