16257

# A case study: Requirements and considerations for the selection of a FLS installation-location in a commercial offshore wind farm project

Patrick Schwenk, Khalid Kamhawi, Claudia Rudolph*
* OWC (Aqualis) GmbH, Hamburg, Germany, patrick.schwenk@owcltd.co.uk;
* Offshore Wind Consultants Limited, London, England, khalid.kamhawi@owcltd.co.uk;
* Fraunhofer IWES, Bremerhaven, Germany, claudia.rudolph@iwes.fraunhofer.de

OFFSHORE WIND CONSULTANTS

Fraunhofer IWES

## Abstract

This case study provides insights into the deployment of a Floating Lidar System (FLS) for a commercial offshore wind project (OWP) and the faced problems during installation which required the identification of an alternative installation location. Both, technical FLS related issues but also project specific aspects needed to be considered to ensure that the new installation location fulfils the requirements to enable safe, precise, high-availability and interference free measurements. Although some problems and corresponding measures are project specific, the case study provides a general procedure on how to continue when changed conditions or unforeseeable problems are experienced.

## Background

Different initiatives are underway to support the further maturation of Floating Lidar technology and to standardise the deployment of a FLS to obtain the best possible site-specific data quality for a Wind Resource Assessment (WRA) [1][2][3][4][5]. Although the available Recommended Practices provide good guidance on many aspects relevant to formal WRAs, there are aspects which require further elaboration, especially as offshore wind is fast becoming a global industry - expanding into sites with more challenging hydrographic and atmospheric conditions.

Currently, the Recommended Practices provide limited guidance on identification of a suitable site-specific installation location for a FLS to enable accurate interference-free measurements with high data availability.

The competing HSE, consenting, technical, commercial and installation vessel specific considerations constitute the complex and coupled optimising and constraining factors, which need to be addressed and considered to find a suitable deployment position.

## The case study

The case study is based on a FLS deployment campaign for a commercial floating offshore wind project in Scottish waters.

On-site, changed conditions have been experienced with a guard buoy which trawled from its original position into the target installation area. The deployment of the FLS at the planned location was not possible.

Technical FLS related issues and project specific constraints needed to be considered to ensure that the new installation location fulfils the requirements to enable safe, precise, high-availability and interference free measurements.

The case study showcases some of the problems that can be faced during installation that demands immediate assessment and intervention. It demonstrates that there is an underlying rationale for finding an alternative installation location in real time, and exhibits the questions and considerations that need to be taken into account. We believe that this can be developed into a general heuristic algorithm on how to proceed when changed conditions or unforeseeable problems are experienced during installation. Continuative a recommended standard method what one should respect to identify a suitable installation site for a FLS could be evolve.

If changed conditions are experienced offshore the best way to avoid any live on-site assessment to find a suitable alternative installation location is to have a second position already pre-selected as part of the planning work. This alternative position must be communicated and approved by competent authorities and accepted by the windfarm owner and project partners. Generally, before installation of a FLS, different requirements and conditions should be considered. The most important requirements and conditions for FLS are summarized below:

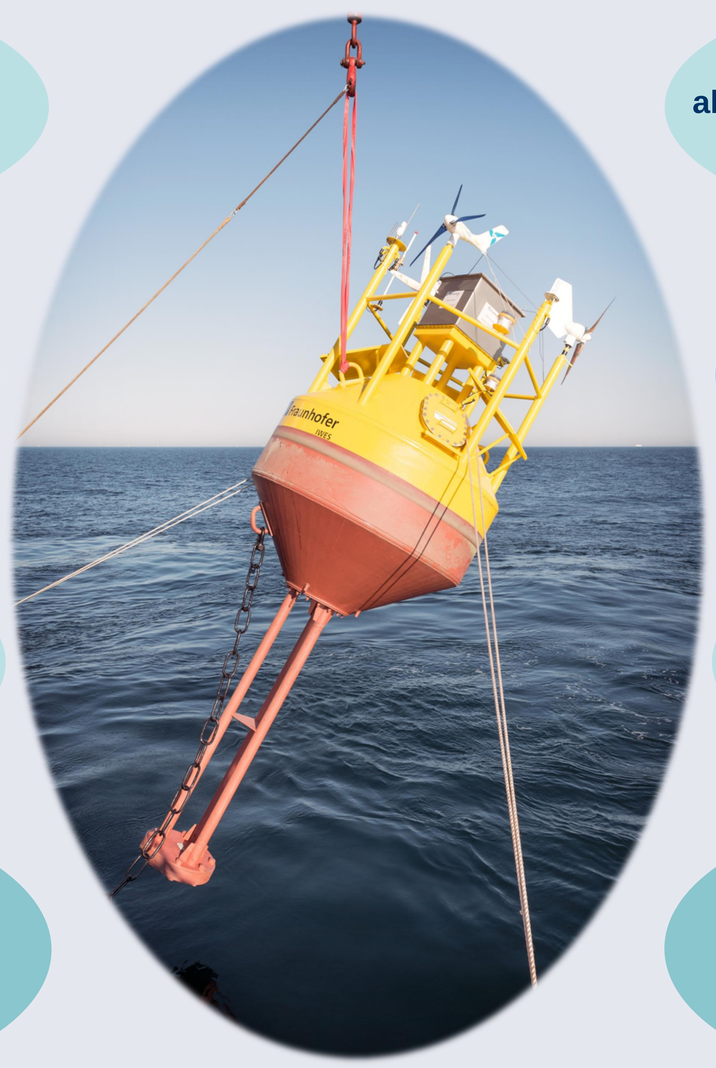
## Requirements and conditions for FLS installation

**HSE Requirements**
- Lift plan
- Method Statement
- Risk Assessment Buoy

**Approval Procedures**
- Approval
- Notice to Mariners
- **alternative position (2nd position)**
- Licences

**Technical Buoy Requirements**
- Distance to land
- Shadowing from Land, other WEAs,
- GSM / Satellite connection
- Met mast, etc

**Vessel Requirements**
- Crane
- Deck space
- Power unit for positioning (DP)
- Experience in buoy laying
- Vessel audit




**Wind park Conditions**
- Water depth
- Swinging circle
- Anchor chain (min. 3 x water depth)
- Type of anchoring (chain, rope, …)
- Anchor stone
- Wind park specifications
- Number of planned or installed OWPs
- Installed measurement equipment
- (wave buoy, ADCP, …)

**Environmental Conditions**
- currents
- Max. wind speed
- significant, max. wave
- Wave period
- Tide hub

**Sea bed Conditions**
- Sandbanks
- Bathymetry
- Type of bottom (sandy, rocky, silty)
- Ship wreck (obstacles general)
- magnetic anomalies
- Sea cable
- UXO

## Conclusions

In preparation of a floating LIDAR installation the examined area must be checked for a suitable position, where the buoy can be located. Therefore previously a lot of information are necessary to get a final decision about the exact position. Especially subsoil, water depth, sea states and weather conditions must be proofed in combination with technical requirements, limitations and if necessary adapting of the FLS. Further distance to land, shadowing effects, obstacles on sea bed and dimension of the wind park area itself influence the positioning. If a position is shortlisted new aspects must be considered relevant to vessel requirements or stipulation from admiralty and possibly other moorings or anchors in the wind park area. If all aspects are recognized and a final position is defined the approval and license process starts. This can take much time, so it is very meaningful to inform all parties about an alternative position. Then a fast reaction is possible, if you cannot move only a few meter away from your planned installation-location without a new approval process. The whole process before can reduced, only an information to the approval parties is necessary.

## References

[1] IEA Wind expert group report on recommended practices.
[2] OWA roadmap for the commercial acceptance of floating LIDAR technology.
[3] IEA Wind TCP Annex 32 Work Package 1.5, "State-of-the-Art Report: Recommended Practices for Floating Lidar Systems". Issue 1.0, 2 February 2016.
[4] Offshore Wind Accelerator, Recommended Practices for Floating Lidar Systems, Issue 1.0, 25 October 2016
[5] IEC 61400-15, Assessment of wind resource, energy yield and site suitability input conditions for wind power plants.