

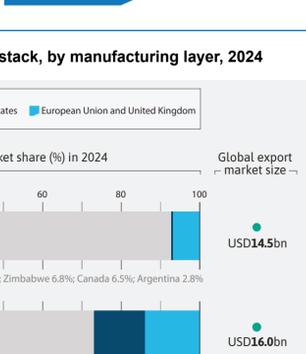
**The electric tech stack:
commercial industrial
capacity and hard power**



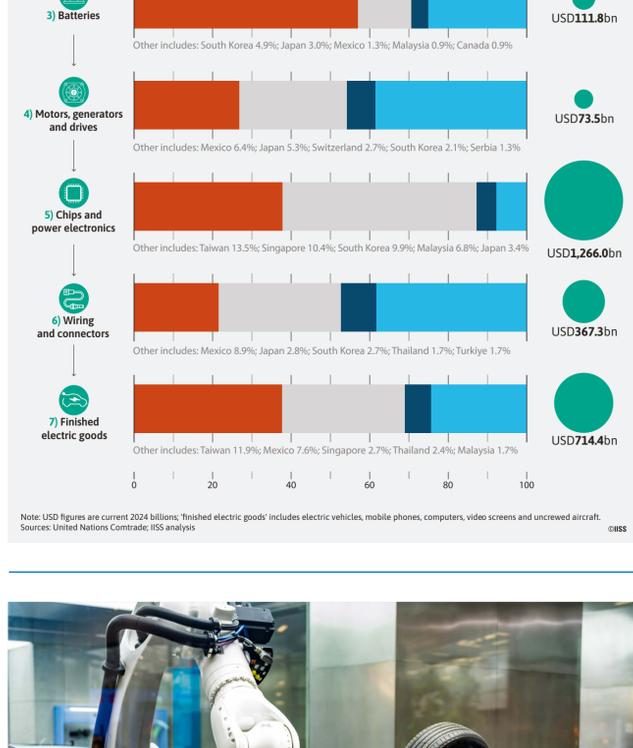
The increasing sophistication of electrified, software-driven machines is redefining how states sustain military power, elevating the strategic importance of the civilian technology stack that produces batteries, motors, low-end semiconductors and finished consumer electronics.

Join industry leaders, policymakers, and security experts at the Global Security and Innovation Summit to explore solutions, strengthen partnerships, and shape the future of critical infrastructure security.

- ▶ The defence-industrial base now extends deep into civilian electric manufacturing: the minerals, wafers, batteries, motors, chips and wiring used in consumer goods and electric vehicles (EVs) are the same components that power drones, autonomous weapons, precision-strike and other capabilities.
- ▶ Given the importance of design speed and feedback loops for innovation, co-located, fast-iteration ecosystems best exemplified in China are directly relevant to future military potential.
- ▶ Europe has an opportunity to increase its commercial reach and defence-industrial security by treating electrification as a strategic, dual-use capability, rather than primarily as a means of decarbonisation.



Top exporters supporting the electric tech stack, by manufacturing layer, 2024



Note: USD figures are current 2024 billions; 'finished electric goods' includes electric vehicles, mobile phones, computers, video screens and uncrewed aircraft. Sources: United Nations Comtrade; IISS analysis



From steam and combustion to electricity

Hard power has traditionally relied on heavy metal powered by combustion and steam. States that mastered jet engines, commercial shipbuilding and steel-intensive industries could convert peacetime production into tanks, munitions, aircraft and naval tonnage. Yet given major advances in batteries and electric motors, an increasing share of commercial and defence goods are now powered not by explosions in metal cylinders but by flows of electrons orchestrated by software. Ukraine's war effort now hinges less on access to exquisite Western systems and more on its ability to manufacture and iterate commercial-style robotic systems at scale.

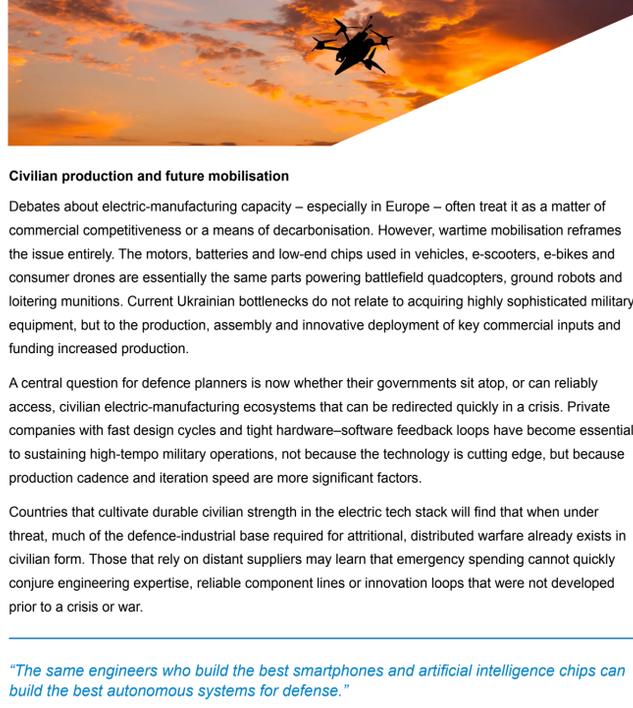
This shift redefines the 'defence industrial base', which now reaches into the peacetime manufacturing sector for electric goods. The interdependent links of this chain include:

1. refined minerals
2. wafers for electronics
3. batteries
4. 'brushless' motors, which rely on power-dense neodymium magnets
5. semiconductors and related 'power electronics'
6. wiring and connectors
7. familiar finished goods such as electric vehicles, consumer electronics and drones

Paired with recent advances in artificial intelligence, products built on this 'electric tech stack' have become software-driven machines that can be updated, networked and continuously improved, with significant defence implications.

"The [electric tech stack] is the bridge between software and the physical world, the foundation animating the machines that will ultimately shape the future."

▶ Ryan McEntush, Partner, a16z, August 2025



Civilian production and future mobilisation

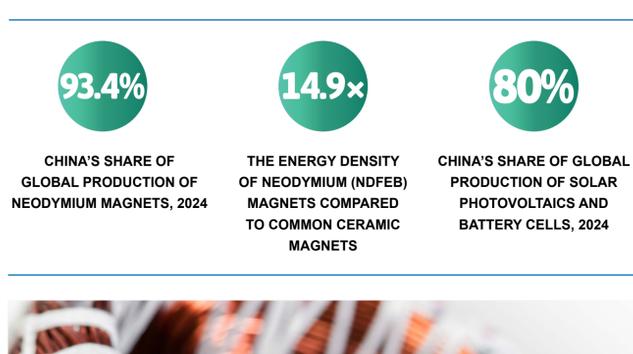
Debates about electric-manufacturing capacity – especially in Europe – often treat it as a matter of commercial competitiveness or a means of decarbonisation. However, wartime mobilisation reframes the issue entirely. The motors, batteries and low-end chips used in vehicles, e-scooters, e-bikes and consumer drones are essentially the same parts powering battlefield quadcopters, ground robots and loitering munitions. Current Ukrainian bottlenecks do not relate to acquiring highly sophisticated military equipment, but to the production, assembly and innovative deployment of key commercial inputs and funding increased production.

A central question for defence planners is now whether their governments sit atop, or can reliably access, civilian electric-manufacturing ecosystems that can be redirected quickly in a crisis. Private companies with fast design cycles and tight hardware – software feedback loops have been essential to sustaining high-tempo military operations, not because the technology is cutting edge, but because production cadence and iteration speed are more significant factors.

Countries that cultivate durable civilian strength in the electric tech stack will find that when under threat, much of the defence-industrial base required for attritional, distributed warfare already exists in civilian engineering. Those that rely on distant suppliers may learn that emergency spending cannot quickly conjure engineering expertise, reliable component lines or innovation loops that were not developed prior to a crisis or war.

"The same engineers who build the best smartphones and artificial intelligence chips can build the best autonomous systems for defense."

▶ Palmer Luckey, Founder, Anduril Industries, August 2024



Co-location and fast feedback

China holds significant advantage across several layers of the electric tech stack – battery cells, critical-mineral refining, neodymium magnets, drone and motor ecosystems – suggesting it would have an advantage in war, particularly if a conflict became a contest of industrial endurance. It has advantages in manufacturing scale, but also in production geography. Dynamic ecosystems such as that in Shenzhen – home to the mega-firms BYD, DJI, Huawei, Tencent and ZTE – co-locate design, component production and systems integration within the same metro region, allowing engineers to cycle through prototypes in weeks rather than months. These dense feedback loops reduce costs and allow fast experimentation. In 2024, 2.9 million EVs were built in Shenzhen and the Greater Bay Area, more than anywhere else in the world, and DJI alone produced roughly 70% of the world's commercial drones.

Co-location also enables vertical iteration, with software and hardware teams revising products in parallel. For commercial-drone manufacturing, when programmers, flight-control engineers, motor designers and airframe fabricators work within kilometres of each other, it enables weekly over-the-air updates and hardware revisions within a single design cycle. China has several such clusters and the gap between these and anything similar elsewhere remains large. Outside China, a handful of smaller and more specialised ecosystems share some comparable features – Seoul in South Korea, Nagoya and Hamamatsu in Japan, southern Germany, and EV-focused hubs in Texas. The closest analogue in terms of wartime adaptation is the defence-tech ecosystem that has emerged in Ukraine.



Europe's opportunity

Trade and production data suggest that countries in the European Union, Switzerland and the United Kingdom are stronger in parts of the electric tech stack than public narratives imply. These states already possess skilled engineering workforces and companies that excel in producing certain components of the stack. These include:

- motors, generators and power electronics (ABB, Infineon, LAPP, LEONI, Schneider Electric);
- wiring, connectors and industrial automation equipment (LAPP, LEONI, Schneider Electric);
- high-voltage grid technologies (Hitachi Energy, Nexans, Siemens Energy); and
- a range of electrified industrial machinery (Bosch Rexroth, Danfoss Siemens)

Years of forward-leaning climate policies have forced utilities and manufacturers to build relevant capabilities and solve problems that others are only now confronting. The United States, for instance, has in 2025 decided down on fossil fuels and coal while downgrading or eliminating industrial policies aimed at electrification. This has opened space for Europe to emerge as a key supplier to the US and other markets (including its own) if it treats electrification as a strategic, dual-use industrial activity rather than something done primarily in service of decarbonisation goals.

Europe's high industrial-electricity costs and slow project delivery remain constraints. And while European firms have excelled at producing high-end industrial equipment, these gaps are not built the types of dense, flexible supplier ecosystems seen in China. Yet some of these gaps are tractable: a straightforward menu of policies could incentivise greater manufacturing co-location and offer targeted support to mid-tier producers in the electric tech stack – particularly in a world of higher tariffs and emerging processes for advanced and robotic manufacturing. The need to build supply lines less reliant on China, particularly for refined minerals and neodymium magnets, is already front of mind in Brussels.

If Europe were to close some of these gaps, it would convert its early electrification moves into real defence capability in a future crisis. With battlefield activity increasingly mediated by batteries, motors and chips, the ability to source, build and iterate these technologies at scale is no longer peripheral to future defence planning but a central element of national power.

"Without immediate, targeted support for local [battery-cell] production, Europe risks losing its strategic autonomy in a critical 21st-century technology."

▶ Frank Blome, Benoit Lemaignan and Yann Vincent, CEOs of PowerCo, Verkor and ACC, respectively, September 2025



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