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RE scenarios in Baltic Sea and North Sea First results

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WP 3 Offshore power generation scenarios – main outputs



- Scenarios and siting of offshore wind power capacity
 - Necessary for wind power generation time series
 - Input to offshore grid design optimisation and required investment
- Grid connection points
 - Input to offshore grid design optimisation and required investment
- Wind power generation time series on per wind farm basis
 - Input to offshore power market modelling

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Data format (example)

Country	Cluster name	Sea	CLUSTER			NEAREST ONSHORE BUS			Installed year	Installed capacity (MW)		Cluster name
			bus	Lon	Lat	bus	Lon	Lat		2020	2030	
Germany	DE Baltic1 (Baltic)	Baltic	DE O1	12,7 E	54,6 N	D-5	12,1 E	54,2 N	2010	53,5	53,5	Baltic1 (Baltic)
Germany	DE Kriegers Flak (Baltic)	Baltic	DE O2	13,2 E	55,0 N	D-5	12,1 E	54,2 N	2010	328,6	328,6	Kriegers Flak (Baltic)
Germany	DE Rugen (Baltic)	Baltic	DE O4	14,1 E	54,8 N	D-3	13,6 E	54,1 N	2015		1605	Rugen (Baltic)
Germany	DE Borkum 1 (N sea)	North	DE O5	6,8 E	54,0 N	D-27	7,2 E	53,4 N	2016		7185	Borkum 1 (N sea)
Netherlands	NL South 1 (far)	North	N O1	3,3 E	52,1 N	NL-15	4,2 E	52,0 N		4223		NL South (far)
Netherlands	NL South 2 (far)	North	N O2	3,4 E	52,2 N	NL-15	4,2 E	52,0 N		2875		NL South (far)
Great Britain	England NE (close)		GB: 3	-1,0 E	54,7 N	GB: 3				634		England NE (close)
Great Britain	England NW (close)		GB: 3	-3,4 E	54,1 N	GB: 3				2471		England NW (close)

- Except of basic data, more details have been collected (if available), i.e.:
 - Number and type of turbines
 - Wind farm owner/developer
 - Area covered by the wind farms
 - Project status

Database status September 2009

- 373 records covering offshore wind projects and concepts from 15 countries included
- Total capacity of potential wind farms over 185 GW
- In general 2 types of records in database:
 - Projects - with developers involved, on-site activities permitting procedures started and implementation schedule available (~ 50 GW); likely to be implemented before 2020
 - Concepts – areas officially defined as available for wind energy purposes in the future, only general estimates of project potential and capacity are possible to give; likely to be implemented 2030 and beyond

Database status September 2009 Number of records for specific countries

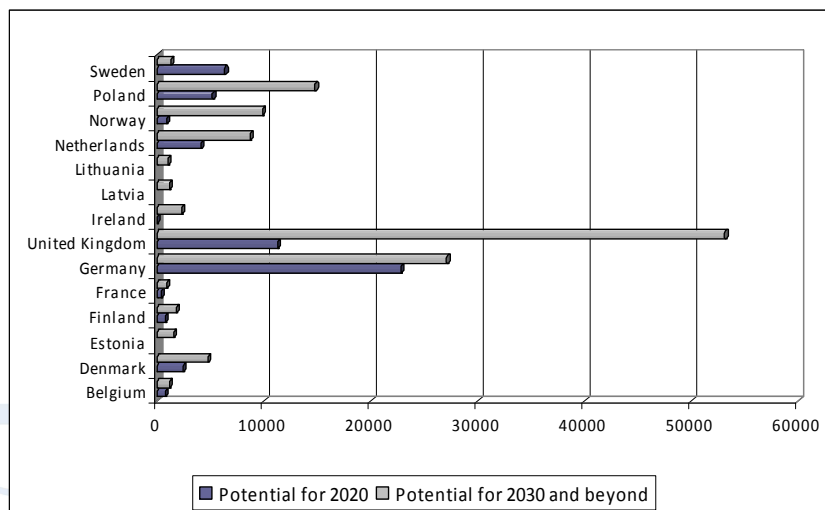


Country	BE	DK	EE	FI	FR	DE	UK	IE	LV	LT	NL	NO	PL	RU	SE
Projects 2020	5	19	1	1	2	51	39	1	0	0	14	5	7	0	16
Concepts 2030	4	14	4	7	4	55	39	5	4	5	27	18	19	2	4

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Database status September 2009 Installed capacity potential (MW) for specific countries for 2020 and 2030



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The working scenario of offshore wind installed capacity in 2020 and 2030 OffshoreGrid

Main assumptions:

- the proactive governmental policy will be continued and joined by further countries;
- wind farms licensed already (areas approved) and with advanced permitting procedure will be implemented before 2020
- the wind farms operating in 2030 will be located in already identified zones
- innovative concepts (far deep offshore, floating) will not significantly contribute before 2030

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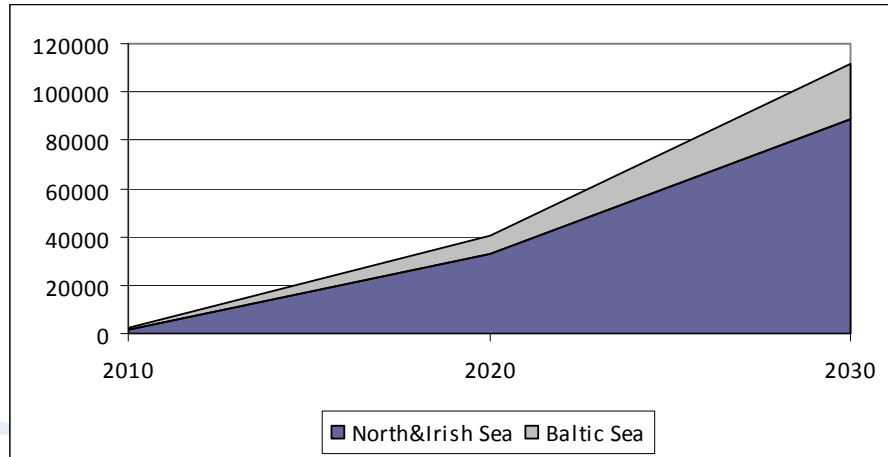
The working scenario of offshore wind installed capacity in 2020 and 2030 OffshoreGrid

Country	Total		North Sea&Irish Sea		Baltic Sea	
	2020	2030	2020	2030	2020	2030
Belgium	1 800	3 850	1 800	3 850		
Denmark	2 100	5 000	440	2 600	1 660	2 400
Estonia	200	1 000			200	1 000
Finland	900	2 600			900	2 600
France	410	2 000	410	2 000		
Germany	14 200	29 300	12 720	24 000	1 480	5 300
UK	11 300	35 500	11 300	35 500		
Ireland	800	2 300	800	2 300		
Latvia	0	400			0	400
Lithuania	0	400			0	400
Netherlands	4 100	11 100	4 100	11 100		
Norway	950	7 400	950	7 400		
Poland	1 200	5 500			1 200	5 500
Russia	0	500			0	500
Sweden	2 400	4 900			2 400	4 900
Total	40 360	111 750	32 520	88 750	7 840	23 000

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The working scenario of offshore wind installed capacity in 2020 and 2030



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Next steps

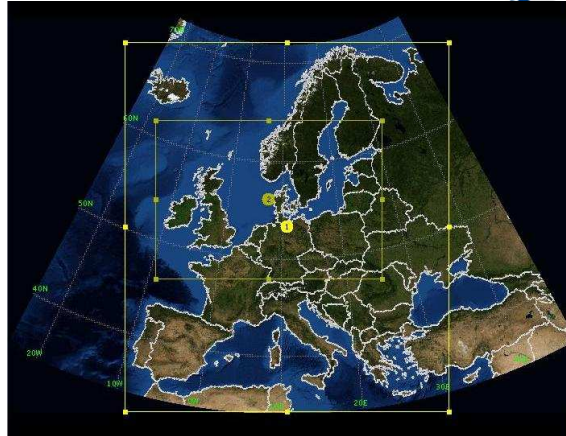


- Final verification of database content and scenarios
- Gathering missing information about wind farms connection options
- Final choice of 2020 and 2030 scenarios
- Calculations of offshore generation time series

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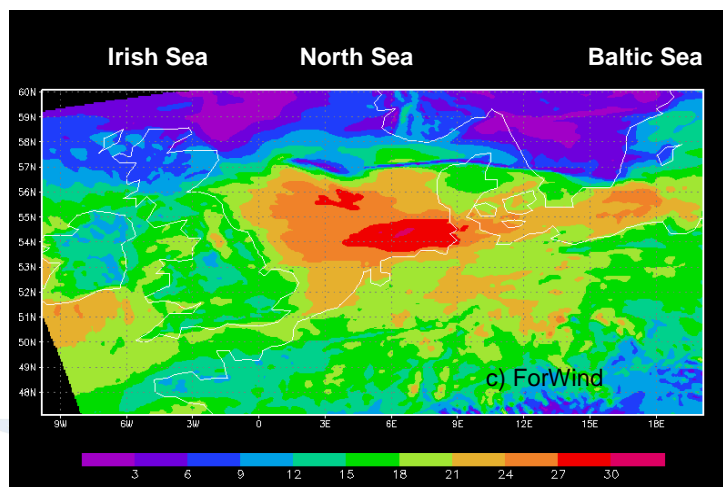
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WRF – model domains

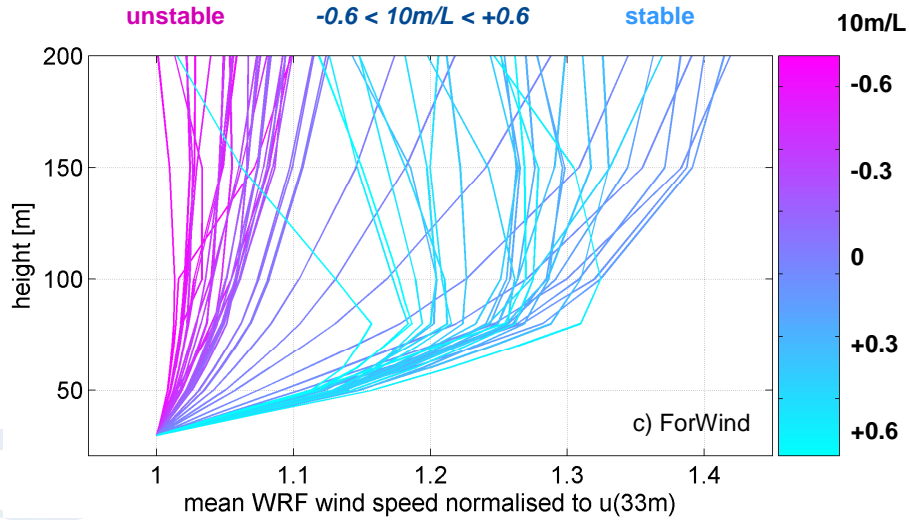


- WRF: 2-domain nested formulation setup
- 1. domain resolution: 27km X 27 km
- 2. Domain resolutuion: 9km X 9km

Example: 100m Wind Speed Simulation (Low Pressure System)



Vertical WRF Wind-Profiles and Thermal Stability



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Thank you for your attention

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