Logistics and transport solutions for offshore wind

The development of large offshore wind farms far from the mainland is a challenging task with complex logistics setups and extensive planning and scheduling activities. Both the installation and the operation and maintenance (O&M) stages require decision making based on a multitude of options. In these cases, analytical decision support tools are necessary to ensure all the relevant aspects have been included in the process and the most cost-efficient and risk-reducing options are considered and optimized.

Different stakeholders within the offshore wind farm industry can benefit from decision support that provides valuable answers to the following questions:

- What are the optimal installation/operation vessel resources?
- What are the optimal installation/operation strategy configurations?
- Which ports should be used for installation/operation procedures and what type of characteristics should they possess?
- What is the optimal installation activity schedule?
- When is it optimal to schedule maintenance tasks?
- Cost/benefit analysis for existing and new vessel concepts
- Early phase feedback on the performance of new vessel designs and their potential effects on the logistic system

Our expertise and services

Scientists at SINTEF Ocean (previously MARINTEK) have over several years, and in cooperation with other research institutions, academia and industry, developed models for optimization of the maritime logistics related to offshore wind farms. Some of these have been developed into decision support tools to aid stakeholders in the industry to select and develop the most promising logistical resources. The tools are based on mathematical formulations of the decision problems and use complex and efficient analytical techniques from operations research to find optimal solutions according to the users' defined objective.

SINTEF Ocean has a proven track record in the following research areas:

- Advanced analysis of the logistic system for the installation and operation phases of offshore wind farm developments
- Vessel fleet size and mix optimization for installation and operation phases of offshore wind farm developments
- Quantitative assessment of vessel designs and their performance in the overall logistic system
- Optimized scheduling of O&M tasks and selection of resource requirements for O&M tasks execution
- Optimized routing of vessels for maintenance tasks

Tools

LIVO – LEANWIND Installation Vessel Optimizer

- ✓ Determines optimal vessel fleet and installation schedule
- ✓ Minimizes total cost and installation time
- ✓ Considers weather conditions – wind and wave

HOWLOG – Heuristic solver for offshore wind O&M logistic resource optimization

- ✓ Aids in selecting the best combinations of logistical resourcesd and their deployment for O&M tasks
- ✓ Weather conditions and corrective maintenance tasks are stochastic

TeCoLog – Technical condition-based logistic planner

- ✓ Combines decision-support system for condition monitoring with a vessel fleet optimization for O&M

Completed projects

- LEANWIND (2013-2017) Logistic efficiencies and naval architecture for wind installations with novel developments
- NOWITECH (2009-2017) Norwegian Research Centre for Offshore Wind Technology
- FAROFF (2012-2013) Far offshore operation and maintenance vessel concept development and optimization

Ongoing projects

- INSTALLER (2018-2020) Floating installation concept for offshore wind developments
- COSMO (2017-..?) Computer tool for optimization and simulation of marine operations

Links

Maritime logistics optimization for offshore wind
https://www.sintef.no/projectweb/marwind/