



Baltic
InteGrid

Integrated Baltic Offshore
Wind Electricity Grid Development

Pre-feasibility Studies – Introduction

Mariusz Wójcik, FNEZ



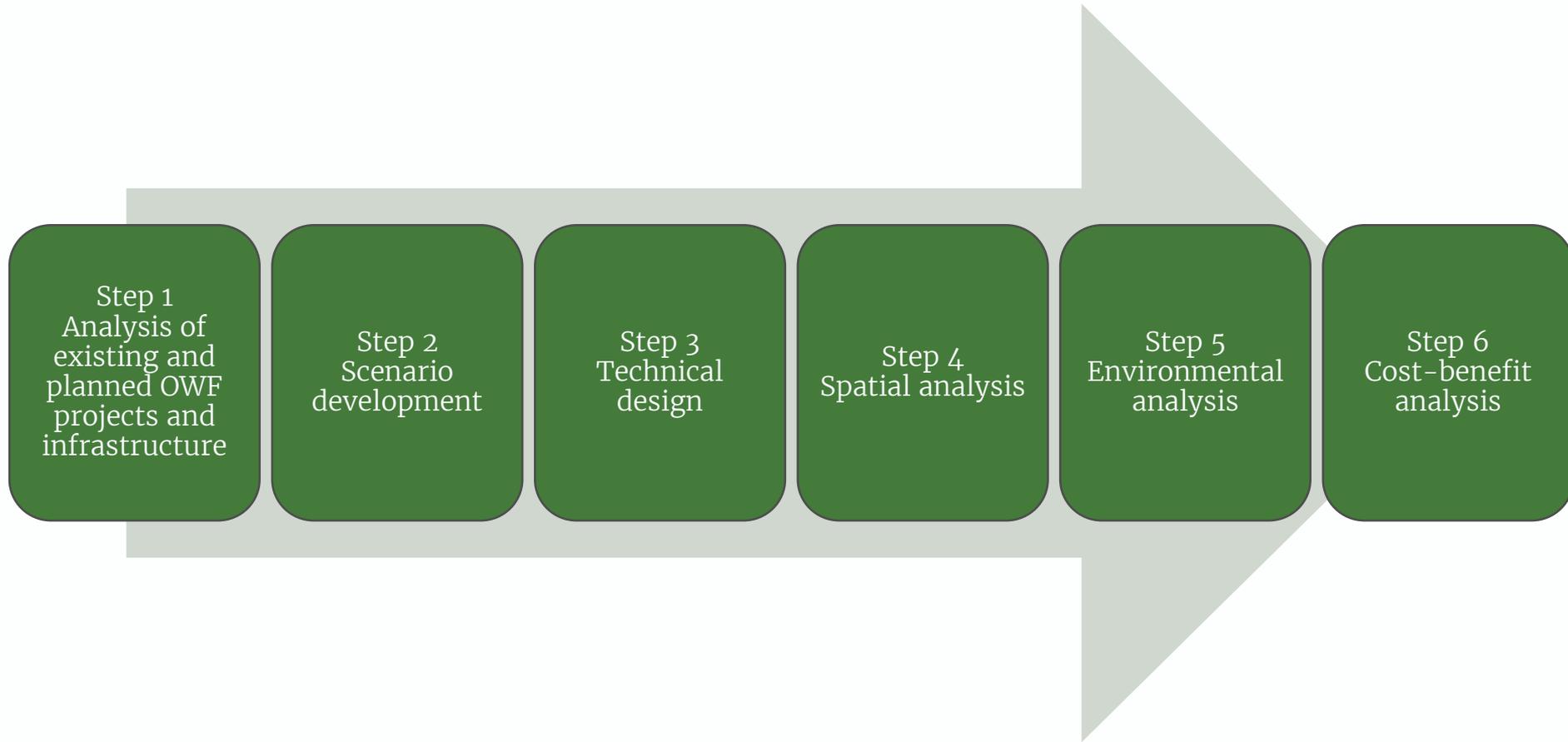
EUROPEAN
REGIONAL
DEVELOPMENT
FUND

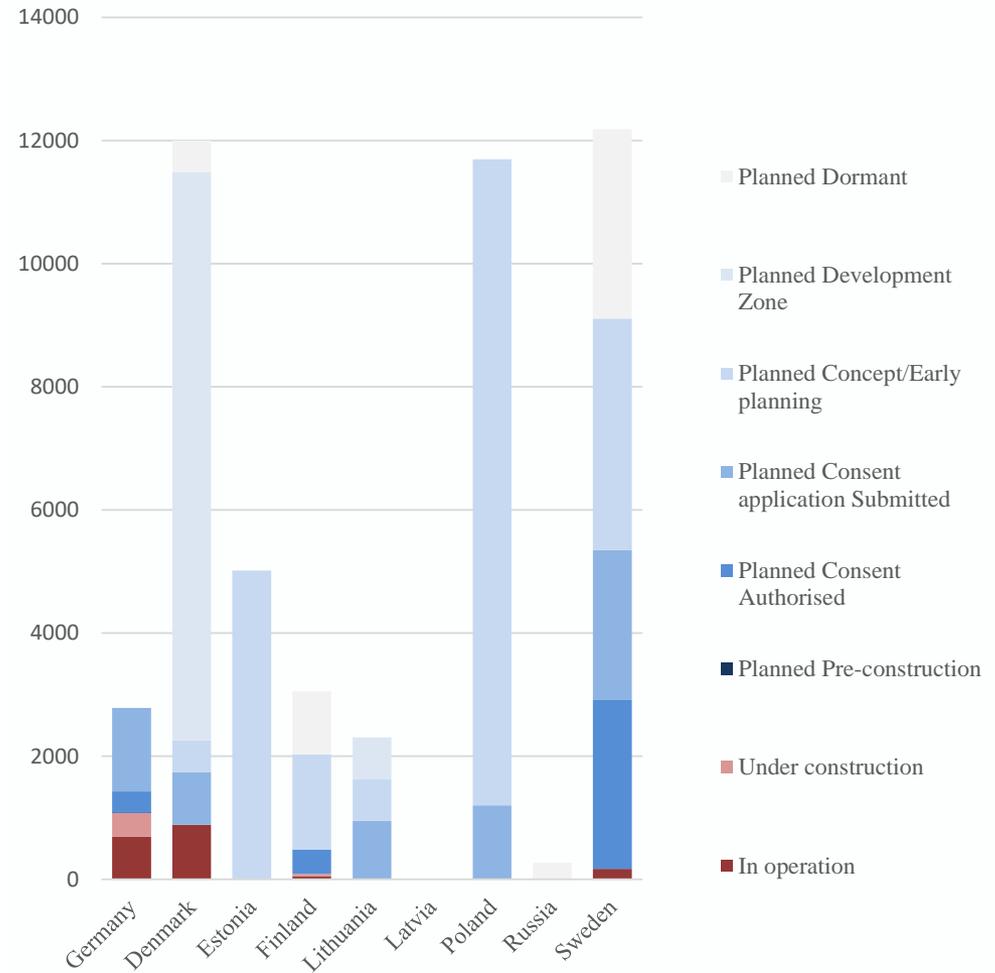
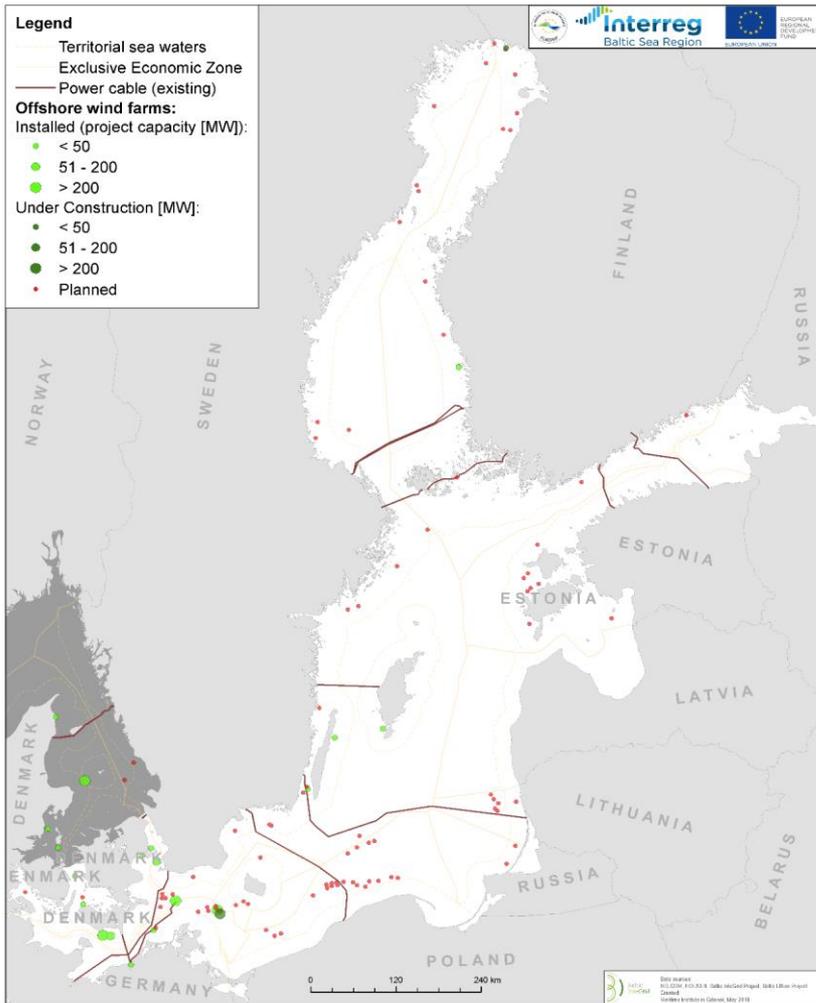
**GOALS:**

- 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:

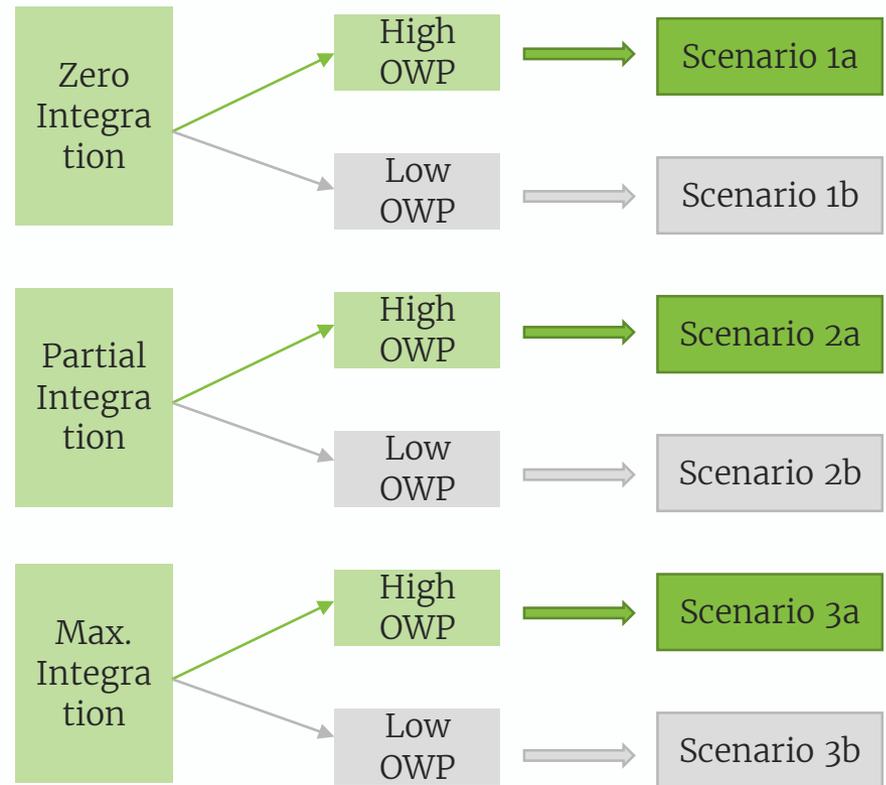
- Provide final solutions – those will have to be subject of a full feasibility study and design process
- Provide prognosis for offshore wind development in the region – the PreFeasibility Studies rather focus on how to connect project already in the pipeline.
- Propose final corridors and layouts – these are also subject to detailed analysis.





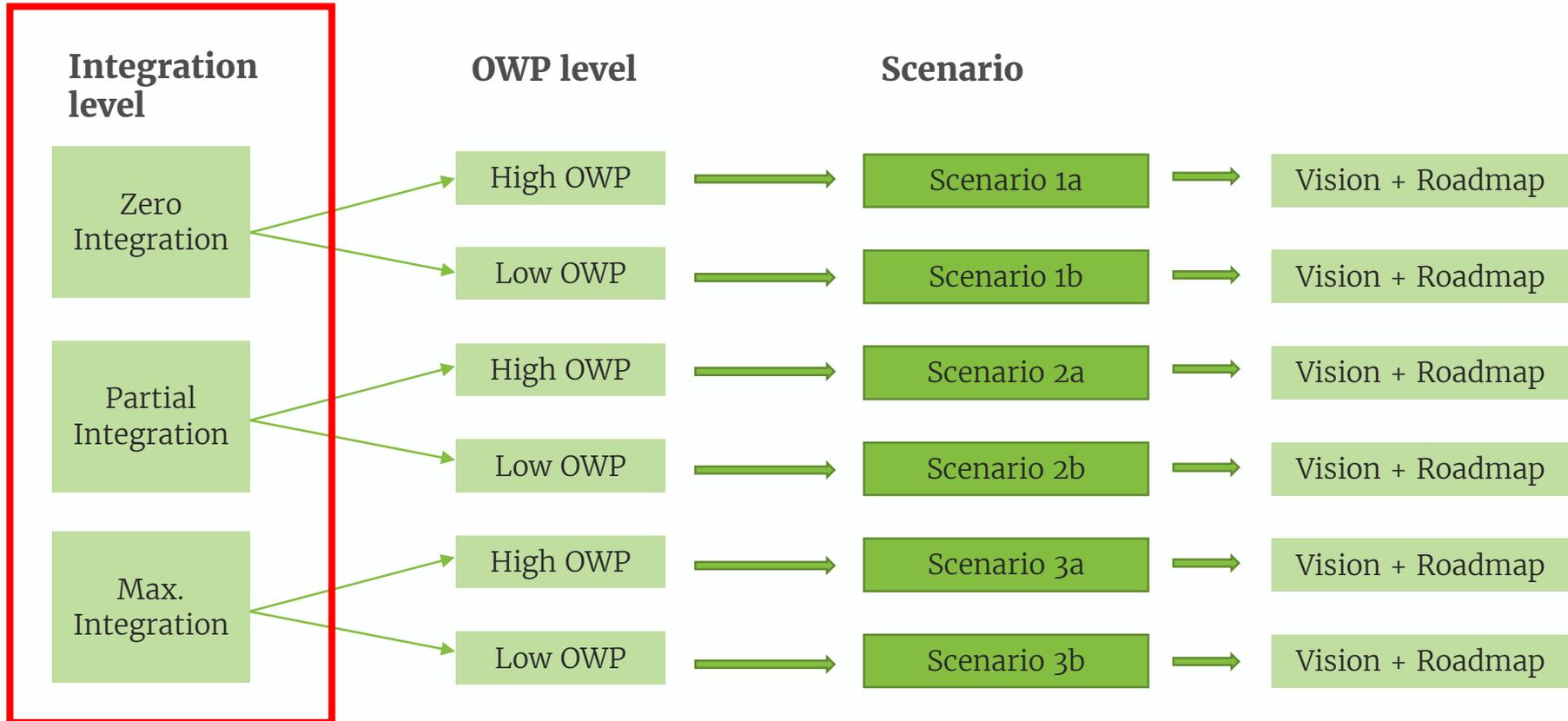
Outline

- 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



Scenarios

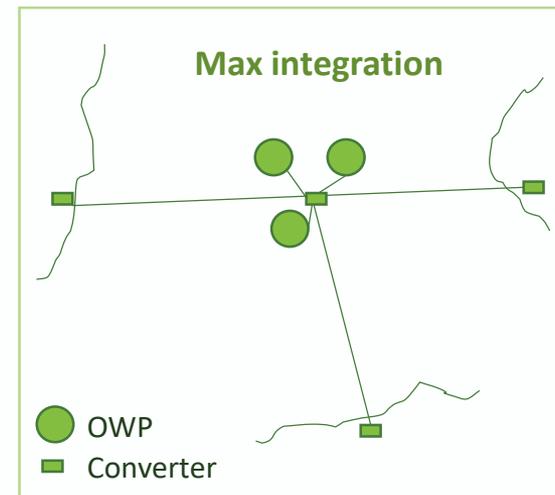
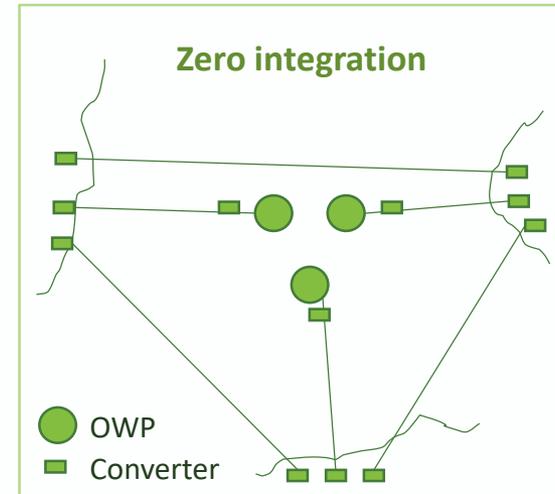
Integration level

Zero
Integration

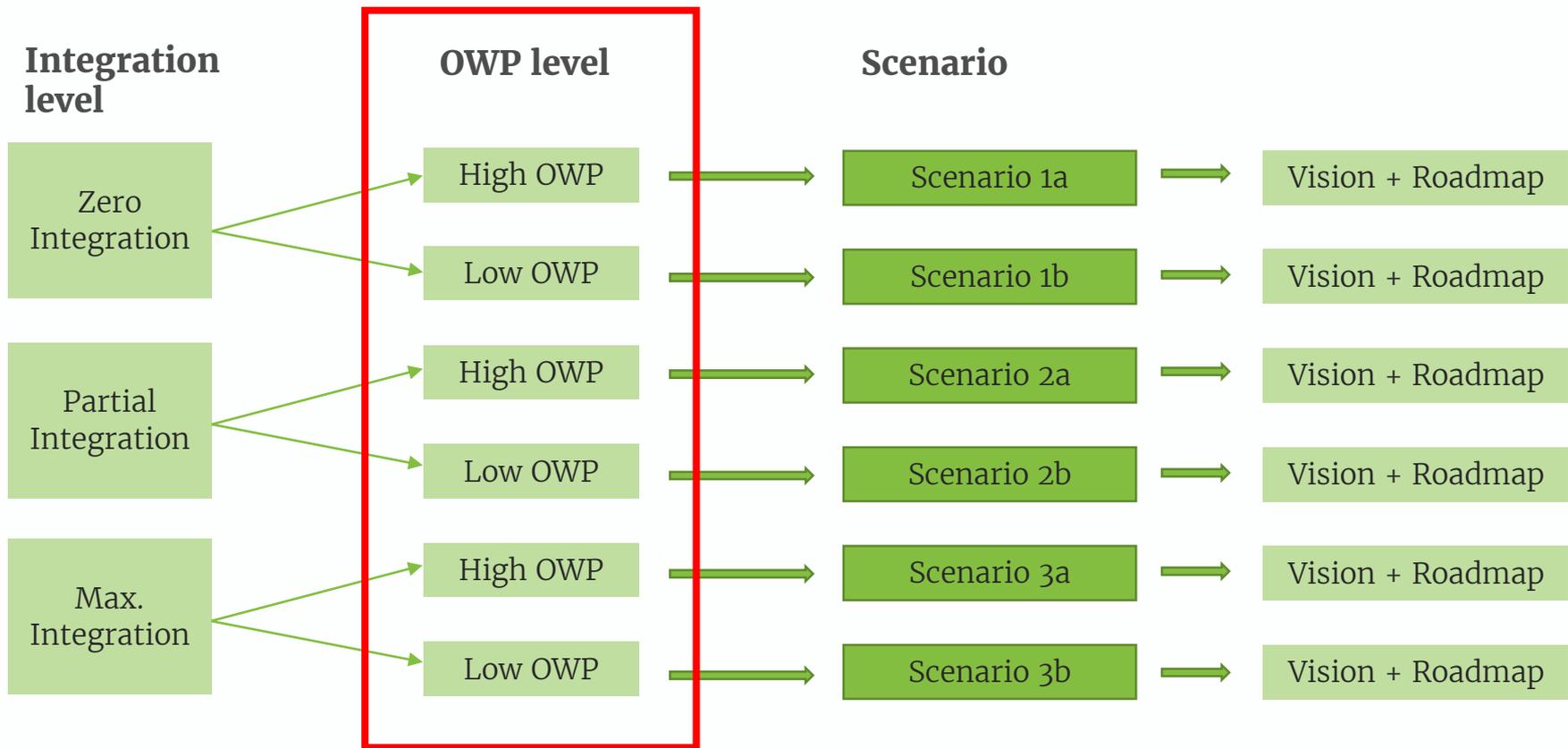


Partial
Integration

Max.
Integration

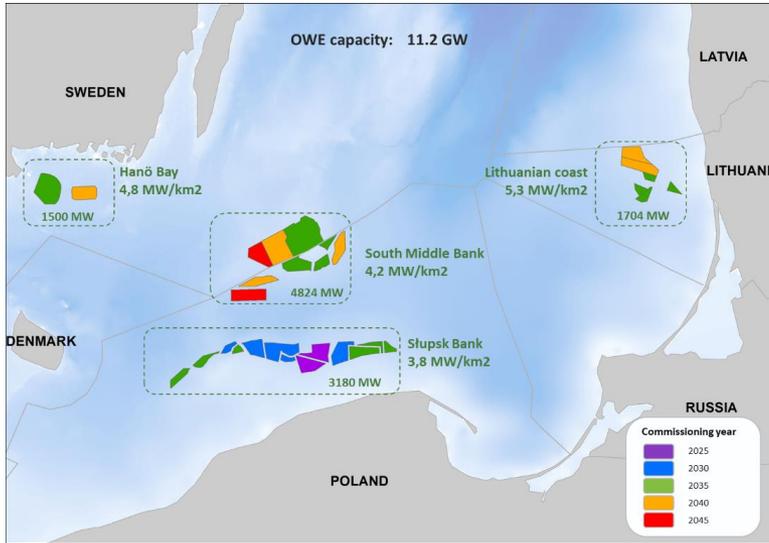


Scenarios

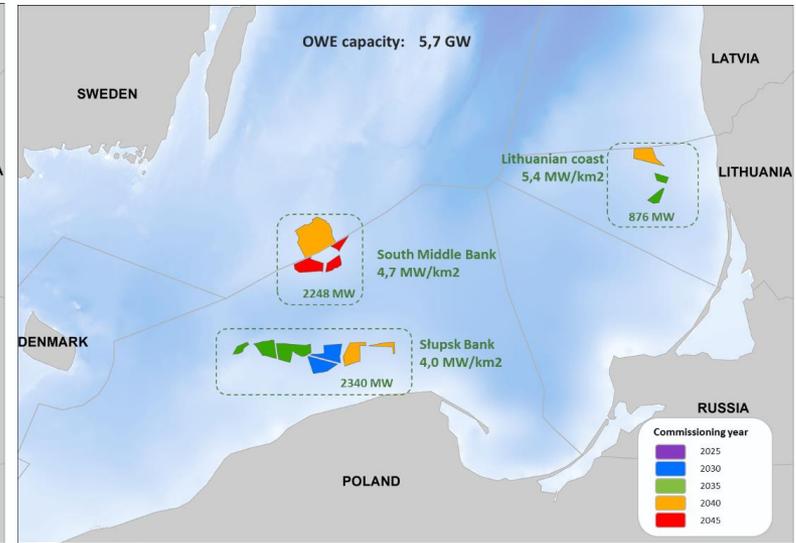


Case Study 1

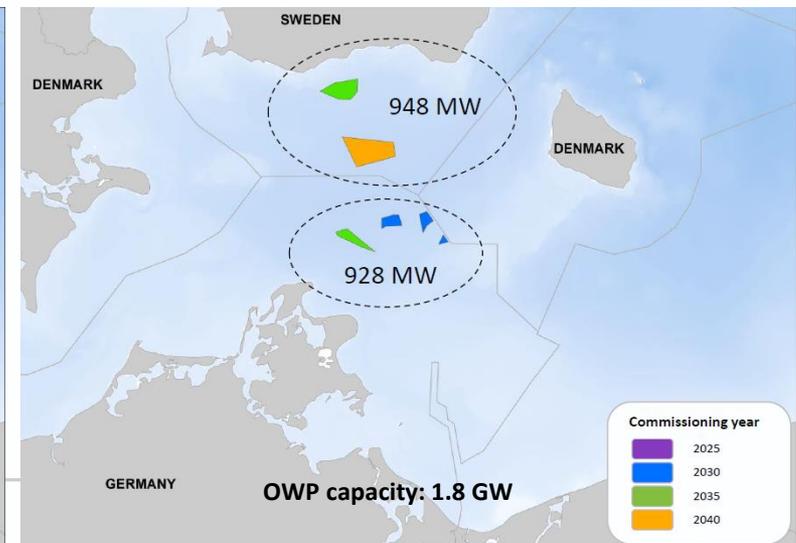
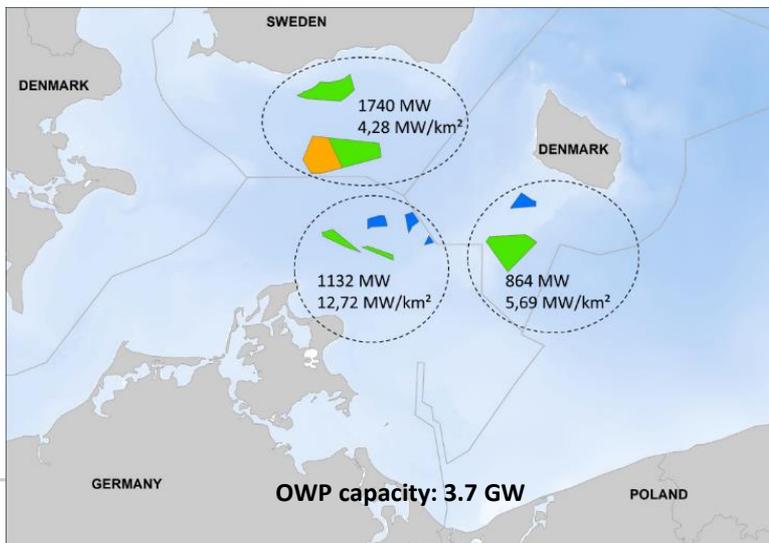
High OWP – 2045

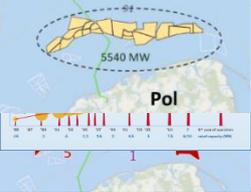


Low OWP – 2045



Case Study 2





Onshore connections

AC/DC converter placement

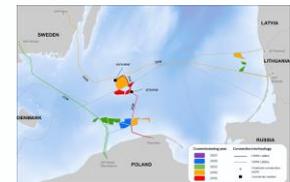
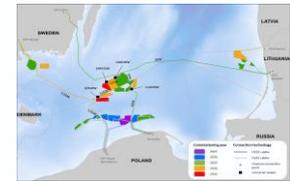
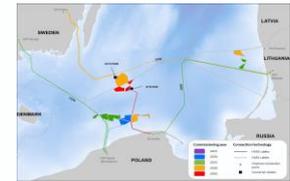
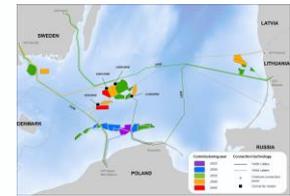
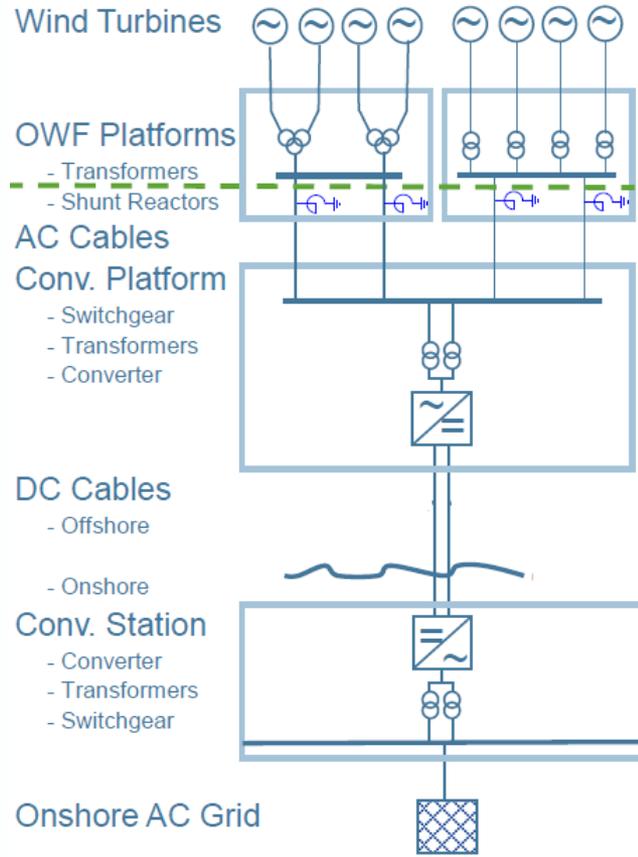
OWF components

Design criteria

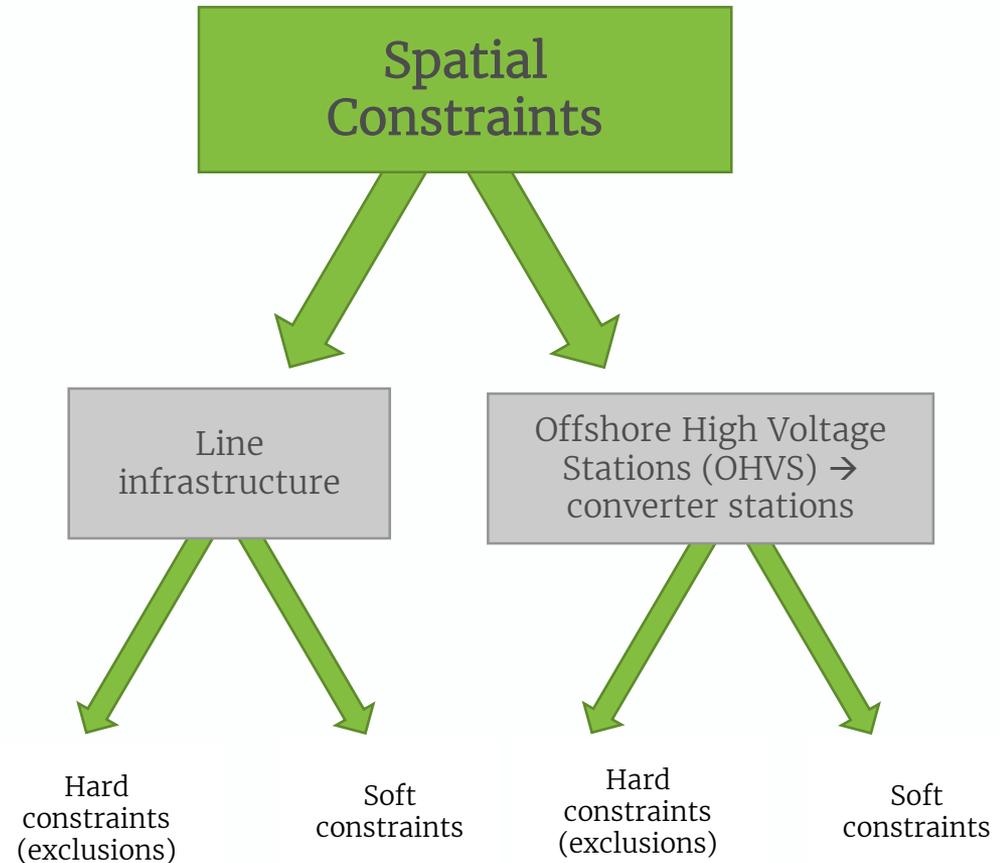
Grid layout

Grid components

Component lists



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





Polish-Swedish-Lithuanian and German-Swedish-Danish interconnectors integrated with offshore wind farms – case studies

Polish-Swedish-Lithuanian and German-Swedish-Danish interconnectors integrated with offshore wind farms – case studies

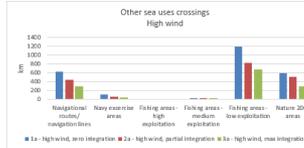


Figure 54 Total length of cables passing through other uses of the sea High wind scenario – Case Study 1

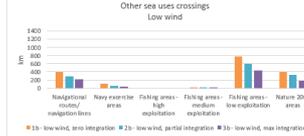


Figure 55 Total length of cables passing through other uses of the sea Low wind scenario – Case Study 1

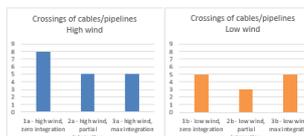


Figure 56 Number of linear infrastructure crossings in High and Low wind scenario - Case Study 1

Interconnector	Year	Country	Status	2015	2020	2025	2030	2035
Baltic-2	2015	Poland	Single Point	47.80	55.0	12	13	158
B-Wind	2015	Poland	Single Point	28.71	42.7	12	11	132
C-Wind	2015	Poland	Single Point	27.94	40.5	12	9	108

Draft

Efficiency wind farms – case studies

	BVDC	BVAC
EWG/km	0.32	1.14
EWG/km	1.32	1.52
EWG	0.00	0.00
EWG	61.57*	5.47
EWG	57.36	-0.23
EWG	173.03	79.66
EWG	118.80	25.32

... In the LCM annual operational ... This complies with the ... for long-term projects

	BVDC	BVAC
Rate of BVDC	2.5%	2.5%
Rate of BVAC	1.5%	0.7%
Rate of APDC	2.0%	2.0%

... needed. Reason: EU electricity ... Capacity of these storage ... In the case of L.T-PL ... connected via AC for cheapest ... size aggregated power here is ... to be the case for all ... able to fact that two national ... The alternative to make ... into the sea. The alternative ... would make it possible to go

Project name (km)	Project length (km)	Turbine size (MW)	Number of turbines	Rated power (MW)
18.35	41.5	12	16	192
23.33	21.5	12	31	372
26.37	34.3	12	13	156
28.71	42.7	12	12	144
36.36	32.9	12	41	492
102.89	33.5	12	49	588
109.27	37.1	8	47	376
139.32	31.0	8	44	352
146.21	33.3	8	50	400
143.58	42.0	8	70	560
172.58	44.7	8	34	412
223.28	36.1	8	11	88
273.34	36.9	8	43	344
162.30	33.8	12	27	324
109.44	29.8	12	33	456
84.40	33.8	12	28	336

- 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



- **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**