Growth Opportunities of Offshore Wind Energy and Decommissioning in the North Sea Region

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Outline

1. Why Offshore Wind matters
2. What about Decommissioning?
3. Practical Challenges
4. Conclusion

About us

- Independent economic research institute
- Main areas of research:
  - Energy and environmental economics
  - Urban and regional economics
  - International economics
  - Labour, education and demography
- Application-oriented research
- Involved in various European cooperation projects

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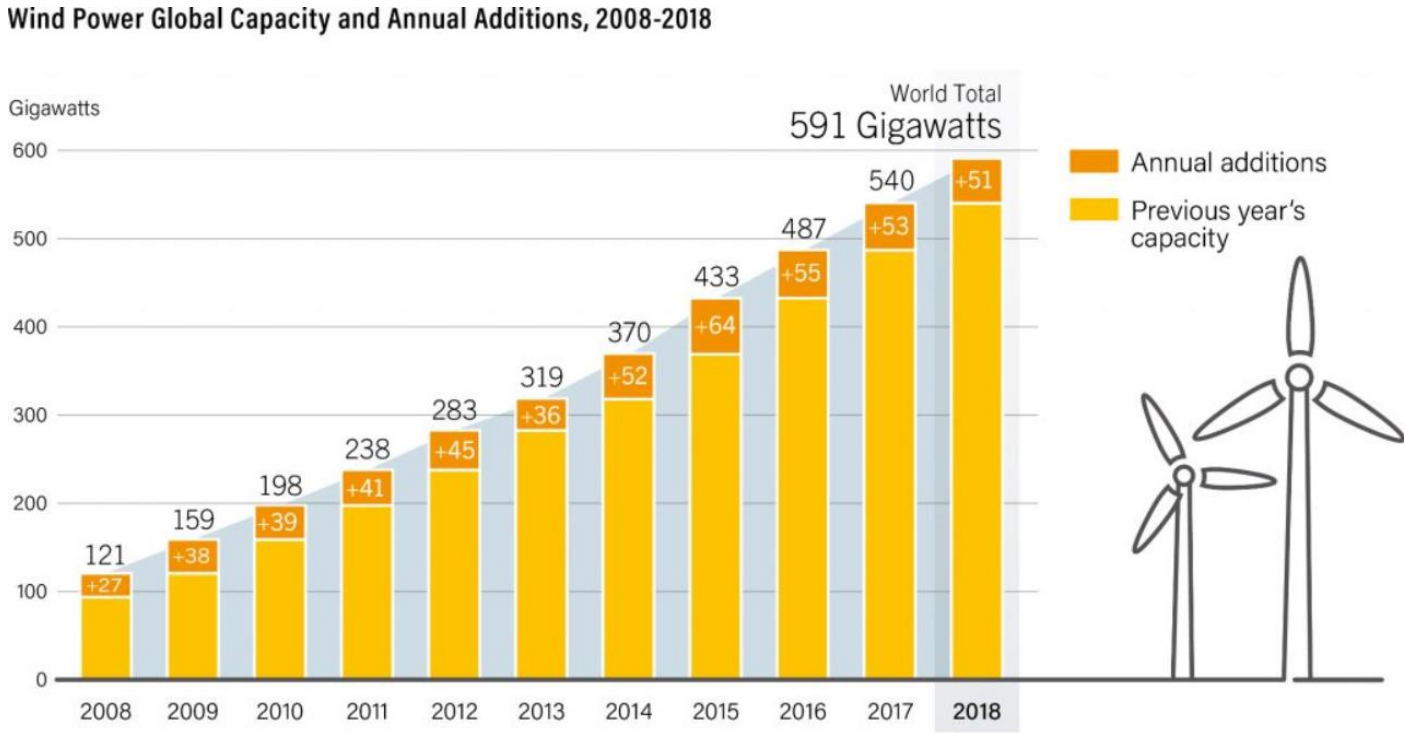
1. Why Offshore Wind matters

- Greenhouse gas emissions must be reduced significantly
- Fossil fuels have to be substituted
- Wind energy is flourishing
- Focus on offshore energy
- Multinational industry
- Significant job effects



Source: REVE (2019): The wind energy capacity in 2018, https://www.evwind.es/2019/06/21/at-least-103-countries-have-commercial-wind-energy-capacity/67662

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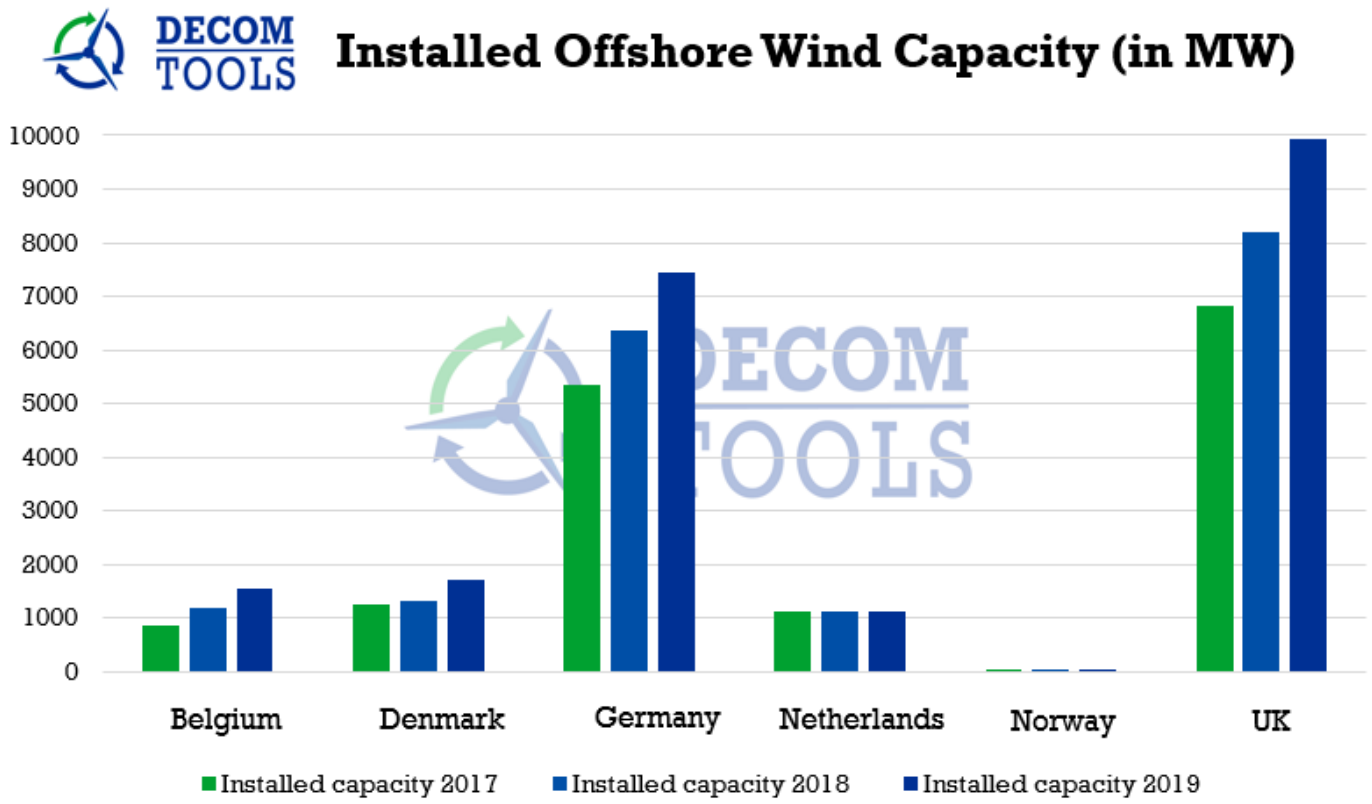
1. Why Offshore Wind matters

- Europe has been a frontrunner in offshore wind
- USA and Asia catching up in recent years
- Germany and UK (Europe), China, Japan, Taiwan (Asia), USA (North America) are dominating



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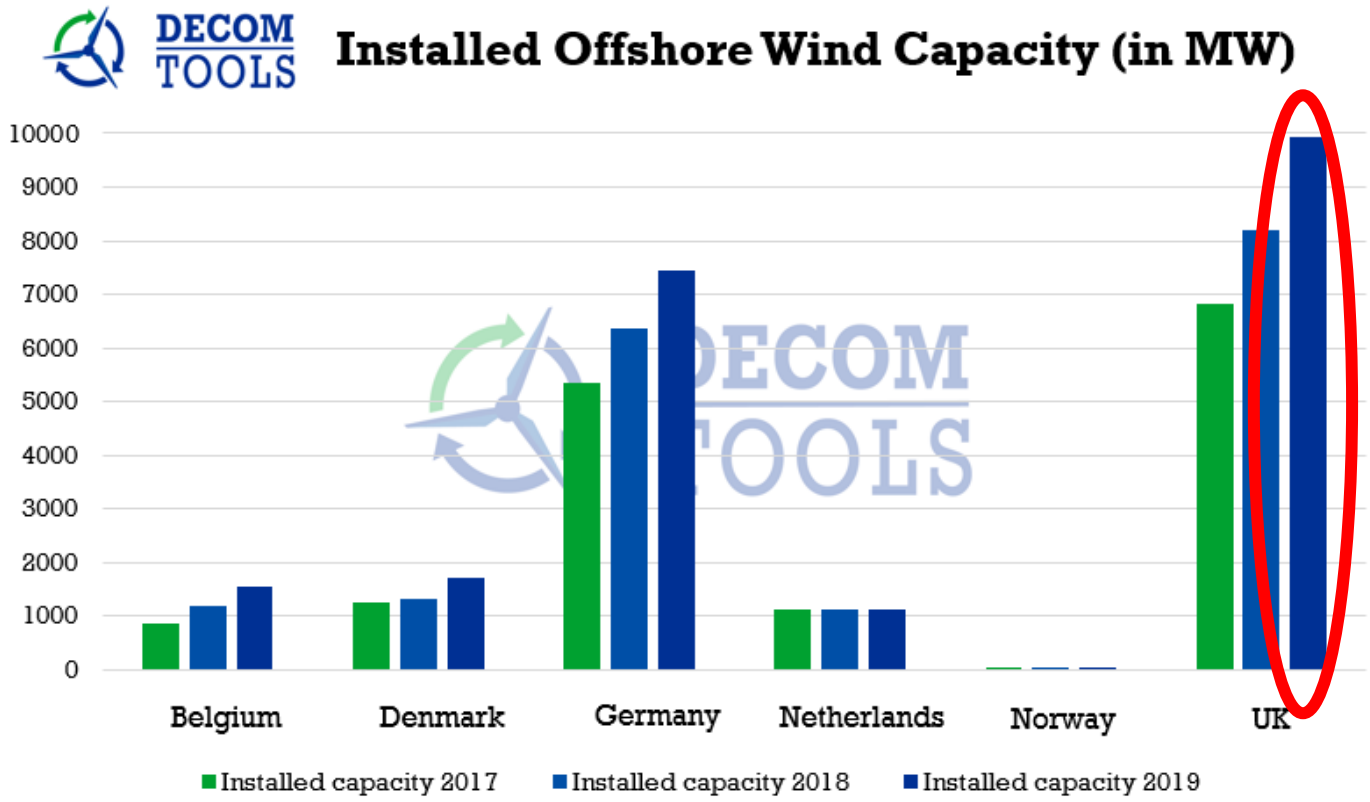

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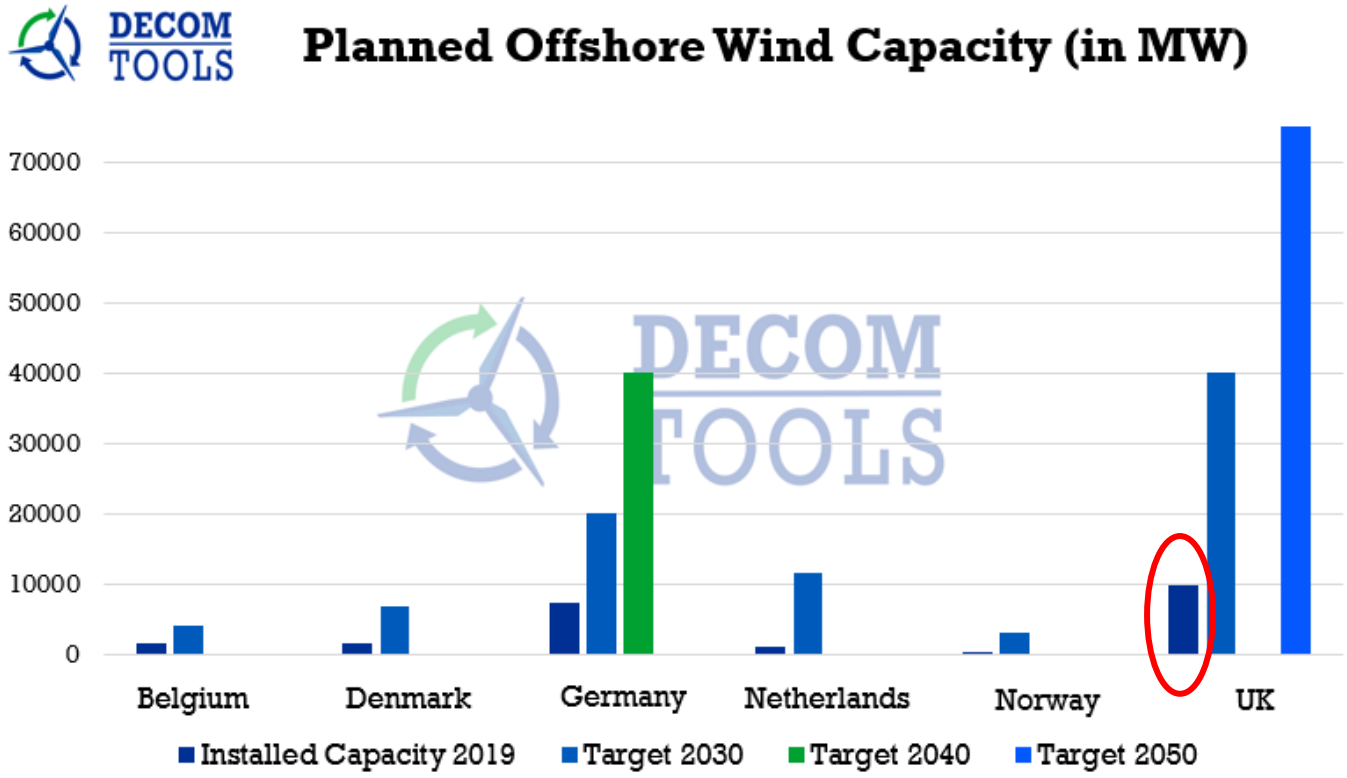
1. Why Offshore Wind matters

- 10.4% of European power demand was met by wind energy in 2016
- Increase installed offshore wind energy capacity in Europe to 300GW by 2050 (Green Deal)
- At current speed 90GW until 2050 is expected



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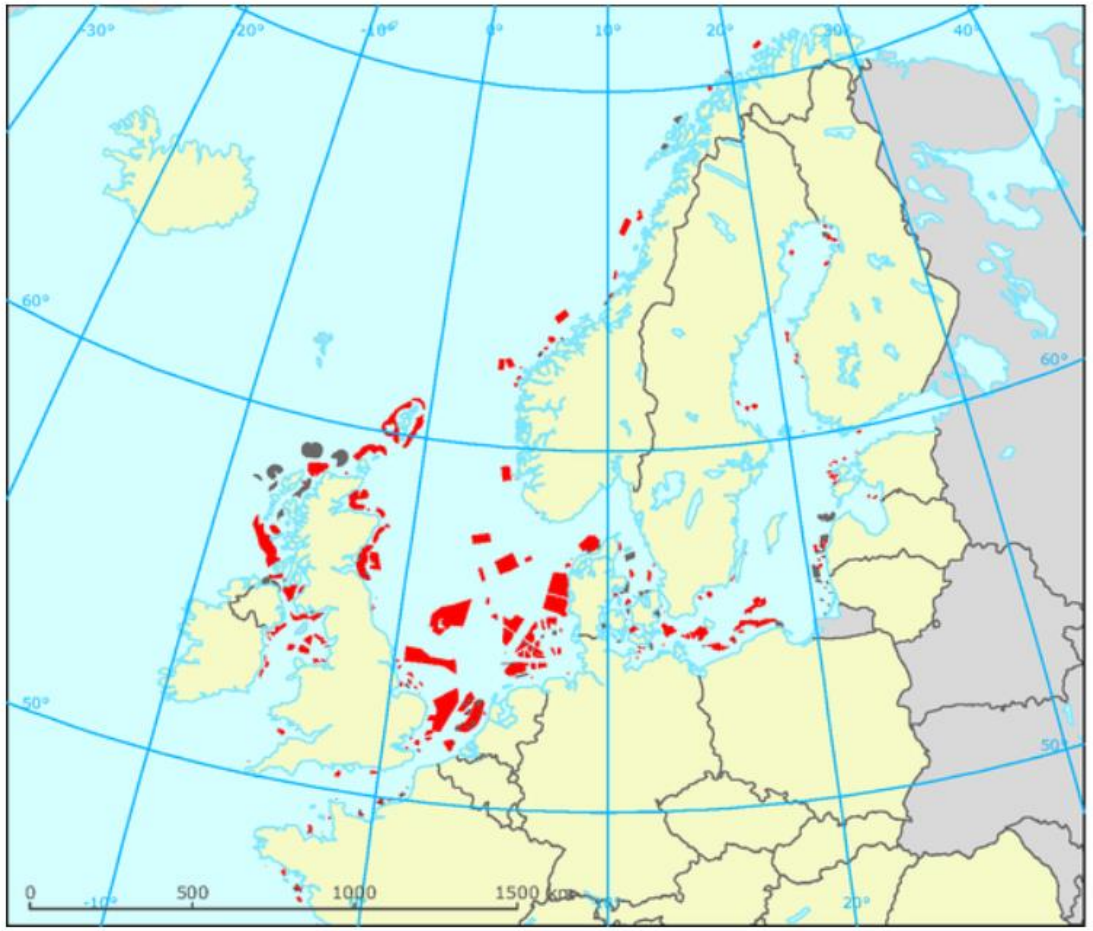
1. Why Offshore Wind matters

- North Sea Region (NSR) as a focus region for offshore wind
- 62% of European installed offshore wind capacity
- Favourable conditions: high wind speeds, shallow water, mostly small waves
- High further development potential



Source: EEA (2015): Development of wind farm areas in Europe, https://www.eea.europa.eu/data-and-maps/figures/development-of-wind-farm-areas

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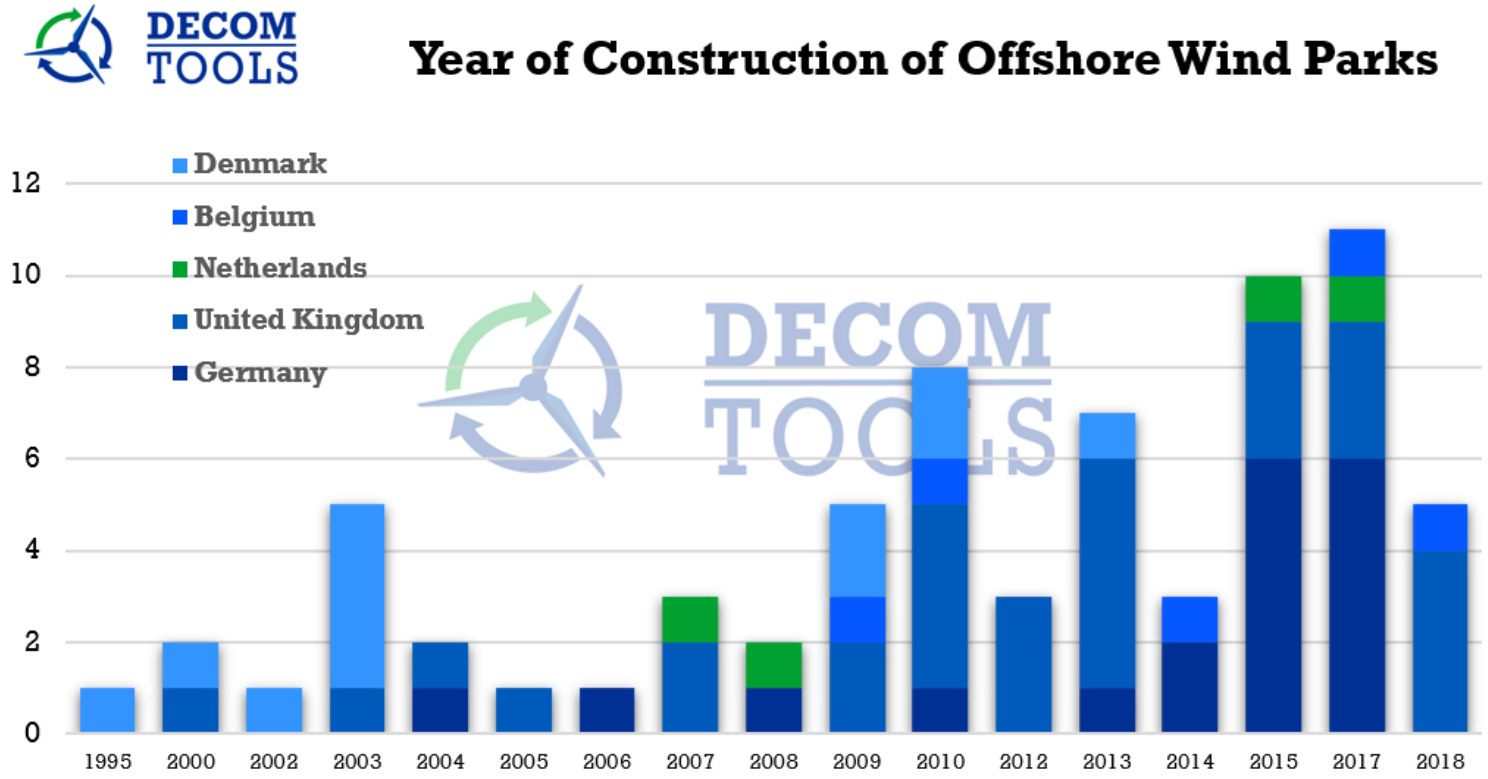
2. What about Decommissioning?

- Offshore wind is established in the NSR
- Construction dates reflect national cycles
- Pioneers now have the oldest wind farms
- Question of decommissioning arises



Source: Kruse, M. (2019): Market Analysis DecomTools 2019, https://northsearegion.eu/media/11753/market-analysis_decomtools.pdf

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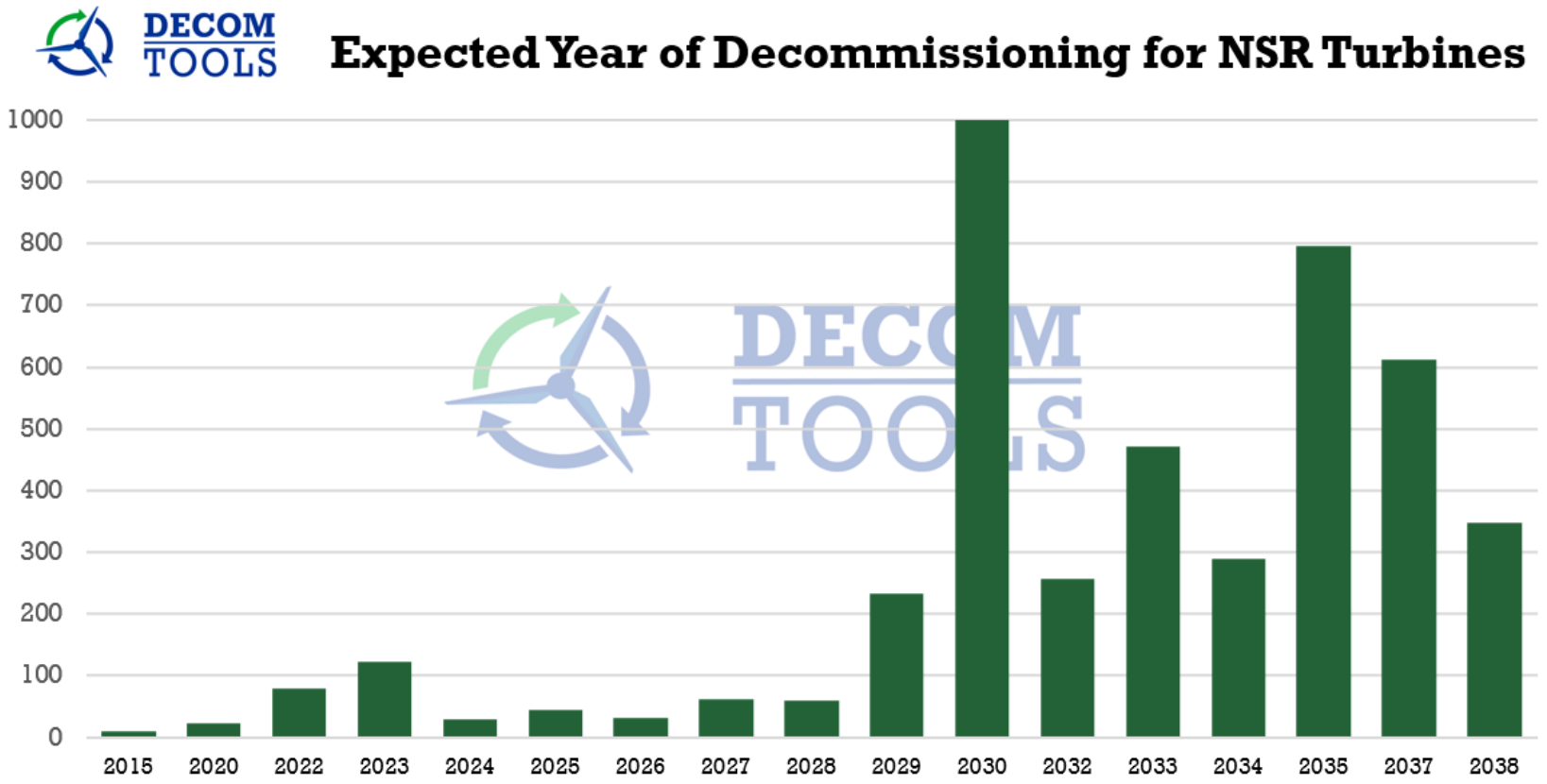
2. What about Decommissioning?

- Expected lifetime of 20-25 years
- Sometimes lower lifetime
- First decommissioning projects already completed



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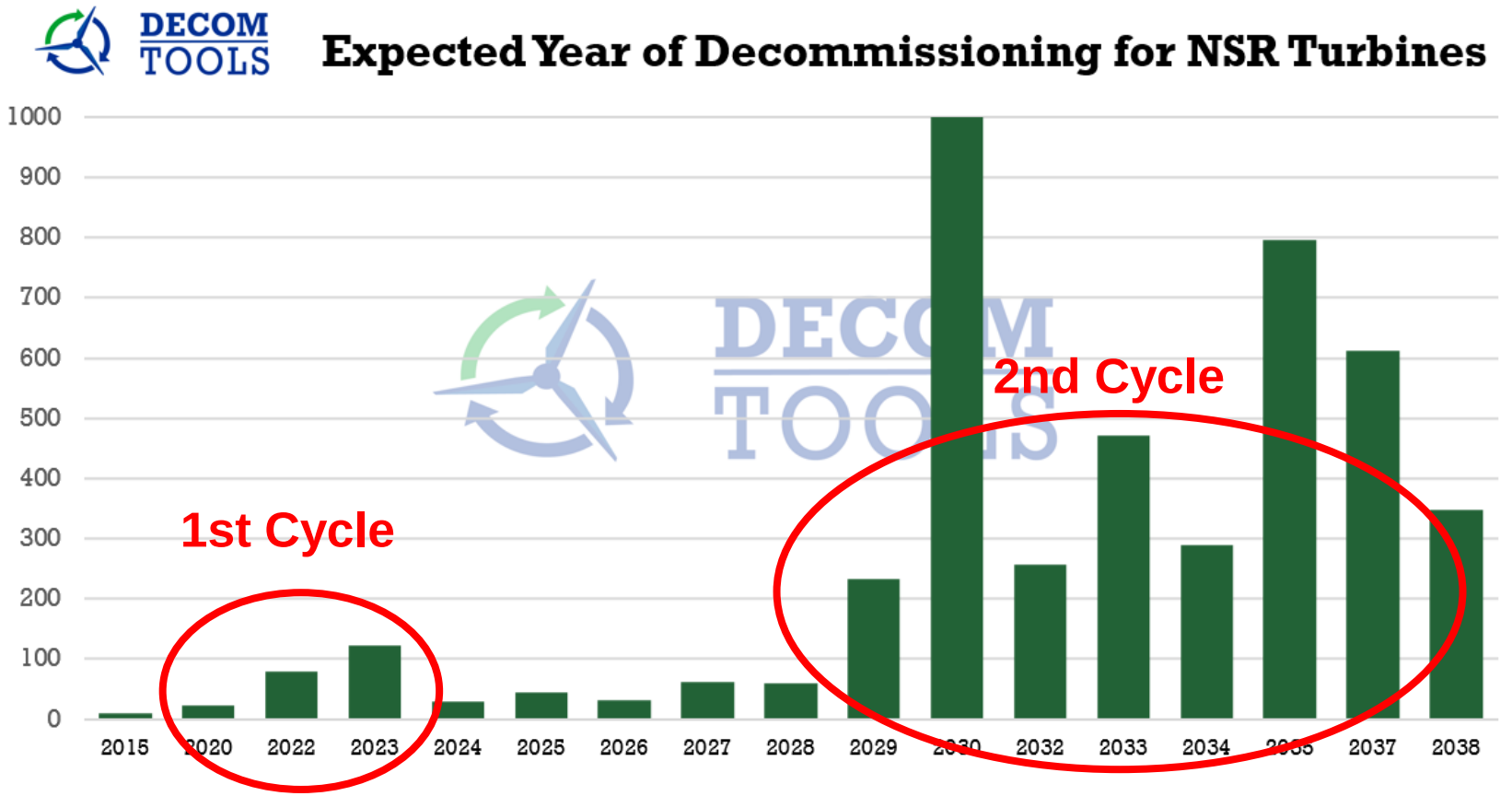
2. What about Decommissioning?

- Two cycles of decommissioning
- Increasing numbers of wind farms qualified for decommissioning

~ 120 in 2023

~ 250 in 2029

~ 1,000 in 2030



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2. What about Decommissioning?

- Experience from former decommissioning projects highlight complexity
- Educational example: Vindeby wind farm in Denmark – world's first offshore wind farm
  - Lack of documentation
  - Complicated recycling

3. Practical Challenges

- Expected decommissioning costs differ significantly
  - £40,000 per MW
  - £100,000 – £300,000 per MW
- Legal uncertainties
- Ecological questions
- How to recycle composite materials?
- Access to qualified labour force
- Availability of adequate infrastructure

4. Conclusion

- Time is running
- Prepare for decommissioning
  - Regulation
  - Processes
  - Infrastructure & qualification
- Expect the unexpected
- Make Europe a decommissioning pioneer

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Thank you for your Attention!

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