Pre-feasibility Studies - Introduction

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Pre-feasibility study

GOALS:

• Compare an integrated and radial approach for planned OWFs and interconnectors

• Provide potential technical designs with general costs for different alternatives

• Facilitate flexible development of the transmission grid

• Provide general spatial alternatives

• Provide comparison of costs and benefits of different approaches

NOT THE PURPOSE:

• Provide final solutions – those will have to be subject of a full feasibility study and design process

• Provide prognosis for offshore wind development in the region – the PreFeasibility Studies rather focus on how to connect project already in the pipeline.

• Propose final corridors and layouts – these are also subject to detailed analysis.
Step 1: Analysis of existing and planned OWF projects and infrastructure

Step 2: Scenario development

Step 3: Technical design

Step 4: Spatial analysis

Step 5: Environmental analysis

Step 6: Cost–benefit analysis
Existing and planned projects

Legend
- Territorial sea waters
- Exclusive Economic Zone
- Power cable (existing)

Offshore wind farms:
- Installed (project capacity [MW]):
  - < 50
  - 51 - 200
  - > 200
- Under Construction [MW]:
  - < 50
  - 51 - 200
  - > 200
  - Planned
Outline

- Scenario based analysis
- 6 scenarios per Case Study
- Timeframe 2025 – 2045
- Snapshots with 5 year steps
- Each scenario analysed and compared
- Extremes represented (zero/max integration)
What variables are changed between the scenarios?
**Scenarios**

### Integration level

- **Zero Integration**
  - High OWP → Scenario 1a → Vision + Roadmap
  - Low OWP → Scenario 1b → Vision + Roadmap

- **Partial Integration**
  - High OWP → Scenario 2a → Vision + Roadmap
  - Low OWP → Scenario 2b → Vision + Roadmap

- **Max. Integration**
  - High OWP → Scenario 3a → Vision + Roadmap
  - Low OWP → Scenario 3b → Vision + Roadmap
**Scenarios**

**Integration level**

- Zero Integration
- Partial Integration
- Max. Integration

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**Zero integration**

- OWP
- Converter

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**Max integration**

- OWP
- Converter
**Scenarios**

<table>
<thead>
<tr>
<th>Integration level</th>
<th>OWP level</th>
<th>Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zero Integration</td>
<td>High OWP</td>
<td>Scenario 1a</td>
</tr>
<tr>
<td></td>
<td>Low OWP</td>
<td>Scenario 1b</td>
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<tr>
<td>Partial Integration</td>
<td>High OWP</td>
<td>Scenario 2a</td>
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<td></td>
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<td>Scenario 2b</td>
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<tr>
<td>Max. Integration</td>
<td>High OWP</td>
<td>Scenario 3a</td>
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<td></td>
<td>Low OWP</td>
<td>Scenario 3b</td>
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High/Low OWP visions

High OWP – 2045

High OWP – 2045

Low OWP – 2045

Low OWP – 2045

Case Study 1

Case Study 2

OWP capacity: 3.7 GW

OWP capacity: 1.8 GW

Cell type

Rocamora

High OWP – 2045

Low OWP – 2045

Case Study 1

Case Study 2

OWP capacity: 3.7 GW

OWP capacity: 1.8 GW

Case Study 1

Case Study 2

OWP capacity: 3.7 GW

OWP capacity: 1.8 GW

Case Study 1

Case Study 2

OWP capacity: 3.7 GW

OWP capacity: 1.8 GW

Case Study 1

Case Study 2

OWP capacity: 3.7 GW

OWP capacity: 1.8 GW
Technical designs

- Onshore connections
- AC/DC converter placement
- OWF components
- Design criteria
- Grid layout
- Grid components
- Component lists
# Spatial Analysis

## Sector Uses

<table>
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<th>Uses</th>
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<td>Energy</td>
<td>Offshore wind farm areas</td>
</tr>
<tr>
<td></td>
<td>Existing constructions (platforms, turbines, platform not only for energy)</td>
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<tr>
<td>Linear infrastructure</td>
<td>Linear infrastructure (cables, pipelines)</td>
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<tr>
<td></td>
<td>Inactive Cable</td>
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<td>Navigation</td>
<td>Navigational routes/ navigation lines</td>
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<td>TSS</td>
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<td>Dumping sites</td>
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<td>Anchorage areas</td>
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<td>Munition Dumps/chemical weapon areas</td>
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<tr>
<td>Navy</td>
<td>Navy exercise areas - closed zones</td>
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<td></td>
<td>Navy exercise areas</td>
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<tr>
<td>Geology/mining</td>
<td>Licence for aggregate extraction</td>
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<td>Licence for hydrocarbons exploration</td>
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<td>Fishery</td>
<td>Fish Value for Trawls - VMS</td>
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<td>Spawning and nursery areas</td>
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<tr>
<td>Nature protection</td>
<td>Special Areas of Conservation (SAC) Natura 2000 (Habitats)</td>
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<td>Special Protection Areas (SPA)</td>
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<td>MPA’s</td>
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<td>National parks</td>
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<tr>
<td>Underwater Culture Heritage</td>
<td>Wrecks without historical value</td>
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<td>Wrecks with historical value, underwater cemeteries</td>
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<tr>
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<td>Cultural heritage areas (underwater landscape parks etc)</td>
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<tr>
<td>Oceanographic</td>
<td>Deep water (over 70m)</td>
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<td>Rocks Seabed</td>
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</tbody>
</table>

![Spatial Constraints Diagram]

- **Line infrastructure**
  - Hard constraints (exclusions)
  - Soft constraints

- **Offshore High Voltage Stations (OHVS) → converter stations**
  - Hard constraints (exclusions)
  - Soft constraints
Spatial analysis

No constraints  High constraints
PreFeasibility Study Report

- Comprehensive joint report on both Case Studies
- Results of all analyses
- Draft report available for industry consultation in July 2018
- Final version in September
- Sign-up to take part in the consultation
TYNDP Recommendations

- Recommendations to TYNDP developed under Baltic InteGrid
- Based on the PFS report, conference and consultation
- Submitted in the TYNDP 2018 consultations

Consultation TYNDP 2018
June – September 2018