Supply chain insights on wind turbine manufacturing

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Energy Transition Insights for Policy (JRC C.7)

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European Commission

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

500 GW
of wind capacity by 2030

≥40%
of annual deployment needs by 2030

15%
of the global production by 2040

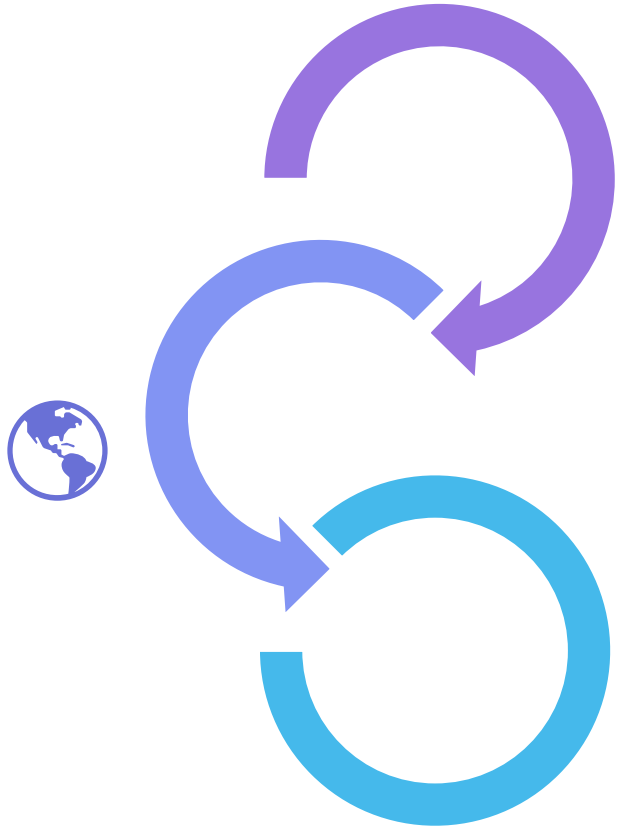
Manufacturing
Accounting for 80% of the EU exports

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

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

Our work on wind value chains

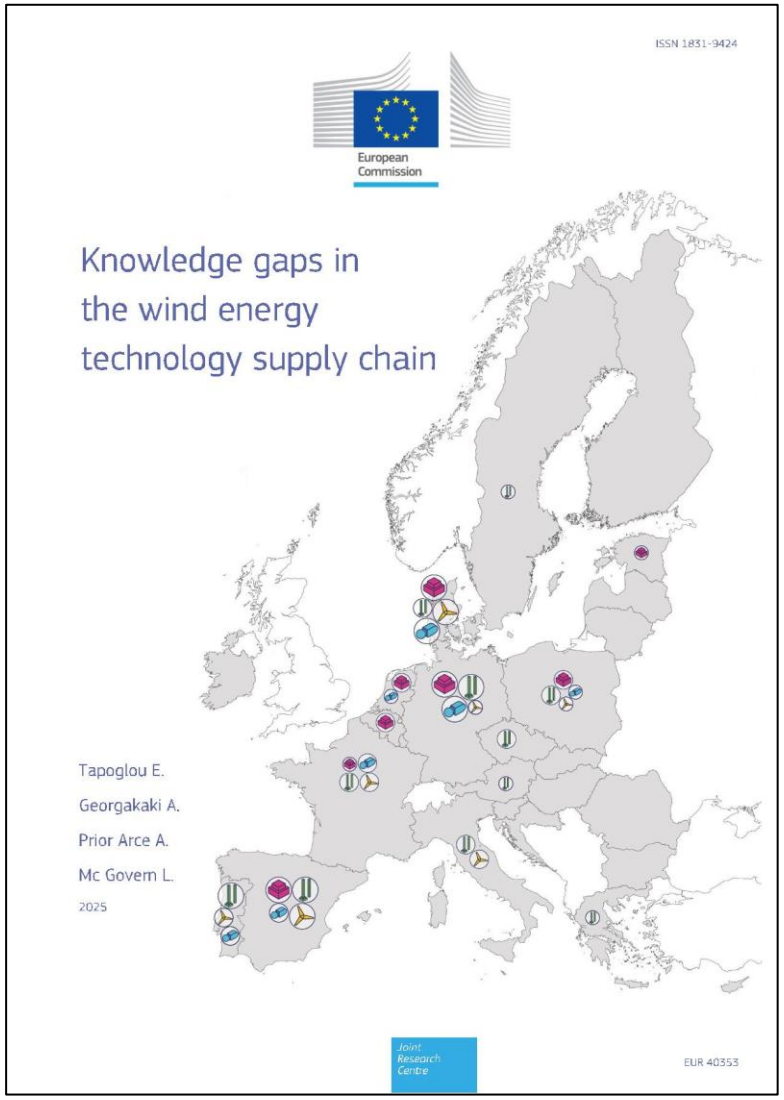
Understand sourcing patterns and manufacturing locations for EU and global companies



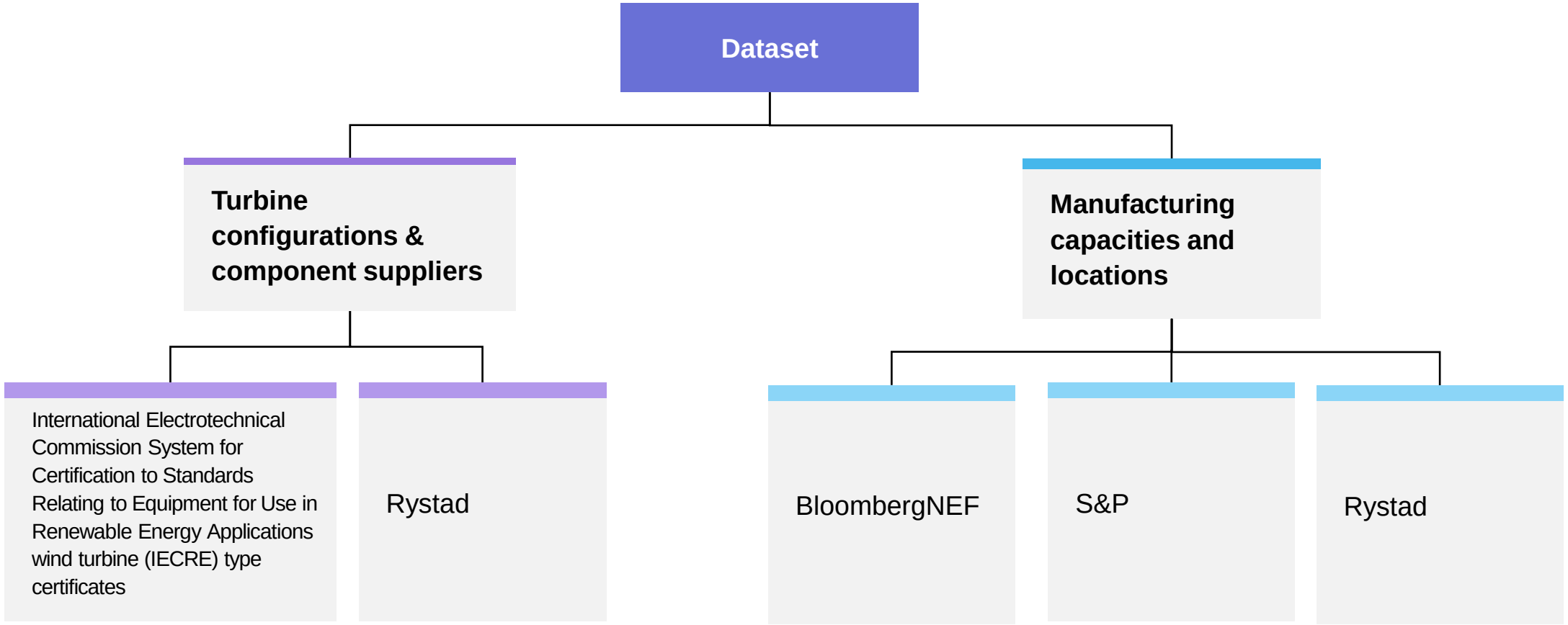
Map where wind turbine components are manufactured

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

Our work on wind value chains

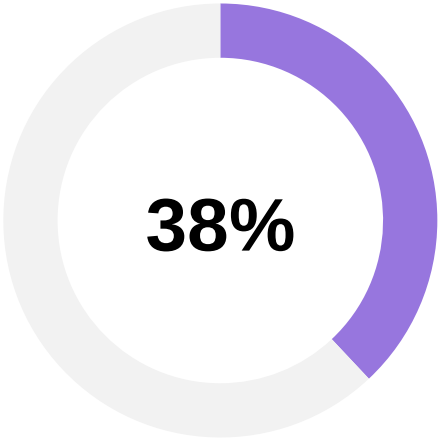


Data sources

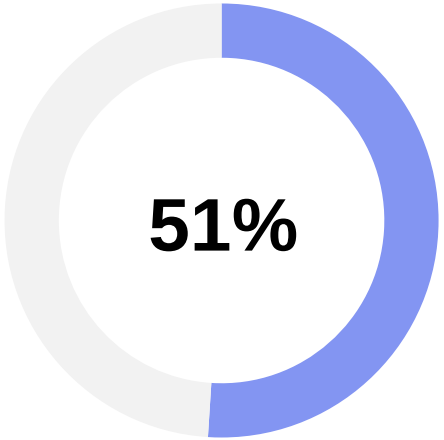


Component sourcing

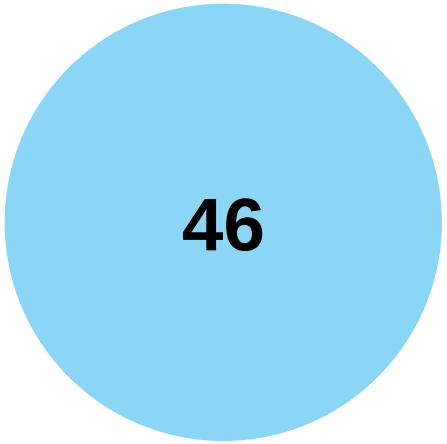
Dataset



of EU 2022–2025 installations

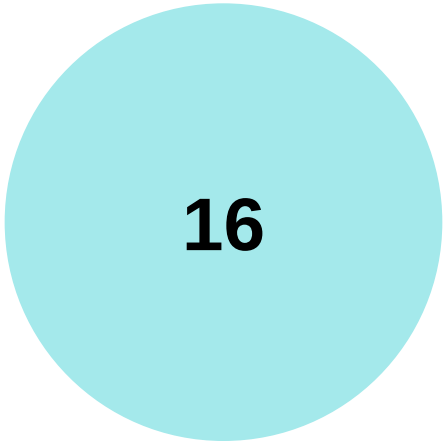


of installations by EU manufacturers



wind turbine models

Equally divided to EU and non-EU manufacturers

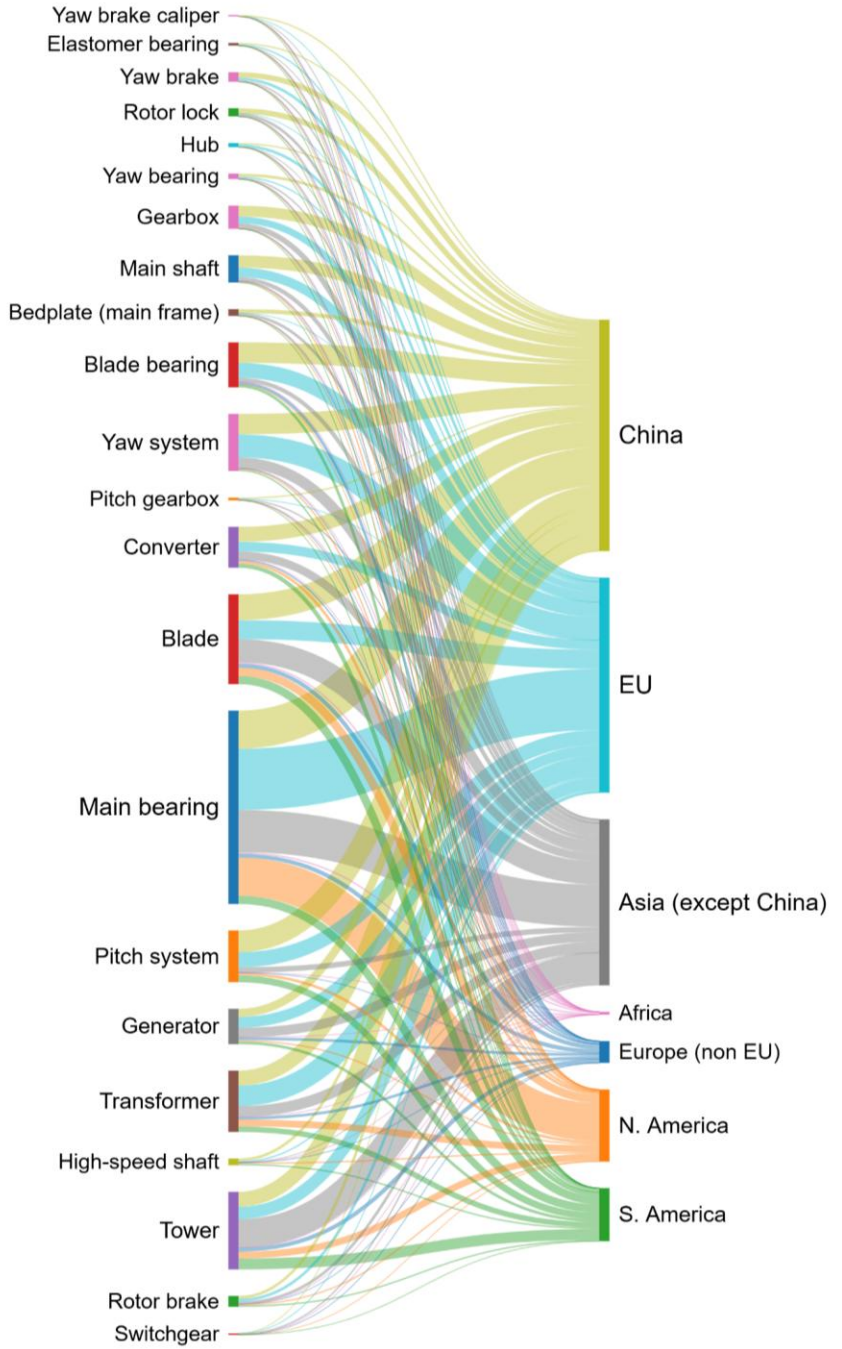


manufacturers

5 with EU HQ, 11 with non-EU HQ

Global component sourcing

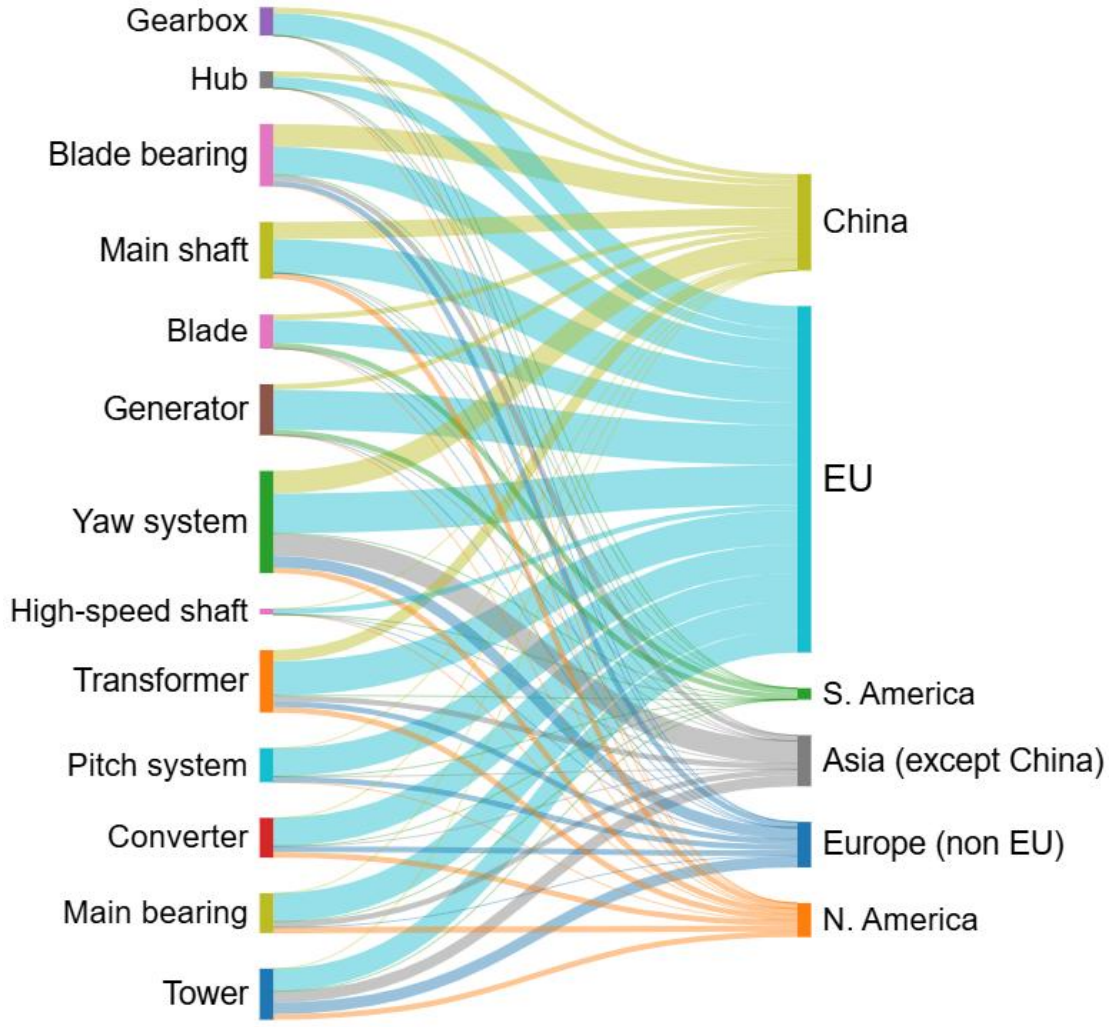
- For all wind turbine manufacturers
- 560 manufacturing locations are recorded:
  - China 30%
  - EU 28%
  - Rest of Asia 22%
- Nonetheless more manufacturing locations doesn’t imply larger manufacturing capacity



Source: JRC analysis based on IECRE certificates and Rystad

Where EU manufacturers source from (HQ)

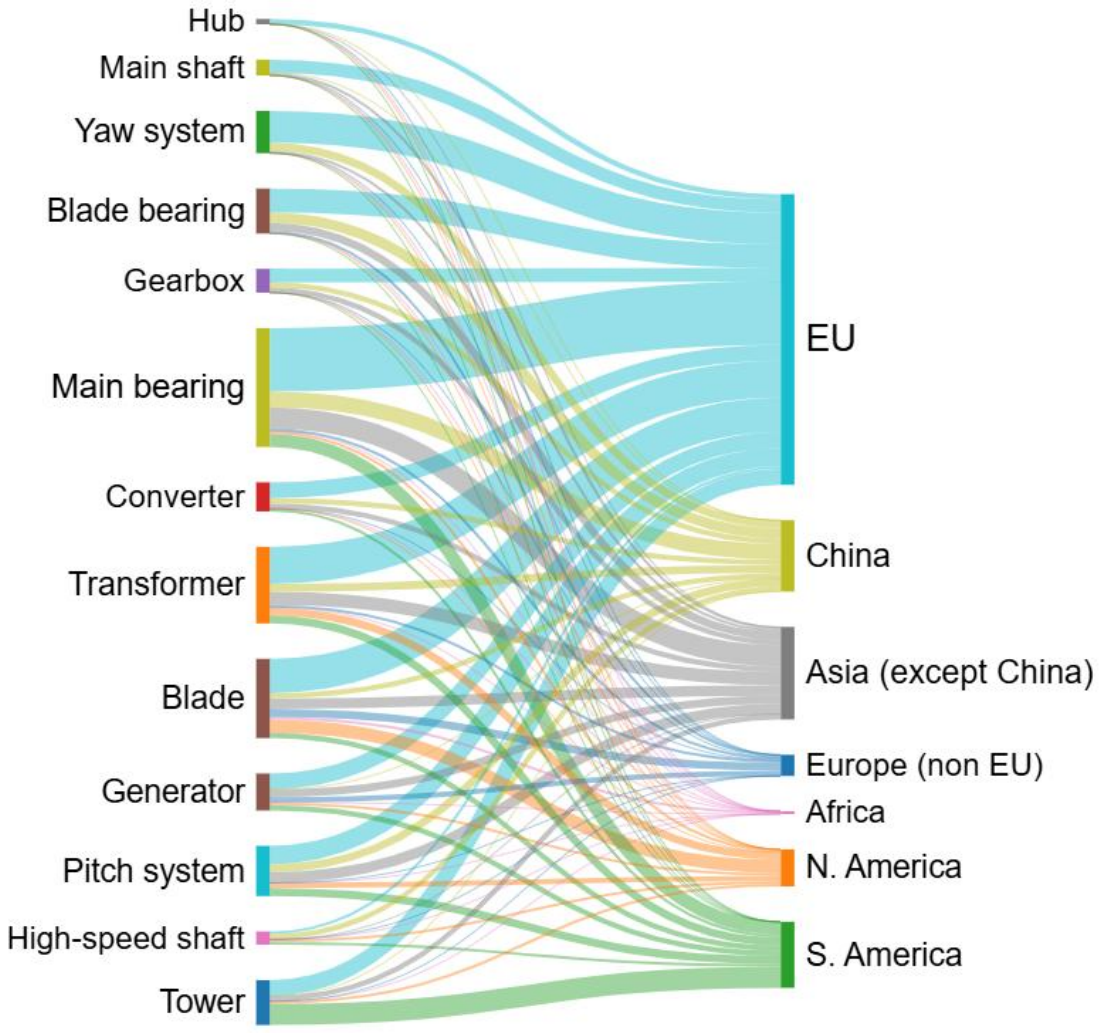
- 103 individual suppliers
  - 59% of the suppliers have HQ in the EU
  - 16% in China
  - Split between rest of Asia, N. America and rest of Europe (non-EU)
- Clear domestic preference, but also strategic links to Asian supply



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



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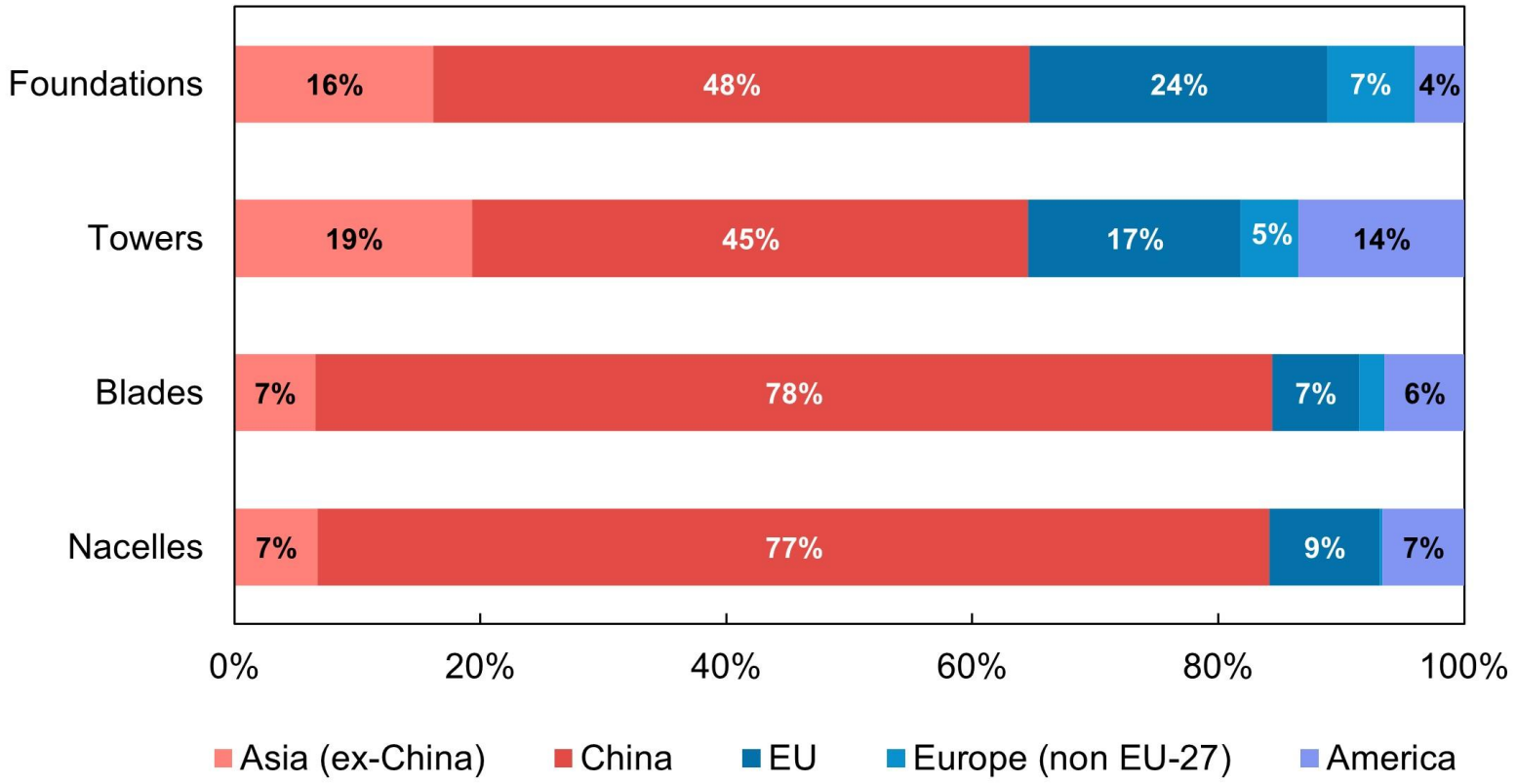
Manufacturing capacities

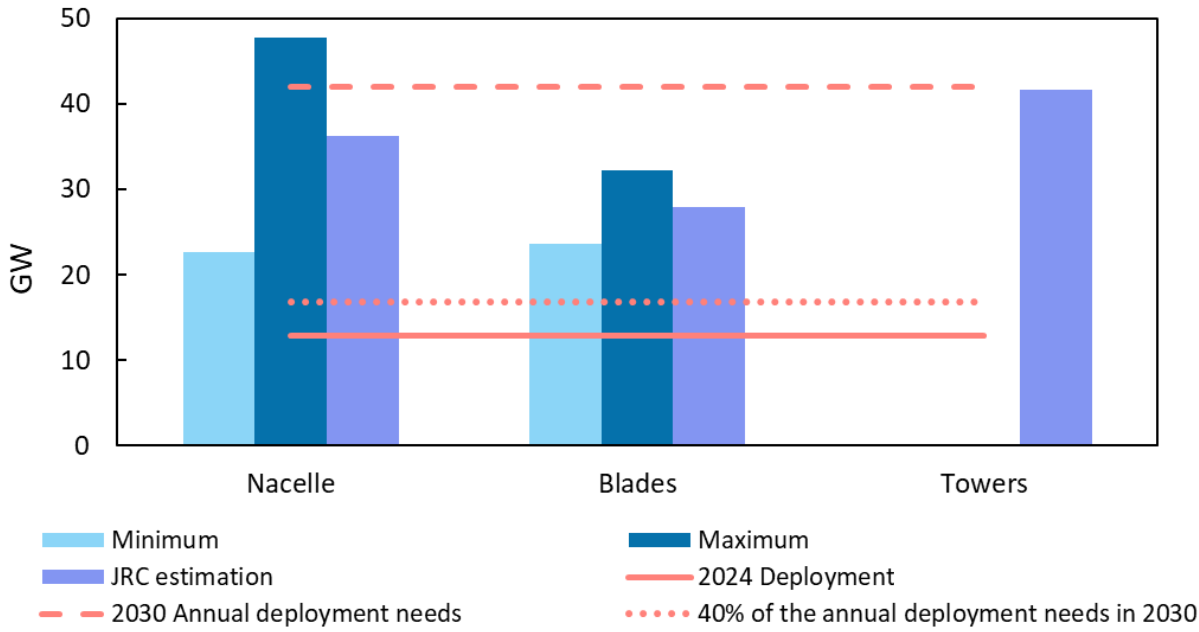
Global manufacturing capacity



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

EU capacity vs current deployment

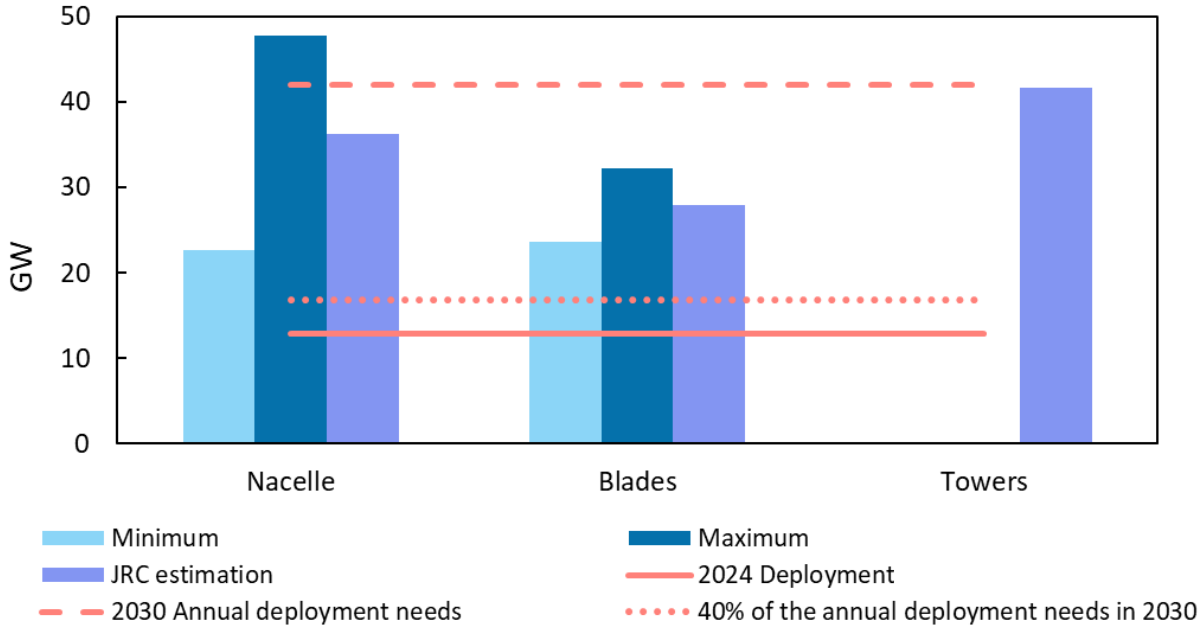
- In 2024, EU installed 13 GW of wind (11.5 GW onshore, 1.5 GW offshore)
- EU manufacturers supply 88% of onshore and 96% of offshore 2024 installations
- For all three, capacity > 2024 deployment



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: ≥ 40% of deployment manufactured in the EU → 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

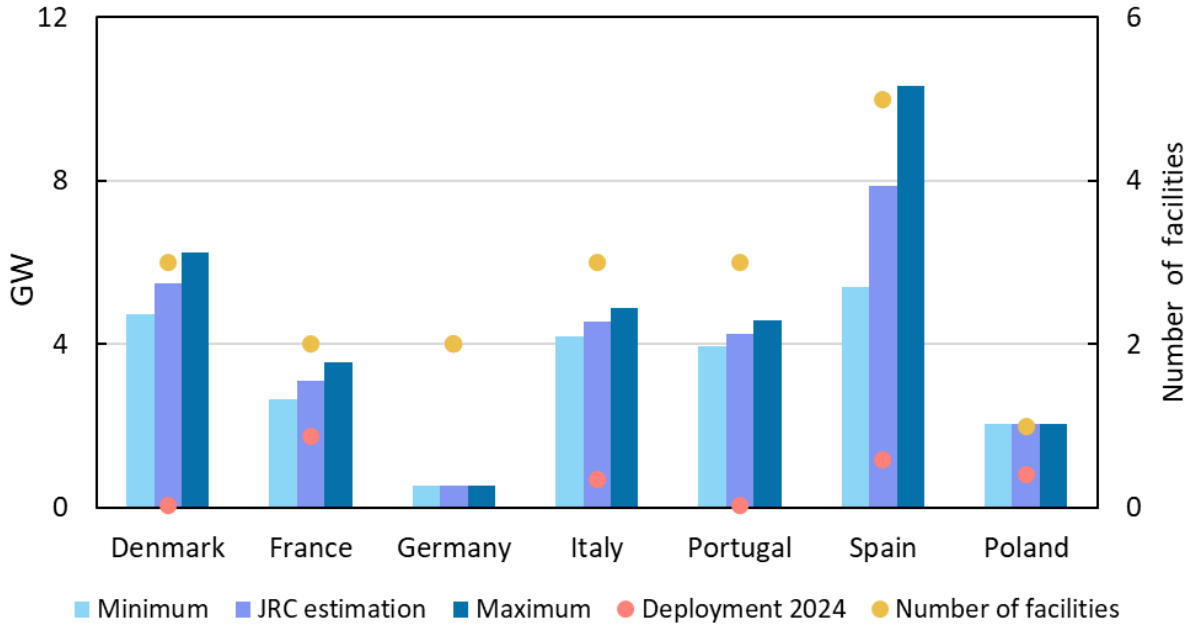


Source: JRC analysis based on BNEF, S&P and Rystad

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



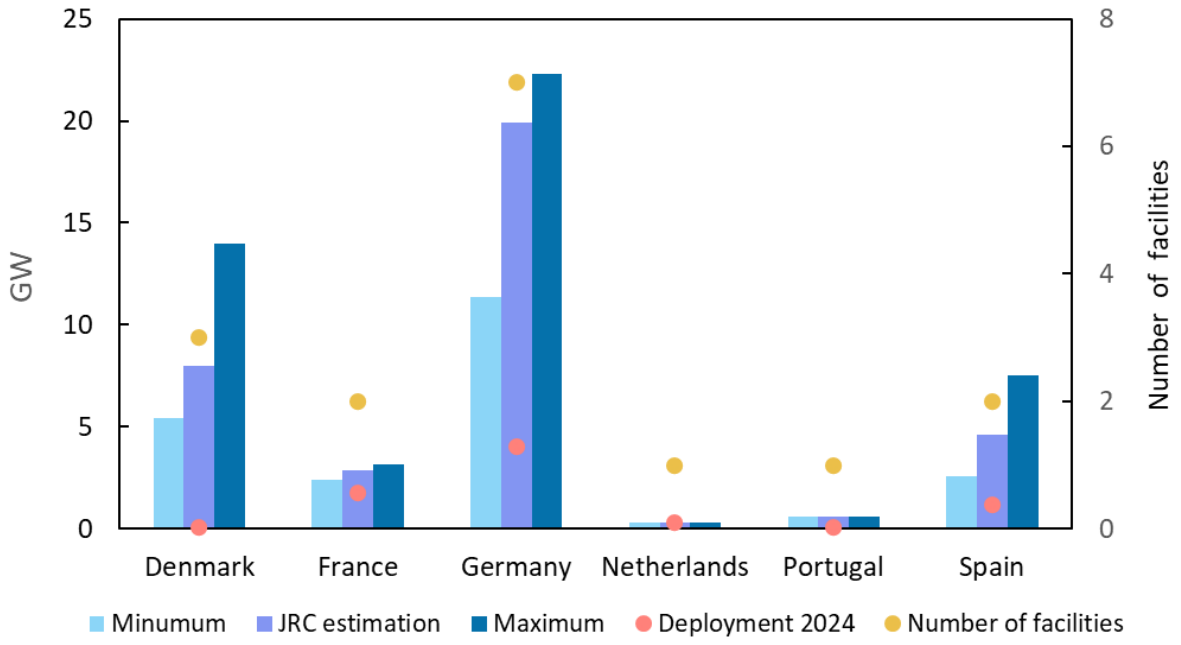
Source: JRC analysis based on BNEF, S&P and Rystad

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

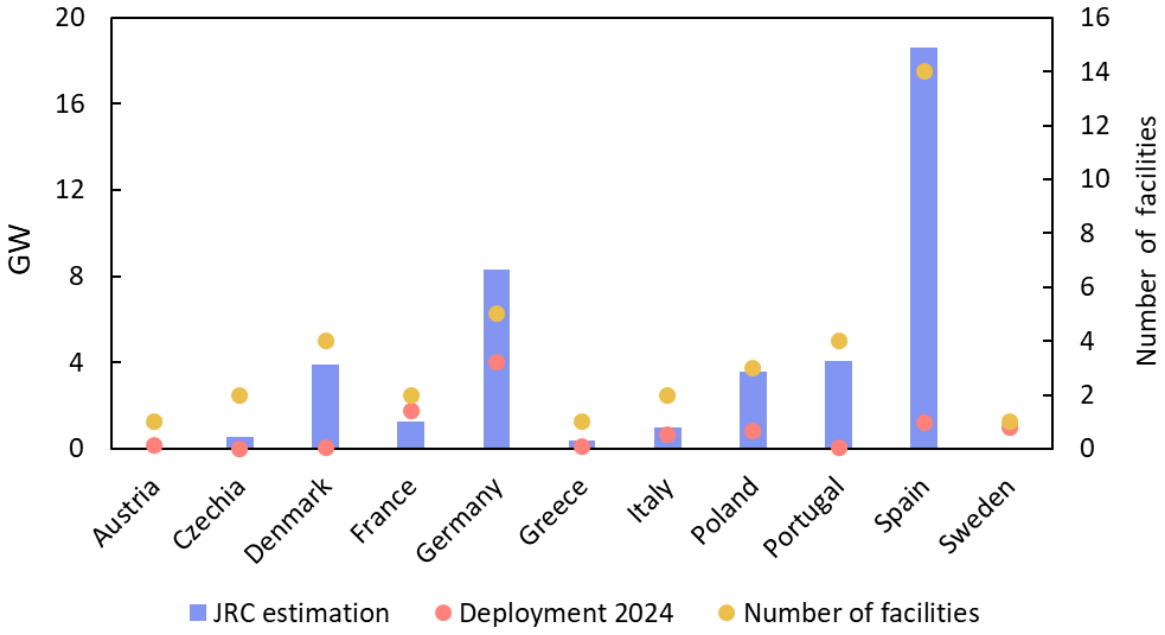


Source: JRC analysis based on BNEF, S&P and Rystad

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)

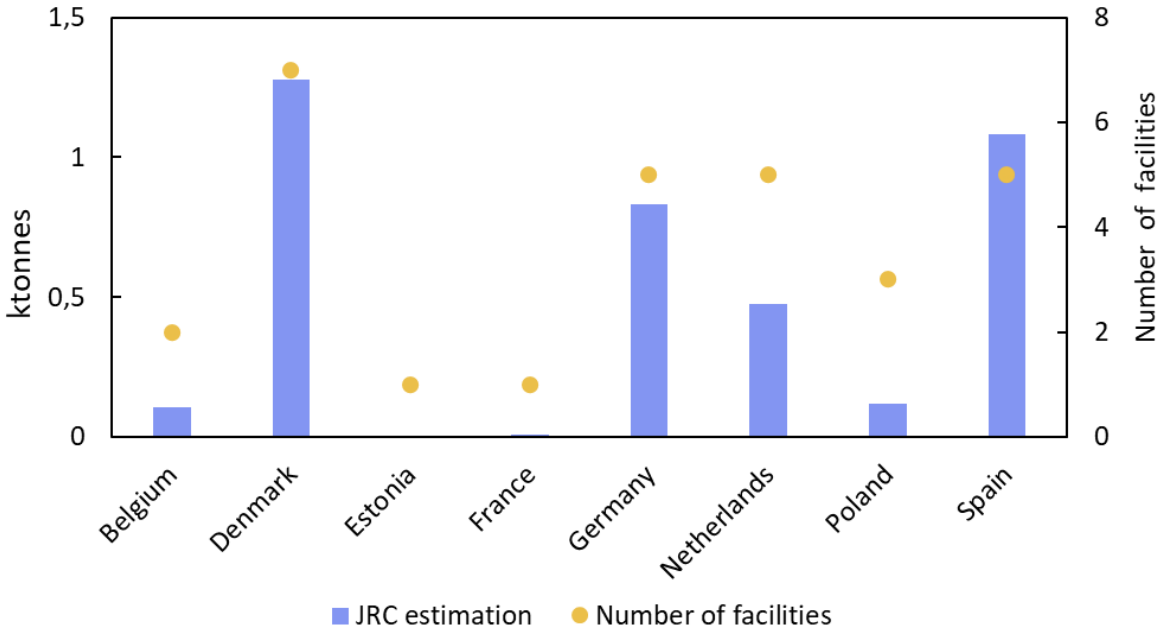


Source: JRC analysis based on BNEF, S&P and Rystad

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!