A EUROPEAN PERSPECTIVE ON DECOMMISSIONING AND OFFSHORE WIND

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WindEurope

windeurope.org

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Our members make wind energy work

500+ MEMBERS

Wind turbine manufacturers	e.g.	GE Renewable Energy, Siemens Gamesa Renewable Energy, Vestas
Wind farm developers	e.g.	acciona Energy, equinor, res powering change, Ørsted, Shell, Repsol
Power utilities	e.g.	RWE, EDF renewables, ERG Evolving Energies, enel Green Power, Iberdrola Renovables, Vattenfall
Component manufacturers	e.g.	LM Wind Power, ZF, Prysmian Group, Eiffage Smulders, tpi composites
Digital solutions & service providers	e.g.	Hitachi Energy, Atos, UL, Schneider Electric, Nokia
EPC, Installation and logistics	e.g.	Jan De Nul Group, Port of Amsterdam, Van Oord Marine ingenuity, Maersk Supply Service, Saipem
Financial & legal services	e.g.	Macquarie Green Investment Group, Allianz, Norton Rose Fulbright, Dentons
Research institutes	e.g.	Catapult Offshore Renewable Energy, Fraunhofer IWES, TU Delft, DTU Danmarks Tekniske Universitet, eit InnoEnergy
Energy Buyers	e.g.	Google, Borealis Keep Discovering, ArcelorMittal, covestro

+ NATIONAL WIND ENERGY ASSOCIATIONS

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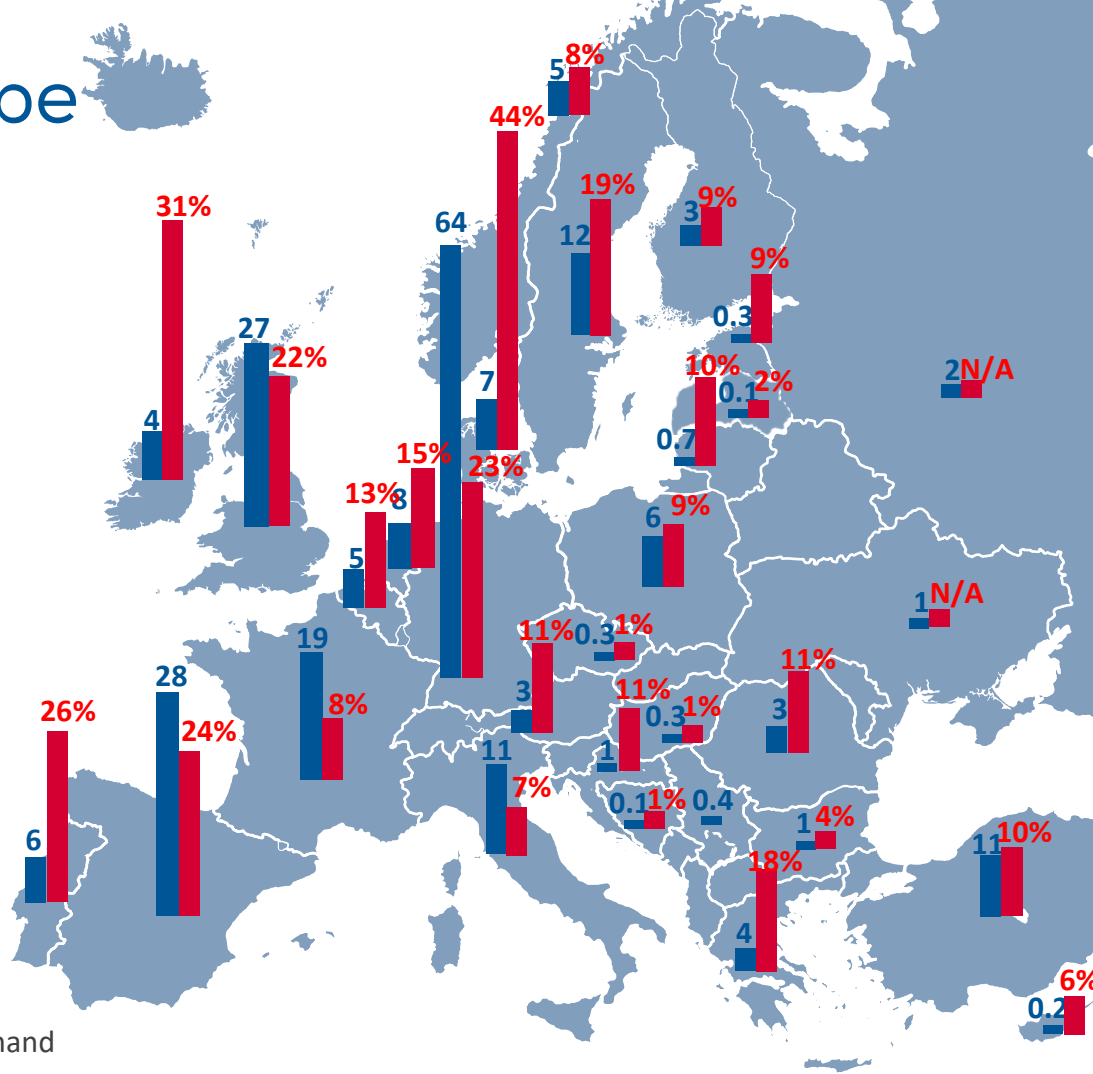
Wind energy in Europe

236 GW

15%
of Europe's electricity demand



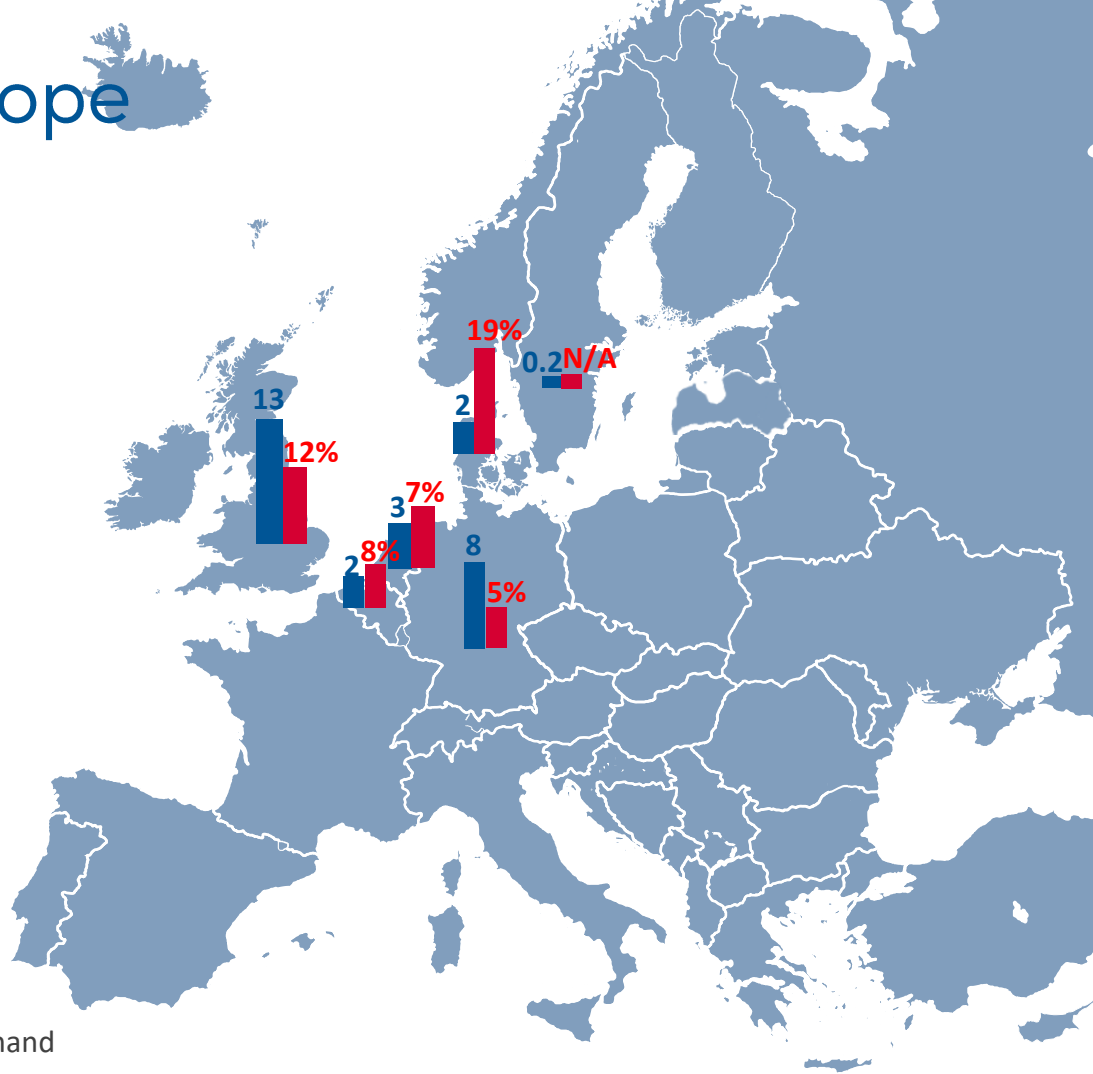
GW installed

Wind share of electricity demand

Offshore wind in Europe

28 GW

3%
of Europe's electricity demand



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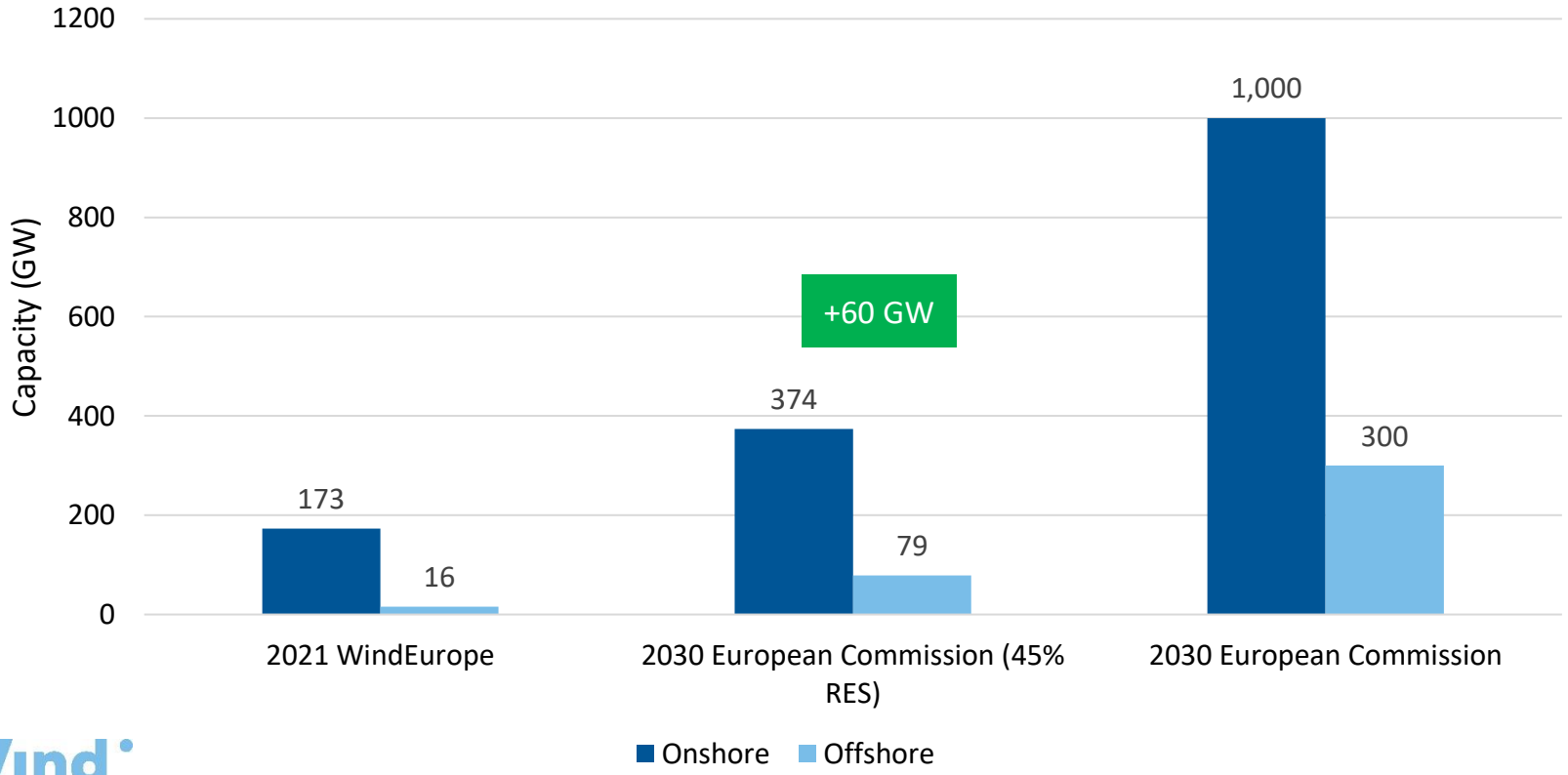
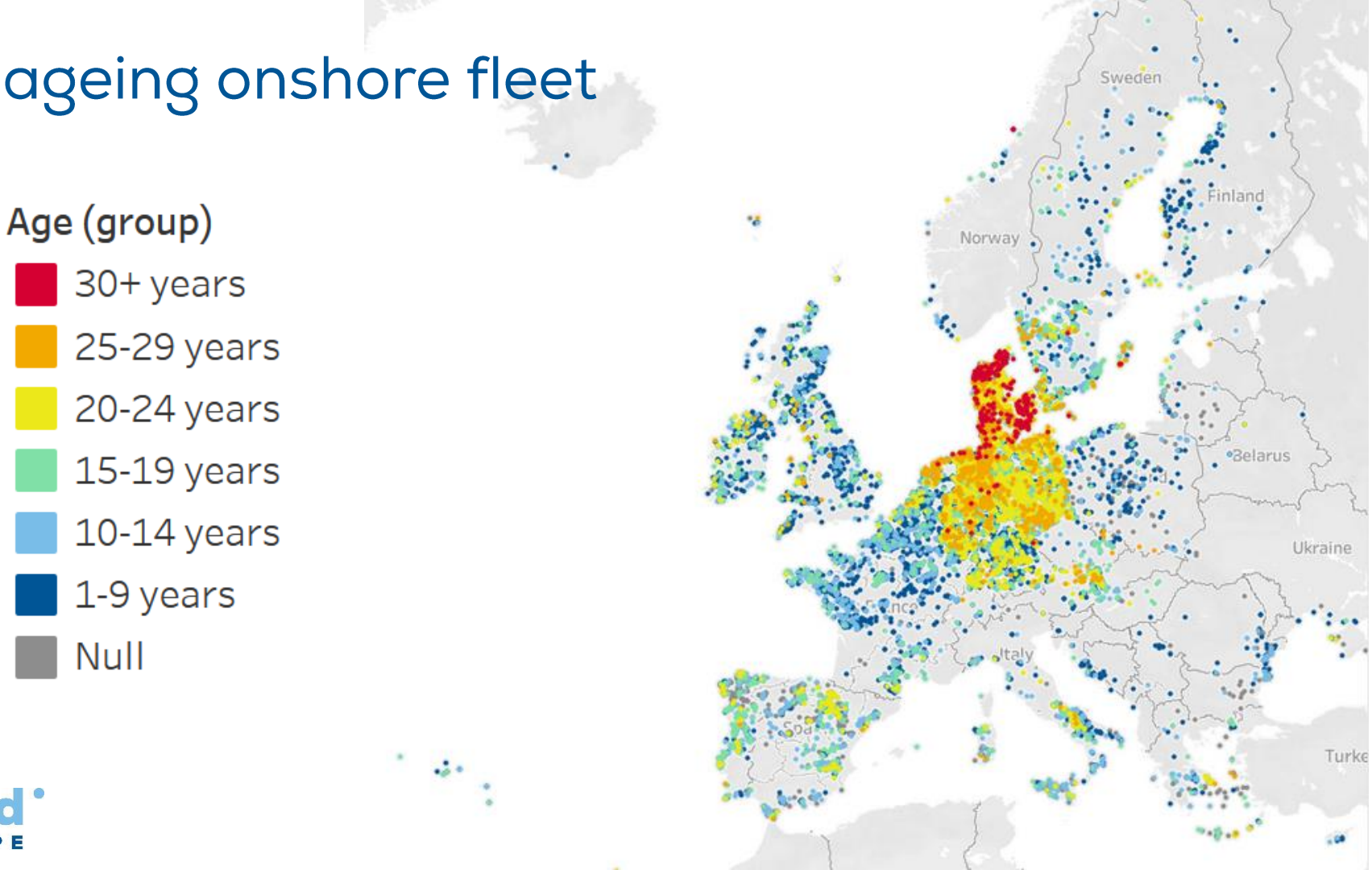
- GW installed
- Wind share of electricity demand

Huge increase in wind capacity coming



EU-27. Source: WindEurope, 2030 & 2050 EC ALLBNK (2030 Impact Assessment)

An ageing onshore fleet



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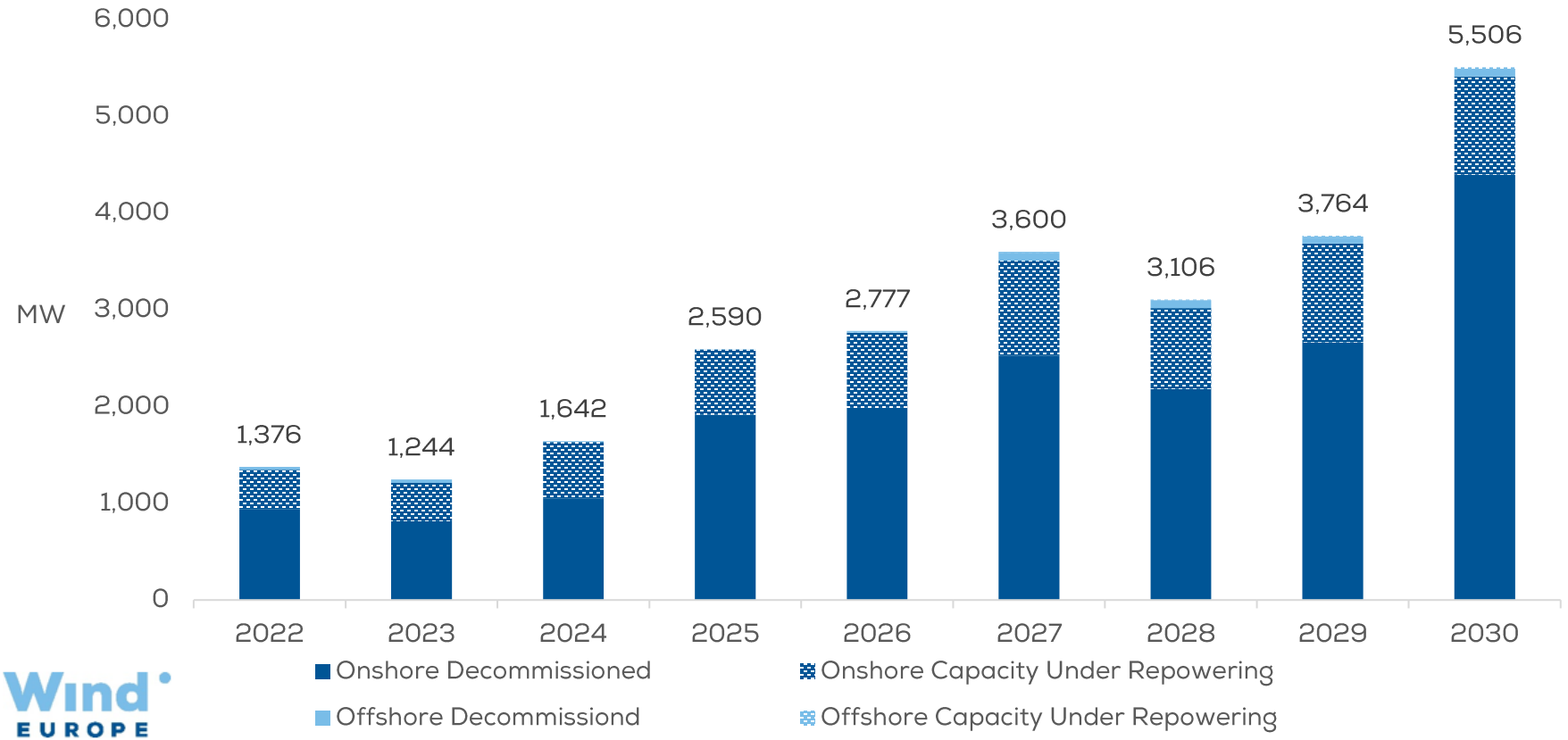
More capacity will reach its natural end of life



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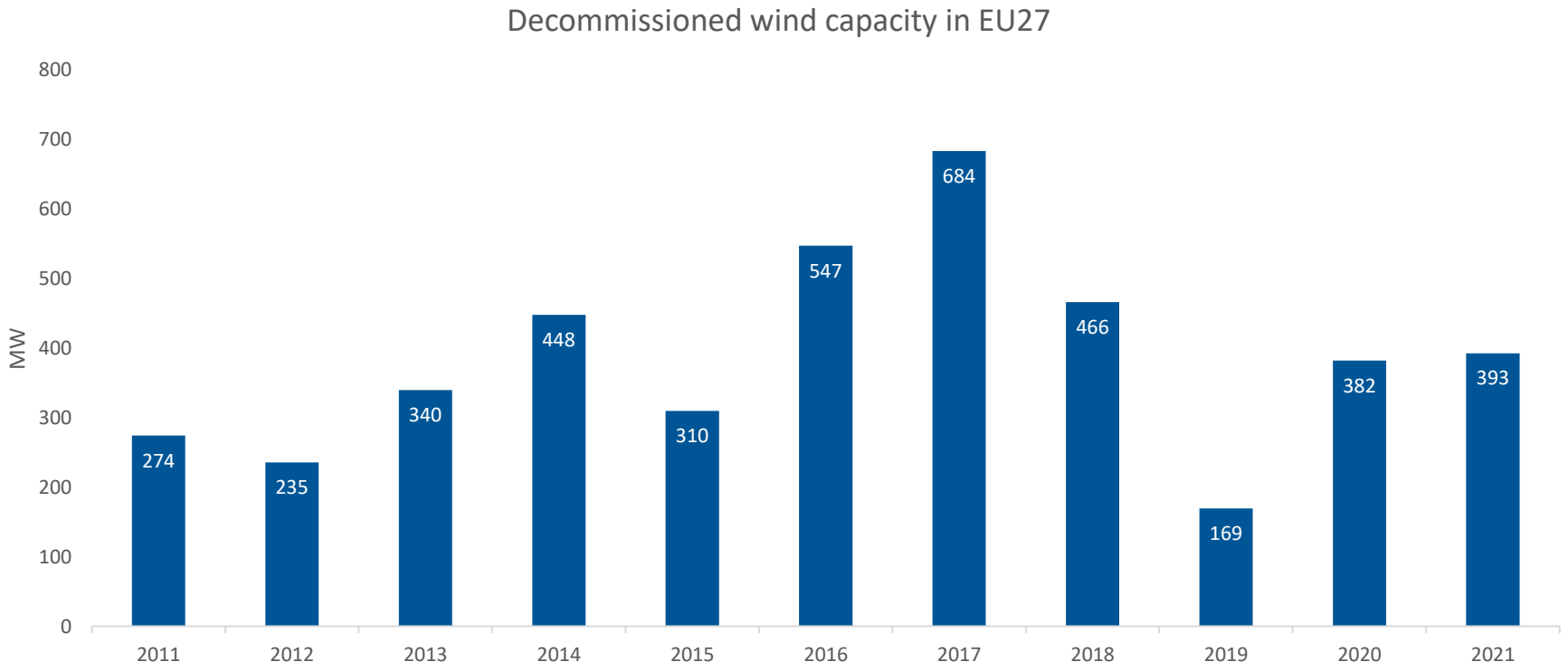
But decommissioning is limited



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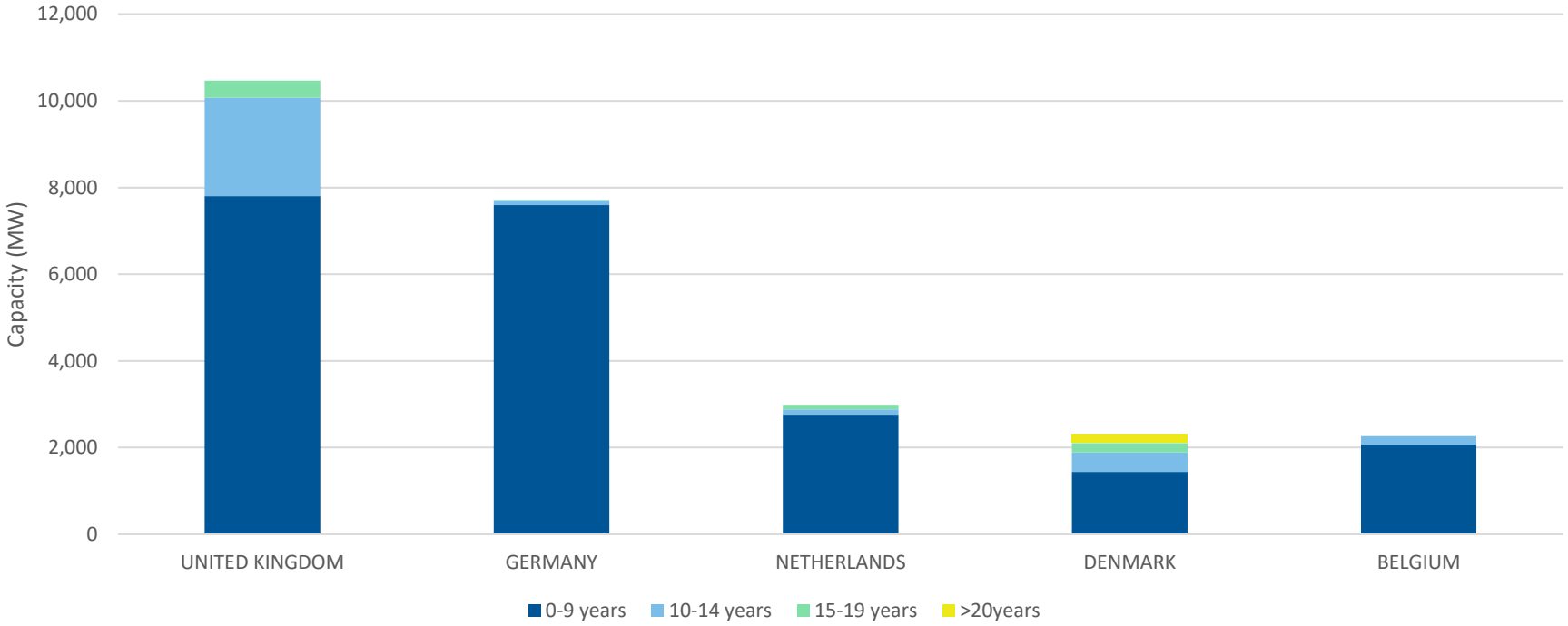
How old are Europe's offshore wind turbines ?



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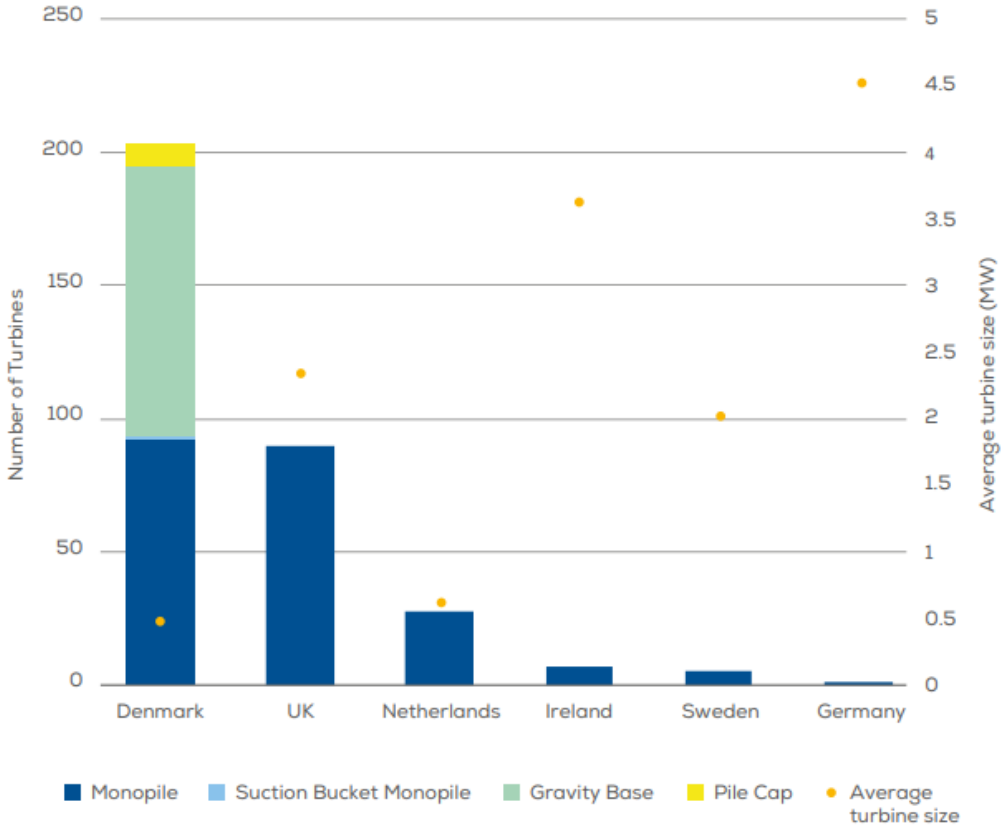
300 turbines could be decommissioned by 2030



Source: WindEurope, 2030 Vision for European Offshore Wind Ports


Vindeby
4.95 MW
1991: First offshore
wind farm in the world
11 x 450 kW
Siemens Gamesa
Renewable Energy
After 25 years of useful life, Vindeby was
decommissioned in 2017
Source: Ørsted for Youtube


Irene Vorrink
16.8 MW
1996: First
28 x 600 kW
Siemens Gamesa
Renewable Energy
After 25 years of useful life, Irene Vorink was decommissioned in 2022
Source: Vattenfall, All copyrights Jorrit Lousberg, Zeist, The Netherlands

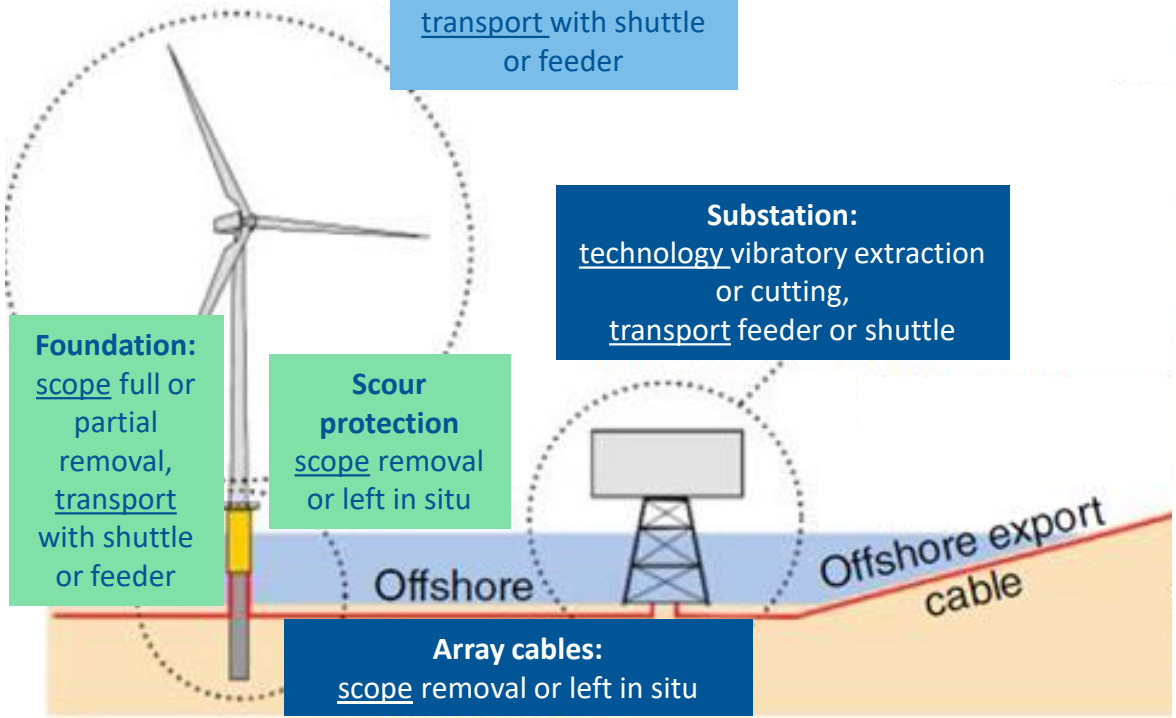
What and how to decommission ?

Turbine:
transport with shuttle or feeder

Substation:
technology vibratory extraction or cutting,
transport feeder or shuttle

Foundation:
scope full or partial removal,
transport with shuttle or feeder

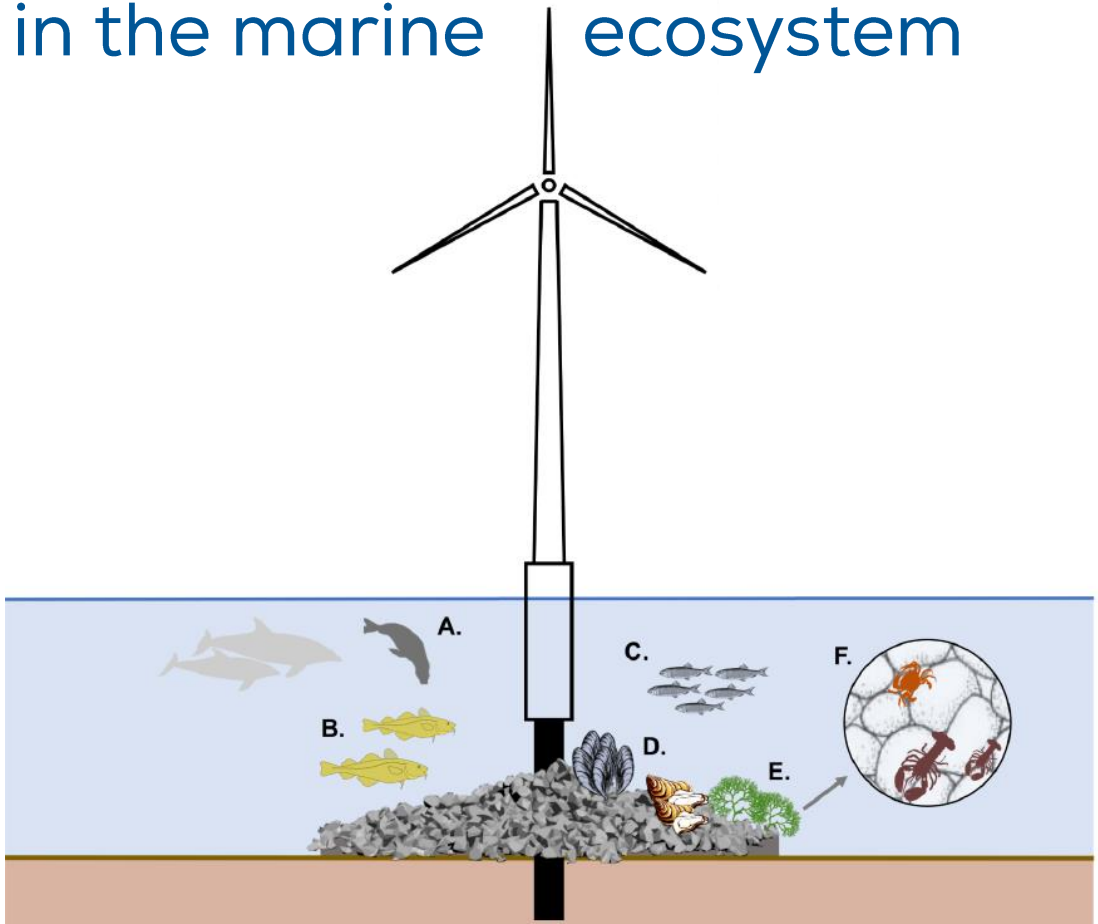
Scour protection
scope removal or left in situ



Array cables:
scope removal or left in situ

Decommissioning scenario		WTG	WTG-FOU			OSS		SPL	Sea cables
		Transport	Scope of decom-missioning	Decom-missioning technology	Transport	Decom-missioning technology	Load-off at harbour	Scope of decom-missioning	Scope of decom-missioning
BS	Baseline scenario	Shuttle concept	Cut 1 m below seabed	AWJ	Shuttle concept	AWJ	Crane vessel	Removal	Removal
S1	Feeder concept: WTG	Feeder concept	Cut 1 m below seabed	AWJ	Shuttle concept	AWJ	Crane vessel	Removal	Removal
S2	Feeder concept: WTG-FOU	Shuttle concept	Cut 1 m below seabed	AWJ	Feeder concept	AWJ	Crane vessel	Removal	Removal
S3	Feeder concept: WTG und WTG-FOU	Feeder concept	Cut 1 m below seabed	AWJ	Feeder concept	AWJ	Crane vessel	Removal	Removal
S4	Load-off OSS with SPMT	Shuttle concept	Cut 1 m below seabed	AWJ	Shuttle concept	AWJ	Roll-off with SPMT	Removal	Removal
S5	SPL left in situ	Shuttle concept	Cut 1 m below seabed	AWJ	Shuttle concept	AWJ	Crane vessel	Left in situ	Removal
S6	Sea cables left in situ	Shuttle concept	Cut 1 m below seabed	AWJ	Shuttle concept	AWJ	Crane vessel	Removal	Left in situ
S7	WTG-FOU: Cut above seabed	Shuttle concept	Cut 3 m above seabed	AWJ	Shuttle concept	AWJ	Crane vessel	Left in situ	Removal
S8	WTG-FOU: Complete removal	Shuttle concept	Complete removal	AWJ -/ Vibratory extraction	Shuttle concept	AWJ	Crane vessel	Removal	Removal
S9	FOU: Cut with diamond wire saw	Shuttle concept	Cut 1 m below seabed	Diamond wire cutting machine	Shuttle concept	Diamond wire cutting machine	Crane vessel	Removal	Removal

We need to understand the implications of offshore wind farms in the marine ecosystem



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Questions for offshore decommissioning

1. Is there a lasting contribution of foundations to marine life and habitat restoration ?
2. Do we want to build new wind farms in the area ? And can we re-use infrastructure ?
3. What are the least impactful decommissioning operations ?
4. Where do we find the space for decommissioned components ?

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THANK YOU !
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