Offshore Wind Innovation Exchange

Innovation Challenge 2

A solution for non-destructive sub-surface structural inspection of large composite wind turbine blade structures, at height in a marine environment, delivered safely and cost-effectively.

Background

The OWiX initiative is supporting an innovation challenge owner in the offshore wind industry to identify transferable solutions to its innovation needs.

The proposed solutions for this challenge must be deployable without affecting existing manufacturing, installation, design and materials used in the inspected composite structure.

Whilst not limiting the technologies from solution providers, it is expected that solutions would consider innovations from some of the following areas:

- Robotics
- Multitasking unmanned aerial vehicles (UAVs)
- Sensors and advanced imaging
- Communications technology
- Non-destructive inspection techniques
- Data processing and analysis
- Artificial intelligence
- Satellite imaging

To meet the desired timescale and risks, it is preferred that the proposed solution, or the key part(s) of the solution, has been demonstrated in an industrial environment. The solution should be in line with health and safety requirements and regulations.

Solution Requirements

Functional Requirements	• A potential solution capable of detecting, monitoring and acquiring data concerning the physical surface, and sub-surface condition of a large complex glass fibre reinforced composite structure. • Solution must be deployed safely and ideally remotely to reduce human intervention. • Inspection must be undertaken with the target structure in-situ, ideally without the need for the composite structure to be stationary. • The acquired data, such as measurements, images, logging time and ambient conditions, must be available for further analysis after inspection. • Ability to work for long periods without the need to recharge the power source.
Technical Characteristics	• Solution must be capable of non-destructive/non-intrusive inspection of the large complex glass fibre reinforced composite structure. • Solution must be capable of detecting sub-surface cracks due to fatigue, damage or manufacturing defects, which could not be identifiable from visual inspection of the surface alone, whether at the structure tip, along the length, or at the root of the structure.

	• Solution should be capable of detecting a minimum physical flaw/defect of 10mm at a resolution of ±5mm, ideally to the depth of 5cm. The flaws may include a surface/subsurface crack, voids, de-bonding, delamination, etc. • For dynamic (i.e. non-stationary) inspection, a solution must operate while physically attached to the structure. • Solution must be as compact as possible and highly mobile with added ruggedness to resist offshore marine environment. • Solution inspection efficiency must not be affected by atmospheric conditions such as poor lighting, high wind gusts, salt/dirt/particle deposits, etc.
Deployment Timescale	• Validation of solution: within 1 year • Field trials: within 1-2 years • Commercial implementation: within 3 years
Operating Conditions	• Solutions must be able to be operated safely and reliably in offshore conditions with: o Wind speeds of 8m/s, with gusts of up to 25m/s o An ambient temperature 0-40°C o Heights of 100-200m from sea level o Distances up to 25km from shore, ideally up to 40km
Cost Requirement	• New solutions must offer faster inspection rate at a lower overall cost. Current industry practice is capable of inspecting three structures per day at an estimated cost of £6,000. • An ideal solution should aim to achieve a 50% overall improvement on cost and time of inspection. • The current estimated UK market for a successful solution will be in the region of £20m p.a. with a significant additional export market.
IP and Potential Commercial Route	• Existing background IP associated with a potential solution will remain with Solution Provider(s). Where any new IP generation is envisaged, it will be subject to the mutual IP agreement of the Solution Provider(s) and Innovation Challenge Owner. • Any commercial deployment of transferred solution or newly developed solution, through licensing, joint venture, partnership or direct investment, will be subject to the commercial agreement between the Solution Provider(s) and Innovation Challenge Owner. • Where necessary, a non-disclosure agreement (NDA) may be signed to uphold confidentiality in the engagement between the Solution Provider(s) and Innovation Challenge Owner. • Innovate UK and KTN do not take any share of IP ownership or enter into commercial venture through the OWiX programme.