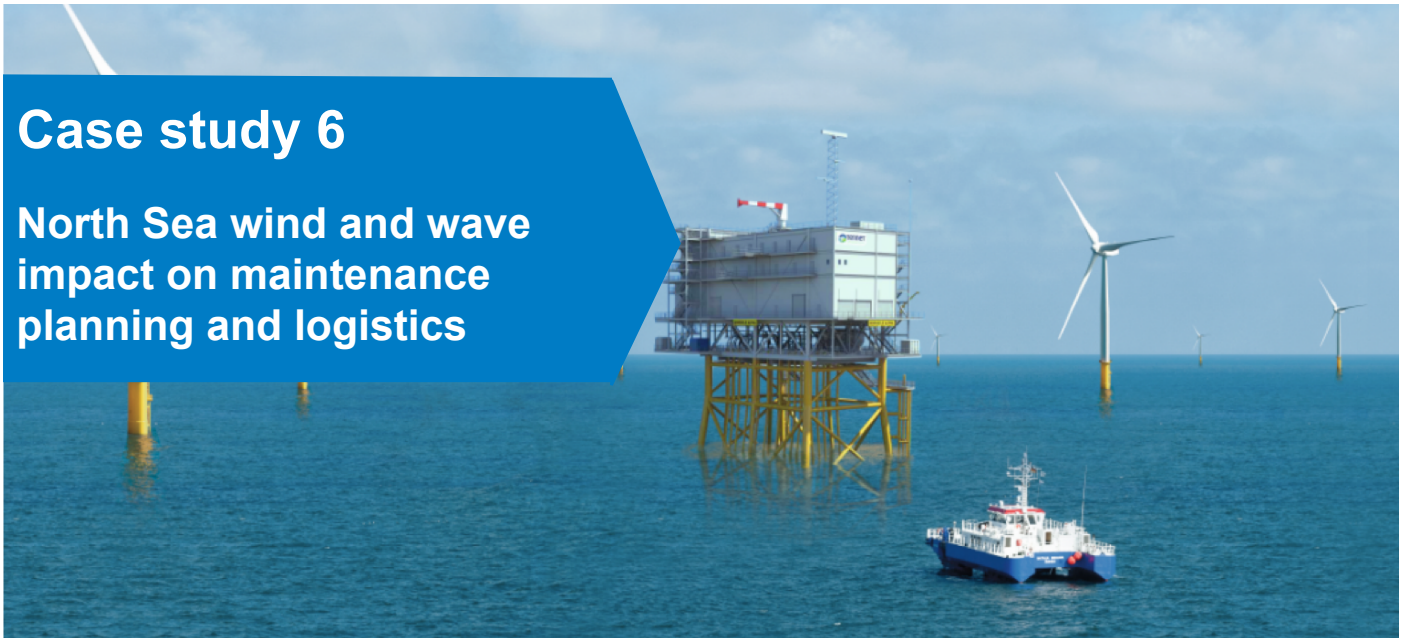

Case study 6

North Sea wind and wave impact on maintenance planning and logistics

Focus: North Sea wind and wave conditions suitable for maintenance

Industrial and research partners

The SECLI-FIRM project aims to demonstrate how improving and using long-term seasonal climate forecasts can add practical and economic value to decision-making processes and outcomes, in the energy sector, but also in the water sectors. To maximize success, each of the nine SECLI-FIRM case studies is co-designed by industrial and research partners. For this case study the industrial partner is TenneT, and the research partner is KNMI.

Boosting decision making

- The main objective of this case study is to illustrate the applicability of longer-range forecasts to optimise the use of vessels for offshore maintenance or supply operations.

The inter-seasonal to seasonal forecasting context

- For offshore maintenance planning meteorological parameters such as wind speed, significant wave height and mean wave period are important. This case study focuses on inter-seasonal to seasonal forecasts of wind (at 10m up to 100m height), and wave (mean wave period, significant wave height) conditions in the North Sea, from a climatological and forecasting perspective.
- This case study will assess the skill and value of forecasts of workable weather windows as early as possible (i.e. at long-lead times beyond 15 days ahead).

Sectoral challenges and opportunities

- Optimising the scheduling of vessel hire and personnel management to minimise downtime for offshore operations and maintenance planning.
- When should the vessel hire take place, and for what period, in order to reduce expected costs of a specific offshore operation that is scheduled within the summer, autumn or spring?

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Wind and wave conditions

The most efficient form of maintenance of wind parks and platforms in the North Sea is via vessels. Criteria for access by boat include meteorological parameters such as wind speed, significant wave height (SWH) and mean wave period (MWP).

Decision making for offshore maintenance planning therefore also includes meteorological information.

Offshore operational planning

For the Doggersbank, located in the centre of the North Sea, two different weather situations show the effect of meteorology on maintenance planning. For the winter months December and January, the number of days that meet the criteria for access by boat are compared below for the winters of 2005/2006 (Figure 1) and 2013/2014 (Figure 2).

Using the example set values for the thresholds provided by TenneT (red horizontal line in the figures), it can be concluded that the winter of 2005/2006 maintenance planning was hardly hampered by the weather.

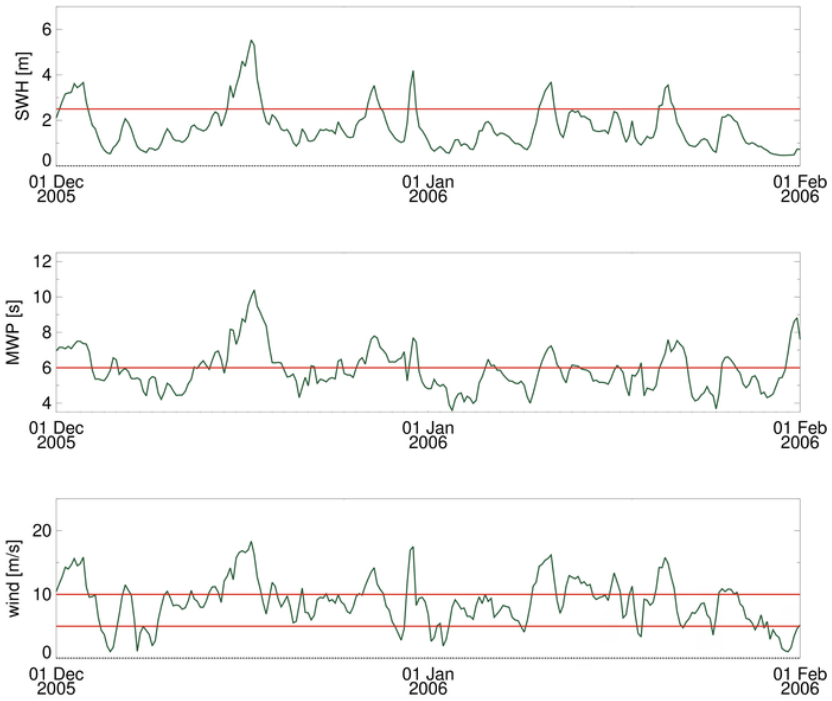

Figure 1 - Days suitable for maintenance in Dec 2005 – Jan 2006, assuming a hypothetical set of thresholds.

Climate event

Calm weather period winter 2005/2006

Sector impact

Increasing energy stability and reducing costs by improving maintenance planning

Industry context

Utility offshore maintenance

Whereas in the winter of 2013/2014 only a few days met the criteria for the most cost-efficient form of maintenance.

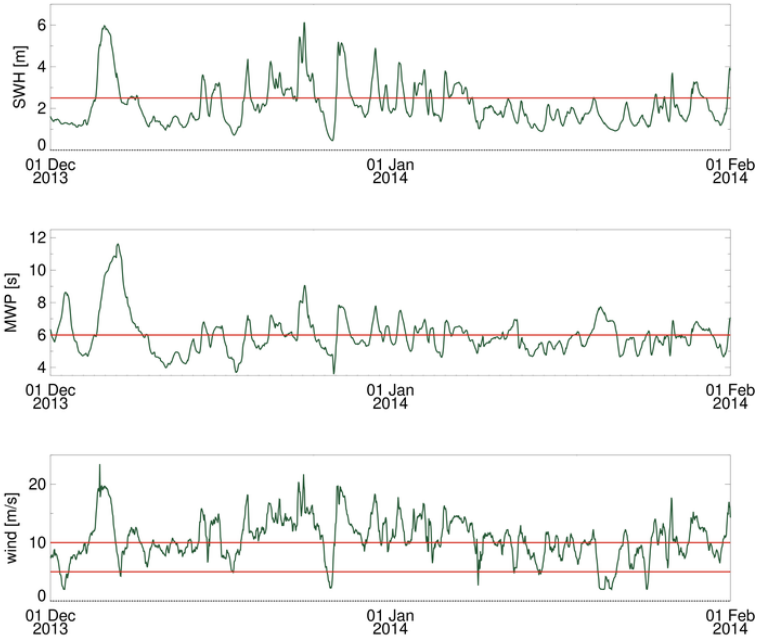

Figure 2 - Using the same hypothetical set of thresholds as used in Figure 1, showing that in the period December 2013 - January 2014, there are no suitable days for maintenance expeditions.

Value assessment of seasonal forecasting

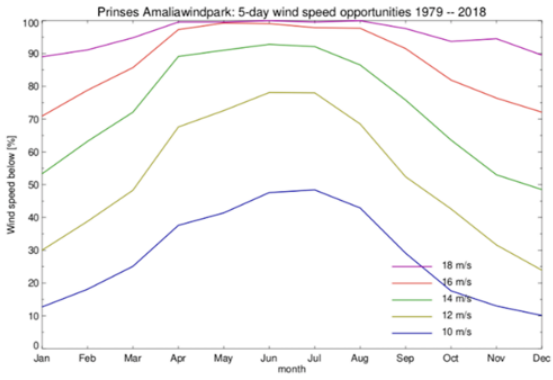

Figure 3 - Plot shows the wind climatology for different thresholds for a 5-day window of opportunity considering only the wind speed. The probability that the wind speed stays below the threshold of 10m/s is above 40% in June, July and decreases below 15% for January.

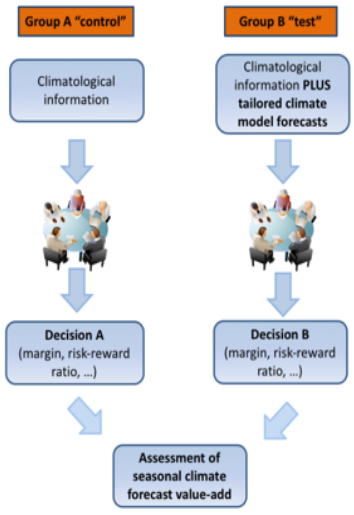

Figure 4 - The flowchart for the evaluation process, with the benchmark being the climatology.

Value assessment

How will the value of seasonal forecasting be assessed?

Forecasting suitable weather time windows

Climatological information is used to assess the probabilities of suitable weather time windows during different seasons. In an attempt to elicit skill of seasonal climate forecasts, these forecasts are evaluated against a benchmark using the short-range ensemble forecast.

Decision trees

To evaluate the impact of the forecasting models, decision trees for different sets of threshold values are under development. An example is given in Figure 5.

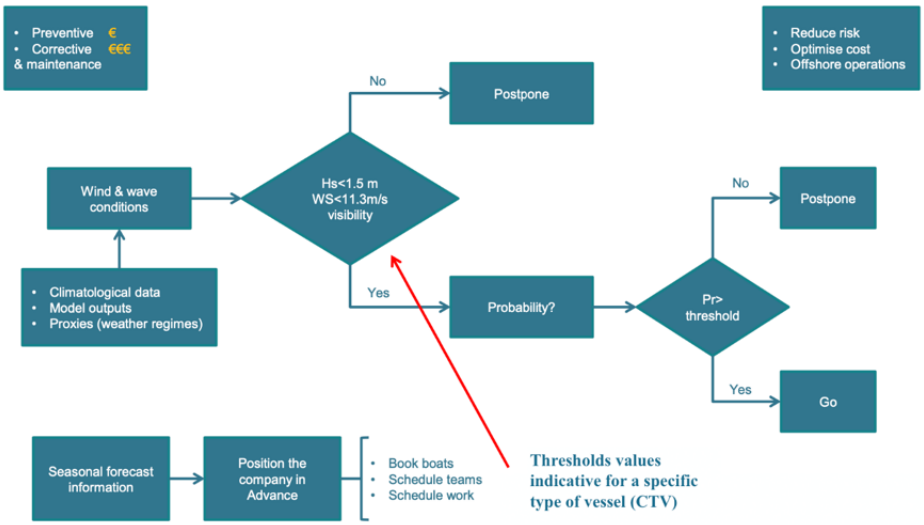

Figure 5 - Decision tree for maintenance planning.

Next steps

- Estimate the added value using the decision tree for different time-range forecasts, from medium-range forecasts to seasonal climate forecasts using econometric models.

The Added Value of Seasonal Climate Forecasting for Integrated Risk Management (SECLI-FIRM)

For more information visit:

www.secli-firm.eu or contact at: **info@secli-firm.eu**

Decision trees

Evaluating the impact of seasonal forecasting models

For more about this and the eight other case studies, visit www.secli-firm.eu

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