Simulation-based design and evaluation of O&M logistics concepts for offshore wind power plants

Prof. Dr.-Ing. Carlos Jahn,

Conference on Maritime Energy 2013, May 22nd

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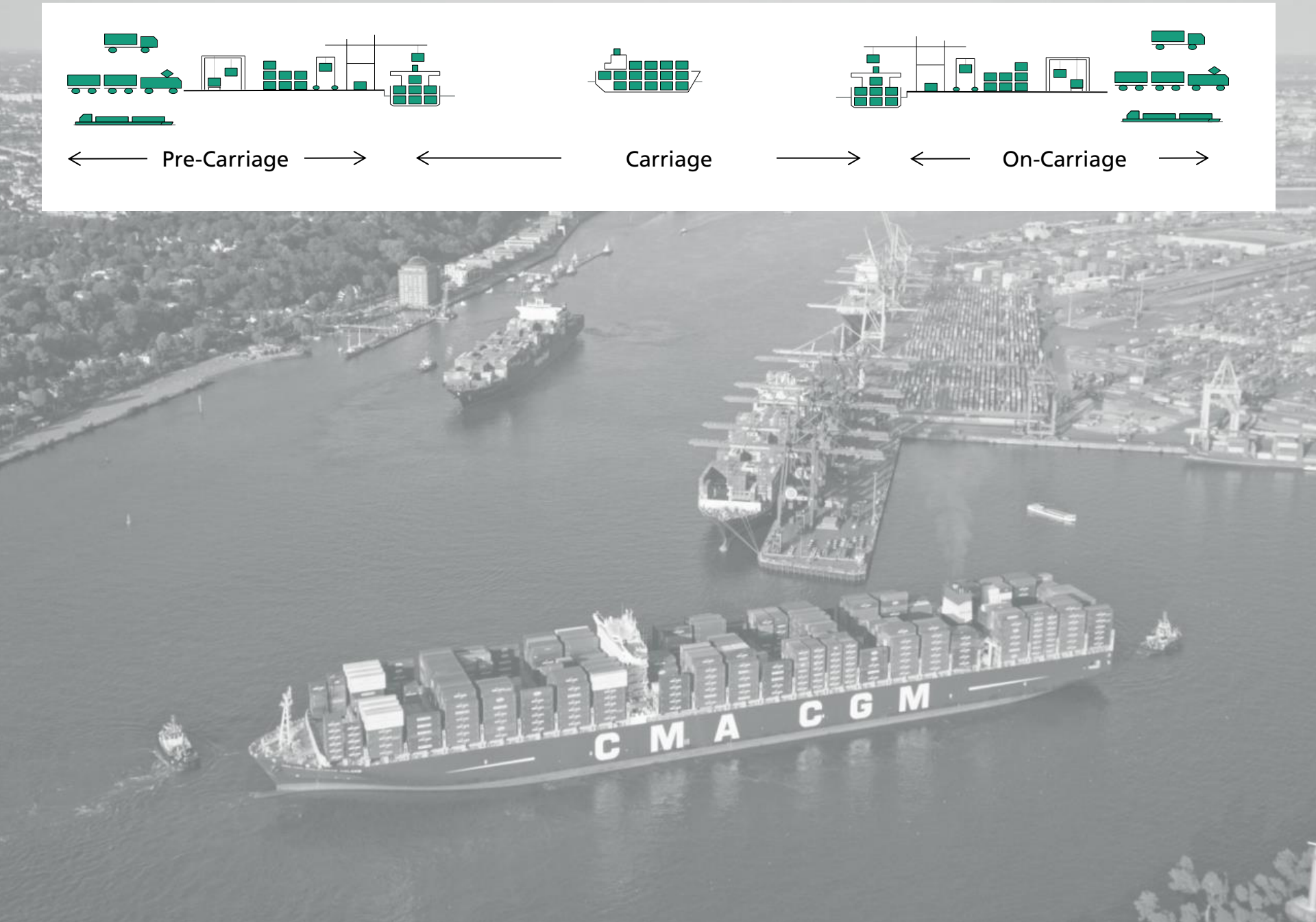
Quelle: HHM – M. Lindner


Pre-Carriage
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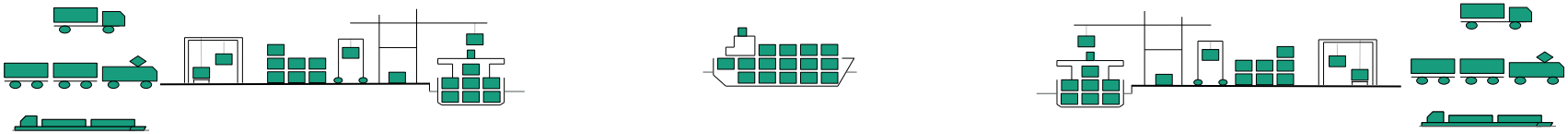
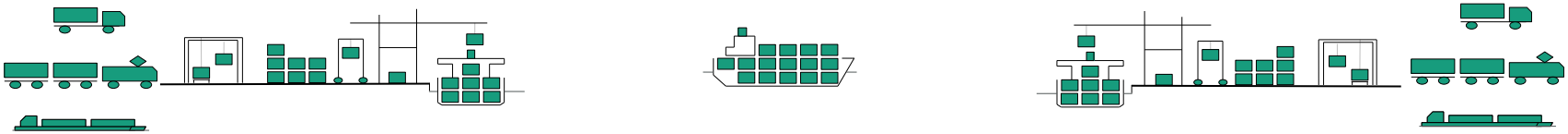


Prognoses

Maritime intelligence, forecasts and studies

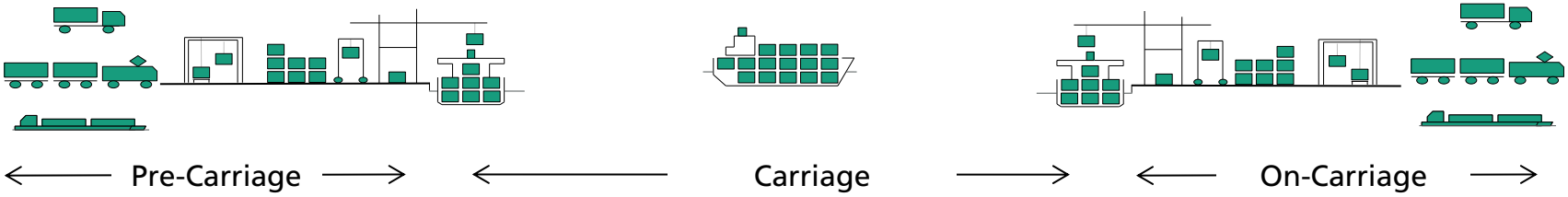


Prognoses

Maritime intelligence, forecasts and studies

Processes

Design and controlling of logistics and business processes



Prognoses

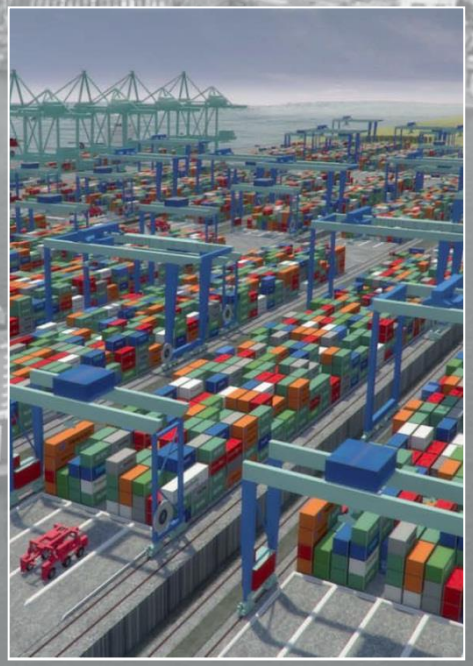
Maritime intelligence, forecasts and studies

Processes

Design and controlling of logistics and business processes

Planning

Port and logistics system planning and optimization



Agenda

1. Cost driver logistics
2. Logistics concepts
3. Simulation model
4. Perspectives

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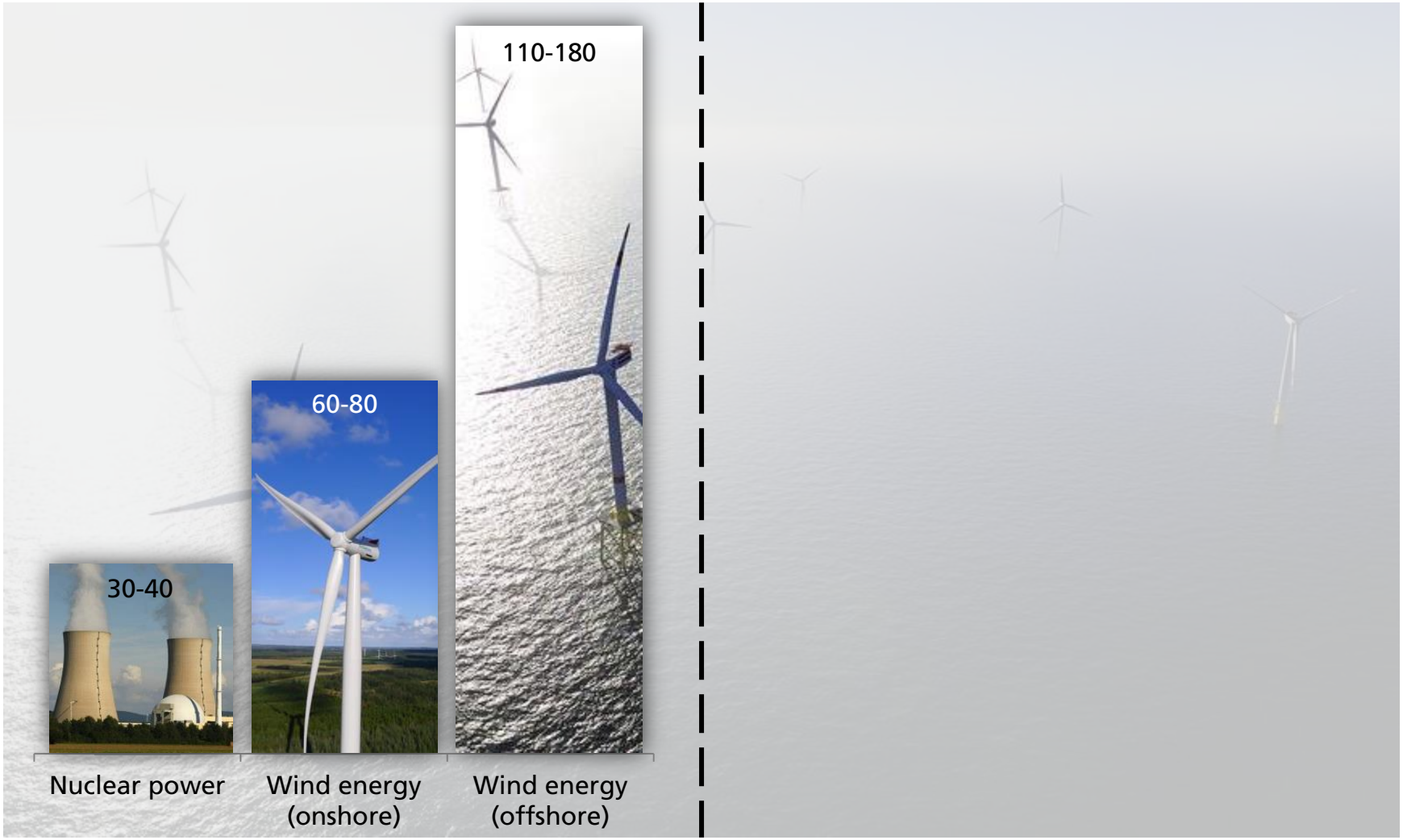
Cost of different energy sources (€/MWh)



Source: www.e-on.de; energy.siemens.com; www.alpha-ventus.de, Roland Berger Strategy Consultants (2013), Krüger et al. (2012)

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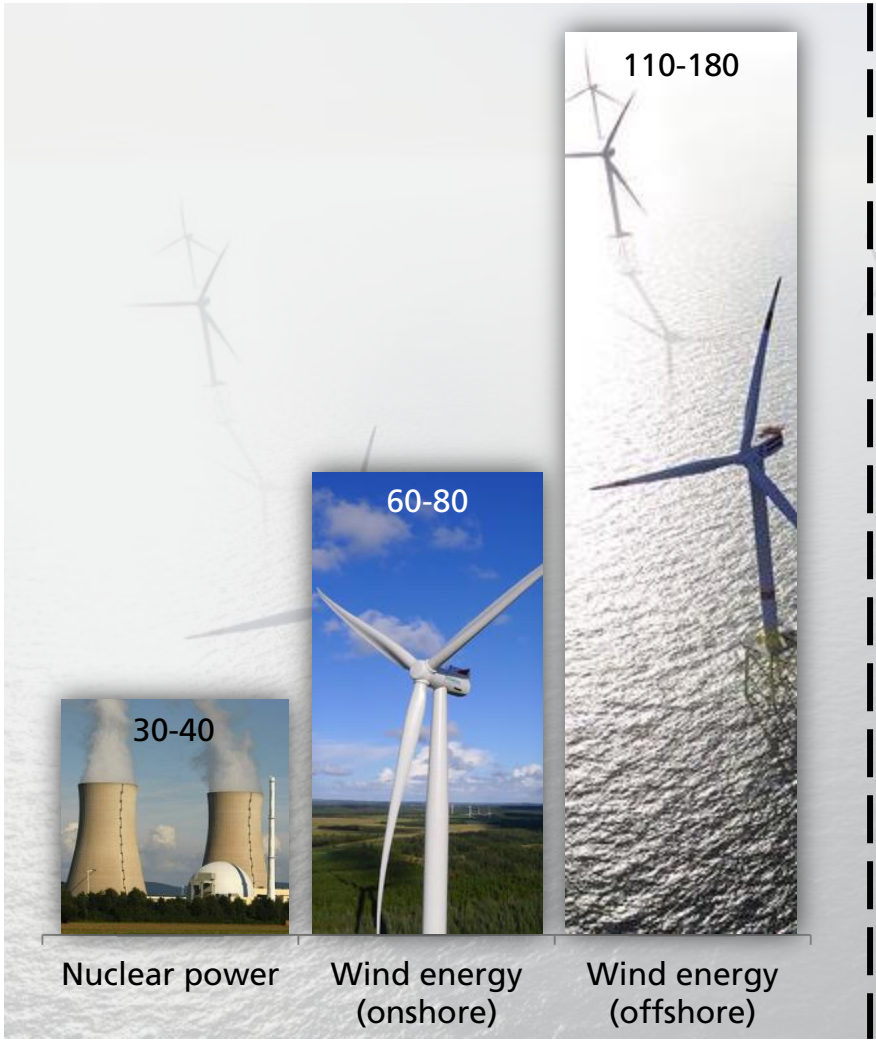
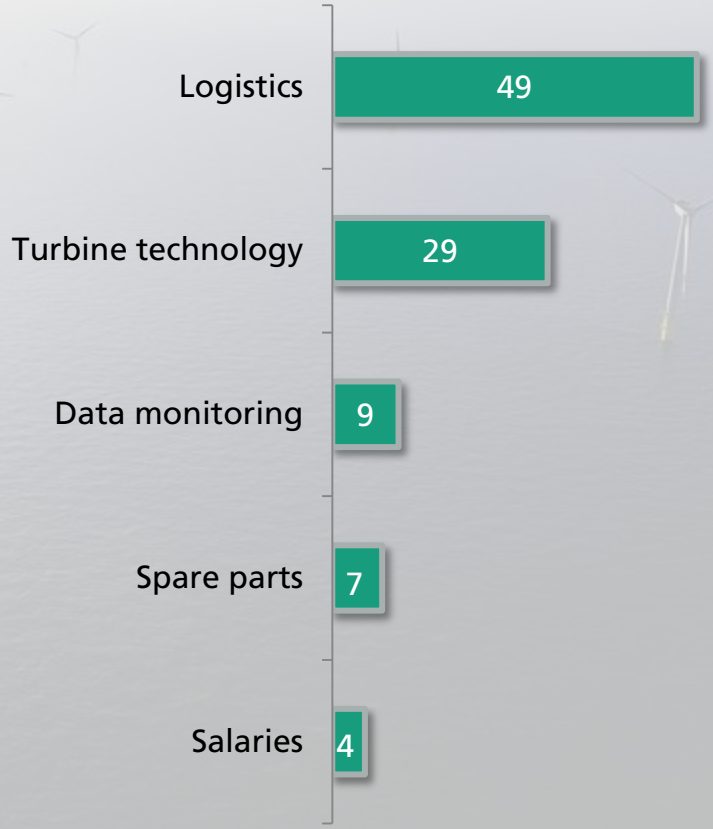
Saving cost by optimizing logistics



Survey-Question: Which area provides the highest cost savings potential for offshore O&M - Share of survey participants in %



Source: www.e-on.de; energy.siemens.com; www.alpha-ventus.de, Roland Berger Strategy Consultants (2013), Krüger et al. (2012)

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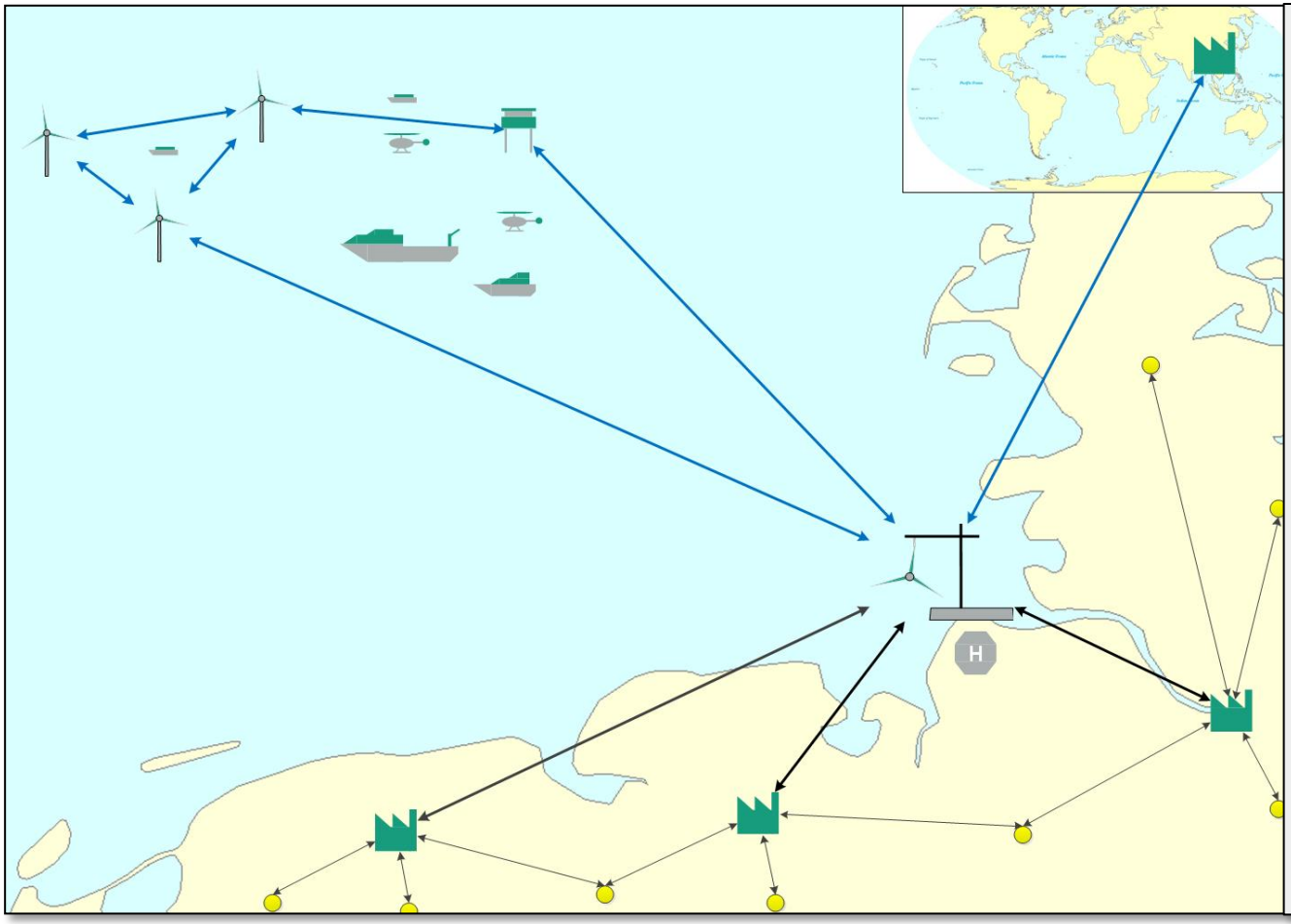
Logistics concepts and its challenges



Influences on logistics:

- Climate conditions
- Distance
- Reliability
- Components (quality & quantity)
- Number of supplied OWPP
- Number of vessels
- Vessel speed
- Vessel capacity

OWPP = Offshore wind power plant

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Logistics concepts – Onshore based

Onshore based

Crew transfer vessel

Helicopter

Source: www.frs.de, Rehfeldt (2012)

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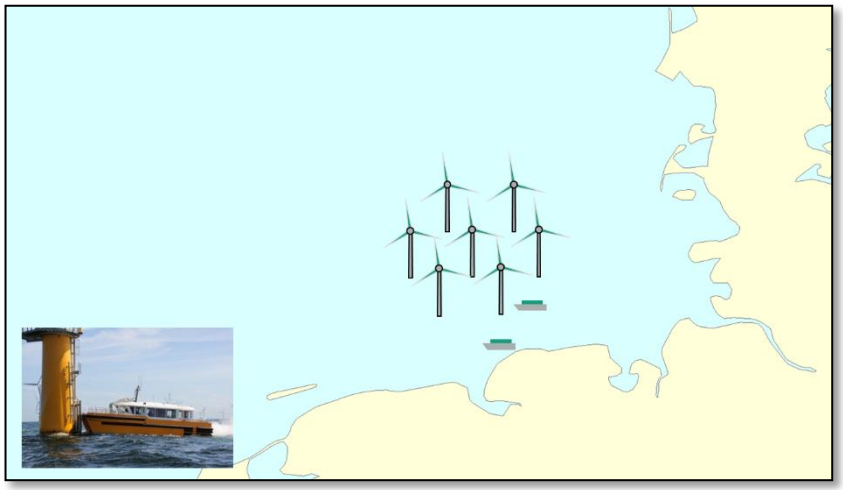
Logistics concepts – Onshore based

Onshore based

Crew transfer vessel

Helicopter



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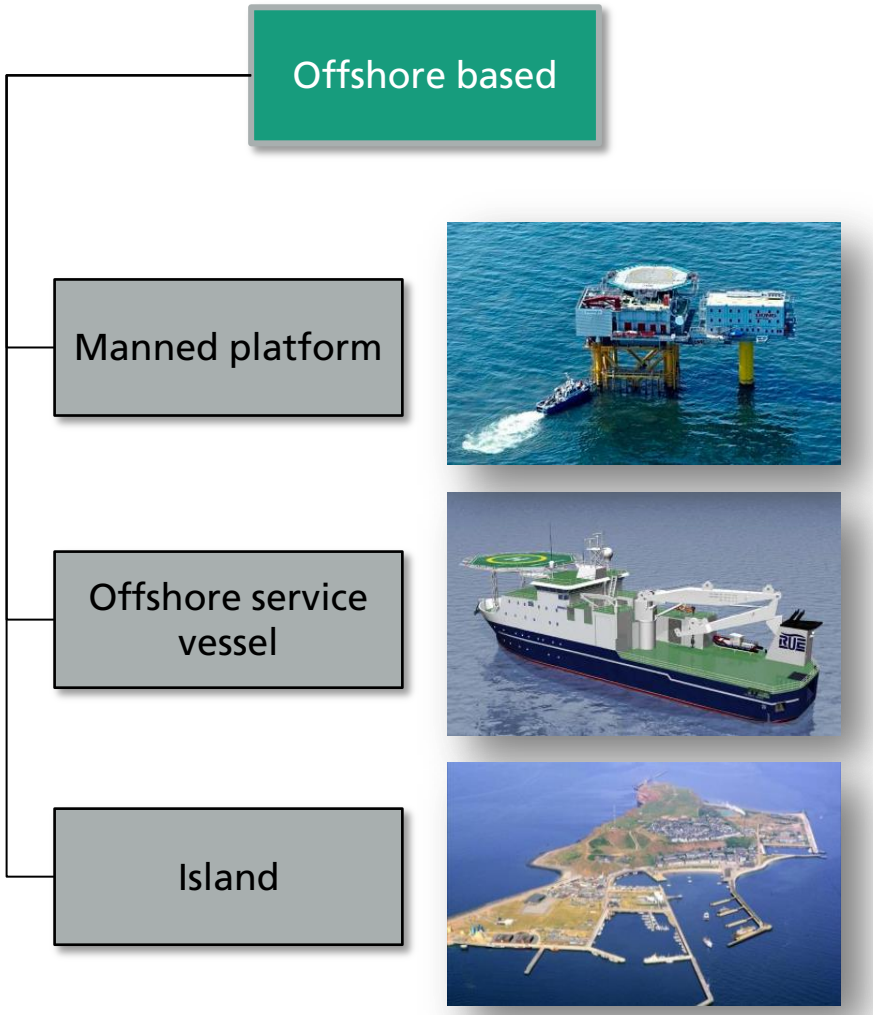
Logistics concepts – Offshore based



Source: Rehfeldt (2012), www.dongenergy.com, Sonne, Wind & Wärme (2012)

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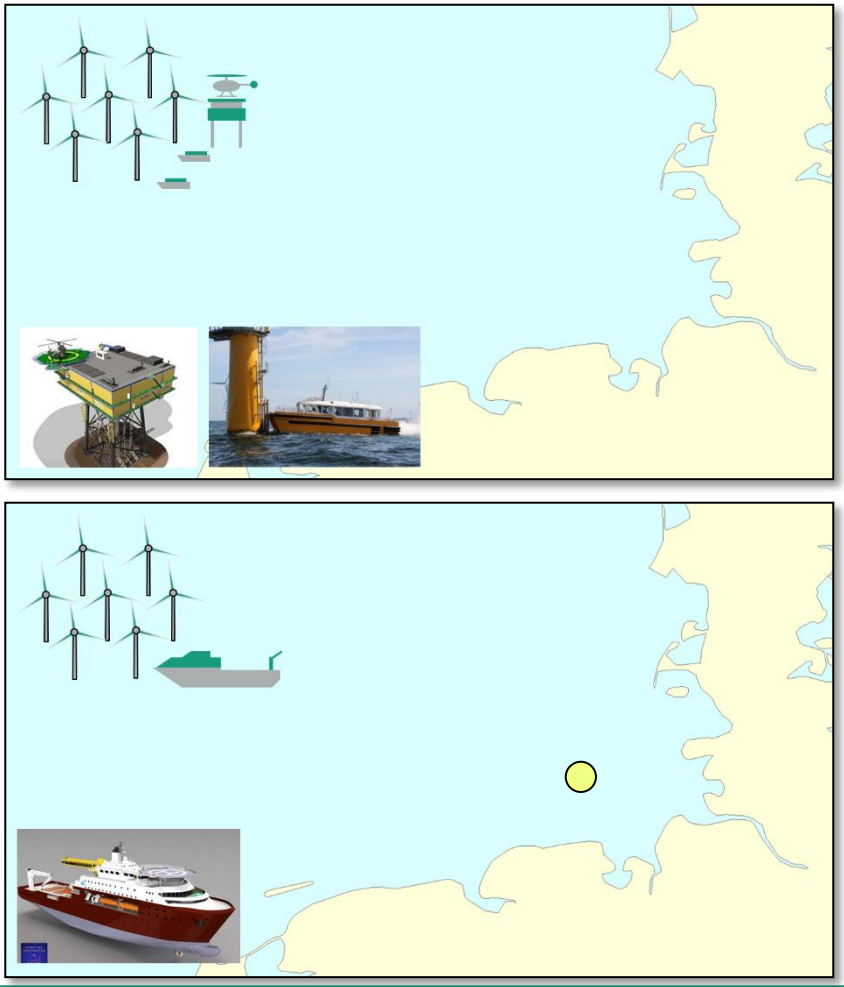
Logistics concepts – Offshore based



- Offshore based
  - Manned platform
  - Offshore service vessel
  - Island

Source: Rehfeldt (2012), www.dongenergy.com, Sonne, Wind & Wärme (2012)

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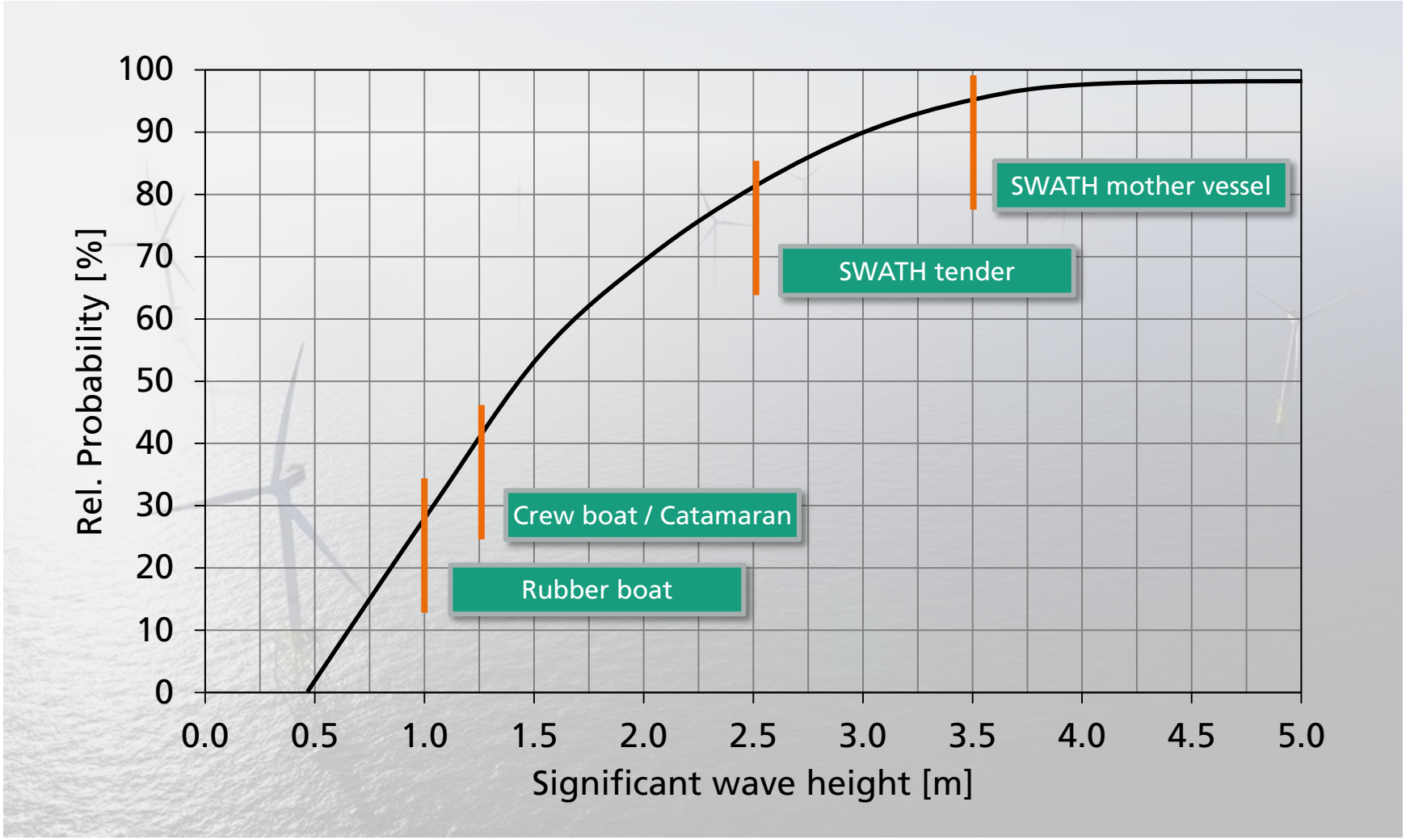
Transport equipment is crucial, it determines accessibility and thus availability of OWPP



Source: Deutsche WindGuard

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Simulation benefit: It handles complex dynamic problems which a static excel tool can not solve

Component

- Blades
- Hub
- Nacelle
- Tower
- Foundation
- Spare parts

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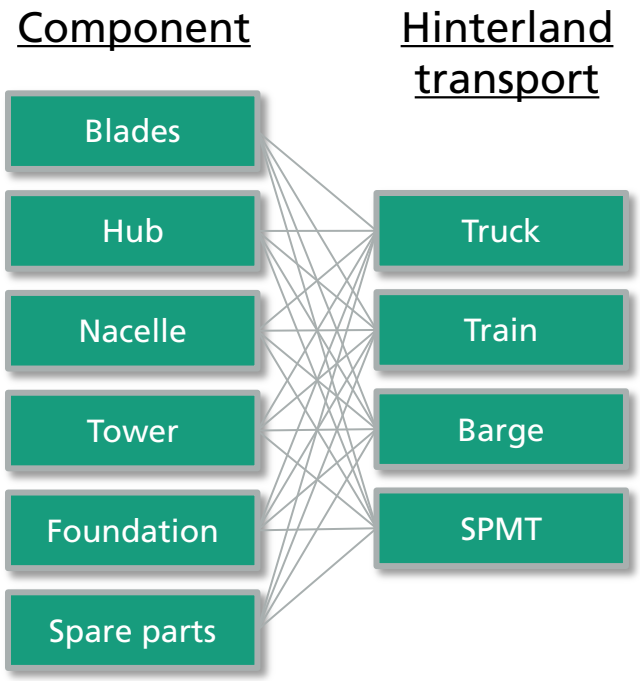
Simulation benefit: It handles complex dynamic problems which a static excel tool can not solve



SPMT = Self-propelled modular transporter

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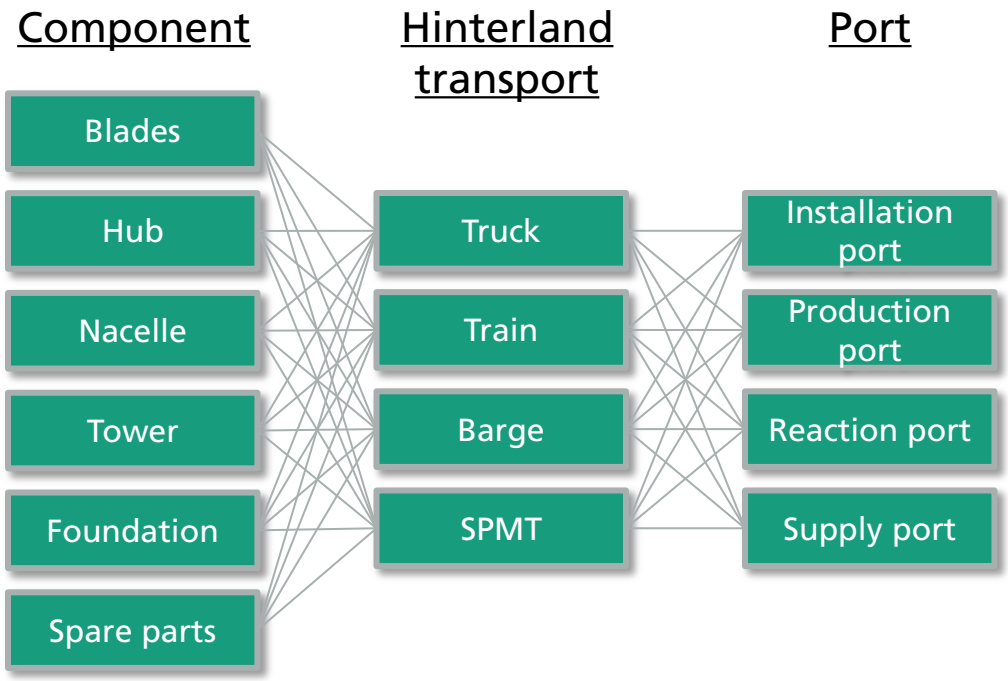

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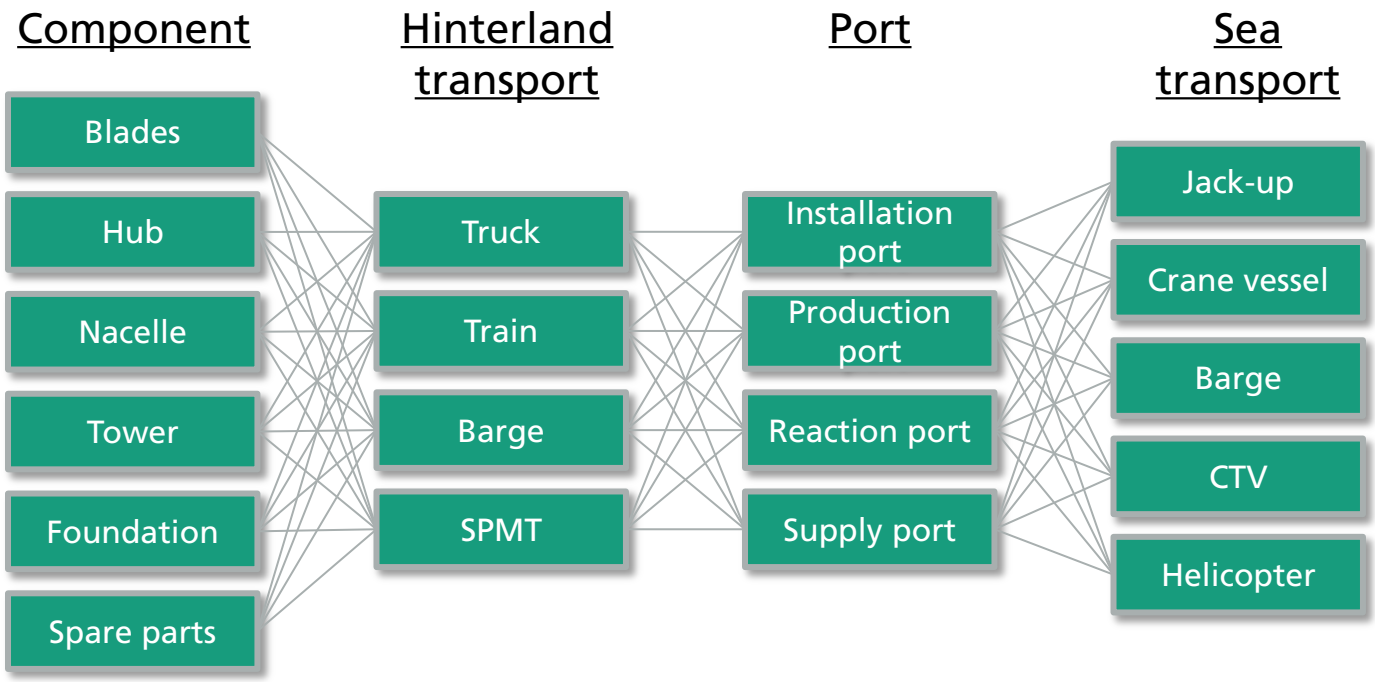

SPMT = Self-propelled modular transporter; CTV = Crew transfer Vessel

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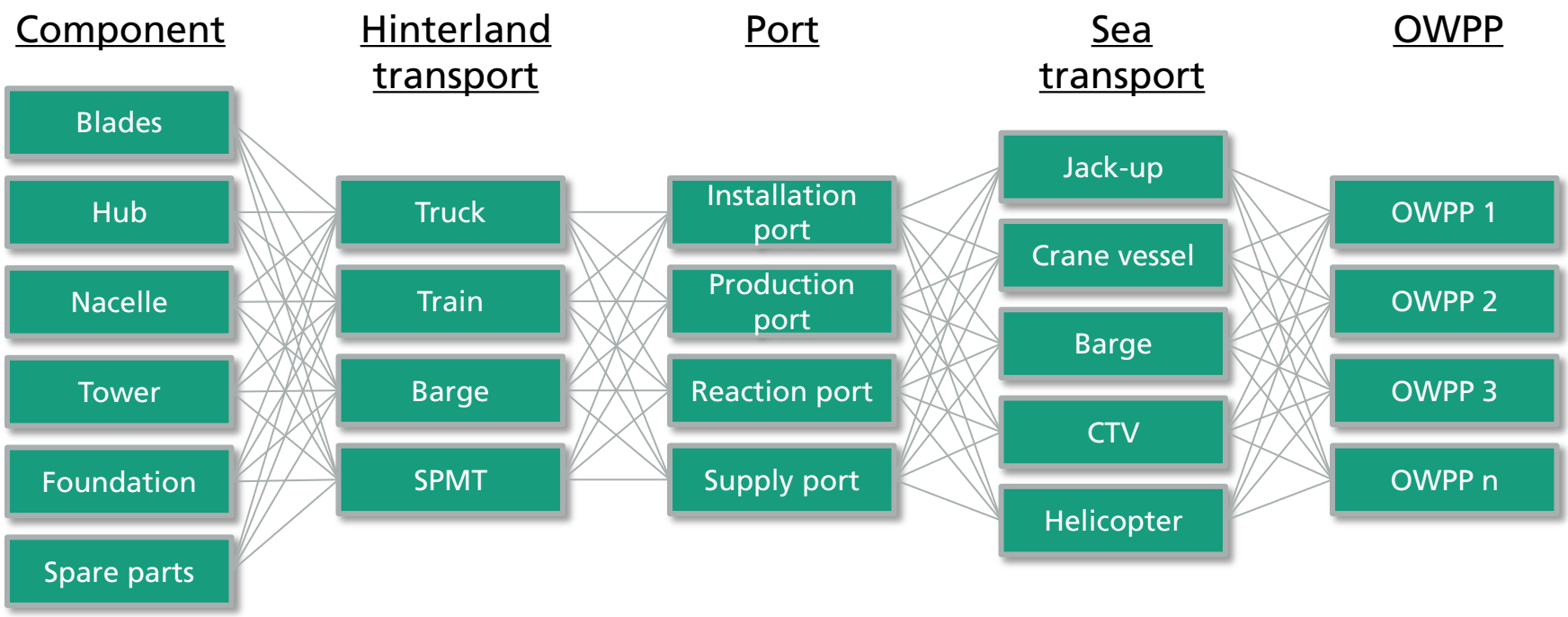

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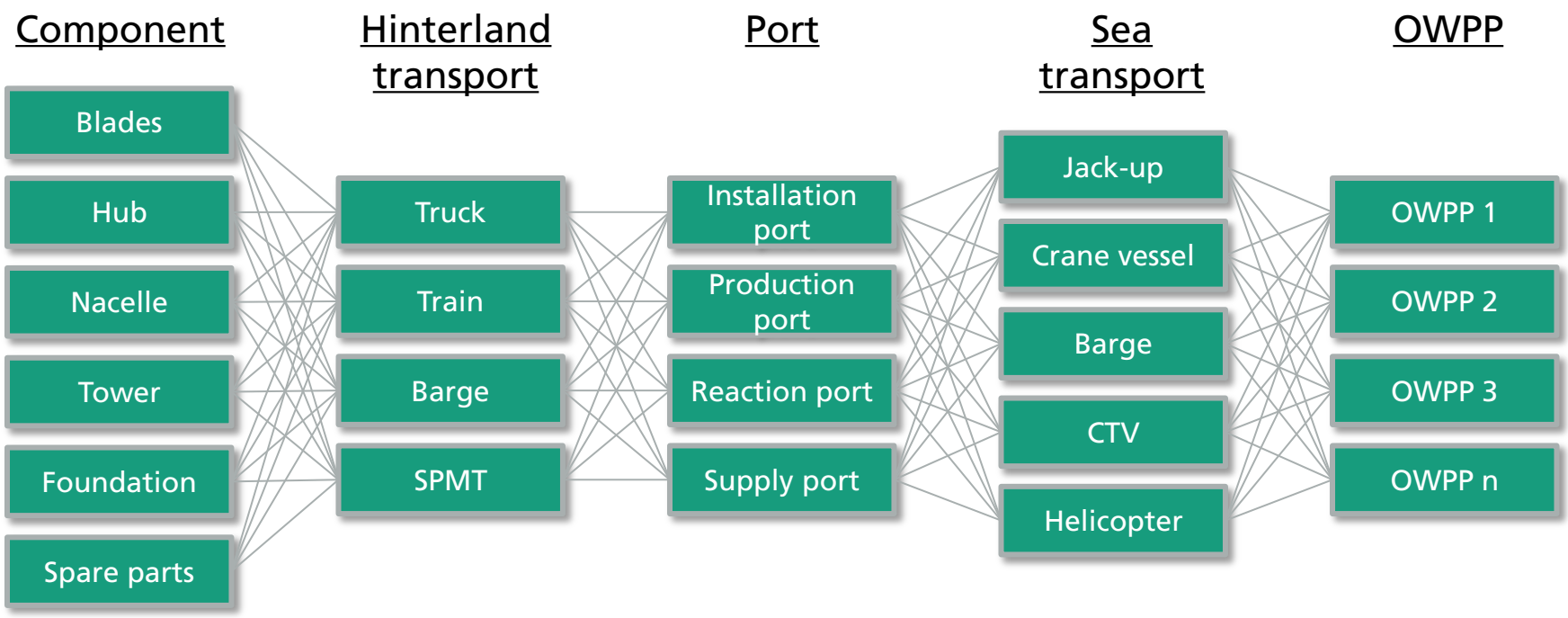

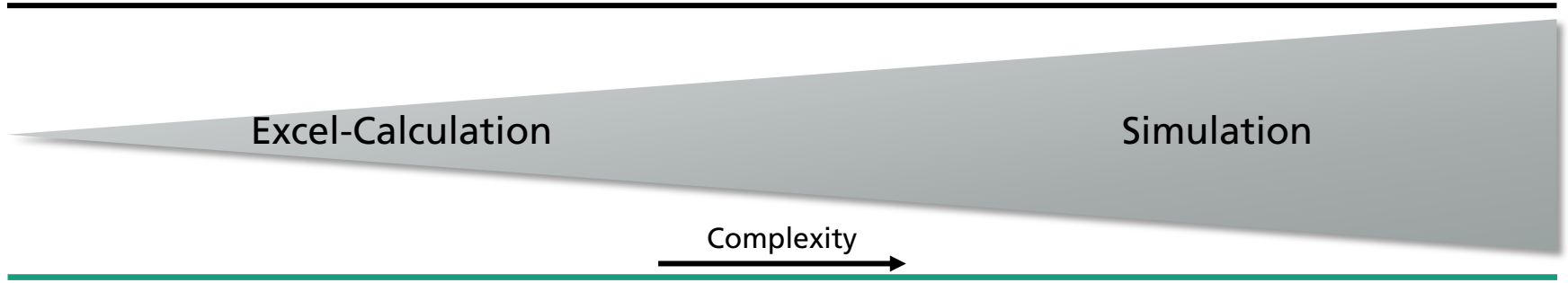

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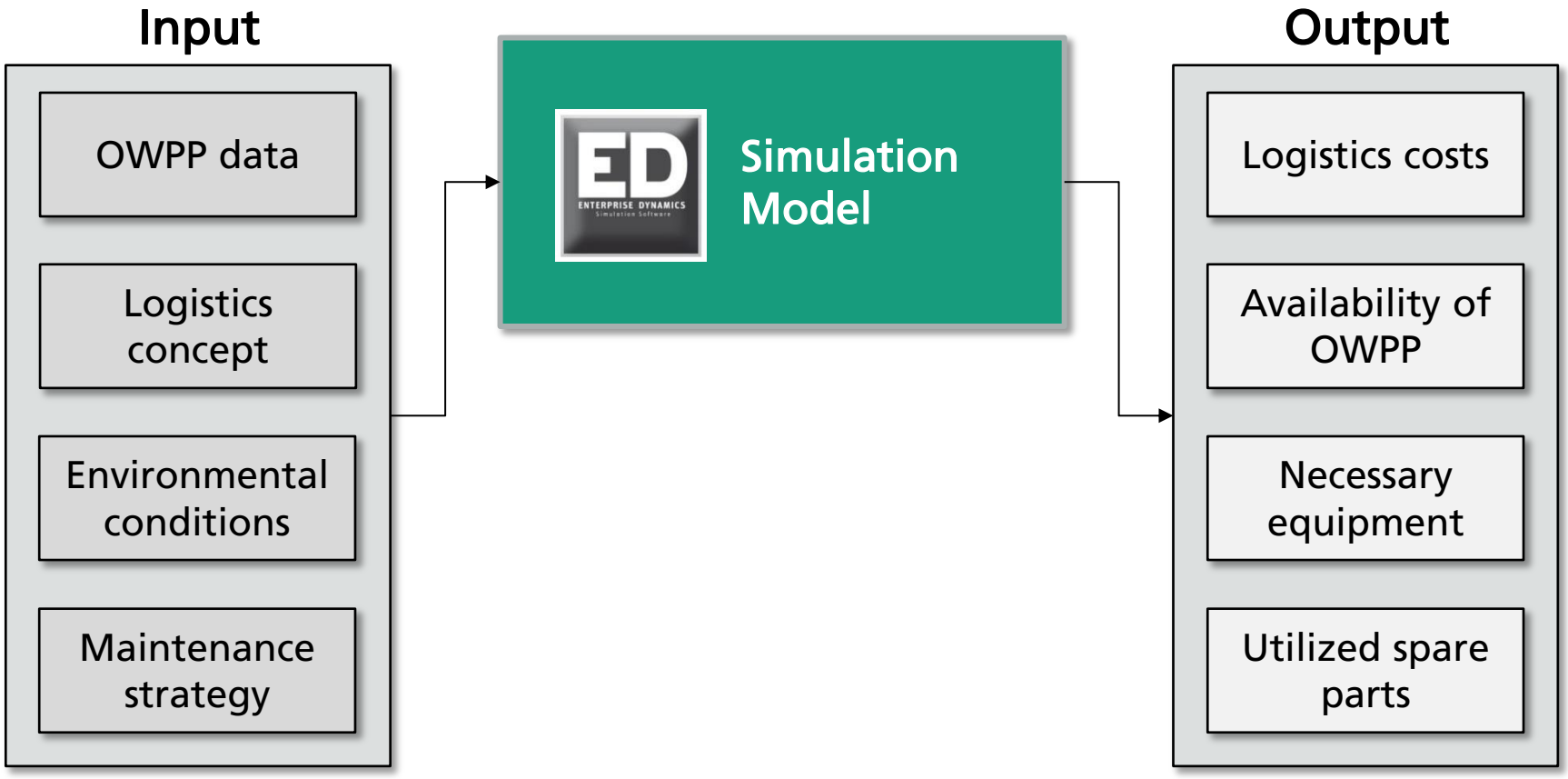
Simulation supports the decision which logistics concept is the right one for an OWPP



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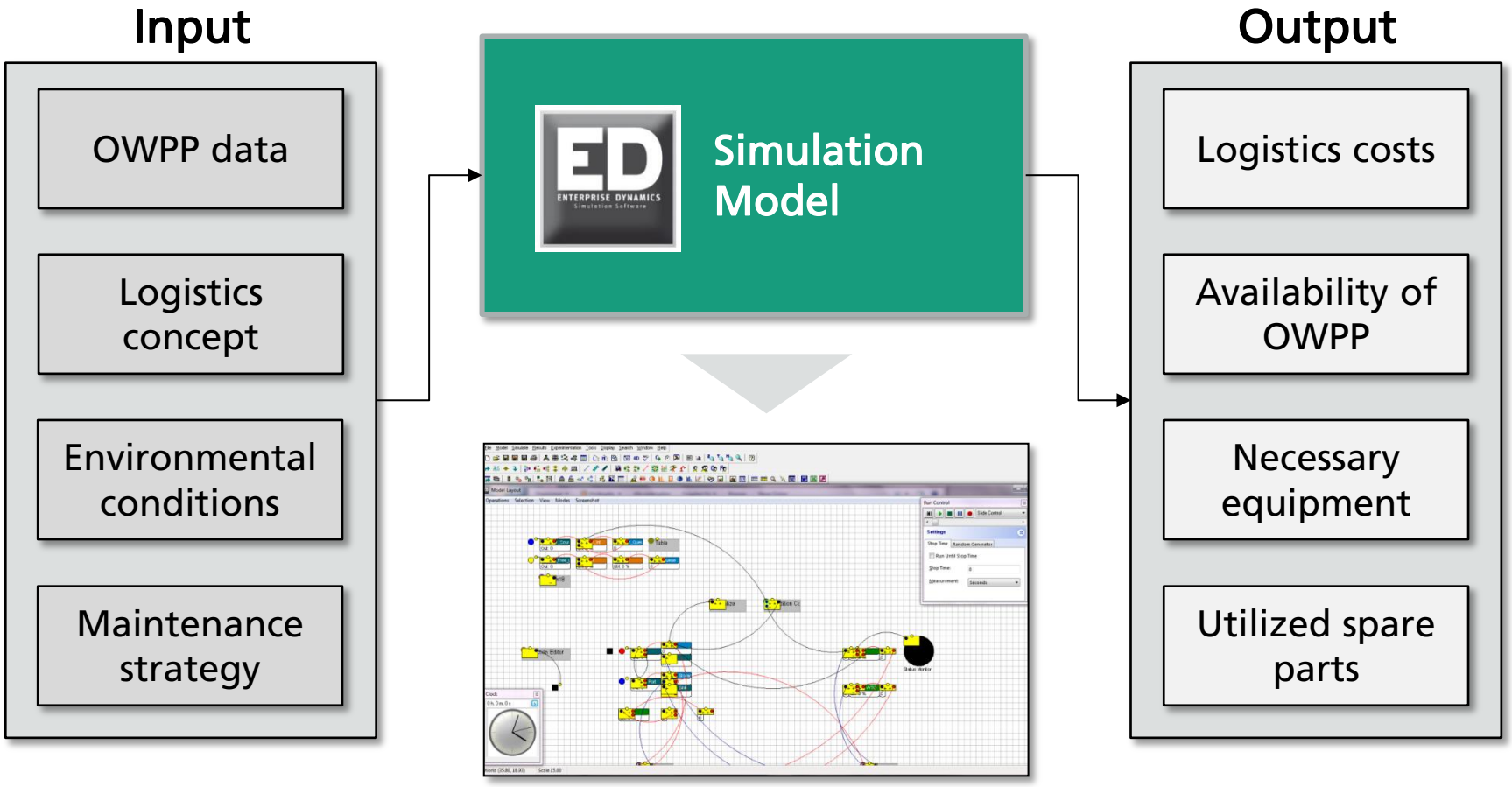
Simulation supports the decision which logistics concept is the right one for an OWPP



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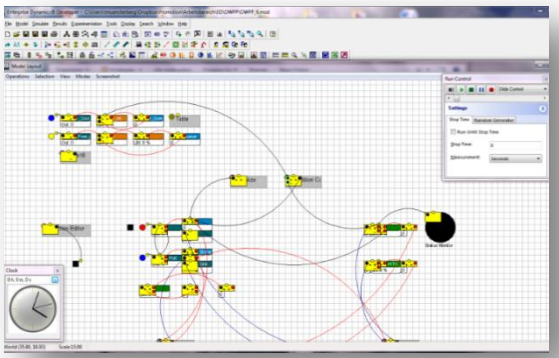
Simulation is only one decision supporting module on the way to an appropriate logistics concept – CML Tools:

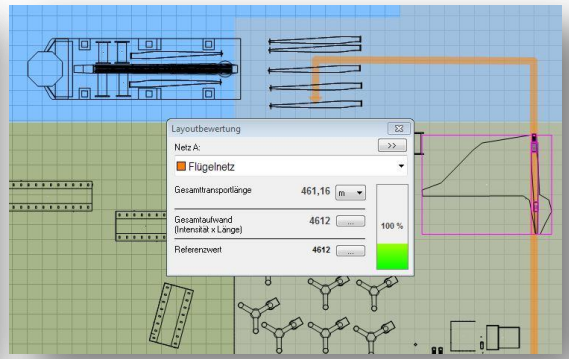
Hinterland → Port → Sea

Simulation

Planning table

Ship handling simulator





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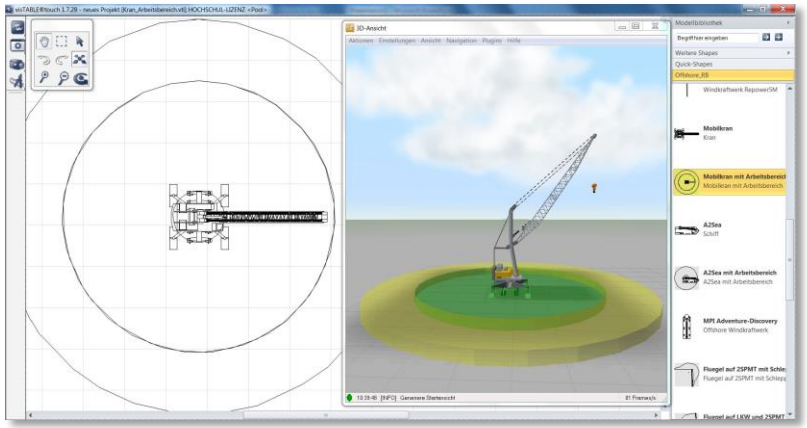
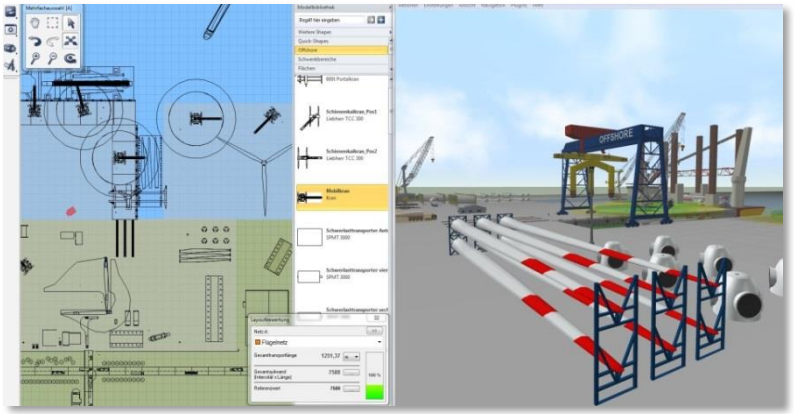
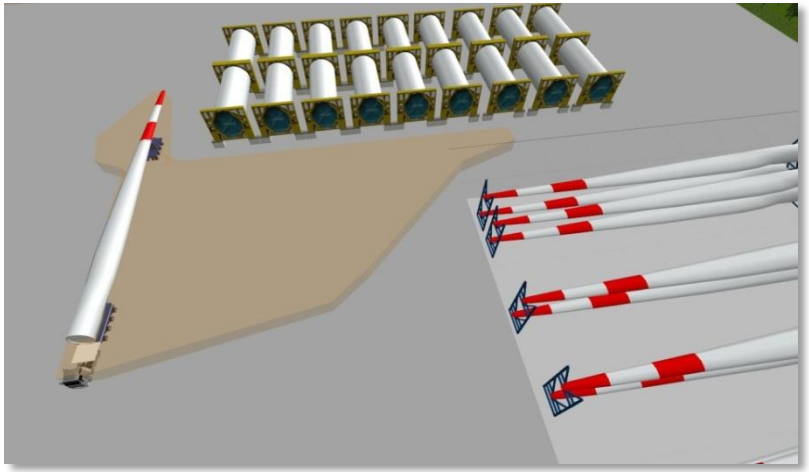
Planning Table: Visual aided planning of logistic processes and logistic systems in, to and from the ports







Planning team in action …

Planning Table Model of an Offshore Wind Terminal

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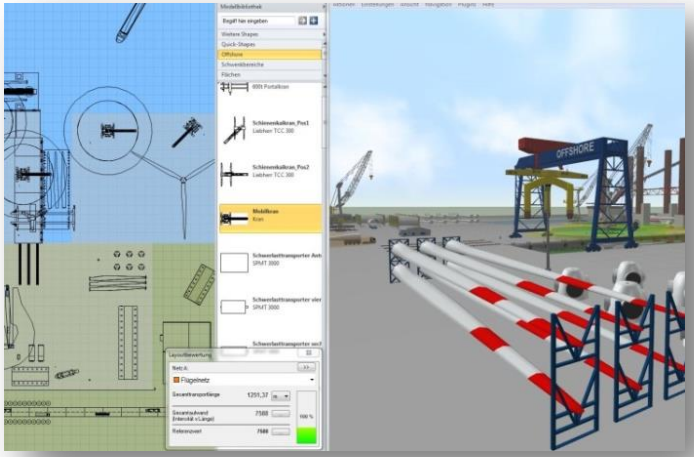
Perspectives

CML Models & Tools

- Realization and connection of models and tools
- Model transfers into control centers



Offshore O&M

- Increasing distance and water depth
- Offshore based logistics concepts (Offshore service vessel, manned platform)
- Equipment pooling

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