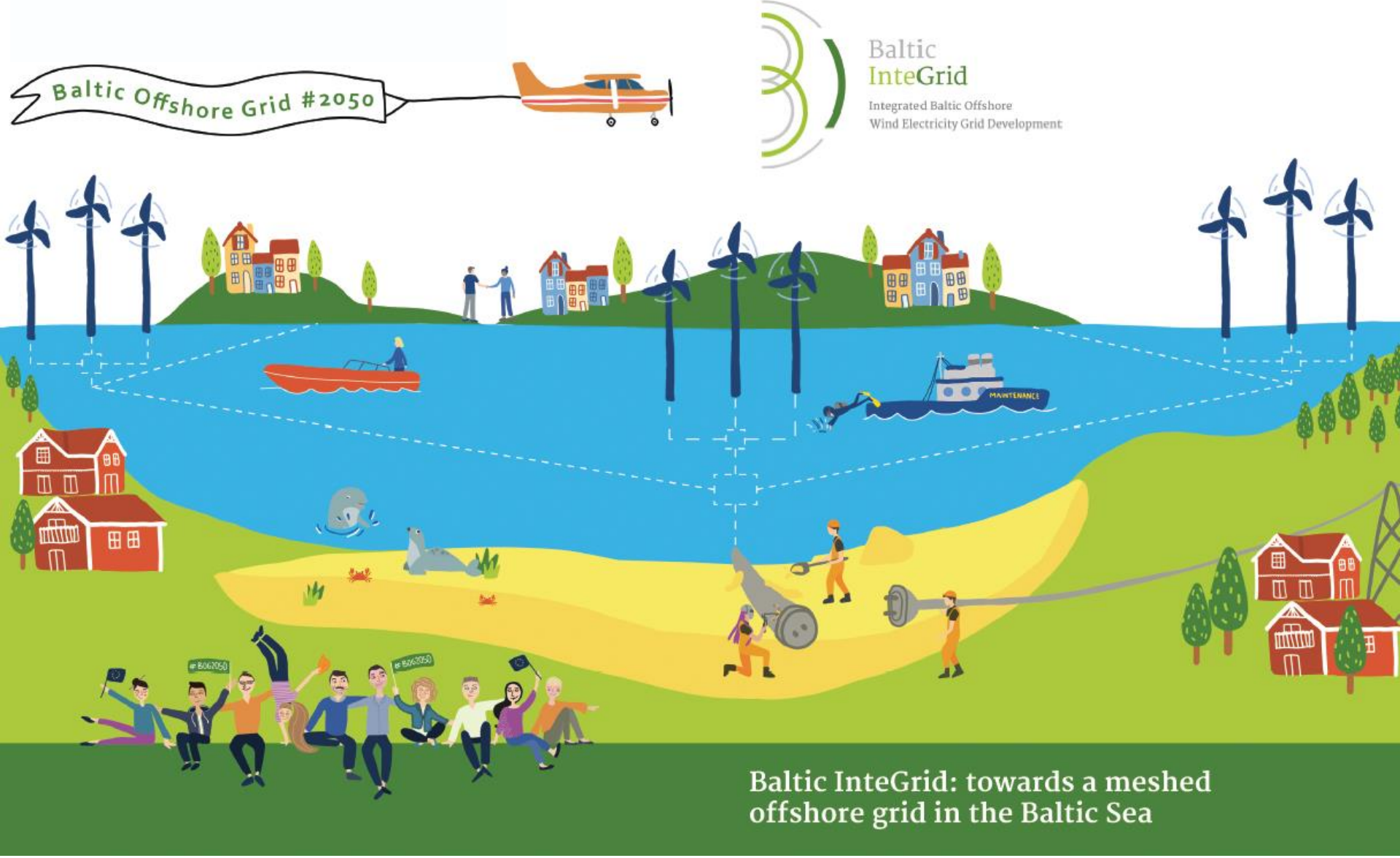


Roadmap and results

Pierre Ståhl

energikontor sydost

EU STRATEGY FOR THE BALTIC SEA REGION FLAGSHIP

Interreg Baltic Sea Region

EUROPEAN REGIONAL DEVELOPMENT FUND

EUROPEAN UNION

All Results/documentation on:

http://www.baltic-integrid.eu/

Results:

6 thematic groups

- > 20 reports/papers
- Conference documentation
- Optimization software (on request)

Policy & Regulation

Technology & Grid Design

Spatial Planning

Market & Supply Chain

Environment & Society

Cost-Benefit Analysis

info@baltic-integrid.eu

Interreg Baltic Sea Region

EUROPEAN REGIONAL DEVELOPMENT FUND

EUROPEAN UNION

Main Output

- Final report
- Summary report

- PreFeasibility Studies

- Impact mitigation strategy

- Cost Benefit Analysis

- Recommendations for:
  - Policy & Regulation
  - Maritime Spatial Planning
  - TYNDP
- BOGF
  Baltic Offshore Grid Forum

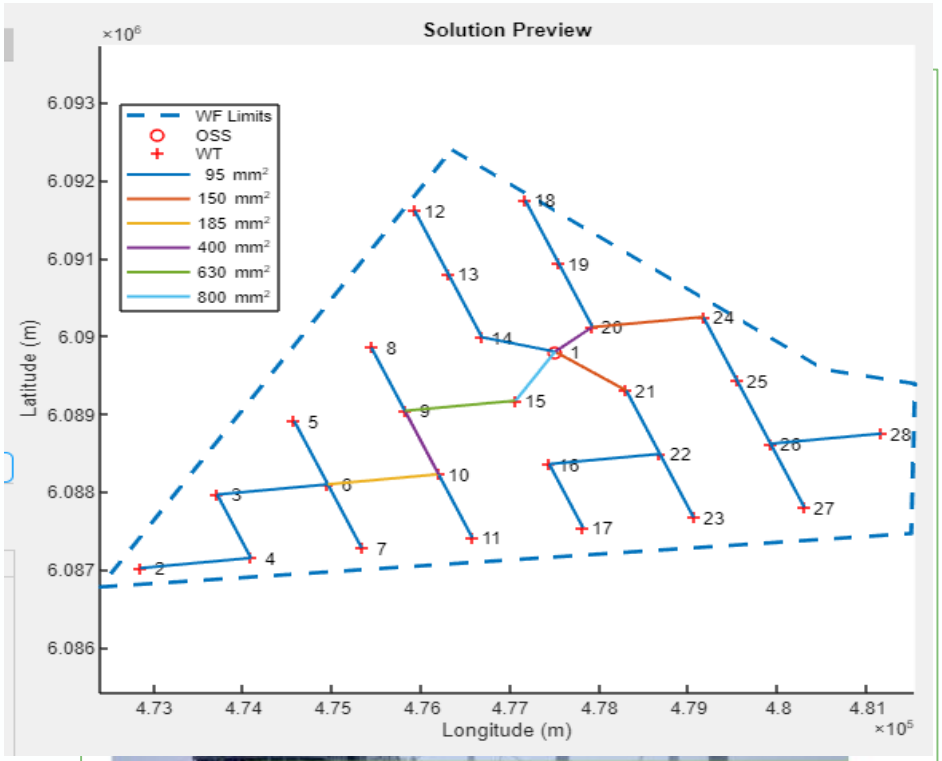
Cost reduction - Technology evolution

Trends:

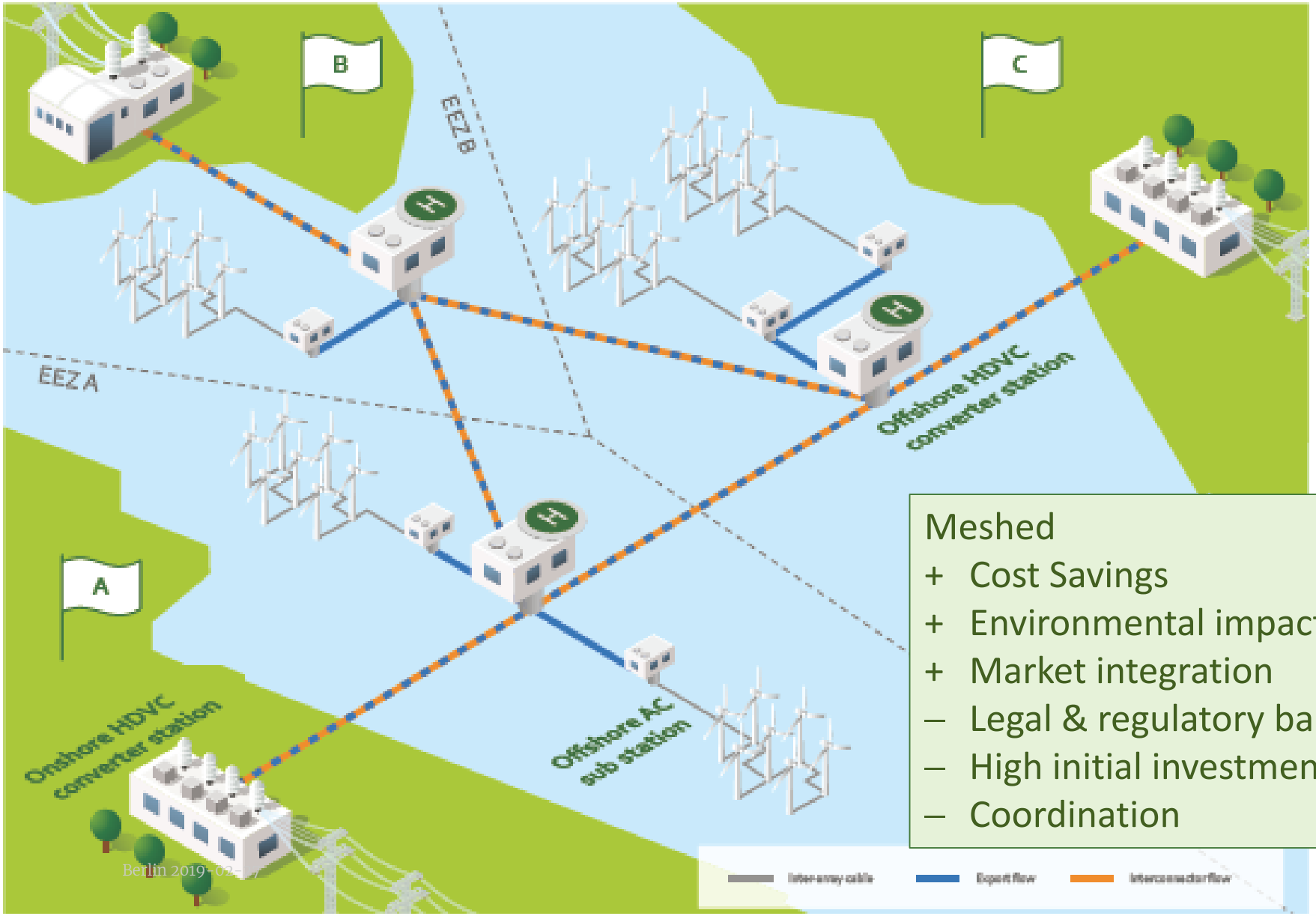
- AC -> DC
- Higher voltage – 66 kV
- Larger wind turbines:
  - 2018: average 6.8 MW (WindEurope)
- Meshed/Combined Grid
  - Kriegers Flak
  - North Sea
- Floating

Baltic InteGrid:

- Technology Catalogue
  - Now, future
- LCOE-tool
  - Collection system
  - Export Cable sizing
  - ➢ Cost savings (20%)



Meshed Grid (InteGrid)



Meshed
+ Cost Savings
+ Environmental impact
+ Market integration
– Legal & regulatory barriers
– High initial investments
– Coordination

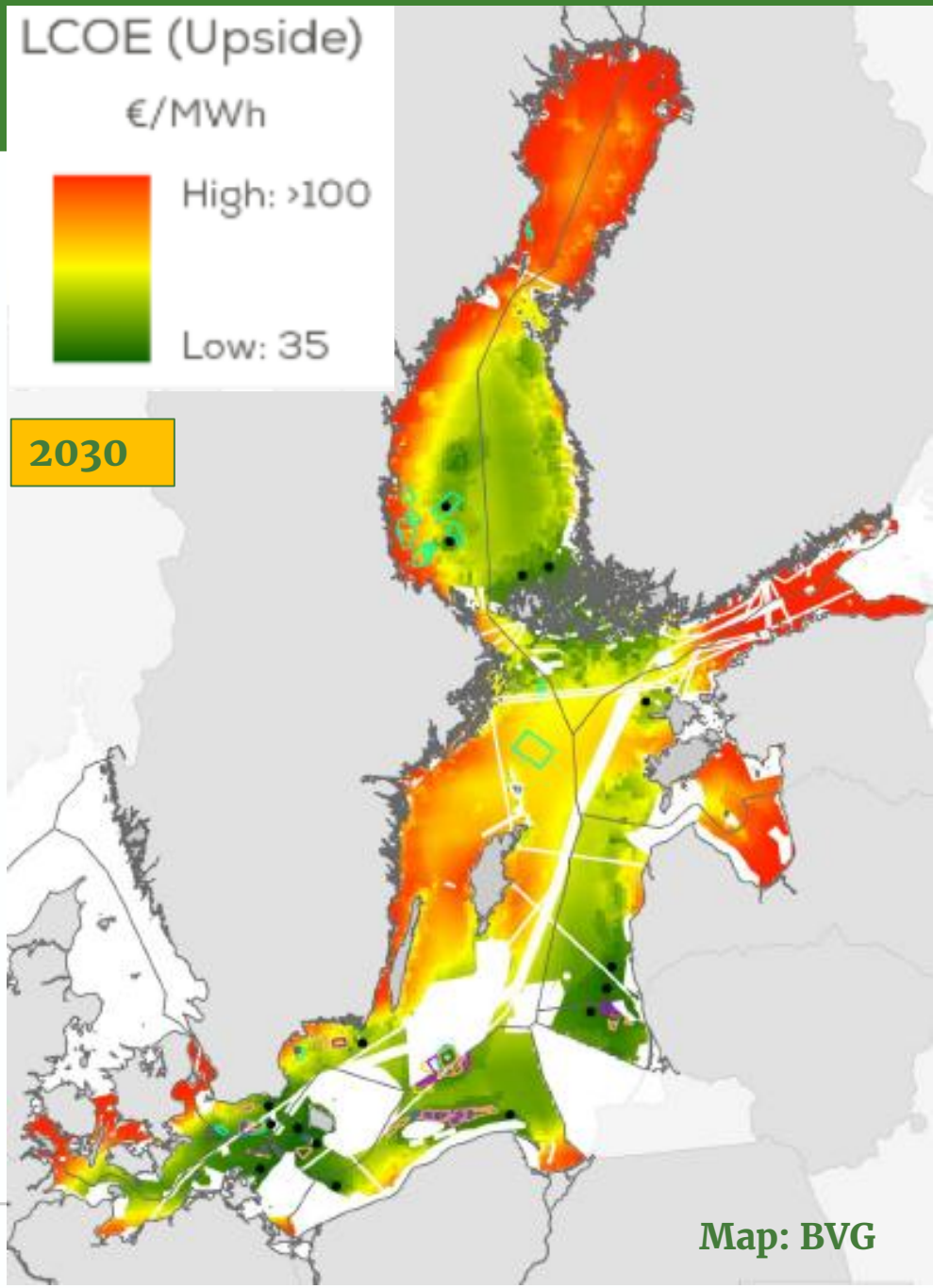
Potential

Baltic Sea

- 2018: Installed Offshore Wind: **2.2 GW**
- 2030: Economically attractive potential:
  750 Twh/yr with **186 GW ***

*WindEurope June 2017

Big potential!



Market

Installed Offshore Wind power: 2.2 GW

Baltic InteGrid:

- **2030 Upside scenario: > 9 GW**
- **Vision 2050: 35 GW, ⟺ 145 TWh/year***

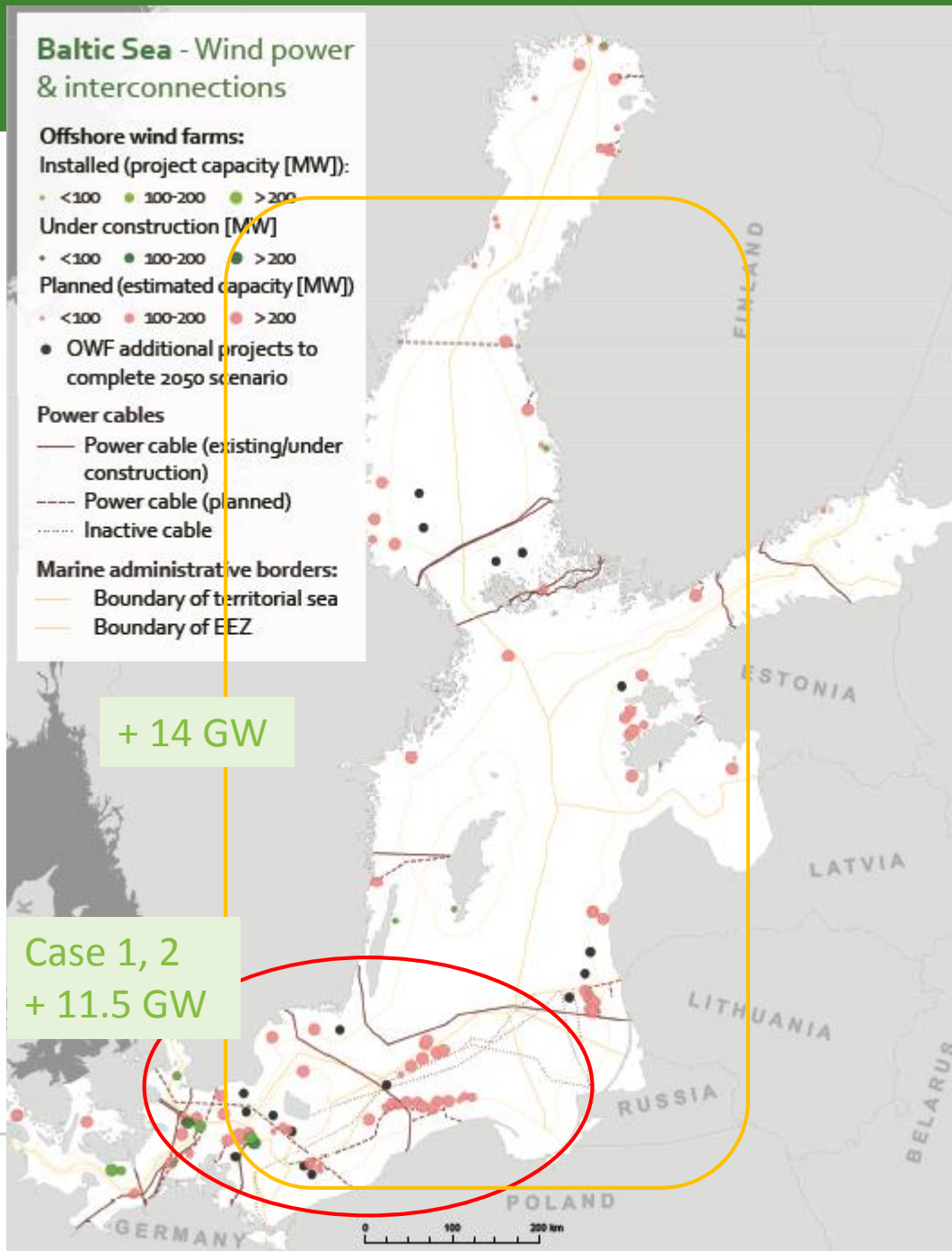
Vision 2050

- Current OWF
- \+ Planned today and realized before 2030
- Add Case studies *High scenario 2045*
- Additional 14 GW

*** The Baltic Sea share of the 80% RES pathway (BVG estimate)**

Installed Offshore Wind power

Country	2030 GW	2050 GW
Denmark	1,7	4,3
Germany	3,3	4,5
Sweden	0,5	11
Finland	0,6	2,1
Poland	2,2	7,3
Estonia	0,9	1,9
Lithuania	0,3	2,4
Latvia	0	2,5
TOTAL	9,5	35



Market SME

Baltic market 12% of total Europe offshore wind:

- Many demands can be met by existing companies
- Hard competition
- SME should look outside BSR also when making their business case

Qualified overview paper

Market and supply chain analysis and overview of SME investment opportunities for offshore wind transmission assets in the Baltic Sea Region

October 2018

Berlin 2019-02-27

Some conclusions

- SME benefit from capability in several work areas
- Expected growth in crew services and crew transfer vessel services
  - Make partnership with existing offshore wind suppliers
  - There is space in the OMS market for new companies to compete

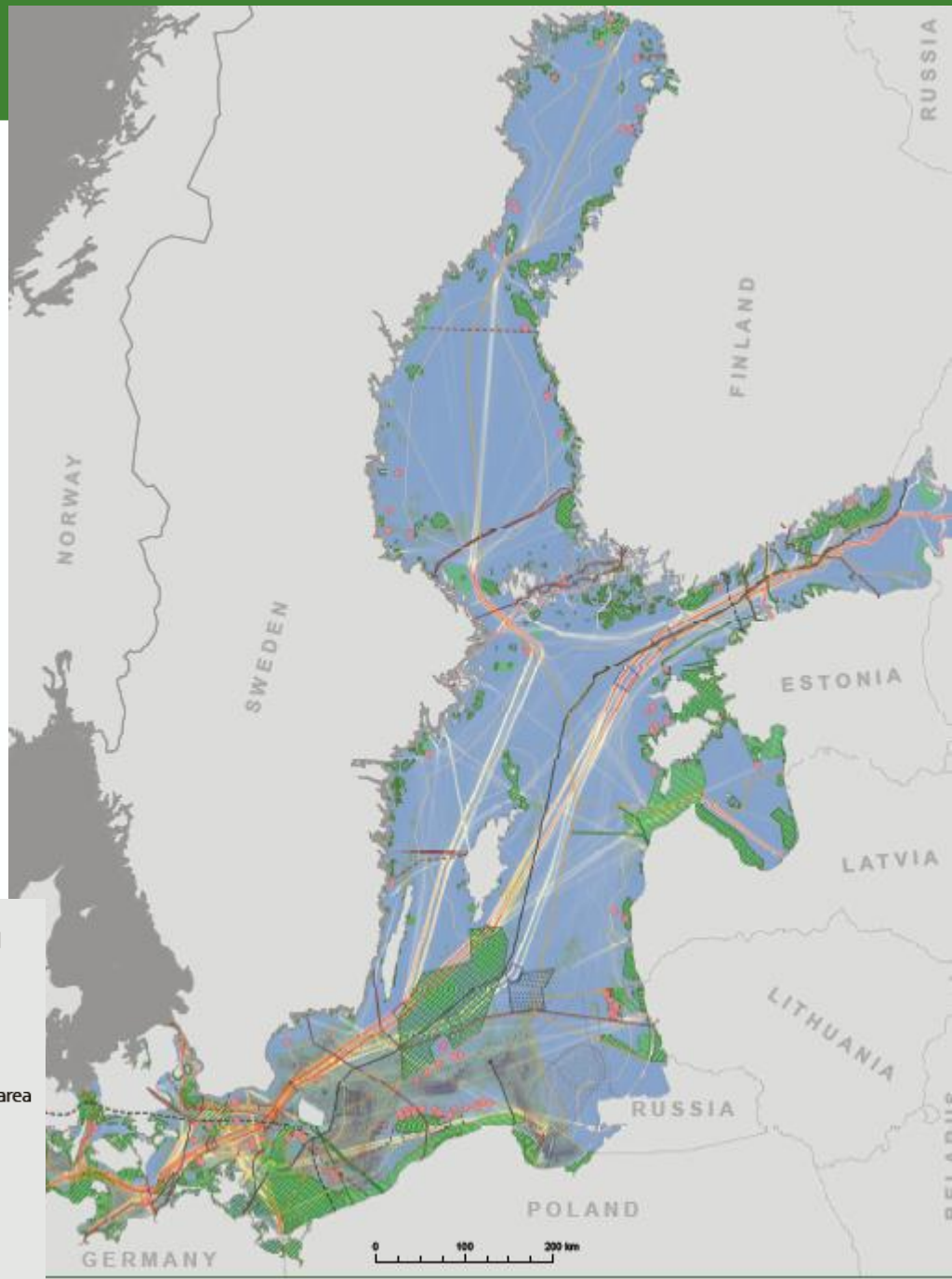
SME Work packages

	Export cables	Substation structure	Substation electrical
Development	Cable design	Structural design analysis	System design
	Cable ancillaries design	Logistic analysis	
	Cable route engineering	Sea fastening design	
Manufacturing	Factory jointing	Architectural steel	Busbars
	Cable ancillaries manufacture	Secondary steel	Heating, ventilation and air conditioning
	Equipment servicing	Signage	Fire detection and suppression
	Transport and storage	Sea fastening manufacture	Lighting
		Cable routes and trays	
		Cranes	
Installation	Cable protection	Port services	
	Route clearance and pre-lay grapnel run	Crewing services	
	Unexploded ordnance survey and removal	Crew transfer vessel services	
	Remotely operated vehicle services		
	Diving services		
	Cable termination and testing		
	Cable surveying		
	Trenching tools		
Maintenance	Repair jointing	Asset inspection services	Safety checks
	Fault monitoring		

Harbours

Maritime uses

- Many uses in the Sea
  - Nature protection
  - Transport
  - Tourism
  - Fishery
  - Energy
- New sea plans– 2021
- Important to make space for OWF and grid infrastructure



MSP - Sweden

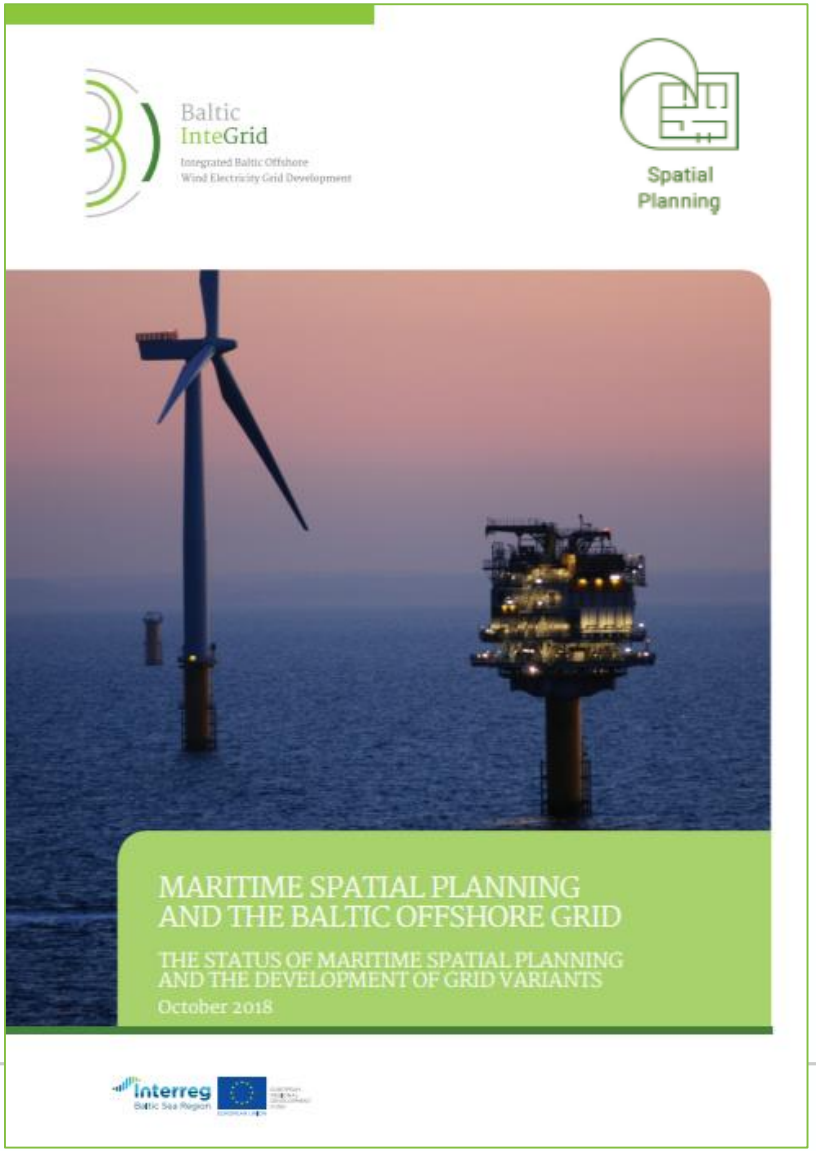
- Large portion of the Baltic Sea
- Work with first sea plans
- Draft exist / comments 2018
- Guiding / Not binding
- **Prioritized areas** for OWE
- Other areas not forbidden

- No national target for OWE!

- Plan for **50 TWh – 12 GWh**
- **Today:**
  - 2 GW application submitted
  - > 6 GW planning

MSP – Key messages in recommendations

1. MSP should be based on a unified approach to all sectors.
2. Well defined OWE targets
3. A cross-border cooperation is crucial.
4. Consider multi use
5. Stakeholder engagement
    1. Early
    2. Face to face meetings
6. Improved data sharing



Recommendations to TYNDP (2020)

1. Interconnectors planned in the Baltic Sea under TYNDP 2018 should be examined for possible integration with offshore wind farms.

2. The results of the Baltic InteGrid case studies carried out in the south Baltic should be applied in practice.

3. Formal support for the integration of meshed-grid solutions with offshore wind farms should be included in the TYNDP.

TYNDP = The Ten-Year Network Development Plan

Recommendations to Policy & Regulations

1. **It is necessary to provide an adequate regulatory framework for investments in offshore wind farms and grid projects.**
   - **Harmonized grid costs – ”super shallow approach”**

2. Policy-makers should be incited to provide an adequate legal framework for the construction and operation of a meshed offshore grid.

- **Regulations for dual purpose cables**
- **Overarching regulatory authority**

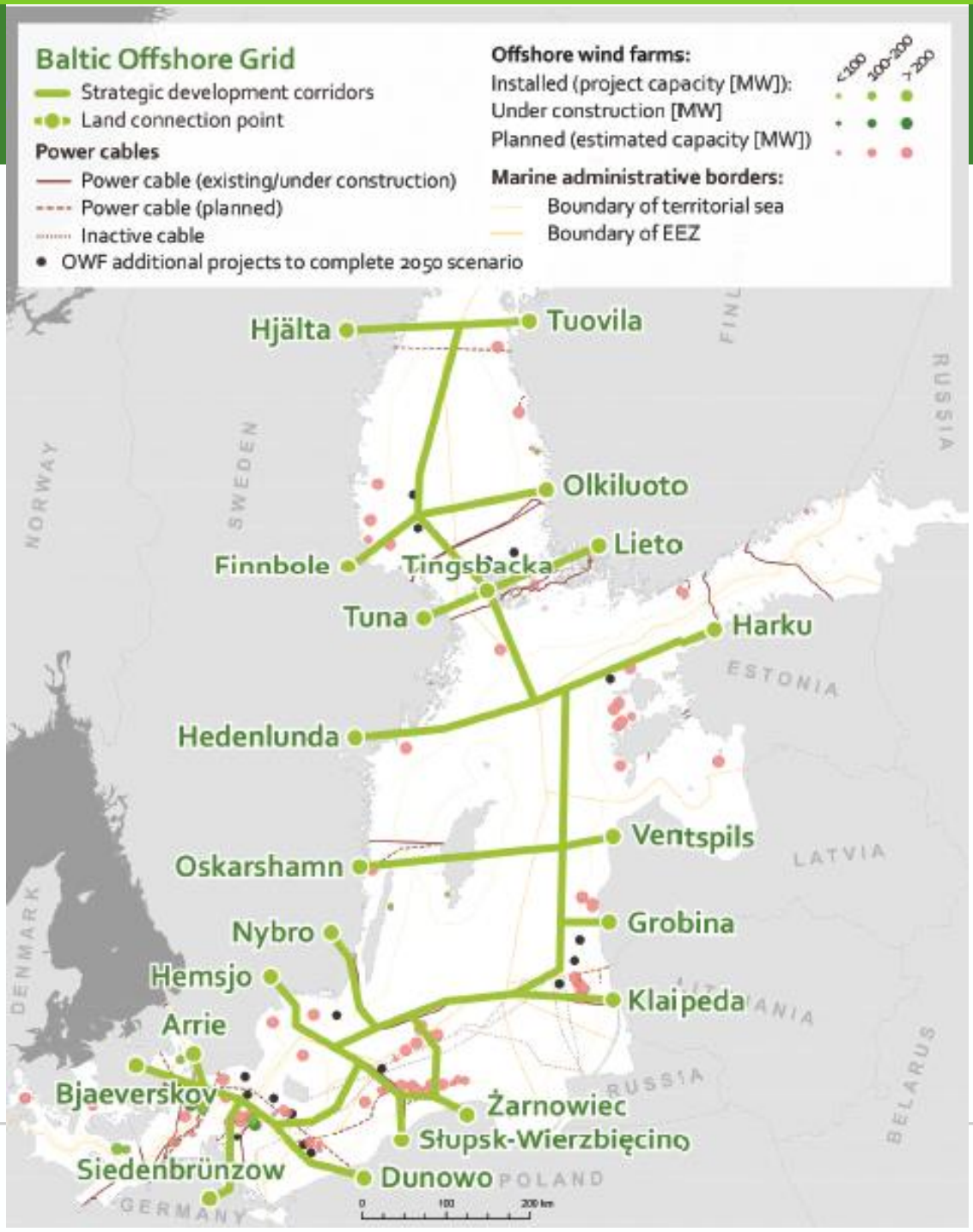
3. It is essential to guarantee environmental protection and increase public acceptance

Baltic Offshore Grid BOG 2050

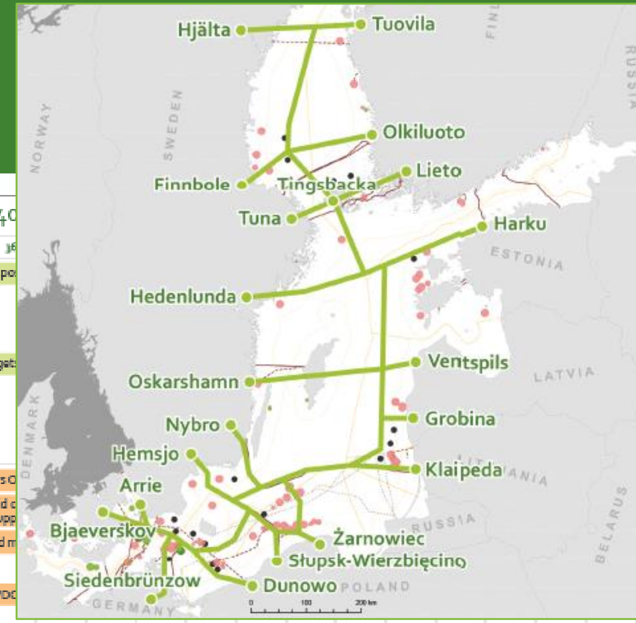
- Vision
- Example
- Based on study cases
- **35 GW** installed OWE
- Meshed Grid

Goals

- Easier to connect OWF
- Increased security of supply
- Further integration of energy markets
- OFW Cost reduction



The Roadmap BOG 2050



	2019 - 2020	2021 - 2030	2031 - 2040
	19, 20	21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33	34, 35, 36 … 49, 50

Policy & regulation

- Adopt regional and national offshore wind energy targets
- Revise and update targets to reflect … new technological po… …ies
- Adopt rules for the operation of meshed offshore grids at EU level
- Develop an EU framework for the transnational coordination of OWE planning
- Set targets and provide incentives for hybrid and meshed offshore grid projects, in line with interconnection and renewable targets
- Evaluate … and adjust the target…
- Develop harmonized CBA guidelines and cost allocation methods for meshed offshore grid connections
- Create regional socio-economic benefits by incentivising developers to establish local service, maintenance and training centres

Technology & market development

- HVDC technology price decrease
- Progress with floating … technologies allows O…
- Install the first offshore converter station in the Baltic Sea
- Diversification of the supply chain for grid c… and increase in the number of supp…
- Further implement of automated condition-based maintenance technologies for subsea infrastructures
- Achieve cost reductions through automated m…
- Integrate SMEs in the service & maintenance sector of meshed offshore grids
- Enhanced efficiency and performance of HVDC…
- Establish the price span and development of DC circuit breakers
- First MTDC grids become operational
- Meshed offshore grid developed
- Optimisation analysis of the meshed offshore grid

Environmental & spatial planning

- Establish a robust framework to ensure international cooperation in the service of producing useful maritime spatial plans for the BSR
- Develop channels for cooperation and data-sharing between MSP agencies, actors from the wind energy industry, and stakeholders from other maritime uses (e.g. fishing, shipping, etc.), at an early planning stage
- MSP agencies and public authorities should seek to optimise use through solutions involving multiple uses of maritime space within each sector
- Prioritisation of the different activities in the BSR based on an unified approach
- Develop best-practice overview to minimise impact during construction and operation of meshed offshore grid
- Maritime spatial plans are adopted and legally binding in all Member States in the BSR
- Ensure that the siting of OWF is done in a way that considers intermediate requirements as well as long-term visions of meshed transmission systems at an early stage of the MSP process
- Establish a transnational organisation responsible for regional MSP, together with national authorities
- Revision*/ adaptation of plans in response to changes in national policies or industry trends
- Revision*/ adaptation of plans
- Revision*/ adaptation of plans
- Revision*/ adaptation of plans
- Harmonised approach to MSP in BSR

Grid planning & construction

- Revise the new TYNDP 2020-2022 to integrate planned interconnectors with offshore wind farms
- Perform a full feasibility study for a meshed offshore grid in the South Baltic as optimal starting point for a regional grid, connecting Poland, Sweden and Lithuania, and Germany and Sweden.
- Begin planning and permitting procedure for a meshed offshore grid in the South Baltic
- Start integrating offshore wind farms in a South Baltic meshed offshore grid
- Operation and monitoring of the meshed offshore grid in the South Baltic
- Study possibilities for expansion of the meshed offshore grid from the South Baltic towards the Middle and North Baltic Sea
- Feasibility study of a meshed offshore grid expansion towards the Middle and North Baltic Sea
- Begin planning and permitting for a meshed offshore grid expansion in the Middle and North Baltic Sea
- Begin the expansion of meshed offshore grid towards the Middle and North Baltic Sea

Offshore wind energy capacity in the BSR (GW)

- >2.2 (2019) – 9.5 (2030) – 35 (2050)

EU renewable energy targets

- 20% (2020)
- Revise targets for 2030 for from 32% to 35%
- Achieve 35% renewable energy target
- Revise and update targets based on new renewable technology, set new target for 2040
- Stock-taking: On track for 95% emissions reduction by 2050? If not, increase renewable energy targets
- Achieve 95% emission reduction on EU level

****EU electricity interconnection targets**

- 10% (2020) – 15% (2030)
- Need for an EU 2040 and 2050 electricity interconnection targets

Thank you for your attention!

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