

Supply chain insights on wind turbine manufacturing

Evdokia Tapoglou
Energy Transition Insights for Policy (JRC C.7)

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Outline

- Policy & industrial context
- Our work on wind value chains
- Data sources
- Components sourcing
- Manufacturing capacities
- Conclusions & supply chain implications



Policy context

~32%
of EU GDP

Manufacturing
Accounting for 80%
of the EU exports

**500
GW**

of wind capacity
by 2030

REPowerEU
42.5% share of
renewables in the EU's
overall energy
consumption by 2030

≥40%
of annual
deployment
needs by 2030

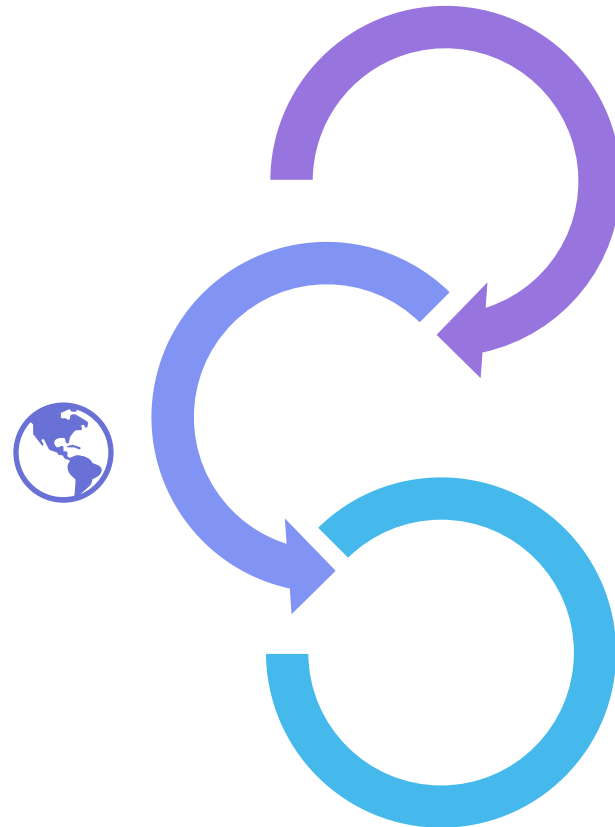
Net Zero Industry Act
EU manufacturers should supply key net-zero
technologies

15%
of the global
production by
2040



Our work on wind value chains

Understand sourcing patterns and manufacturing locations for EU and global companies




Map where wind turbine components are manufactured



Assess to what extent EU can meet its own demand and contribute to global supply chains

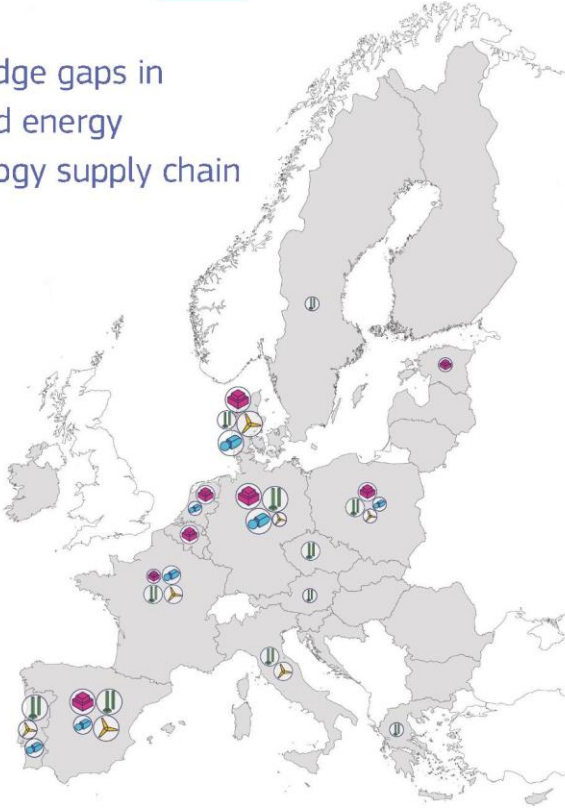
Our work on wind value chains

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European Commission

Knowledge gaps in the wind energy technology supply chain



Tapoglou E.
Georgakaki A.
Prior Arce A.
Mc Govern L.
2025

Joint Research Centre
EUR 40353



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Joint Research Centre

SCIENCE FOR POLICY BRIEF



The manufacturing landscape of wind turbine components

2025

HIGHLIGHTS

- ▶ The Net-Zero Industry Act (NZIA) aims to ensure the reduction of strategic dependencies in the Union of net-zero technologies and their supply chains by reaching a manufacturing capacity for those technologies of a benchmark of at least 40% of the Union's annual deployment needs for the corresponding technologies necessary to achieve the Union's 2030 climate and energy targets. Current data suggest that the EU industry is already broadly capable of meeting this level of demand for the wind sector.
- ▶ Despite China's dominance, the EU maintains a significant role in global wind turbine component manufacturing, with countries like Spain, Denmark, and Germany having substantial manufacturing capacities for key components such as blades and nacelles.
- ▶ The EU supply chain for wind turbine components shows a strong preference for sourcing domestically. About 60% of components are sourced from EU-based companies, highlighting both the region's robust manufacturing capabilities, and its focus on reducing reliance on global supply chains.

Introduction

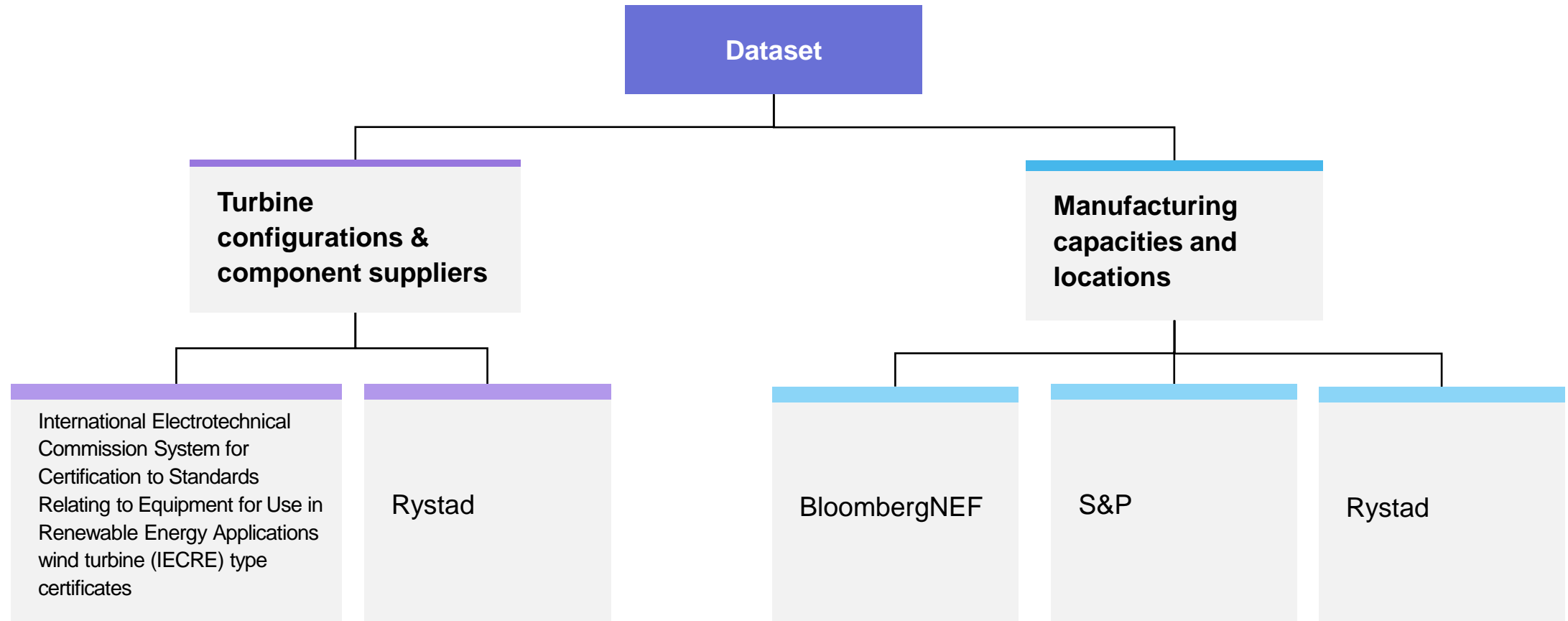
The manufacturing sector has a critical role in the EU economy, accounting for EUR 5 860 billion of manufacturing sales and representing approximately 32% of EU gross domestic product (GDP) in 2024 [1]. Manufacturing is a leading driver of innovation, responsible for a significant share of research and development activities, and it contributes to nearly 80% of EU exports. These factors highlight the sector's essential role in sustaining economic growth

and maintaining the competitive position of the EU in the global market. As the world transitions towards a low-carbon economy, the importance of manufacturing in the EU will only continue to grow, particularly in the production of net-zero energy technologies such as wind turbines, solar panels, and energy storage systems.

The wind energy sector is a prime example of the importance of EU manufacturing for net-zero technologies. The EU target of at least 42.5% renewable energy by 2030, aiming to reach 45% [2], will require installed capacity to grow from 204 GW

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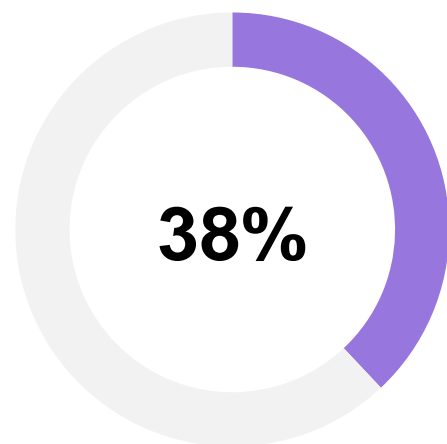
Data sources



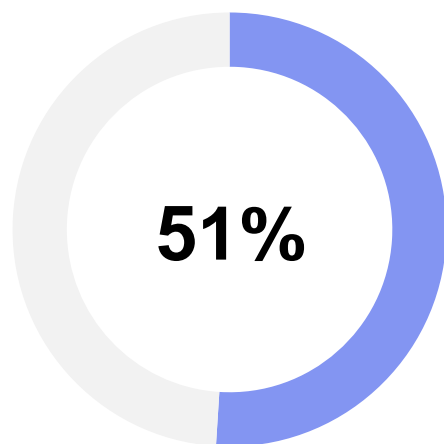
Component sourcing



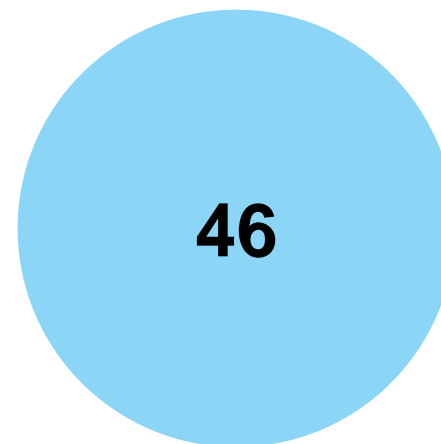
Dataset



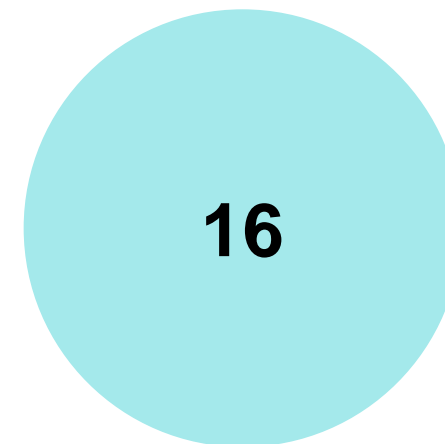
of EU 2022–2025
installations



of installations
by EU
manufacturers



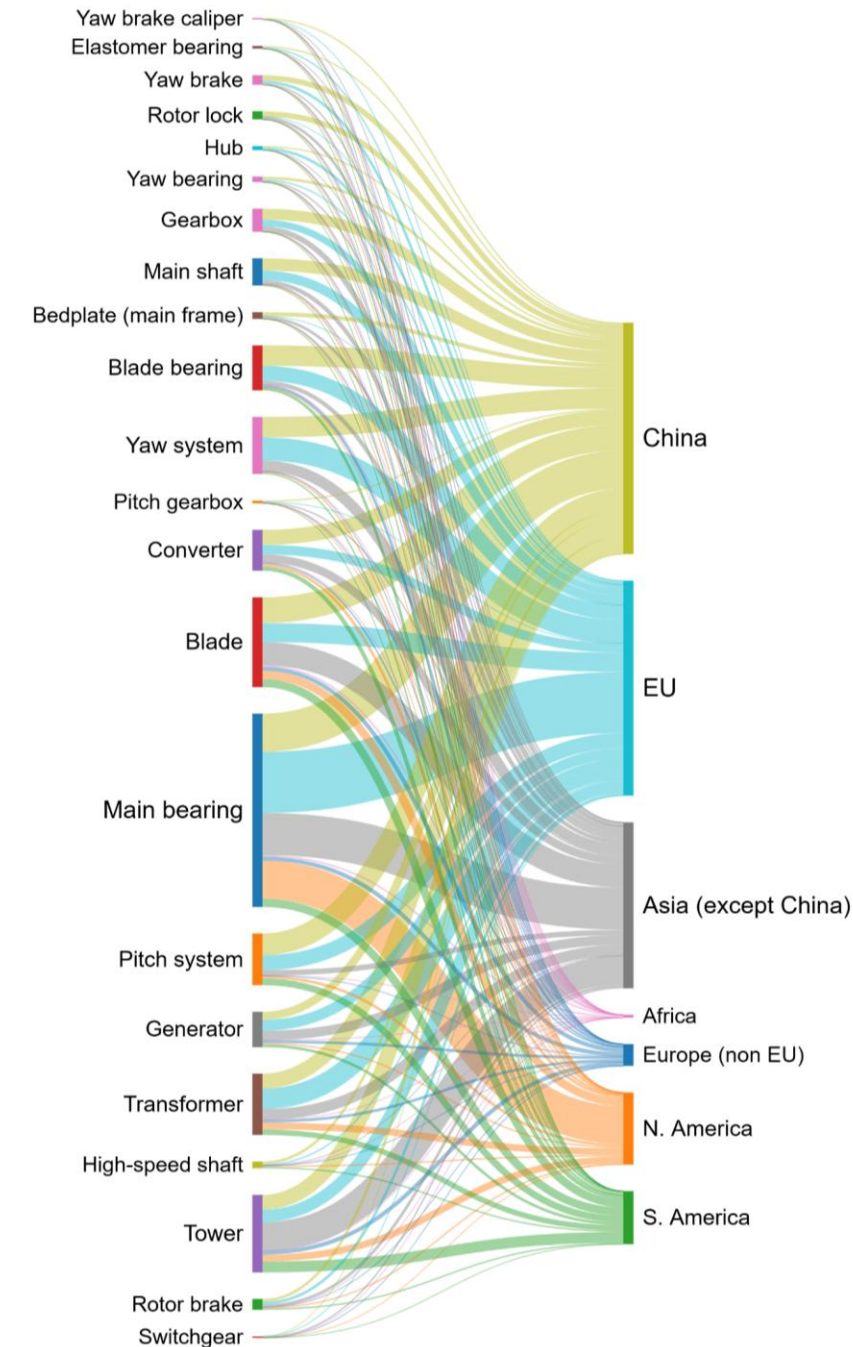
wind turbine
models
Equally divided to EU
and non-EU
manufacturers



manufacturers
5 with EU HQ, 11 with
non-EU HQ

Global component sourcing

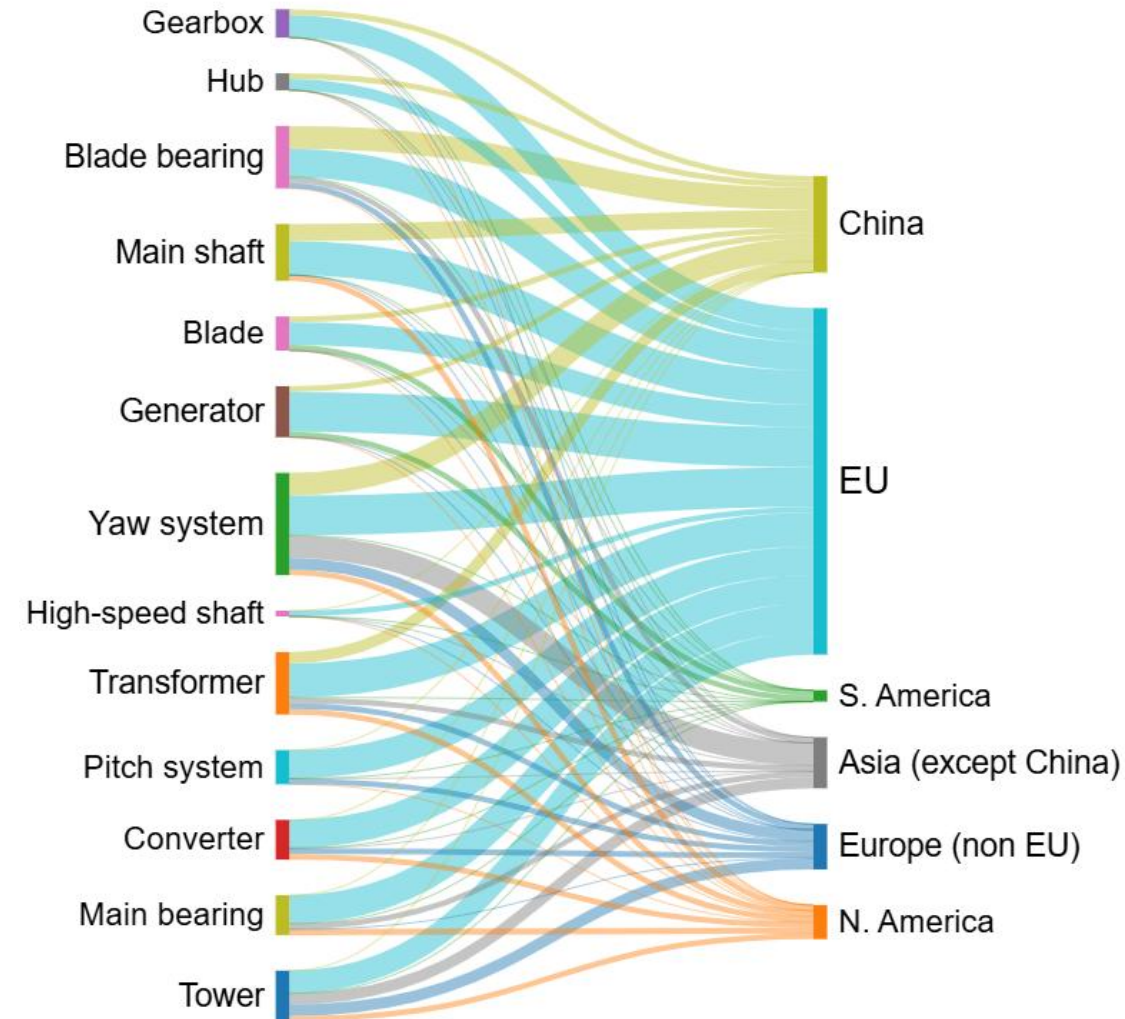
- For all wind turbine manufacturers
- 560 manufacturing locations are recorded:
 - China 30%
 - EU 28%
 - Rest of Asia 22%
- Nonetheless more manufacturing locations doesn't imply larger manufacturing capacity



Source: JRC analysis based on IECRE certificates and Rystad

Where EU manufacturers source from (HQ)

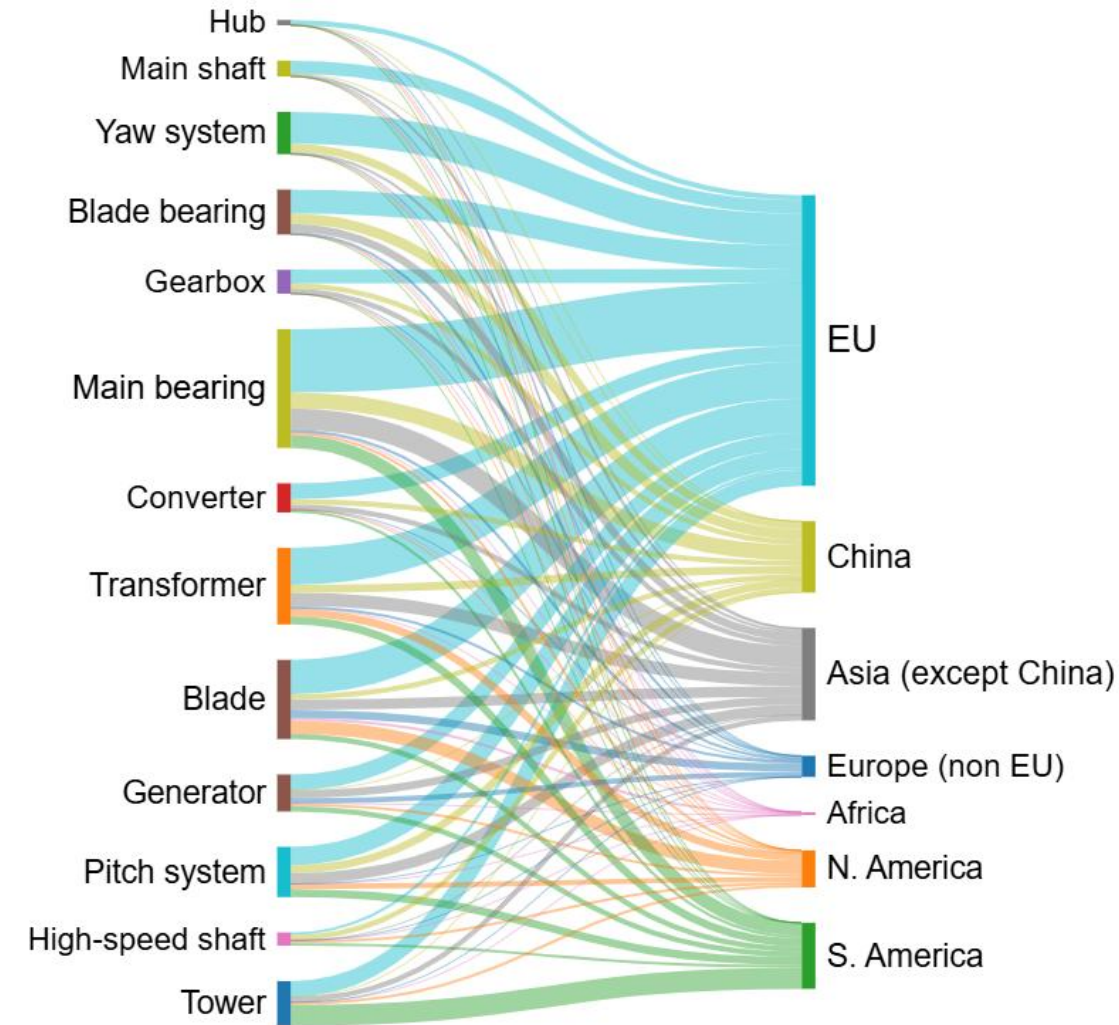
- 103 individual suppliers
 - 59% of the suppliers have HQ in the EU
 - 16% in China
 - Split between rest of Asia, N. America and rest of Europe (non-EU)
- Clear domestic preference, but also strategic links to Asian supply



Source: JRC analysis based on IECRE certificates and Rystad

Where EU manufacturers source from (manufacturing location)

- 223 manufacturing locations were identified
 - 59% of the suppliers in the EU
 - 28% in Asia (12% in China)
 - Remainder split between rest of Asia and rest of Europe (non-EU)
- 91% of the EU headquartered component suppliers have manufacturing capabilities within the EU
- Rotor brakes have the lowest EU manufacturing coverage

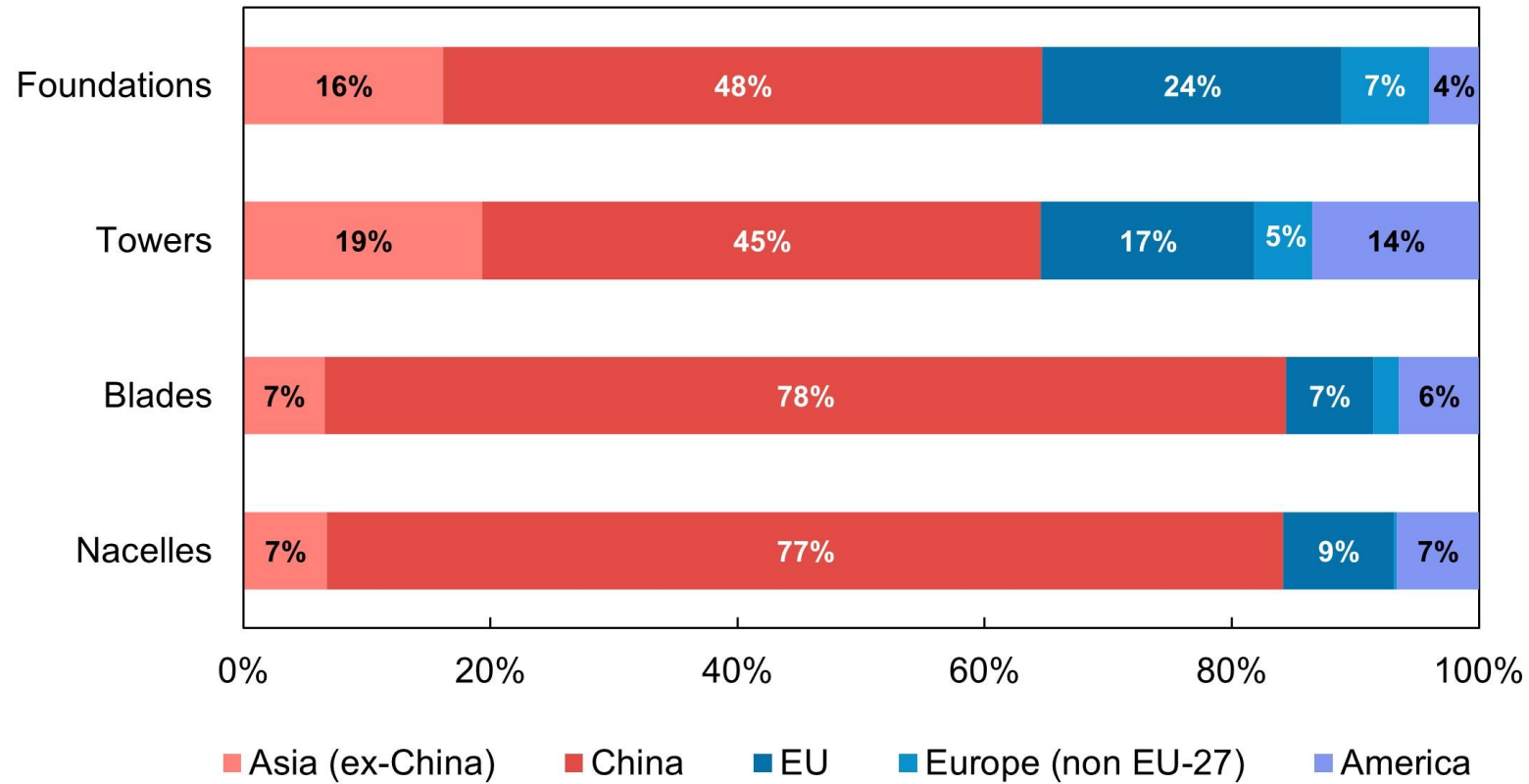


Source: JRC analysis based on IECRE certificates and Rystad

Manufacturing capacities



Global manufacturing capacity

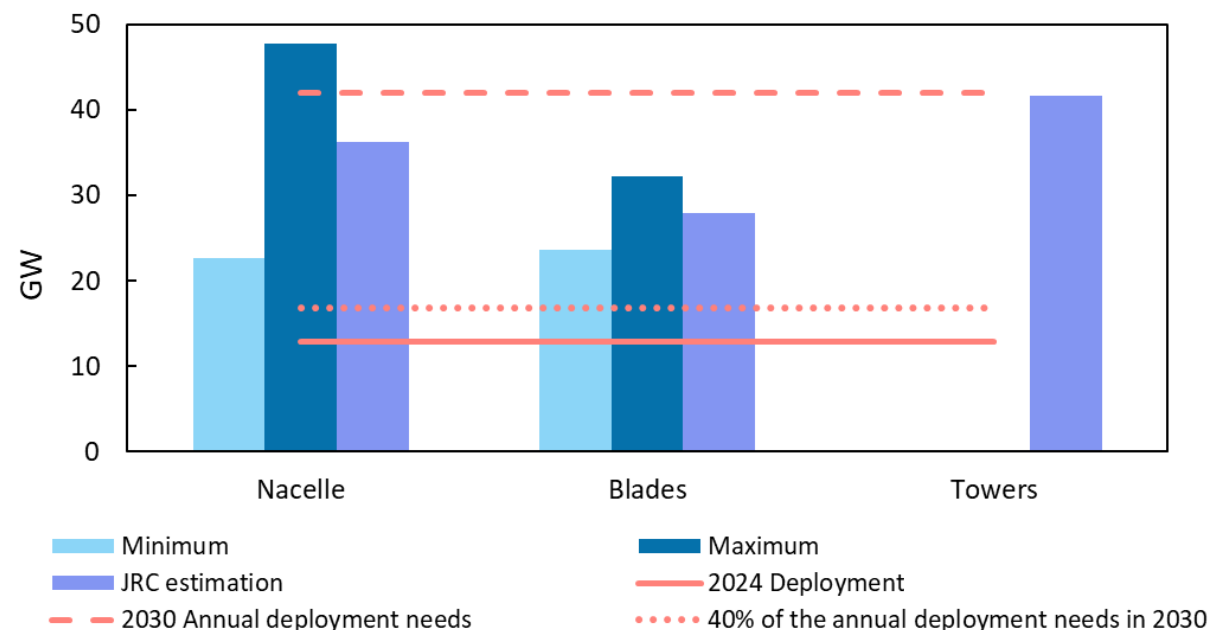


Source: JRC analysis based on BNEF, S&P and Rystad



EU capacity vs current deployment

- In 2024, EU installed 13 GW of wind (11.5 GW onshore, 1.5 GW offshore)
- EU manufacturers supply 88% of onshore and 96% of offshore 2024 installations
- For all three, capacity > 2024 deployment

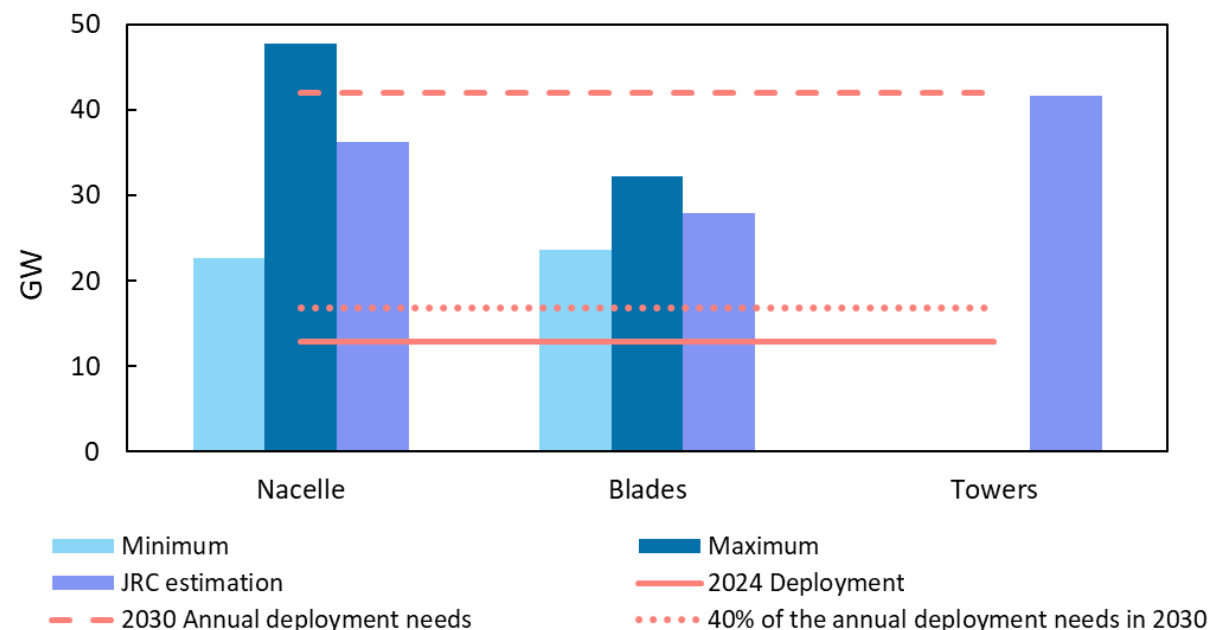


Source: JRC analysis based on BNEF, S&P and Rystad



EU capacity vs NZIA targets

- By 2030, annual EU deployments need to exceed 42 GW to hit REPowerEU goals
- NZIA requirement: $\geq 40\%$ of deployment manufactured in the EU \rightarrow 16.8 GW per component (40% of 42 GW)
- Estimated EU manufacturing capacity for key components
 - Nacelles: 36.2 GW
 - Blades: 30 GW
 - Towers: ~42 GW



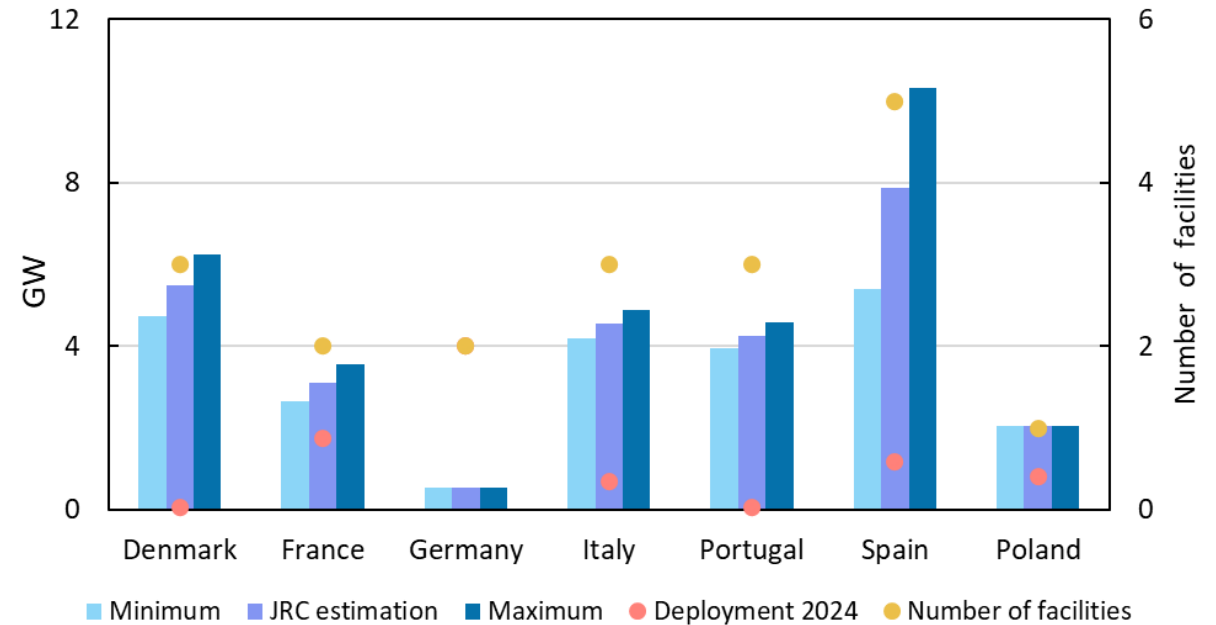
Source: JRC analysis based on BNEF, S&P and Rystad



Where is EU capacity and who owns it?

Blades

- Manufacturing countries
 - Spain 7.9 GW
 - Denmark 5.5 GW
 - Italy 4.5 GW
- Denmark, Portugal, Spain have large surplus capacity vs 2024 deployment
- All blade capacity from EU-HQ companies, 72% of parent companies also EU-based



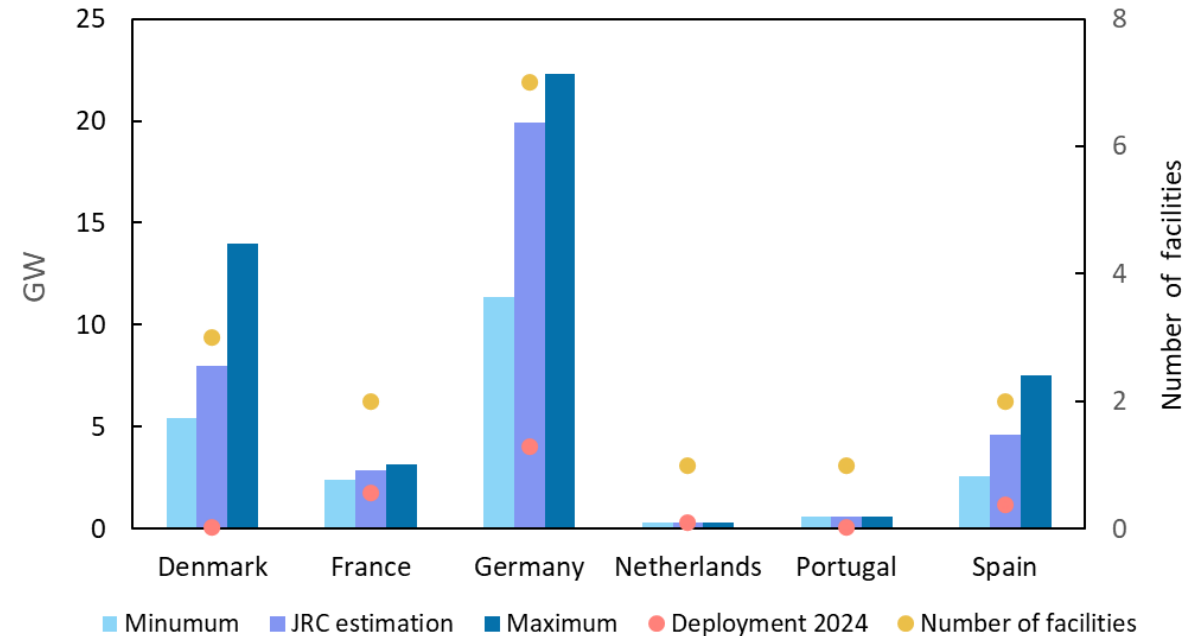
Source: JRC analysis based on BNEF, S&P and Rystad



Where is EU capacity and who owns it?

Nacelles

- Manufacturing countries
 - Germany 20 GW
 - Denmark 8 GW
 - Spain 4.6 GW
- 85% of capacity from EU-HQ firms, 85% EU parent ownership as well



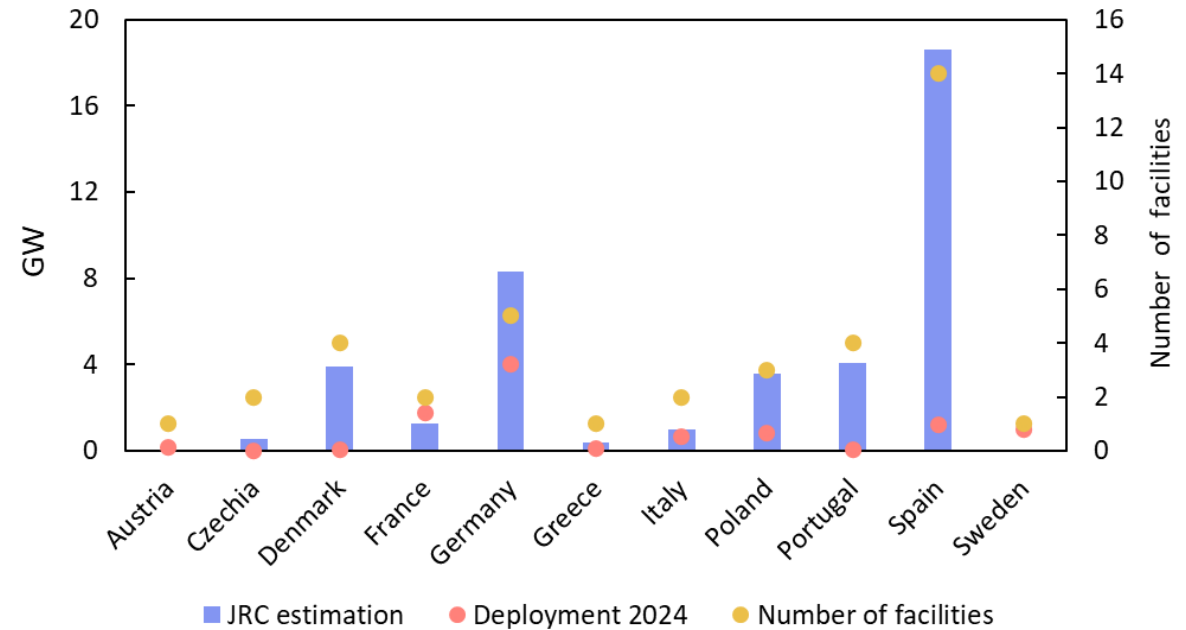
Source: JRC analysis based on BNEF, S&P and Rystad



Where is EU capacity and who owns it?

Towers

- Manufacturing countries
 - Spain 18.6 GW
 - Germany 8.3 GW
 - Portugal 4 GW
- 86% of tower capacity from EU-HQ firms, (75% EU at parent level)



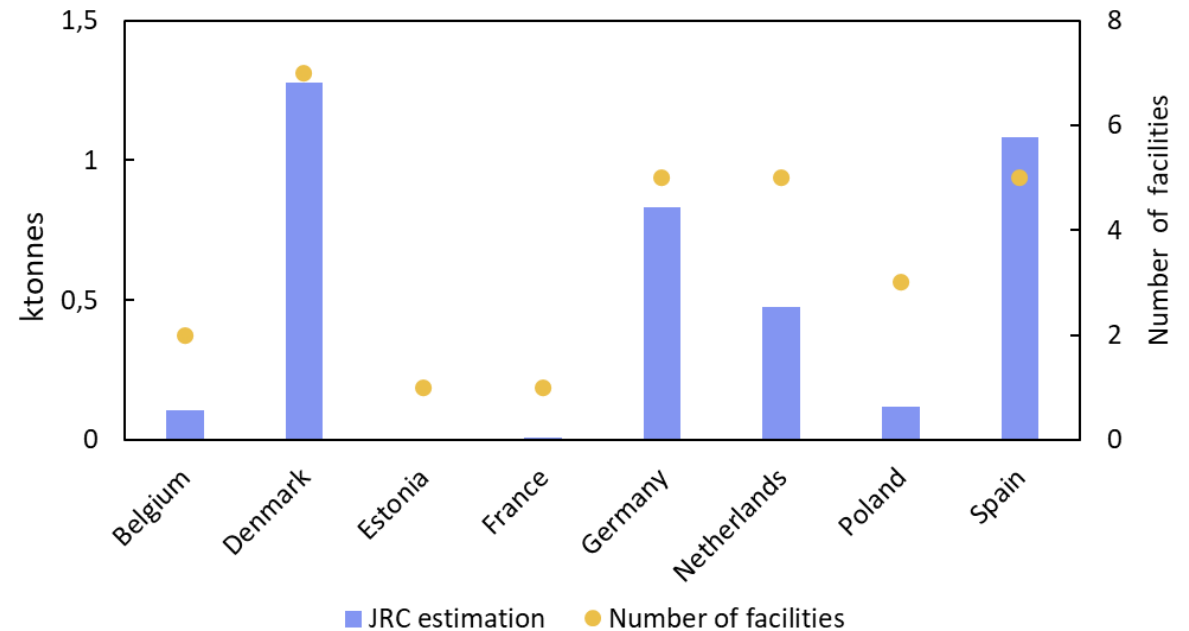
Source: JRC analysis based on BNEF, S&P and Rystad



Where is EU capacity and who owns it?

Foundations

- Manufacturing countries
 - Denmark 1.2 ktonnes
 - Spain 1 ktonne
 - Germany 0.8 ktonnes
- All companies HQ in EU, only one non-EU parent



Source: JRC analysis based on BNEF, S&P and Rystad

What does this mean for EU wind supply chains?

- Strong domestic backbone in the EU
 - EU manufacturers source ~60% of components from EU-based companies
 - Capacity for blades, nacelles, towers already above NZIA's 40% threshold for 2030
 - Capacity is geographically concentrated (Spain, Denmark, Germany) and largely controlled by EU firms
- But embedded in a global system
 - Significant number of manufacturing locations in Asia (especially China)
 - Global capacity for key components is dominated by China



What does this mean for EU wind supply chains?

- Resilience questions & potential bottlenecks
 - Some components (e.g. rotor brakes) show weaker EU presence → possible points of vulnerability
 - Data gaps at component-level make it harder to see hidden dependencies
- Follow-up
 - Maintain & expand EU capacity in key components and countries
 - Broaden analysis to more wind components and wind turbine models to fully map vulnerabilities



Thank you!



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