Fraunhofer CML

PRODUCTS

FRAUNHOFER CENTER FOR MARITIME LOGISTICS AND SERVICES CML

Offshore heavy lift vessel

PORT LOGISTICS FOR OFFSHORE WIND ENERGY

German offshore wind farms

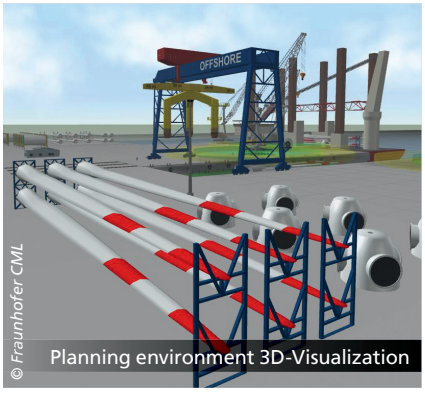
More than 100 new German offshore wind farms are scheduled to be built in the North and Baltic Sea by 2030. A total of 25 GW of installed capacity is planned. This will be generated by close to 5,000 plants, which will be installed and subsequently regularly maintained over an almost 20-year operating period.

Challenges

The transport and handling of large offshore wind energy components is a very challenging task for future wind farm operators and consequently also for port and terminal operators. Heavy lift and project cargo is already handled in ports and terminals but not in the quantity and frequency that would be expected with offshore wind energy plants. In particular, the extremely large dimensions and weights have a formative influence on the layout of a port (see rotor blade up to 90 m in length).

The designated assembly concept is therefore crucial in determining the necessary areas and handling equipment in the port. Assembling a full star, for example, requires a much larger area compared to a single rotor blade. However, the large-scale components in an offshore wind energy plant are not the only elements that affect the layout of a terminal – the tremendous weights involved must also be taken into consideration (see 500-ton tripod).

Due to the huge dimensions of the large components, the appropriate turnaround areas are also needed in the ports in order to make it even possible to handle or transport these components.



Planning environment 3D-Visualization

Planning environment 2D-Visualization

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IMPRESSUM

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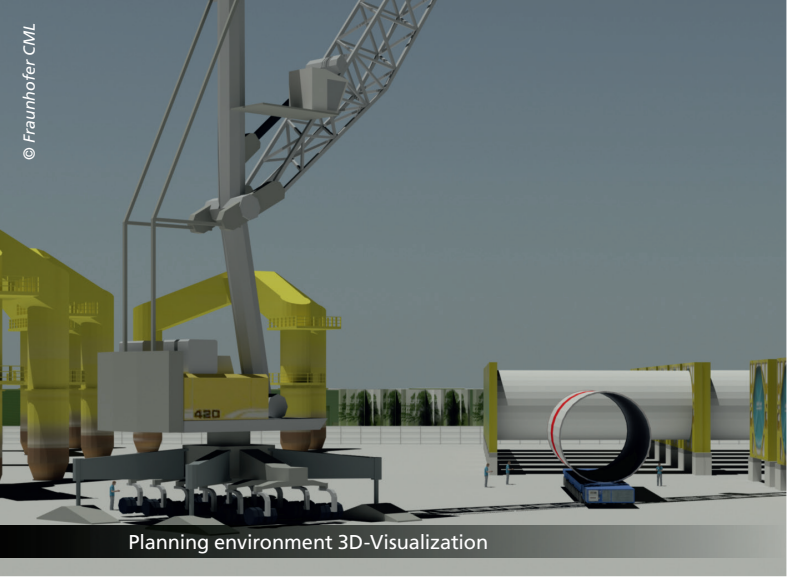
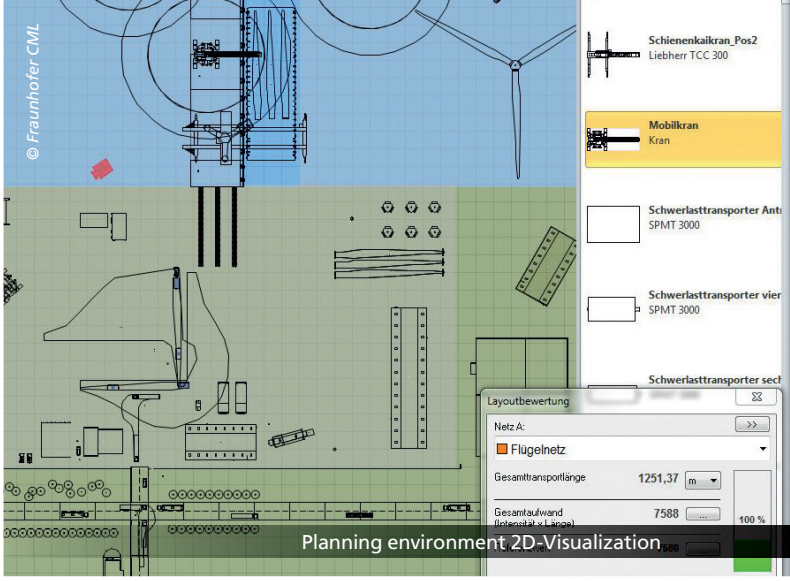


Planning environment 3D-Visualization



Planning environment 2D-Visualization

Procedure

1. Analyze the actual situation:
We work with you to establish the framework conditions for your project, such as available space, number of plants to be handled and existing processes, and define your objectives and requirements.

2. Design area layouts and material flows:
In accordance with your requirements, we use the planning environment to create different area layouts containing the associated material flows or we visualize complete operational concepts. Depending on what you want, we can provide you with a 2D and/or 3D representation. We can use our planning tools to create videos at any time to present the models.

3. Simulate operating processes:
In a following step, the planned areas can be verified using a simulation process. The simulation process makes it possible to link the previously planned layouts with the associated target processes and check them for weaknesses. As part of the simulations, we create a sensitivity analysis to identify the crucial factors in the processes.

4. Evaluate and 5. Select:
In a final step, the results of the simulation are reviewed and compared with the target requirements. The results of the simulation include costs, the duration of the processes and the number of vehicles or amount of handling equipment needed in order to achieve or improve required productivities. Finally, it is a case of selecting the relevant layout.

1. COLLECT DATA & CURRENT STATE
Your requests and objectives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2. DESIGN OF LAYOUTS & TARGET PROCESSES
Display of area layouts


Planing environment 2D-Visualization @ CML

3. SIMULATION OF OPERATIONS
Run simulations


Planing environment 3D-Visualization @ CML

4. EVALUATION OF RESULTS
Comparison of results


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5. SELECT LAYOUT
Decision support


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Our services

Fraunhofer CML supports port and terminal operators and wind farm operators in attaining an optimum position in the offshore wind energy market. We optimize your transport and handling processes. Based on these processes, we design your entire port logistics system.

The benefits for you

The multitude of different wind energy plants and foundation structures makes it difficult to have a standard process for handling offshore wind energy components. In particular, the planned supply concepts have a direct effect on the layout of the port superstructure.

Fraunhofer CML supports you in planning your logistics space and helps you to optimize your internal transport and handling processes so you can extrapolate new transport concepts. To do this, Fraunhofer CML uses the planning environment developed at the Institute to create, visualize and evaluate various layout alternatives.

Fraunhofer CML

PRODUCTS

FRAUNHOFER CENTER FOR MARITIME LOGISTICS AND SERVICES CML

Offshore wind energy plants

DEVELOPING AND EVALUATING LOGISTICS CONCEPTS FOR OFFSHORE WIND FARMS

Offshore wind energy

The German government's offshore strategy aims to generate 25,000 MW of energy (equivalent to roughly 5,000 to 7,000 plants) in 2030 through the use of offshore wind farms. This will entail the construction of many new wind farms on the North and Baltic Sea in the near future.

Challenges

The logistics involved in installing and operating the offshore wind farms are a particular challenge and a major cost in this strategy. The logistics costs are estimated to account for 15 to 20% of the total installation costs for an offshore wind farm.

The main challenges in the installation are rough weather, heavy swells and distance from the ports which allow just short windows of opportunity for installing the wind farms at sea. In some cases, the installation periods are just a few days long and in total come to approximately 100 to 120 days a year. In order to ensure that the available time is used efficiently, ships, materials and staff must be 'ready for action' as soon as weather conditions permit the installation of the wind farms.

In addition to the installation of offshore wind farms, the operation of the plants themselves is a major challenge for maritime logistics. A wide variety of logistics concepts currently exist relating to the maintenance of offshore wind farms located far from shore. Apart from weather conditions, other challenges include the safe transfer and crossing of staff to the plants, an ability to troubleshoot rapidly and the availability of ships for the transportation of large components.

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IMPRESSUM

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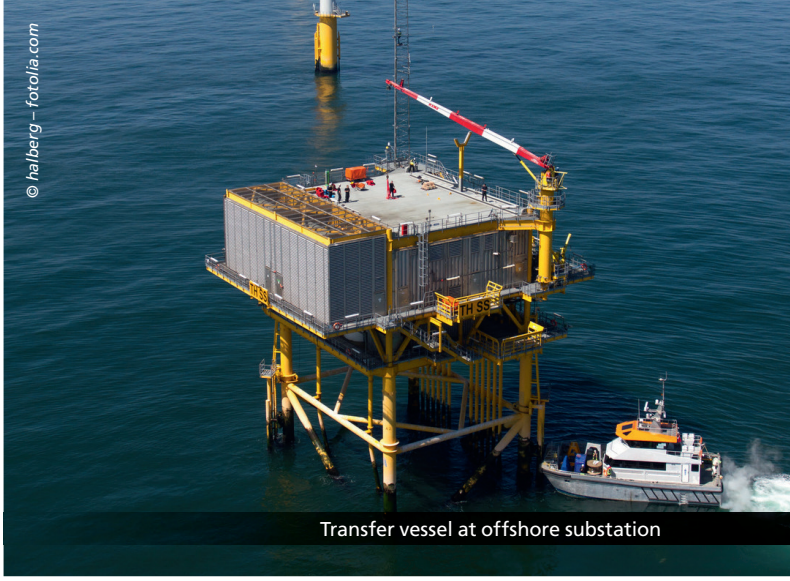
Wind farm installation



Transfer vessel at offshore substation

Procedure

1. Analyze the actual situation:
We work with you to establish the framework conditions for your project, such as the location of the wind farm and the number of plants, and help you to define your requirements and objectives.

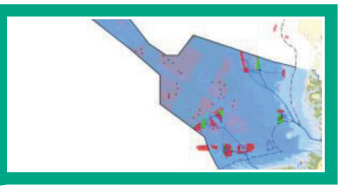
2. Develop and model the logistics concepts:
We then develop several potential logistics concepts in line with your requirements and model these in a simulated environment. Alternatively, we can also model the concepts that you yourself have designed.

3. Simulate the concepts:
In a following step, the planned areas can be verified using a simulation process. The simulation process makes it possible to link the previously planned layouts with the associated target processes and check them for weaknesses. As part of the simulations, we create a sensitivity analysis to identify the crucial factors in the processes.

4. Analyze the simulation results:
The simulation results are then evaluated and compared in terms of your objectives and preferences. The output of the simulation process includes costs and process duration but also details about the availability of the plants.

5. Select a concept:
Based on the simulation results, we support you in identifying the logistics concept that is best suited to your project and corresponds most effectively to your requirements.

1. ANALYZE THE ACTUAL SITUATION
- Your requirements and objectives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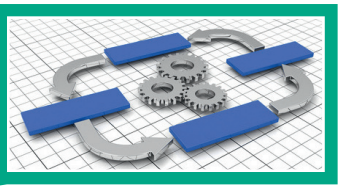
2. DEVELOP AND MODEL THE LOGISTICS CONCEPTS
- Map the logistics concepts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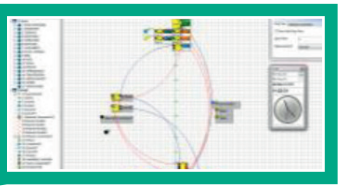
3. SIMULATE THE CONCEPTS
- Run simulations


Enterprise Dynamics Visualization @ CML

4. ANALYZE THE SIMULATION RESULTS
- Compare results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5. SELECT A CONCEPT
- Support decision

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Our services

We support operators, manufacturers, project developers and suppliers in the offshore wind industry in dealing with the logistical challenges. This includes the development and evaluation of efficient logistics concepts for the installation and operation of offshore wind farms using established methods such as simulation.

The benefits for you

Selecting a suitable logistics concept for the installation or operational phase of an offshore wind farm is a major and, in some cases, costly decision. A large number of potential concepts must be identified and validated in order to select the most suitable concept for a specific wind farm. We can support you in this task with our methodological expertise.

With a tailored concept design and the simulation of concepts in the most realistic conditions, the relevant concepts can be comprehensively evaluated before the first foundation is built. This provides you with a solid basis on which you can make decisions. And of course we can support you during this decision-making process.