NAUTICAL RISK STUDIES TO EVALUATE THE LOCATION OF NEW OFFSHORE WIND FARMS

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Introduction

The location of an offshore wind turbine project must be carefully studied due to its possible effect on maritime traffic. The methodology for the assessment of nautical risks, developed by Siport21, makes it possible to evaluate the initial location in detail, considers all the related factors, proposes future scenarios -with new infrastructures- and incorporates proven hypotheses on the evolution of maritime traffic, both in typology as well as in frequency of operations.

The starting point is based on reports by IALA “Recommendation O-117. On The Marking of Offshore Wind Farms” and PIANC (World Association for Waterborne Transport Infrastructure) “Interaction Between Offshore Wind Farms and Maritime Navigation” (2018), a Working Group joined by Siport21.

This methodology, already applied in several projects, incorporates new tools based on Big Data, Data Analytics and DataViz techniques (artificial Intelligence algorithms to identify space-time relationships between the various traffics and physical conditions with advanced representation methods) that allow to efficiently analyse huge volumes of data.

The new methodology combines the traffic prediction mathematical model, Siflow21, with the assessment of nautical risks and, as a result, allows establishing the safety and service level in the offshore wind energy field. This combination makes it possible to identify the main risk factors, therefore improving the design, and defines contingency measures to reduce risks, ensuring that they remain within acceptable limits.

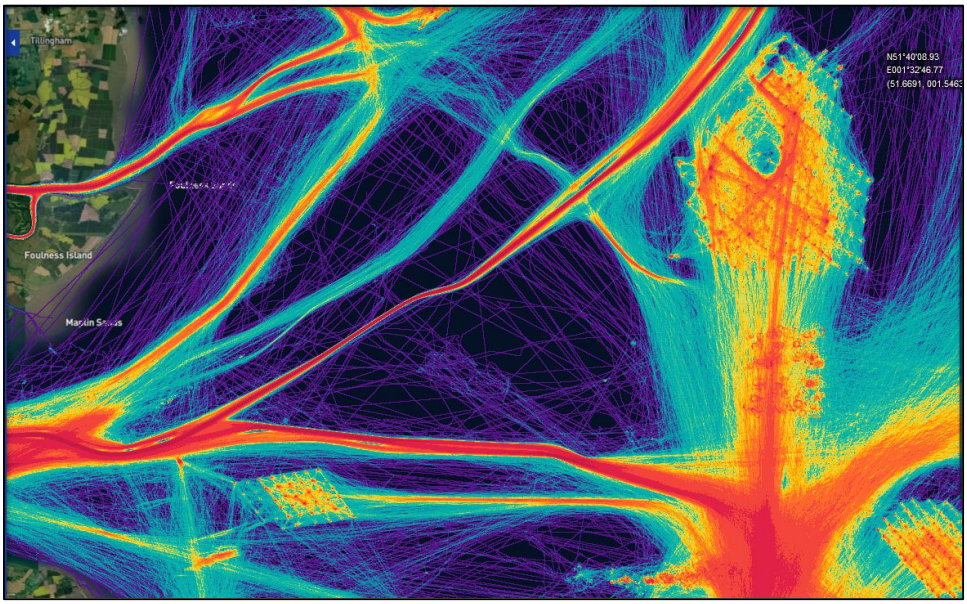

Figure 1. Traffic Density at English Channel (area for offshore wind farm development)

(AIS Data 2020-2021, www.marinetraffic.com)

Maritime Traffic Analysis

The Maritime traffic analysis allows to understand the behaviour of shipping in the area prone to install offshore facilities to determine ship movements, allowing to predict future movements, increase of traffic in the area and therefore, associated risks. The Maritime traffic analysis has the following steps:

- Characterization of the traffic by means of AIS Data
- KPI definition, selected ad-hoc for each project aligned with particular aims
- Building a traffic flow model replicating current traffic in the area
- Calibrating the traffic flow model
- Implementing future scenarios, new traffics, interferences, rerouting, … to see the new behaviour of the system allowing to start analysing the data for future risk assessment

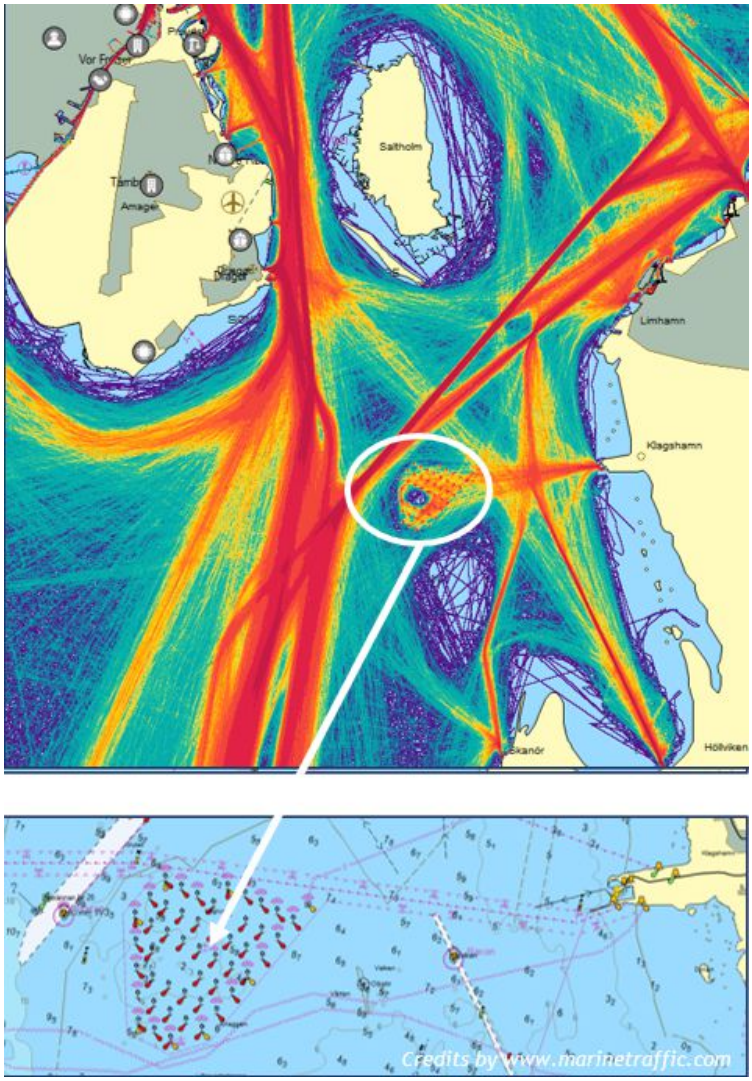

Figure 2. Maritime Traffic Around an Offshore Wind Farm

Nautical Risks Assessment

Through the nautical risk assessment, it is possible to evaluate the nautical risk to which the ships and wind farm are exposed based on the location of the installation.

The first point is to identify the Hazards that could create some risks through a HAZID process. This should incorporate local project location information, rules, strategies, hydro-meteorological conditions …

The second step is to evaluate the potential risks of the nautical hazards related to ships by determining in detail the frequency and the consequence that could be created based on the described hazards, such as the frequency of collision of a ship with a wind turbine. In this case, ship manoeuvring models, either fast time or real time are used to determine response actions, and effectiveness of counter measures if used, such us availability of external help as tugs.

This assessment, can be used as a basis to determine the navigation restricted areas, elaborate contingency plans, and reduce the collision/allision risks associated with the presence of the windfarms.

Finally, the risk evaluation based on the values obtained, and in comparison, with the acceptable values, allows to determine whether we are in acceptable, unacceptable, or tolerable (As Low As Reasonable Possible - ALARP) risks, leading to identify, weather some modification or additional countermeasures should be applied to minimize the risks. As an example, the risk acceptability values for the UK

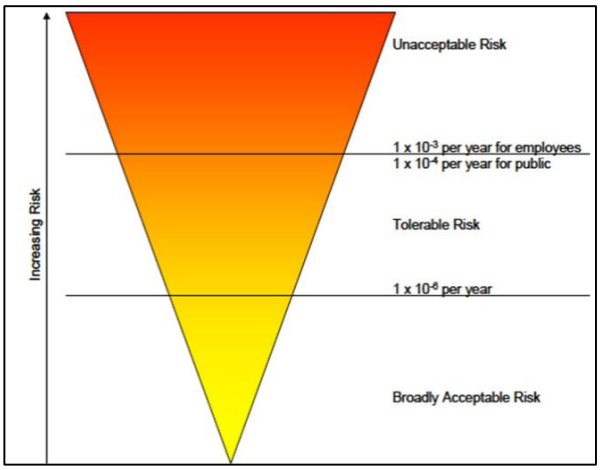

Figure 3. Risk Acceptance Criteria HSE

Conclusions

The location of an offshore wind turbine project must be carefully studied due to its possible effect on maritime traffic. The methodology for the assessment of nautical risks, developed by Siport21, makes it possible to evaluate the initial location in detail, considers all the related factors, proposes future scenarios -with new infrastructures- and incorporates proven hypotheses on the evolution of maritime traffic, both in typology as well as in frequency of operations.

The new methodology combining maritime traffic analysis and nautical risk assessments allows to establish the safety and service levels in the offshore wind energy field. This combination identifies the main risk factors, allows to improve/adapt the design, and defines contingency measures to reduce risks, ensuring that they remain within acceptable limits.