



Greentech
Partners

Wind Industry – Selected Topics

March 12, 2024













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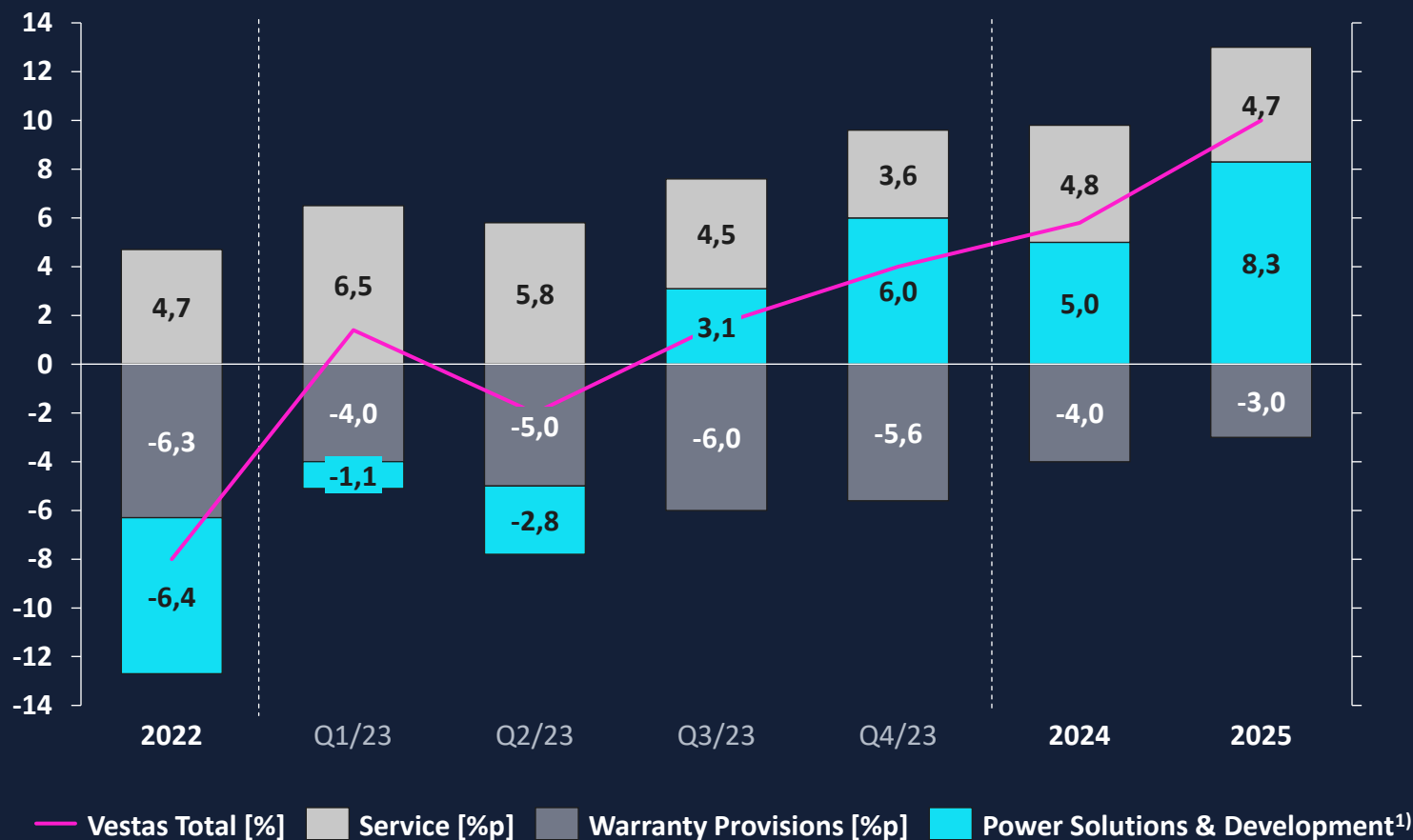
Most of the Western OEMs have found „their way forward“

Western OEMs

			 		
	<p>Revenues</p> <ul style="list-style-type: none"> • EUR 15.382m (14.486m) <p>Profit margin</p> <ul style="list-style-type: none"> • EBIT: 1,5% (-8.0%) <p>Installations¹⁾</p> <ul style="list-style-type: none"> • 12,7 GW (12,3 GW) <p>OI¹⁾</p> <ul style="list-style-type: none"> • 18,4 GW (10,5 GW) <p>ASP²⁾</p> <ul style="list-style-type: none"> • 970k⁷⁾ EUR/MW (1,070k EUR/MW) 	<ul style="list-style-type: none"> • EUR 9.04m (8,905m) • EBITDA: -9.2% (-19.2%) • >3,7 GW (US onshore only) • 2,4 SunZia/1,4 Squadron/0,6 ESP 	<ul style="list-style-type: none"> • EUR 6.489m (5.694m) • EBITDA: 0,0% (-4,3%) • 6,8 GW (4,7 GW) • 7,4 GW (6,3 GW) • 840k EUR/MW (840k EUR/MW) 	<ul style="list-style-type: none"> • EUR 9.090m (9.814m) • -47,8%. (-9,6%) • 8,6 GW (6,8 GW) • 11,6 GW (7,7 GW) • 830k EUR/MW (820 EUR/MW) 	<ul style="list-style-type: none"> • n/a • 2,4 GW
	<ul style="list-style-type: none"> • V150/163: Extremely strong especially in the US with ca. 6 GW US OI in 2023 • V172-7.2 <u>two</u> publicly <u>announced</u> deals (first COD 2025-Q3)⁴⁾ 	<ul style="list-style-type: none"> • 3.6-154 for (MW constrained), GE-158 (land constrained), H-250 (offshore) • GE-154/164 not competitive in most of Europe 	<ul style="list-style-type: none"> • One platform strategy (D4k), strong in land constrained markets • <u>SOP N175/6.X by end of 2024⁵⁾</u> • Development of US product (“larger rotor on existing platform”) 	<ul style="list-style-type: none"> • SSG222/236-14/15MW is a strong offshore machine, • Sales of 4.X and 5.X platform still on hold 	<ul style="list-style-type: none"> • E-175/6 EP5 prototype planned to be installed in <u>early 2024⁶⁾</u> • 140 x E-160/5,6 EP5 under construction (Chile), 240 x E-138/4,2 EP3
	<ul style="list-style-type: none"> • Healthy and global portfolio of business segments (on-/offshore, service, development) • Scaling a solid business with pricing discipline 	<ul style="list-style-type: none"> • 1bn offshore burden, IRA tailwind, energy portfolio • Workhorse big project strategy with break even at 1.000 units/a 	<ul style="list-style-type: none"> • #1 onshore Europe (strength & risk) • OI margin improvement through growth in Europe • Acciona backing, H2 starting 	<ul style="list-style-type: none"> • Offshore wind leader + advantage of alternative business segments • Onshore lacks a product, business and reputation in decline (OI 2023 was 3.7 GW only) 	<ul style="list-style-type: none"> • Service fleet 2x NX, 50% share in Alterric • 25% market share DE + selected international markets
	<ul style="list-style-type: none"> • Leverage position of solid market leader, long term investments • High chances to achieve “10% EBIT in 2024” target 	<ul style="list-style-type: none"> • Clear strategy, (smart) execution is key • Plan for Europe required, offshore turn around needed 	<ul style="list-style-type: none"> • Succeeding in the US is critical for relieve on Europe dependency • 8% EBITDA achievable in 2025 • Partner needed for long term success 	<ul style="list-style-type: none"> • Communicated plan on onshore required 	<ul style="list-style-type: none"> • Continuation of niche strategy • Playing in selective markets (US?)

Chances are high for Vestas to achieve their target of around 10% EBIT margin by 2025

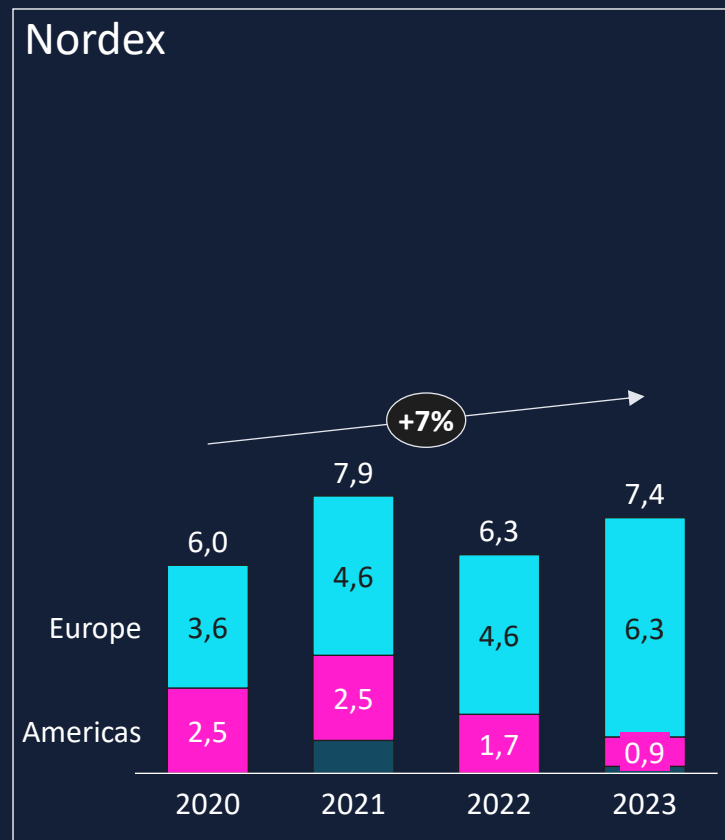
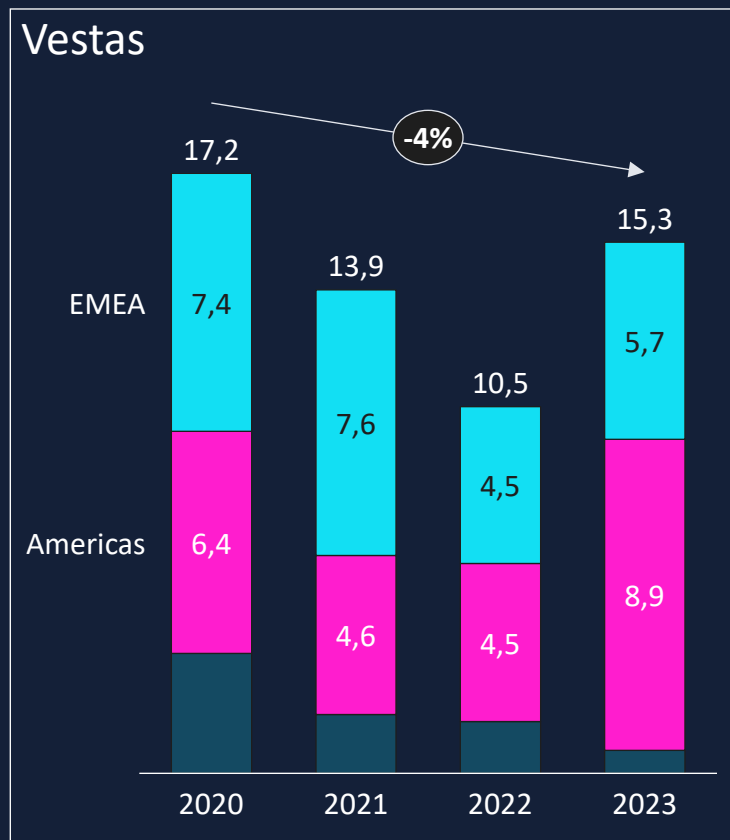
Vestas EBIT margin [%] and key contributors [%p]



- Vestas guided a 4-6%²⁾ EBIT margin for 2024 targeting 10%³⁾ for 2025/mid-term.
- The 10% are ambitious given the loss in 2022 and the positive but low 1.5% margin in 2023.
- We believe chances are high for Vestas achieving around 10% by 2025:
 - Price maker enabled by strong product portfolio and global strength
 - Cost and quality advantage though scale and conservative product approach

Vestas with strong US product and local footprint – Nordex grabbed the opportunity in Europe

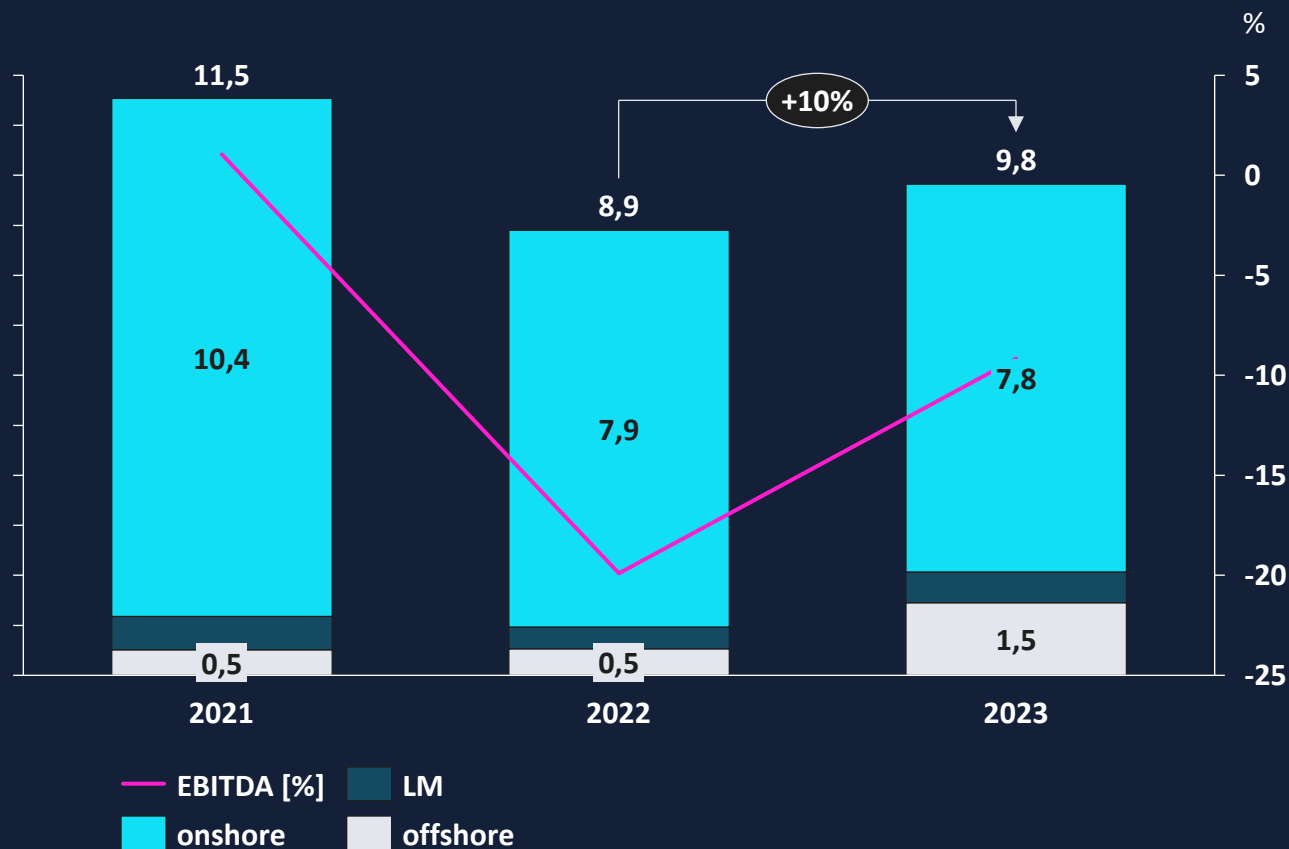
Order Intake [GW]



- Nordex is increasingly strong in Europe, steadily growing from 4.6 GW to 6.3 GW (+38%, 2021 - 2023).
- Nordex outperforms the market in Europe with around 17% annual order intake growth over the last 2 years.
- Nordex substantially decreased orders in Americas from 2.5 GW to 0.9 GW (-65%, 2021 - 2023).
- Vestas' onshore business is x2 that of Nordex, driven by high volume in the US.
- Vestas accepted to let go of some share in the Europe business to increase prices and maintain pricing discipline. Duopoly with GE in the US is pushing Vestas's growth (Americas +96%, 2021 - 2023)

Substantial 49% EBIT margin development for GE Vernova – Offshore wind remains a burden

GE Vernova wind revenues [USD bn] and EBITDA margin



- Clear strategy: Streamlined product portfolio, a focus on the US market and large projects and an answer (scale, lean, quality) to the question: How to improve unit economics?
- Offshore wind burden: Around 1bn loss in 2022/23 respectively and the prospects of a “slight profit improvement” in 2024 is weighing heavily on @GE Vernova’s results.
- Onshore wind turnaround: Onshore has been profitable in H2 2023 and GE is guiding “high-single-digit EBITDA” margins for 2024. This would be a very impressive turnaround.












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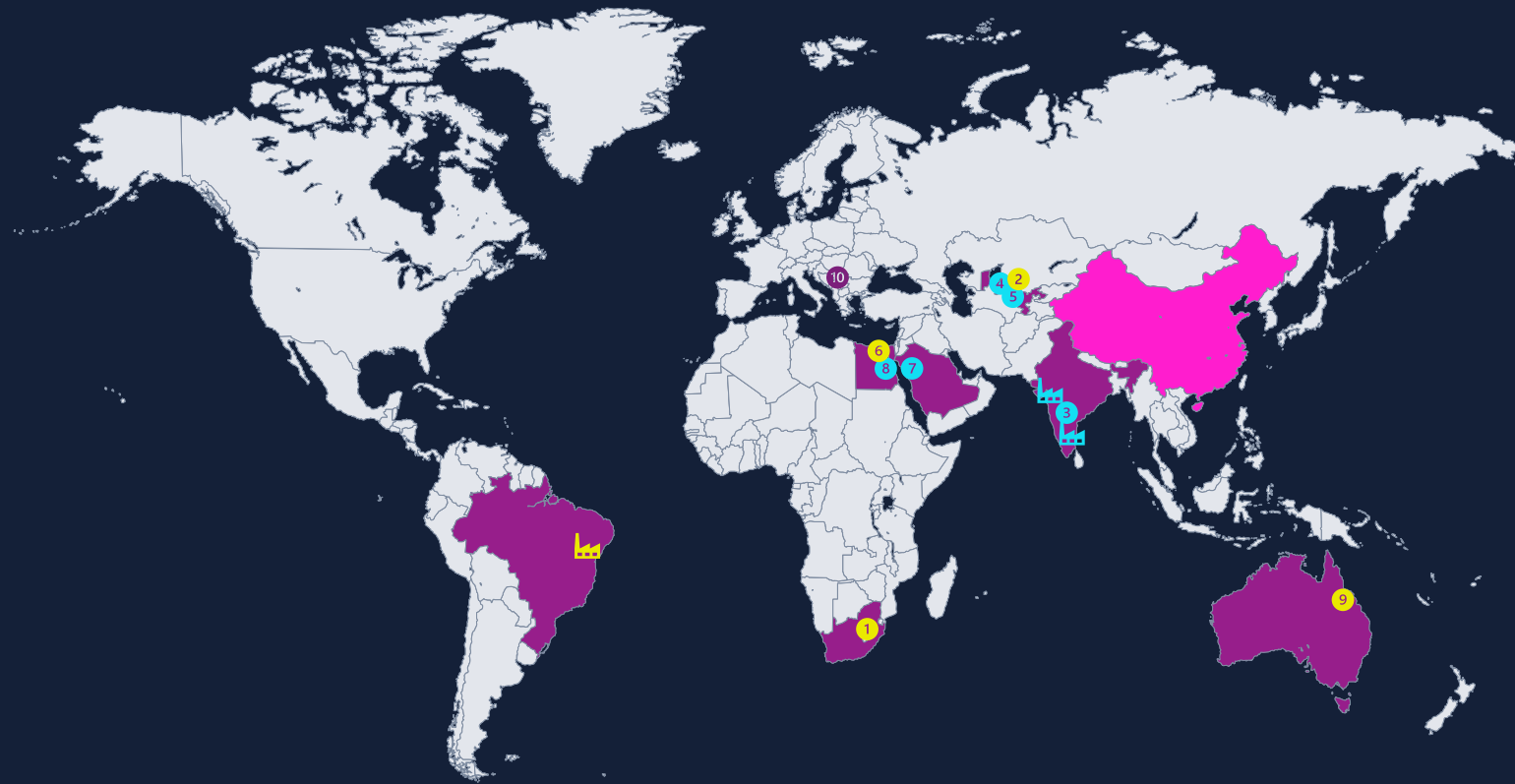
Fierce competition in China, massive overcapacities and appetite for growth push Chinese OEMs into international markets

Overview of leading Chinese OEMs

					
	<p>Revenues • EUR 6.019m</p> <p>Profit margin • EBIT: 6,4%</p> <p>Installations³⁾ • 12,7GW</p> <p>Price/MW ²⁾ • 474k EUR/MW</p>	<p>• 8,3GW</p>	<p>• EUR 3.874m</p> <p>• Net profit: 12,2%</p> <p>• 6,8 GW</p> <p>• 570k EUR/MW</p>	<p>• EUR 2.252m</p> <p>• EBIT: 3,5%</p> <p>• 6,4 GW</p> <p>• 352k EUR/MW</p>	<p>• EUR 1.590m</p> <p>• EBIT: 6,3%</p> <p>• 4,0 GW</p> <p>• 398k EUR/MW</p>
	<ul style="list-style-type: none"> • PMDD historically, switched to MSPM in 2021 • Launched various new platforms over last 3 years; GWH191 is being installed in 1.75 GW project 	<ul style="list-style-type: none"> • Traditional 3-point gearbox support and DFIG • EN-156 and EN-171 are flagship products (workhorse strategy) • EN-220-10 announced 	<ul style="list-style-type: none"> • Installed the worlds largest offshore turbine (MySE17-260) in 2023 • MySE 6.25-172 has been sold to intl. projects in 2023 • Announced MySE11-233 (on-) and the MySE22-310 (offshore) in 2023 	<ul style="list-style-type: none"> • Windey has developed both DFIG-based high-speed and PMG-based medium-speed products • Serbia: WD164 3.3/3.6 is being installed; 7.7 MW turbine for Maestrale Ring project 	<ul style="list-style-type: none"> • Aggressive product strategy • 919-series launched (230m rotor) • 131m blade produced to 15MW onshore • Licensing agreement JSW (India)
	<ul style="list-style-type: none"> • Stock listed (IPO 2010, >60% state) • Wu Gang • Intl. focus markets: Global • Masdar, Mainstream, EDF, Engie, Potentia 	<ul style="list-style-type: none"> • Privately owned, US/APAC investors • Lei Zhang • India, Uzbekistan, MENA, APAC • NEOM, AMEA, ACWA, CIP, Engie 	<ul style="list-style-type: none"> • Stock listed (IPO 2019) • Chuanwei Zhang • APAC, BR, Europe (RS, IT, UK) 	<ul style="list-style-type: none"> • Stock listed (IPO 2019, >40% SASAC) • Zhen Yu Yang /Ling Gao • Serbia, Vietnam 	<ul style="list-style-type: none"> • Stock listed (IPO 2022) • Part of Sany Group • Liang Wengen • DE, Europe, India
	<ul style="list-style-type: none"> • Global #1 in 2022, some success internationally • Maersk biofuel deal in 2024-01 • Founded in Xingyang 	<ul style="list-style-type: none"> • Leader in “going global” • Workhorse products big projects • Building battery factories in EU/US • BASF, Brookfield, Jabil, ZF 	<ul style="list-style-type: none"> • Offshore wind leader • 2023 revenue and profit drop • BASF, ACWA 	<ul style="list-style-type: none"> • Preferred supplier for Maestrale ring, to be watched 	<ul style="list-style-type: none"> • Seem to leverage their SHI footprint to grow internationally starting from Europe

Chinese wind turbine OEMs on their way to dominate the markets of the Global South

Big international onshore wind projects supplied by Chinese wind turbine OEMs



	OEM	Project	MW	Commissioning
1	Goldwind	Korusun	437	Q2 2024
2	Goldwind	Zarafshan	500	Q4 2024
3	Envision	JSW Energy	653	2024
4	Envision	Dzhankeldy	500	Q1 2025
5	Envision	Bash	500	Q1 2025
6	Goldwind	Gulf of Suez II	504	Q3 2025
7	Envision	Neom	1,670	2025
8	Envision	Amunet	500	2025
9	Goldwind	Clarke Creek	450	unknown
10	Windey ¹	Maestrale Ring	854	2025

■ Chinese OEMs have >95% market share

■ International markets with Chinese production facility or onshore wind project > 400 MW (not exhaustive)

1) Windey as announced preferred supplier



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Whilst the OEMs' strategies differ, there is a pattern – The OEM structure, especially in 3rd markets is changing fast

Western OEMs



- **Price increase** from 2021 levels and **innovation slow down** in **growing “domestic” markets** to survive through return to profitability
- **Focus on selected** markets to maximize ASP and reduce structural costs
- **Careful horizontal integration** into H2 and portfolio sharpening (GE, SGRE)
- **Supply chain follows partially local content demand** (total landed cost favours LCC production in most cases)
- **Reduction of vertical integration** to reduce cost

Chinese OEMs



- **Price reduction** and **accelerated innovation** to survive in **stagnating domestic market**
- **“Going global”** in pursuit of volume at better margins
- **Bold horizontal and integration** (H2 production, BESS, net zero parks)
- **Supply chain follows partially local content demand** (local production can be gamechanger)
- **Increase of vertical integrations** for supply chain control and innovation speed

Considerations for developers

- OEM presence in single countries is changing fast
- Some projects are only viable with Chinese OEMs in certain markets
- Using Chinese OEMs changes the risk profile of projects





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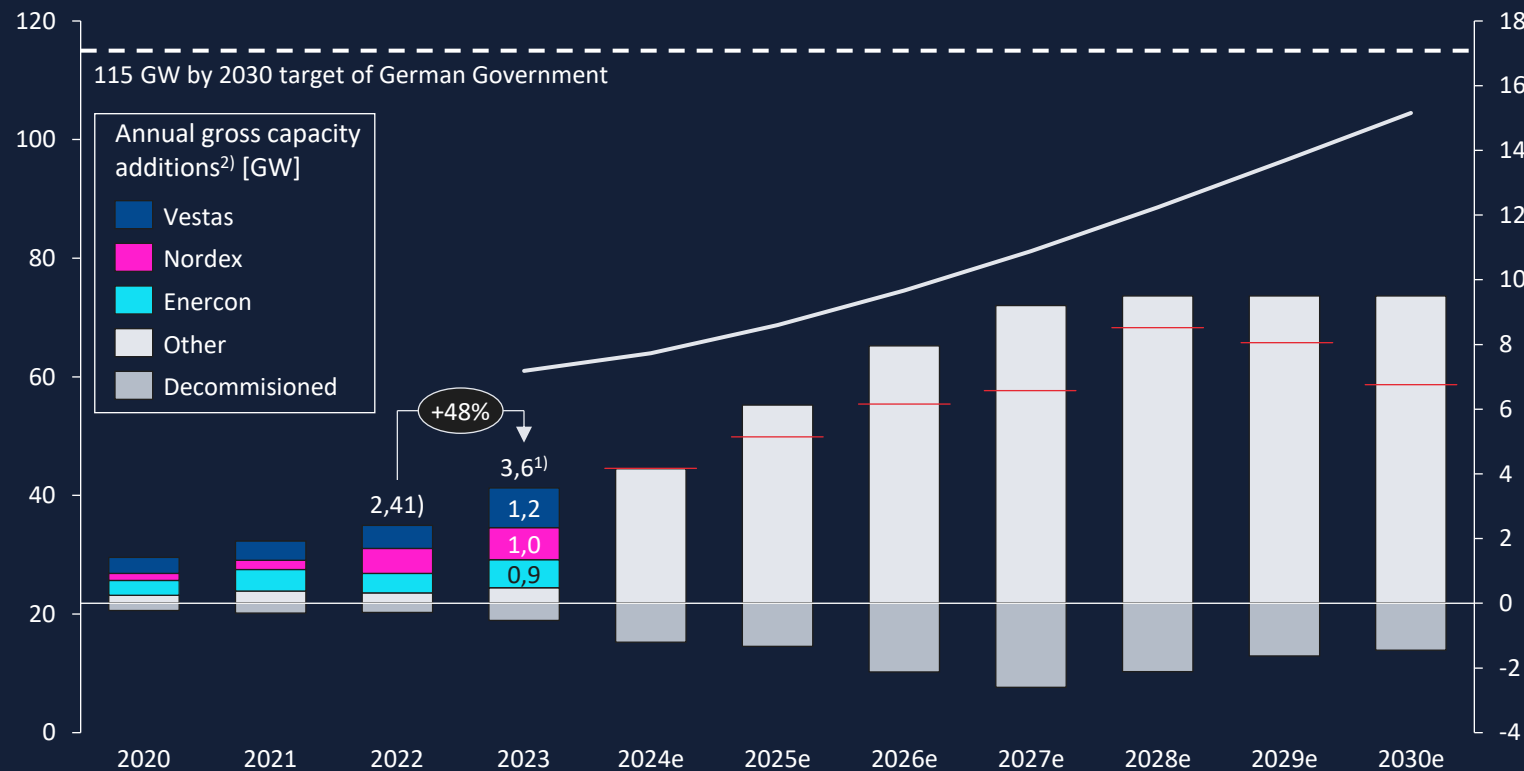
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Strong growth YoY – Achieving 115 GW by 2030 is a significant stretch, even in a high case scenario

Onshore wind in Germany

Installed capacity (cumulative)²⁾ [GW]

Annual gross capacity additions²⁾ [GW]



Target is to have 115 GW installed by 2030 vs. 61 GW as of today → Around 8 GW p.a. required

Progress

- New installations 2023: 3.6 GW (+48% vs. 2022)
- Permitted 2023: 7.5 GW (+76% vs. 2022)
- Awarded 2023: 6.4 GW (+83% vs. 2022)

Companies

- > 300 project developers participated in the auctions. The top 10 secured 20% of the volume
- Top 3 OEMs capturing 86.5% of the market

Challenges and bottlenecks

- Not: Auction volume or cap, availability of WTG, lack of market participants
- Rather: Availability of sites / securing the land, getting the transport permit and in the future pretty sure the grid

1) Gross Installations 2) GTP analysis, high case for 2024 ff (red line = WoodMac Q3/2023)



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The attractiveness of repowering in Germany has increased substantially since July 2023

Repowering in Germany

Numbers

- [28.000 WTG \(61 GW\)](#) installed¹⁾
- 7.600 WTG (7.8 GW) 20 years or older (out of EEG tariff)
- In 2023, around 400 turbines (500 MW) have been dismantled (22y on average), 30% have been repowered
- 12.7 GW of the German fleet will reach 20 years between 2024 and 2030

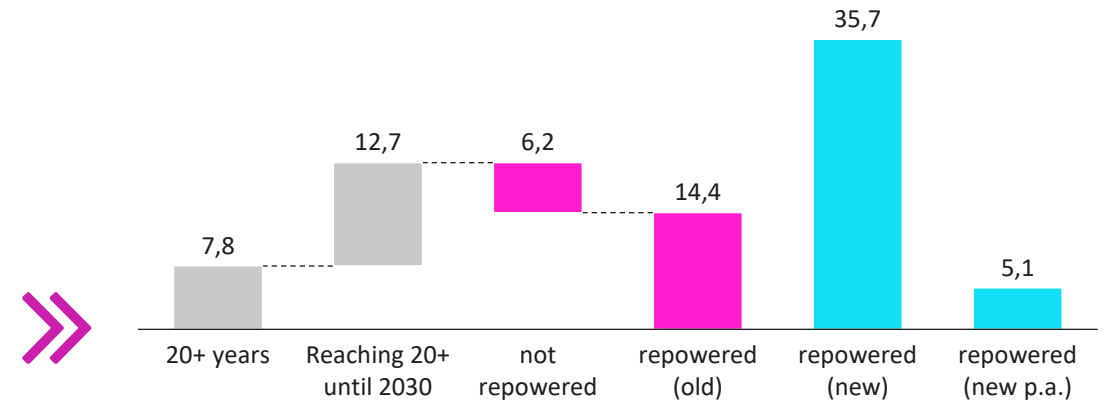
Attractiveness of repowering has increased substantially since July 2023

- **Positive legislation changes** in 2022-12 (EU) and 2023-07 (Germany) for permitting of repowering projects
- **Electricity price** came down substantially (high prices made repowering less attractive)
- **Average auction cap was increased** from 58,8 EUR/MWh to 73,5 EUR/MWh. Effectively 58,1 to 113,5 EUR/MWh over 20 years (depending on correction factor) + option to sell on spot price)



1) As of 2023-12

Rough estimate of repowering potential



Assumptions: 70% of the turbines 20+ will be repowered, 1 new turbines of 7 MW replaces 2 old turbines (1.4MW on average)

Other

- Statkraft buys up old windfarms in Germany to [repower them](#) (600 MW operational today, target is >2GW by 2030)



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