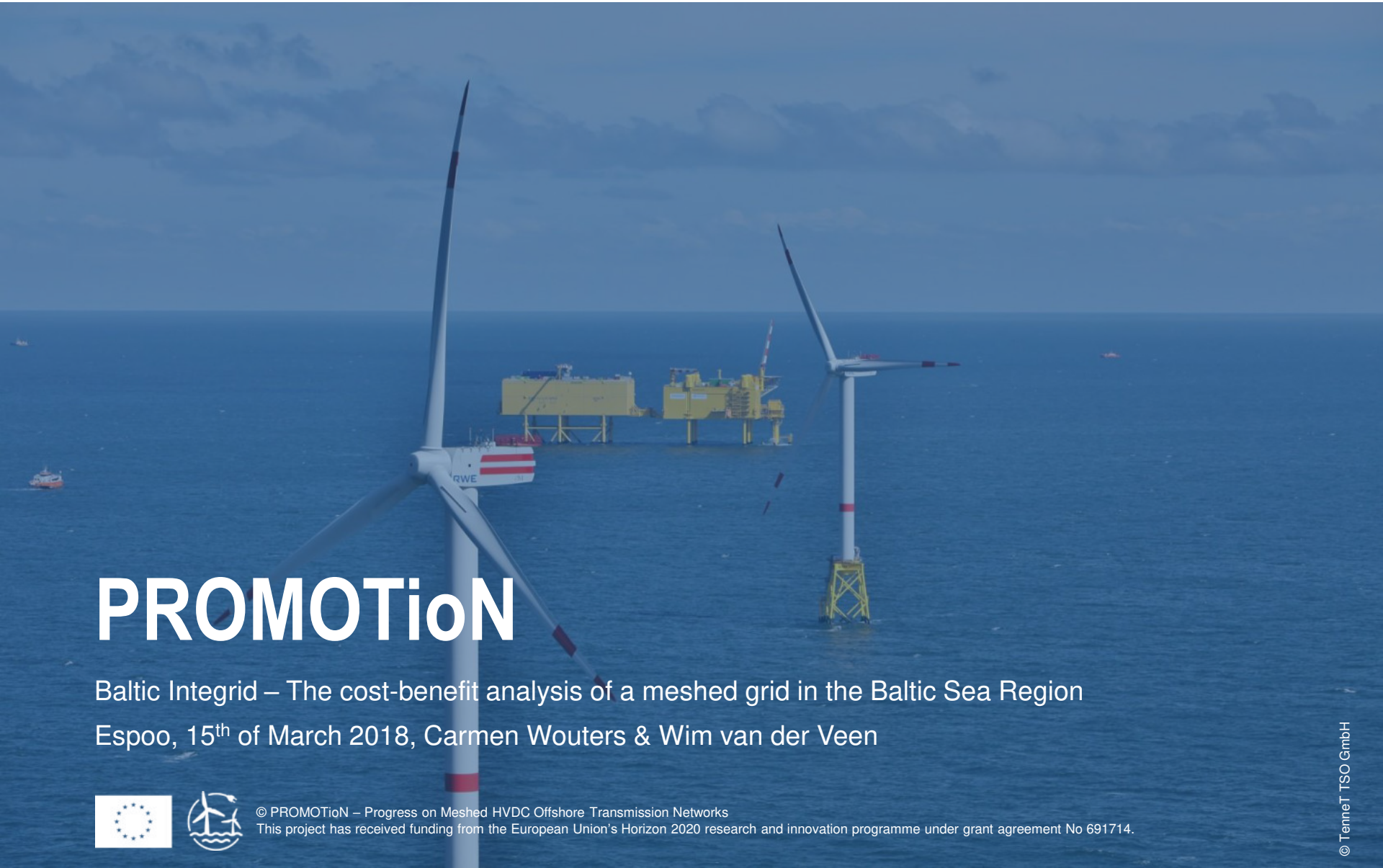
PROMOTioN
PROGRESS ON MESHED HVDC OFFSHORE TRANSMISSION NETWORKS



PROMOTioN

Baltic Integrid – The cost-benefit analysis of a meshed grid in the Baltic Sea Region

Espoo, 15th of March 2018, Carmen Wouters & Wim van der Veen

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691714.

PROMOTioN

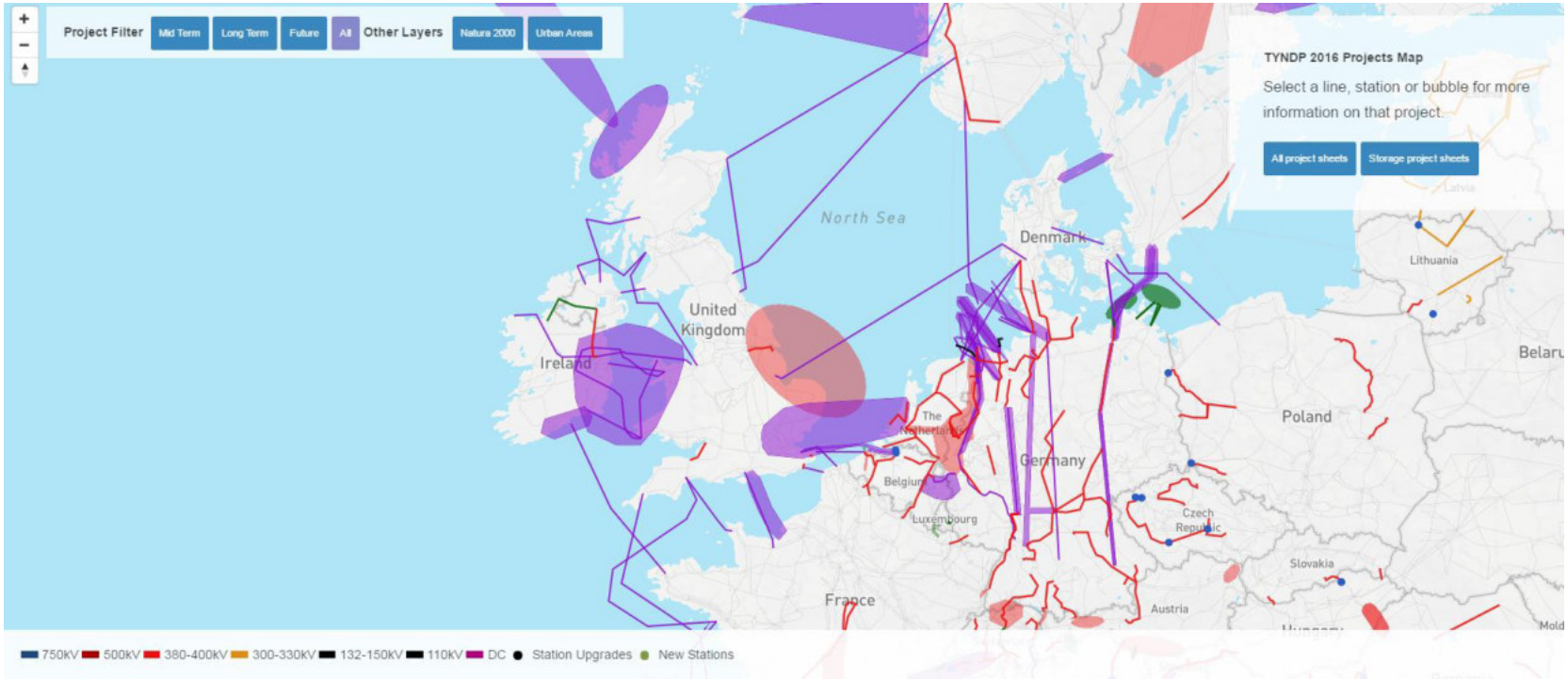
Perspectives from the North Sea:
Challenges in comparing offshore grid solutions

Content Slide

- **The Project**
- CBA methodology for offshore grids
- Challenges in comparing offshore grid solutions
- Conclusions

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691714. 15 March 2018

Objectives and challenges



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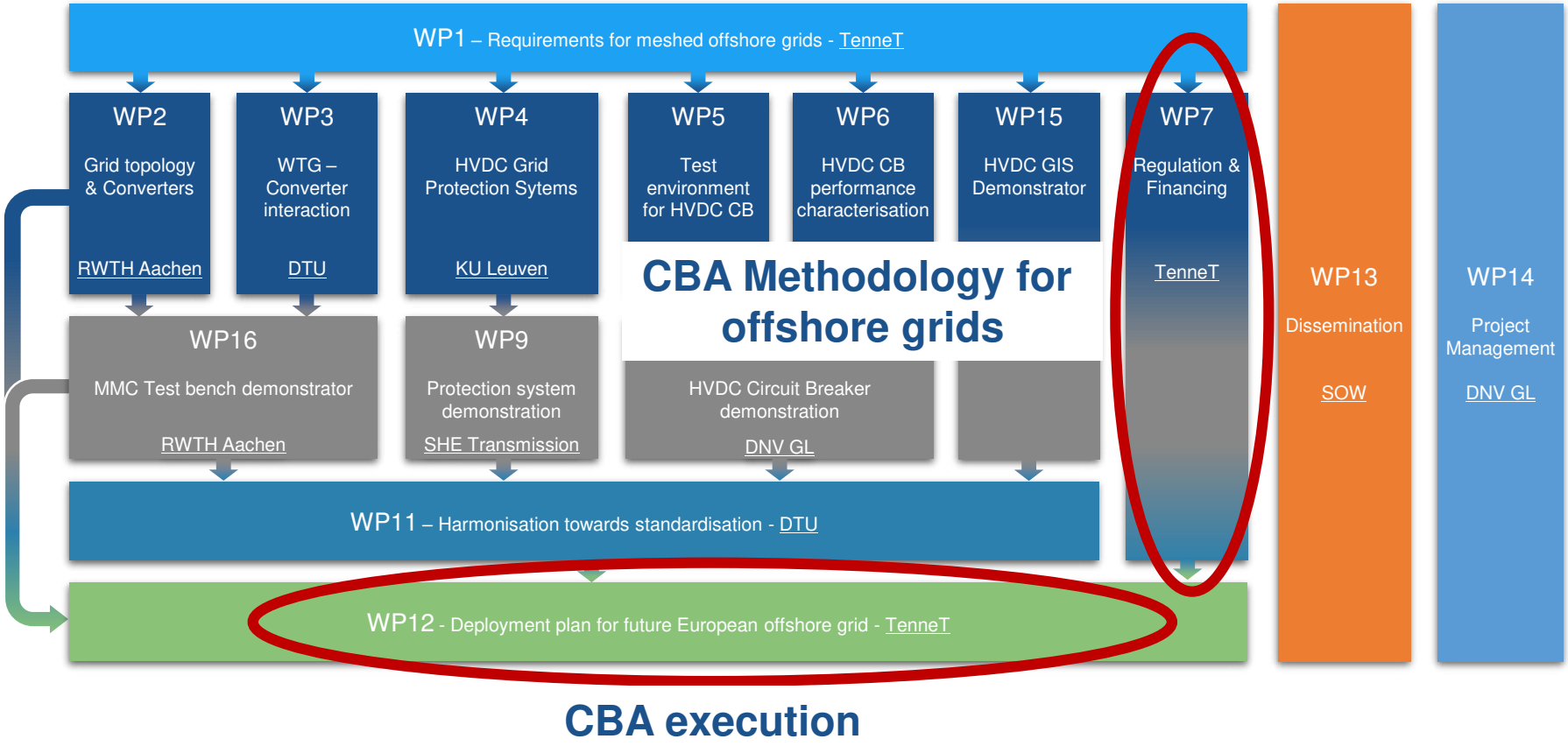
Organisation



CBA execution

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691714.

Partners

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 691714.

Content Slide

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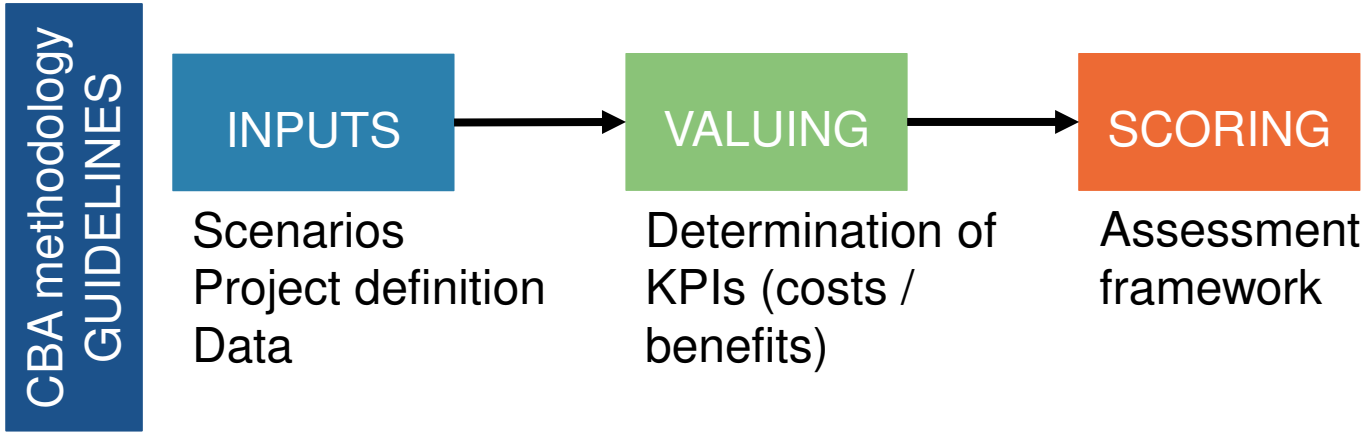
Aim of the CBA

- To develop a CBA methodology able to identify the “best” offshore grid design



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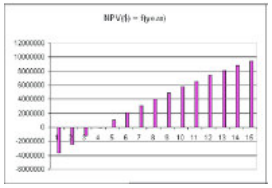
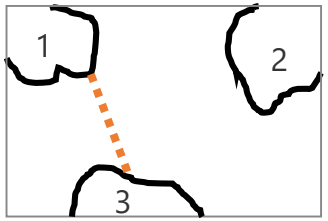
Scope



Financial CBA



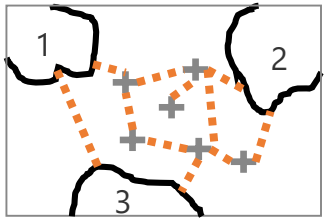
Project

Project CBA

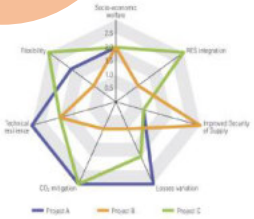
ENTSO-E CBA

PROMO-TioN CBA

System



Societal CBA



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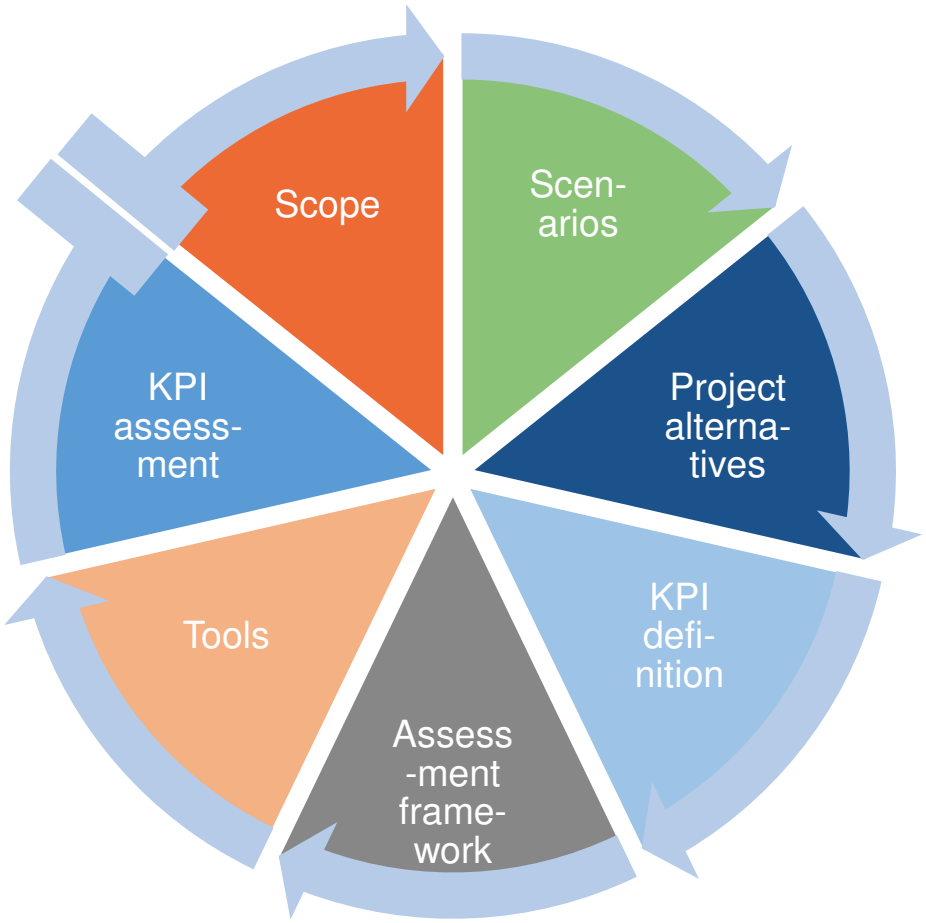
Dimensions



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Pragmatic vs ideal methodology

Pragmatic ⟷ Ideal

Dimension					
Scope	***CBA***	Value to society	Value to each member state	Value to society & each member state	Value to all stakeholders
		Multi-criteria	Augmented CBA (hybrid)	Standard CBA (full monetisation)	
	Purpose of project	Offshore grid for evacuation of wind	Offshore grid for evacuation of wind & market integration	Offshore & onshore grid for evacuation of wind	Offshore & onshore grid for evacuation of wind & market integration
Scenarios	***Onshore development***	Assume onshore grid can take on wind	Include full develpment and reinforcement needs		
	Wind development (offshore scenario)	One scenario of locations & capacity	One scenario of capacity with multiple locations	Multiple scenarios of capacity and locations	Surprise scenario
Project alternatives	***Scope***	E-network	E-network & E-storage	E-network & E-storage & P2G	E-network & E-storage & P2G & G-network
	Boundaries	Offshore grid (incl. Onshore and windpark connection points)	Offshore grid & wind parks	Offshore grid & onshore grid	Offshore grid & wind parks & onshore grid
	Alternative offshore grid	Optimised radial AC/DC	Optimised radial AC	Optimised meshed DC	Hybrid radial/meshed
	Reference grid	Base case	Null alternative		
Tools	***Scope onshore market model***	Zonal core (surrounding countries) & satellite	Nodal core & zonal sattellite	Full nodal	
	Offshore market model	Split to belong to each surrounding country	One virtual bidding zone	Multiple virtual bidding zones	Full nodal
	Region	Surrounding countries	EU28	EU28 + borders	
Assessment framework	***Evaluation period***	End-situation, as build in one go & 30 years operational life (2050-2080)	Complete development & operation (2020-2080)		
	Time step for clustering	Build “in one go”	5 years	1 year	
	Assessment projects	With and without the project (PINT/TOOT)	Projects vs null alternative		
KPI's	***Quantitative/Qualitative***	Quantitative	Monetised	Hybrid	

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Scenarios

- How to evaluate project alternatives?

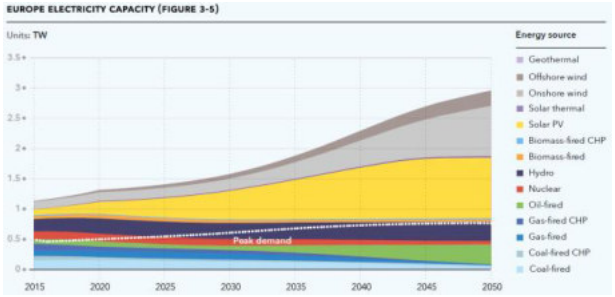
Onshore scenarios

Offshore scenarios

Technologies

Market design

Grid development



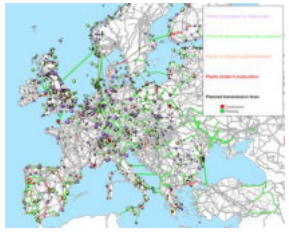
Source: ETO, DNV GL

AC

HVDC

Source: DNV GL

Source: TenneT



Source: Platts

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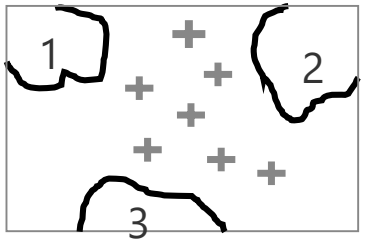
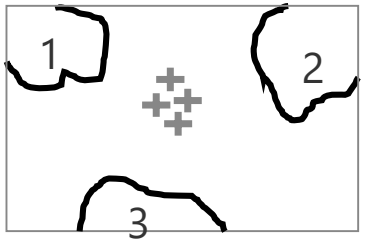
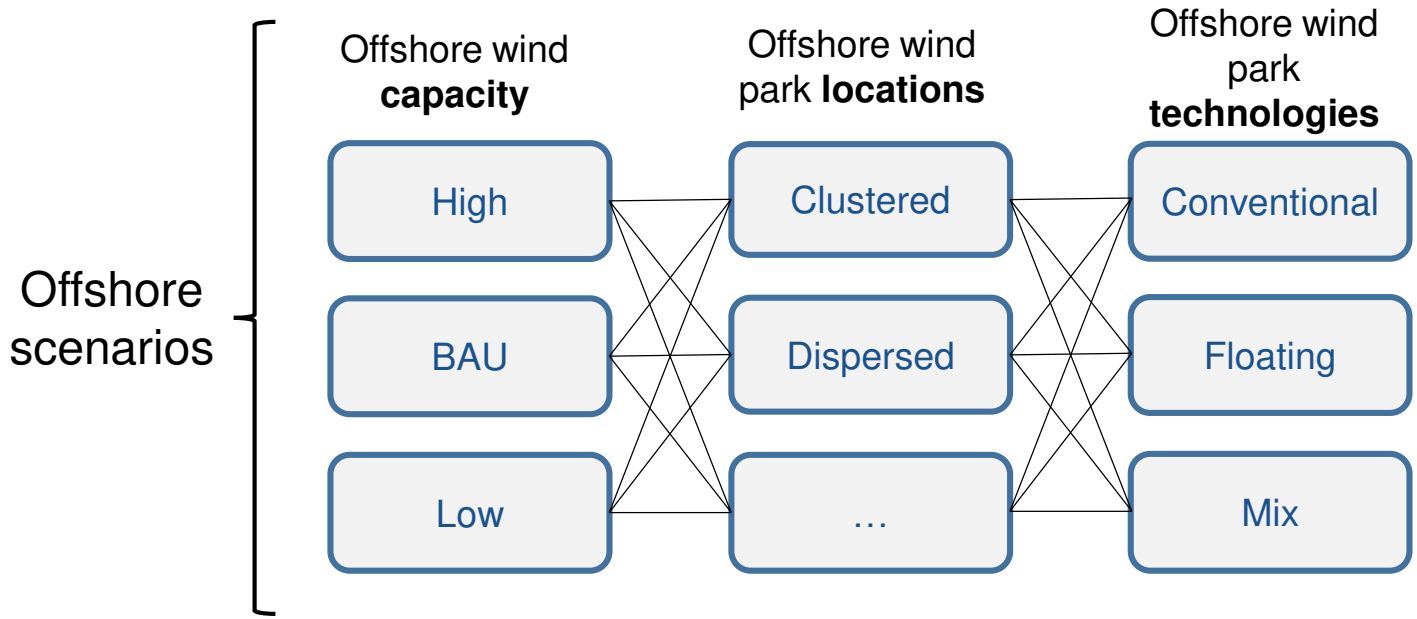
Scenarios





- Guidelines on scope of scenarios to avoid bias
- On - and offshore scenarios
- Ideal vs practical



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Assessment framework - reference

- PINT vs TOOT
- Reference for project assessment
  - Null-alternative = base-case = BAU

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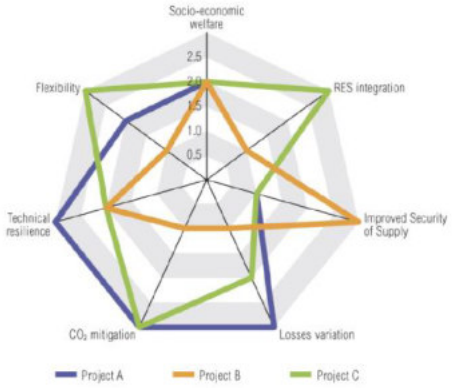
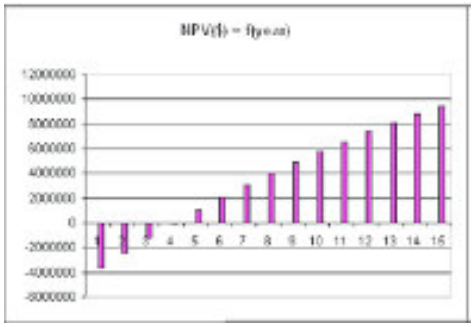
Assessment framework

- Project comparison
- Limits on full monetisation of KPIs
- Objective KPIs and weights
- Ideal vs practical



Degree of
quantification and monetisation



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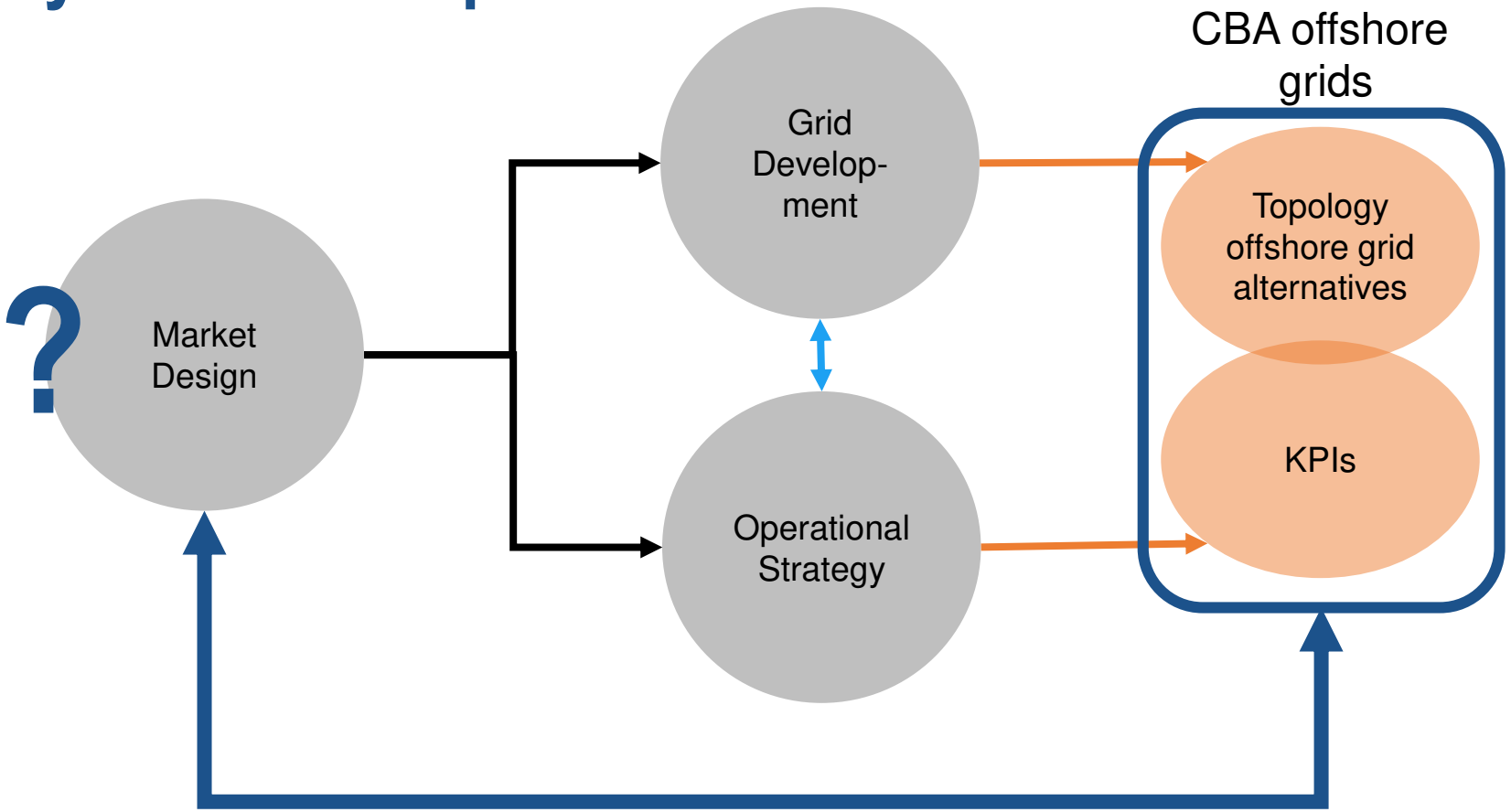
System development



CBA methodology might differ depending on concept

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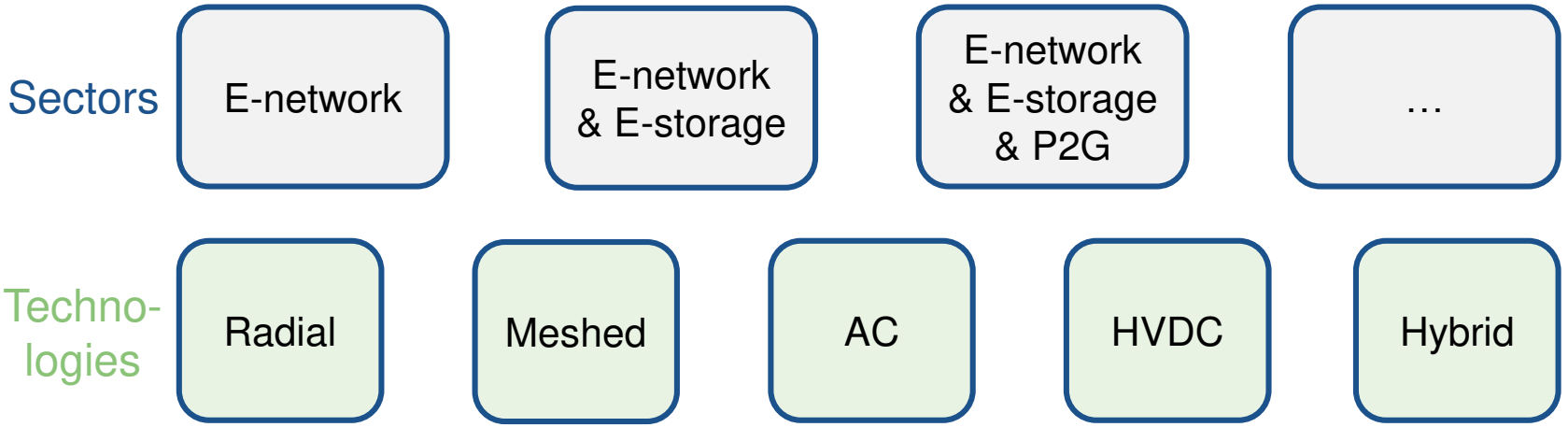
Project alternatives - scope

- Purpose of the project
- Sectors/technologies where project alternatives can draw from
- Ideal vs practical



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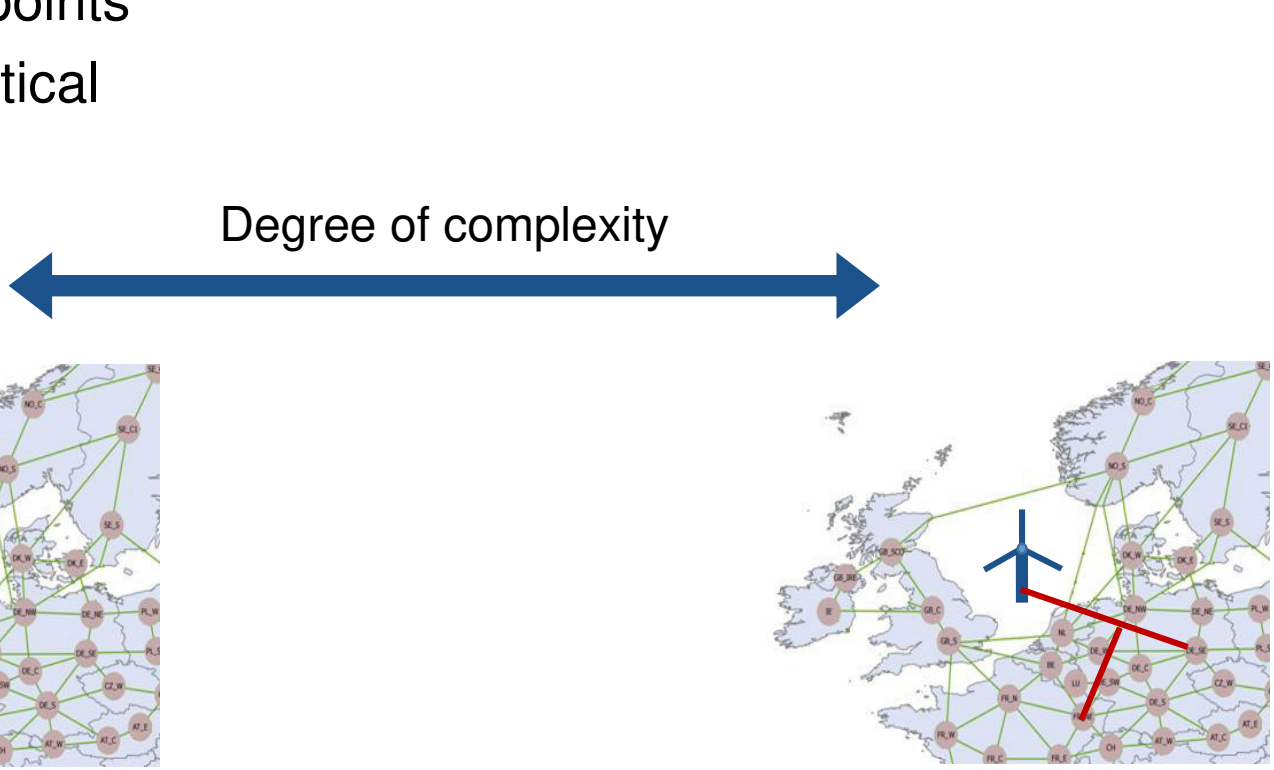
Project alternatives - boundaries

- How to deal with the onshore grid?
- Connection points
- Ideal vs practical

Degree of complexity



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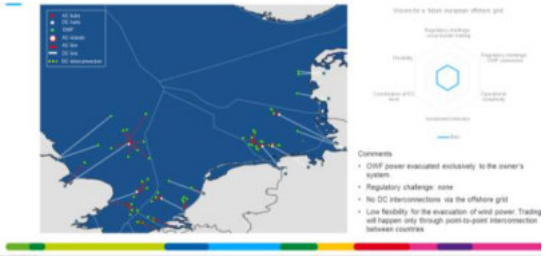
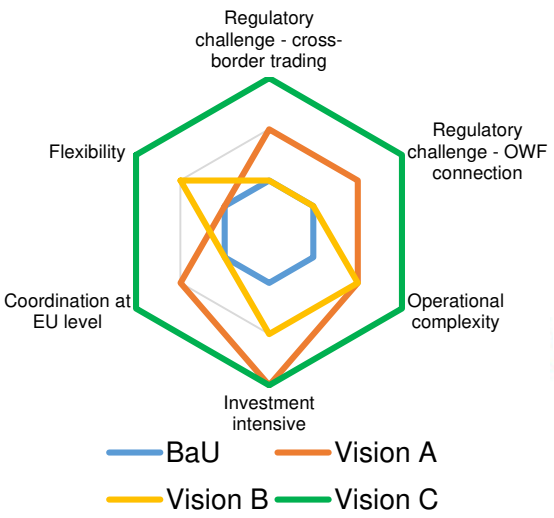
Project alternatives - concepts

- Concepts to develop project alternatives

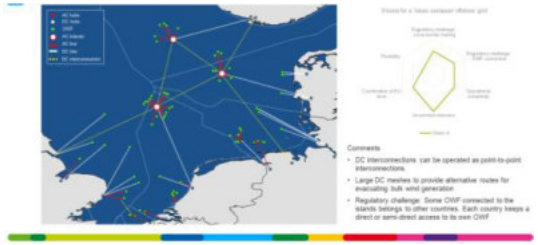
Reference concept



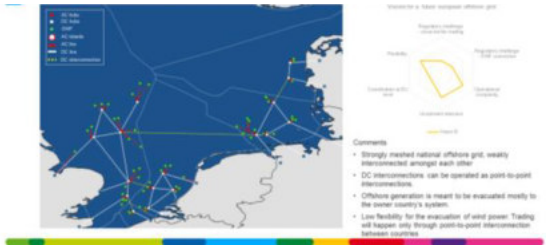
Concepts for a future european offshore grid



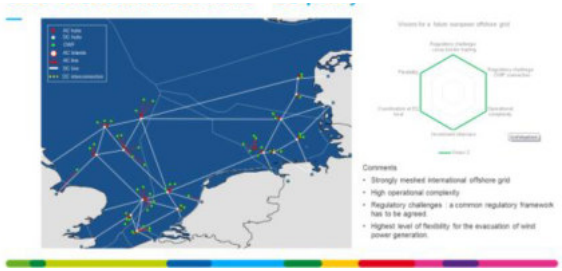
Concept A: Centralised EU grid based on AC islands



Concept B: Decentralised Hubs – National policy



Concept C: Decentralised Hubs – EU policy



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Challenges in comparing offshore grid solutions

- Complexity in CBA dimensions
- Single project vs system
- Financial vs societal CBA
- Ideal vs practical methodology
- CBA approach may differ between evaluated project alternatives

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PROGRESS ON MESHED HVDC OFFSHORE TRANSMISSION NETWORKS

www.promotion-offshore-net/newsletter

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APPENDIX

DISCLAIMER & PARTNERS

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