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Mobility

The Future of Electric Motors in a Changing Electrification Landscape

CWIEME Webinar

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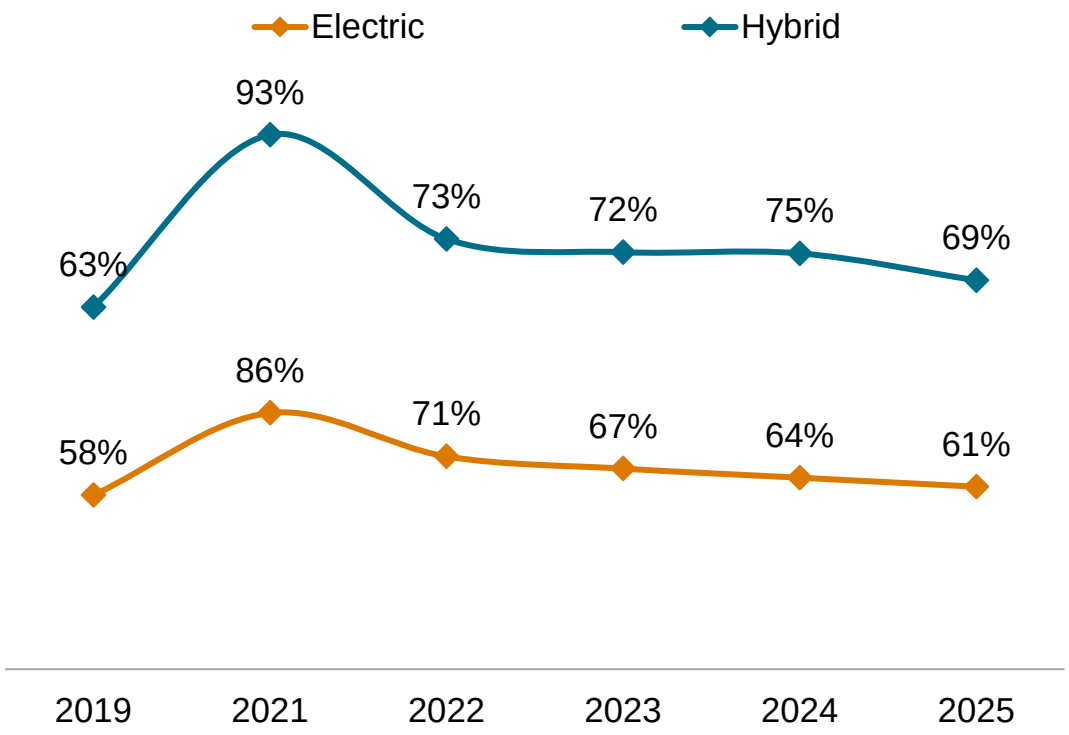
Industry Sentiment and global overview

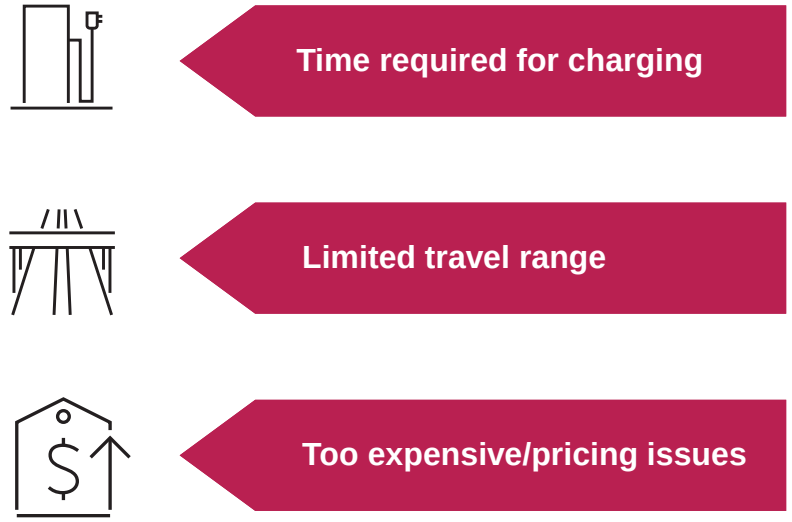
The EV transition: Teetering on a precipice

EV perceptions are shifting — openness to purchasing electric and hybrid vehicles declines year on year with open questions around charging efficiency, range capability and pricing issues.

Openness to purchasing electric or hybrid vehicles



Reasons for and against purchasing an EV/hybrid



As of August 2025.
2025 N=5,582 (US: 700; UK: 700; DE: 701; CH: 705; JP: 700; SK: 681; IN: 690; BR: 705)
Source: S&P Global Mobility, Consumer Survey, Supply Chain and Technology Division

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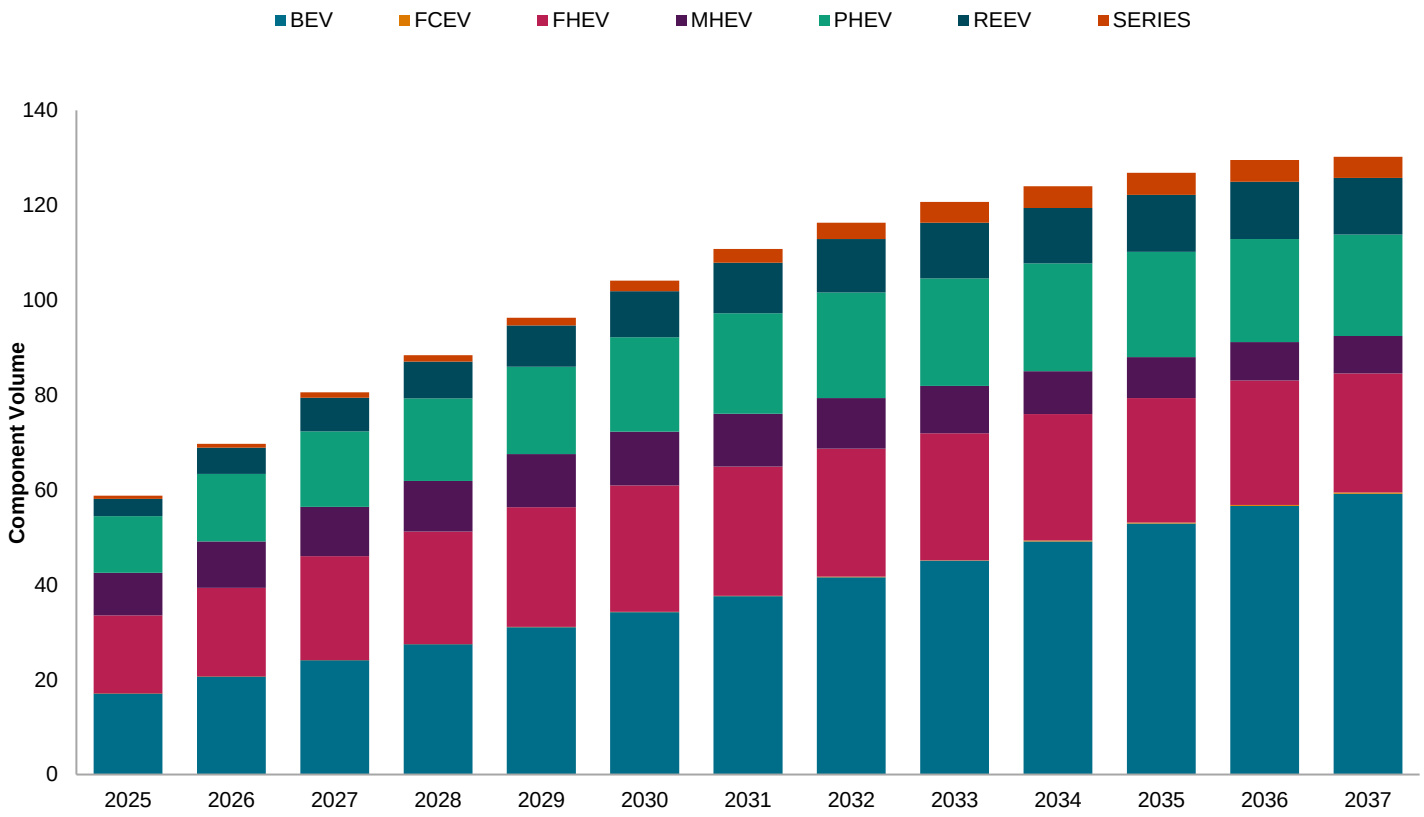
Electric motor volumes by propulsion split

The global industry is shifting to less of a ‘one solution fits all’ approach

Growth of eMotor volumes by propulsion type (millions)



Data compiled September 2025

Source: S&P Global Mobility.

- Global shifts towards BEV perception are seeing the industry adopt more of a **split approach** to future propulsion systems
- **BEV** still forecast to be the dominant system, with **33%** of motors produced in 2030 being used in a full electric vehicle, growing to **45%** globally by 2037.
- The emergence of **Range Extender** and **Plug-In Hybrid** systems as viable alternatives to BEV, particularly in Greater China
- The adjustments mean **~8million** more motors are added to the topline number in **2035** vs November 2025

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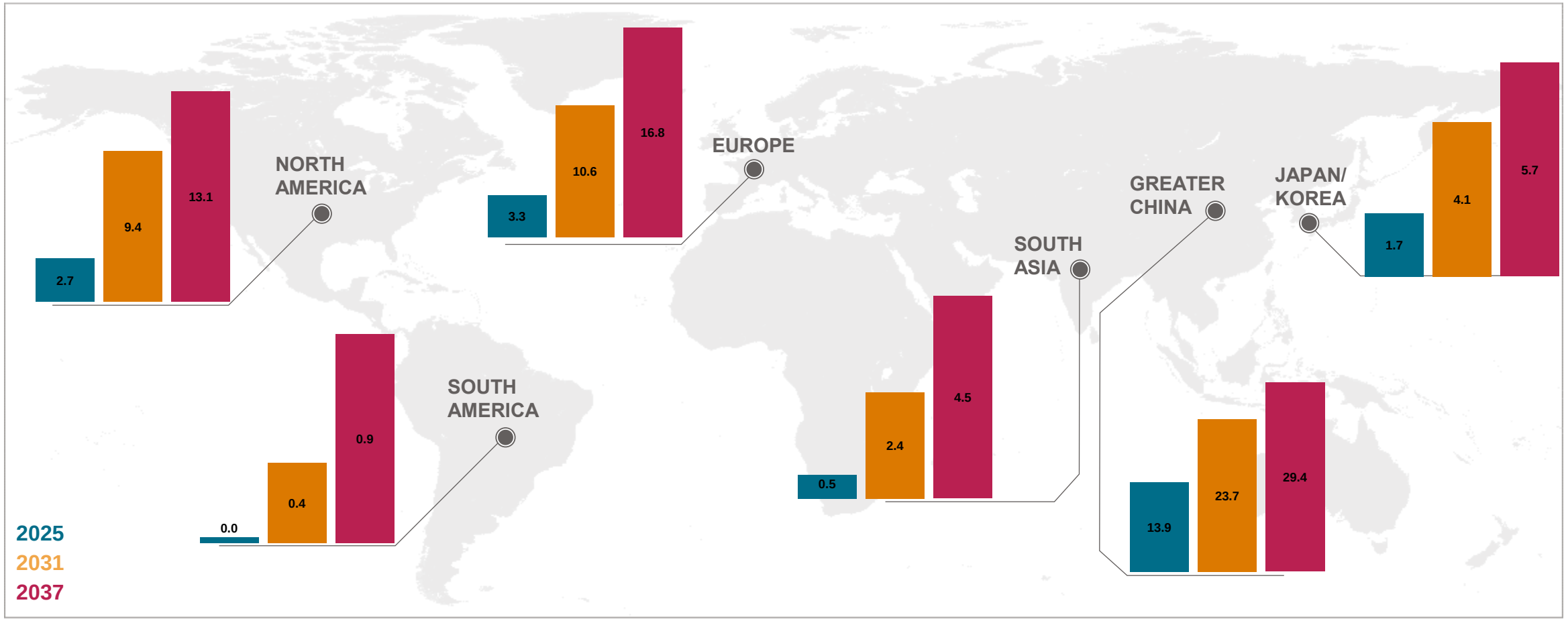
eAxle emotor Demand Regional Breakdown

A substantial increase in the demand for electric motors is anticipated across both major and emerging markets.

Global volume (Millions)



Date compiled Aug 2025
Source: S&P Global Mobility

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US Tariffs: Moving Targets and Growing Certainty

Latest status as per S&P Global Rapid Response #16

Multiple trade agreements in progress. Status/projections for key automotive trading partners

Date	Canada/Mexico		EU, South Korea, Japan	UK	Most Others (ex China)		Metals	
	LV	Parts	LV and Parts	LV and Parts	Light vehicles	Parts	Steel, aluminum	Copper
March 12	25% net of US value	Non-USMCA 25%, less OEM offset	25%	25%	25%	25%	From March 12, 25%. Raised to 50% June	50% Aug 1
April 3		USMCA Compliant – no tariff						
May 3								
Q3 2025			15%. No quota. EU effective 1 Aug; Jpn mid-Sept, S Korea pending	10% on LV to 100K units, then 25%. Parts 25%. Effective June 30th	New baseline: 15%, including MFN			
2026	12% with adjustment for US value add	Expected increase Labor Value Content and/or US value add						
After 2026								

Implementation still variable

Latest updates

1. Reciprocal tariffs from IEEPA distinct from Section 232 autos/parts, steel/aluminum and copper tariffs.
2. UK-US autos tariff June 30; steel TBD
3. US-China tariff extended to early November
4. EU framework progressing. US could apply 15% retroactive to Aug 1
5. Japan framework signed; implementation about Sept.12.
6. Tentative framework with South Korea timing uncertain.
7. Section 232 Copper tariffs on Aug. 1
8. Possible 100% chip tariff for non-US investment companies – late Q3

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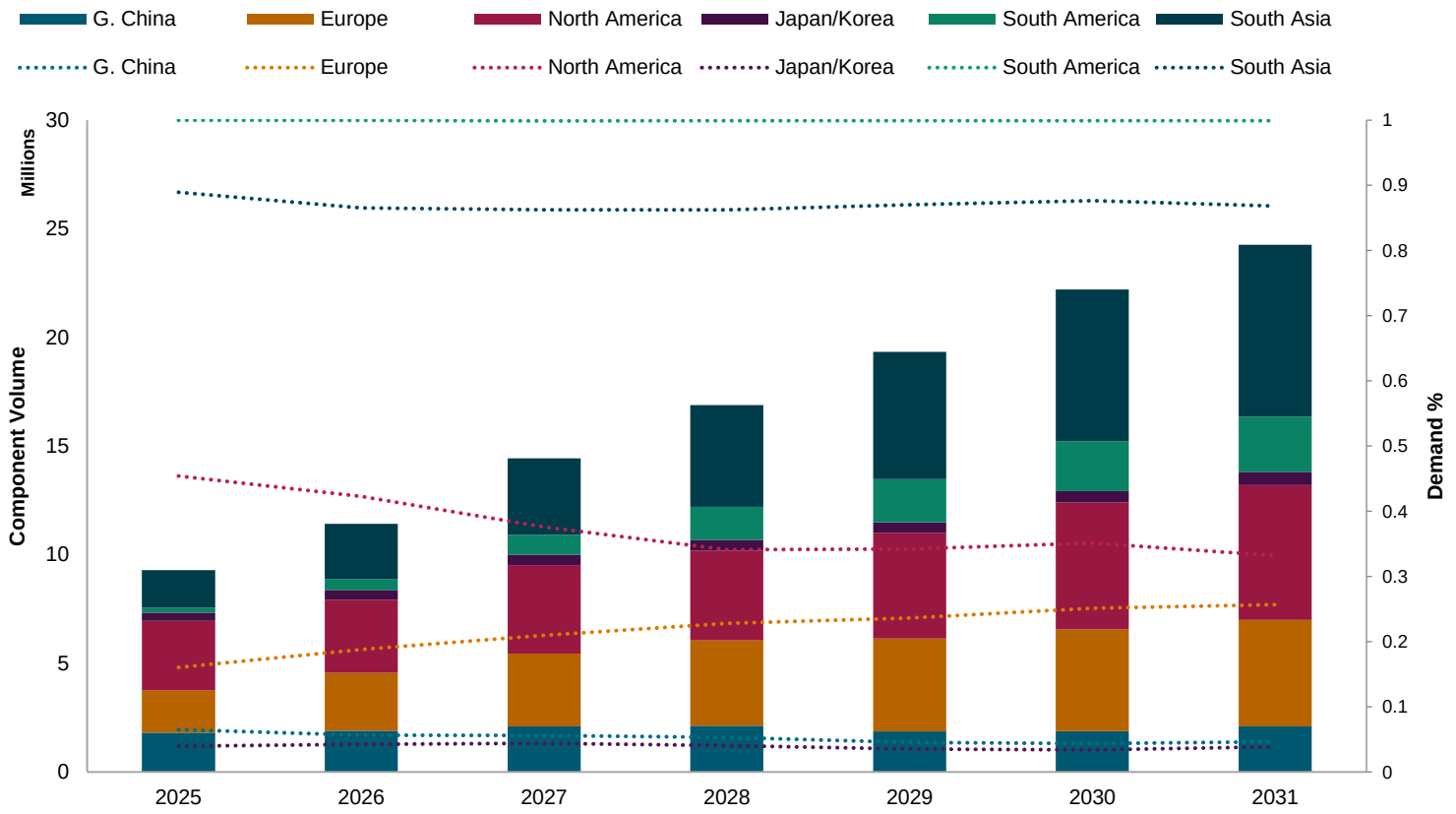
Global trade importance

With trade wars and tariffs still a threat to global trade, the importance of exports is crucial to the electric motor industry

Global imports of electric motors



- Approximately **1/5th** of the entire electric motor market will move **cross-continents** in 2030.
- Of the major automotive markets, **North America** currently the largest dependent on imports at **45%** in **2025**.
- Investments are coming to the region, taking this market reliance down to around 33% by 2030.
- **Europe** will see imports as a % demand increase as the decade continues, predominantly due to the growing presence of Chinese OEMs and suppliers (~**52% of imports from G. China in 2030**).

Data compiled September 2025

Source: S&P Global Mobility.

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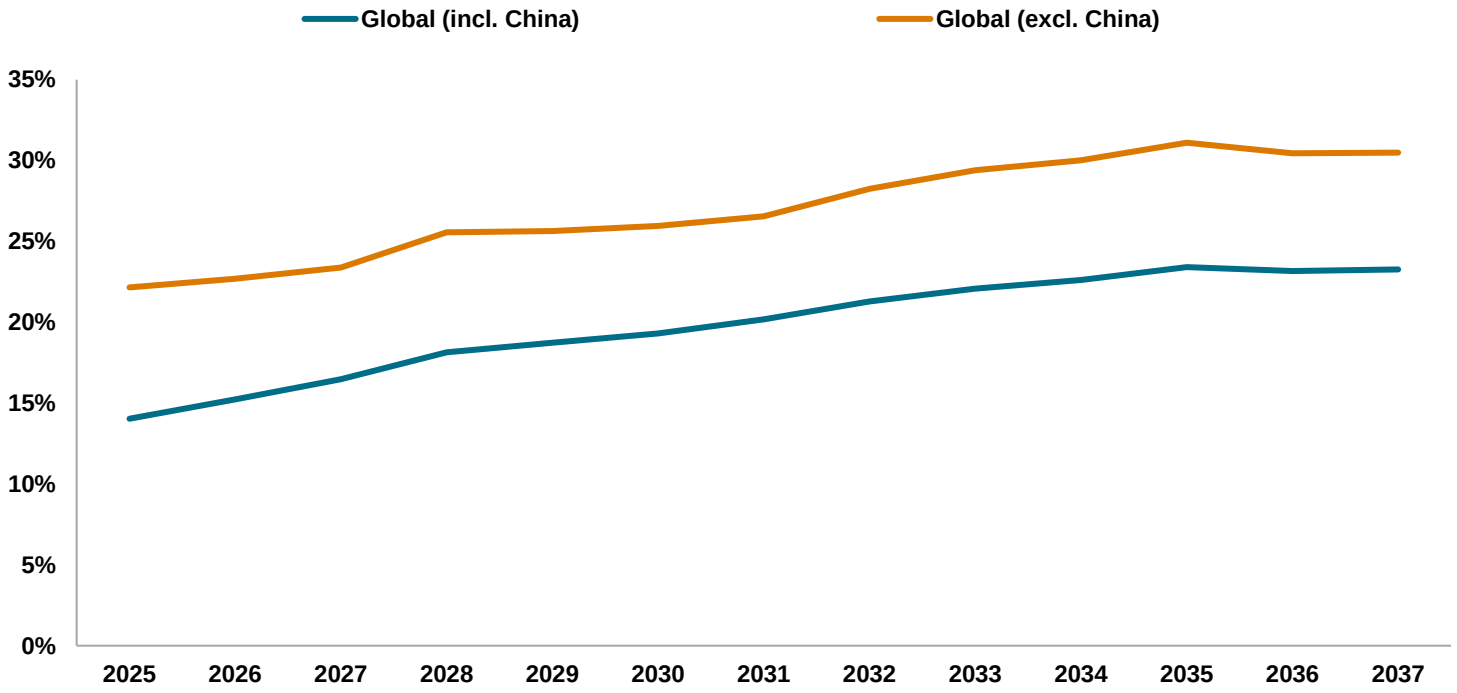
Rare Earth Free motor uptake

There is a concern in the industry around potential supply chain constraints on **rare earth materials & technology** in the future

There is already shift away from rare-earth dependency technology, various OEMs and Suppliers are exploring alternative technologies that make use of more common materials such as copper.

Rare Earth Free Motor Uptake



Data compiled Aug. 19, 2025.

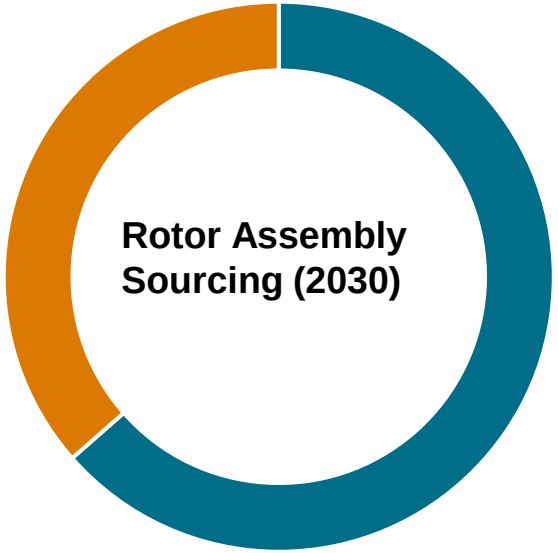
Source: S&P Global Mobility.

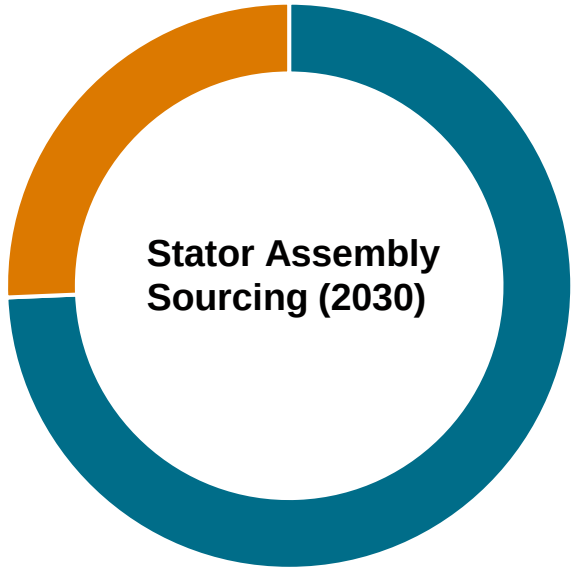
- **Europe** is leading a **notable shift** toward **externally-excited synchronous motors (EESM).** This technology replaces the rotor's magnet with copper wire to generate the required rotation.
- **BMW** and **Renault** have been early adopters of EESM, but more OEMs and suppliers are expected to follow to reduce exposure to the magnet-based automotive supply chain.
- Major suppliers such as **BorgWarner** and **Vitesco Technologies** have developed **drive units** where in **PMSM** can be **seamlessly** replaced with **EESM**
- Given **Greater China**'s access to ample rare earth elements, the uptake of rare earth elements in the Rest of the World (RoW) **is projected to increase** by an **average of 7.2%** over the specified time horizon if China is excluded in the analysis.

Rotor Stator sub-component supply chain importance

As volumes increase and OEM involvement in the design and manufacture of drive units, motors and inverters, suppliers are increasingly having to be flexible in their approach.

Sub-components of Rotor & Stator are increasingly emerging as opportunities for direct supply or print-to-build.





Data compiled September 2025

Source: S&P Global Mobility.

Inhouse (produced by motor assembly supplier)

Outsourced

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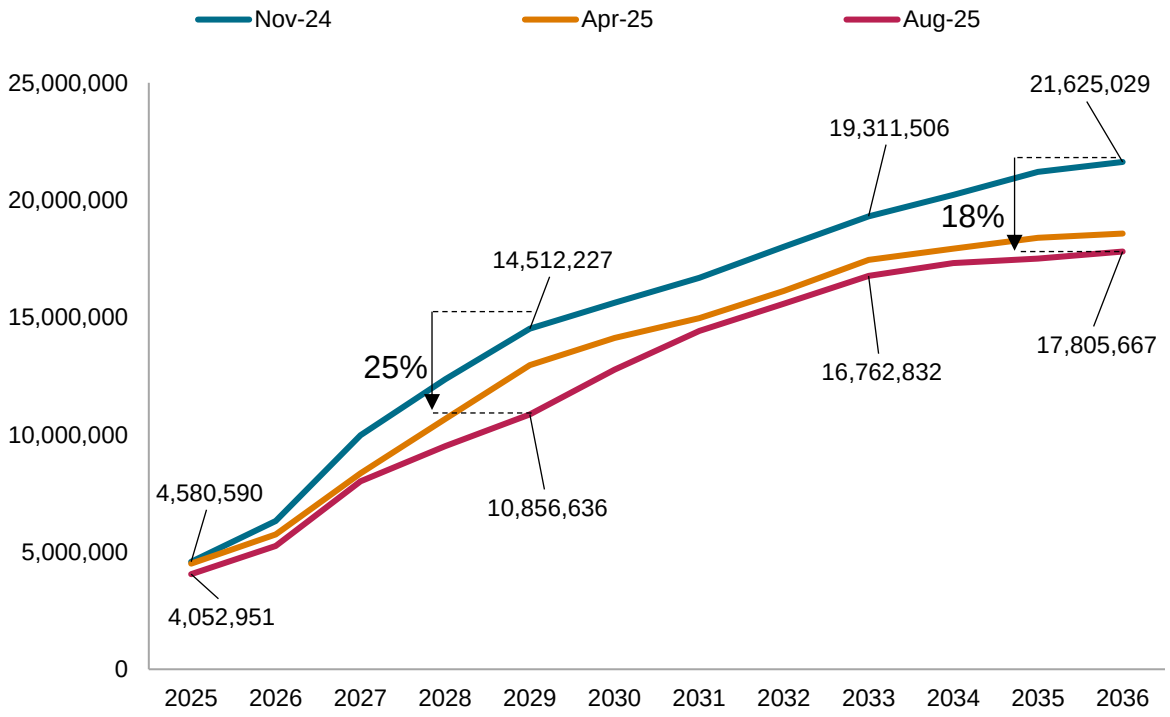
North America

Global Forecast Comparison vs NA Forecast Comparison (E-Motor Production)

Lately **USA Tariffs**, Rare Earth Materials ban to USA and basically Trumps hitting the **brakes** on electric vehicle growth in USA translate on a **decrease** in the **NA E-motor production** forecast compared to the Global production.

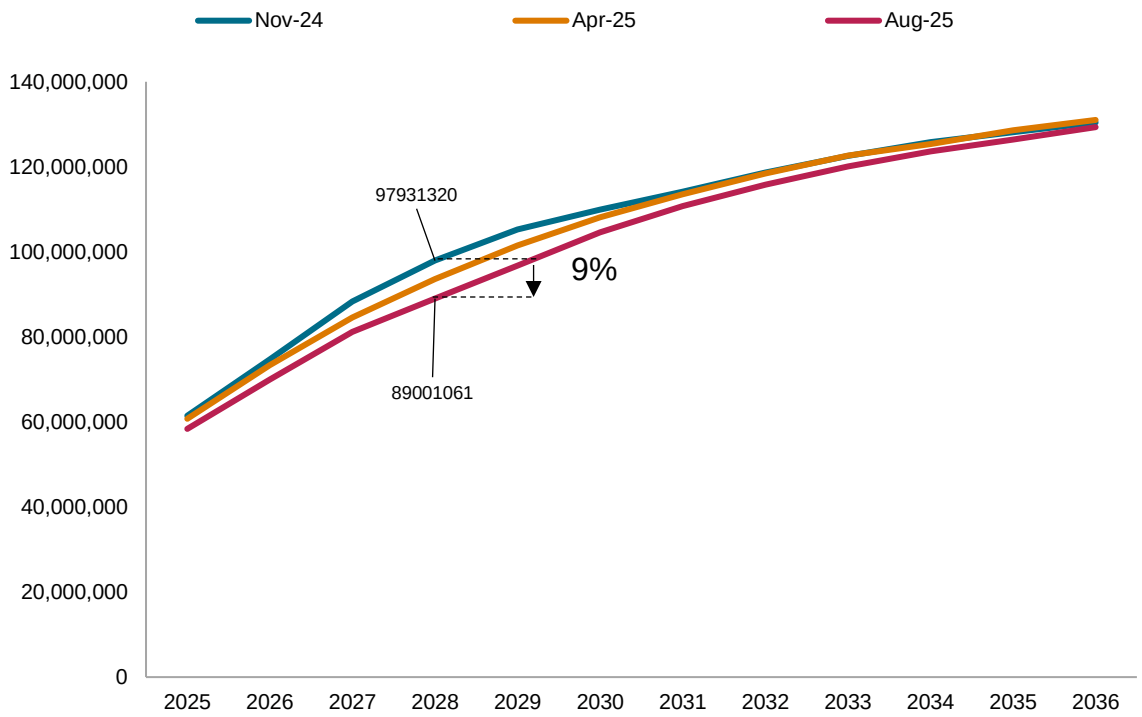
North America Forecast Comparison (E-Motor Production)



Data compiled 08. 27, 2025.

Source: S&P Global Mobility.

Global Forecast Comparison (E-Motor Production)



Data compiled 08. 27, 2025.

Source: S&P Global Mobility.

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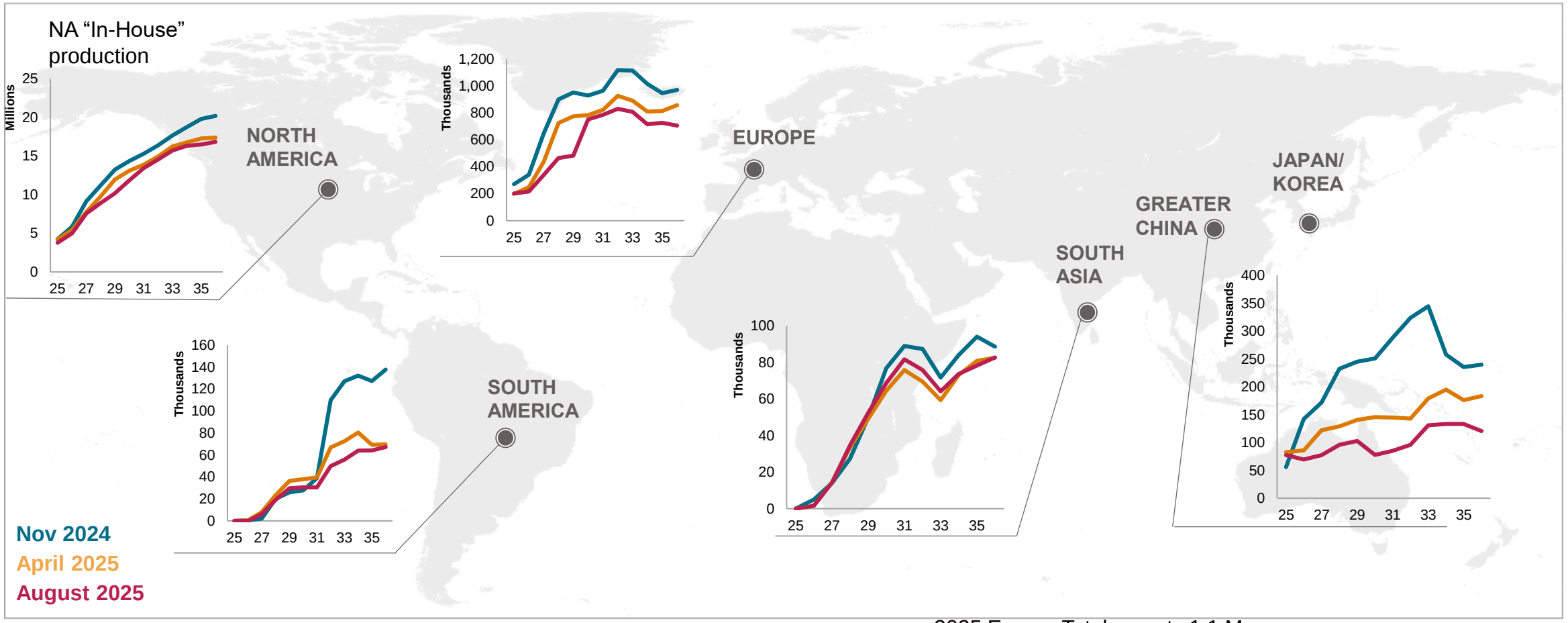
NA E-Motor Export Regional Breakdown

A substantial increase in the **demand of NA E-Motors** is anticipated across regions but has been slowed down do to **Trump´s administration** and **Tariffs** specially Europe.

NA Regional Export of E-Motor



Date compiled Aug 2025
Source: S&P Global Mobility

2025 NA exports around 278,949 E-Motors
2035 NA exports around 1,001,818 E-Motors

2025 Europe Total exports 1.1 M
2025 China Total exports 1.9 M
2025 Japan/Korea Total exports 5.6 M

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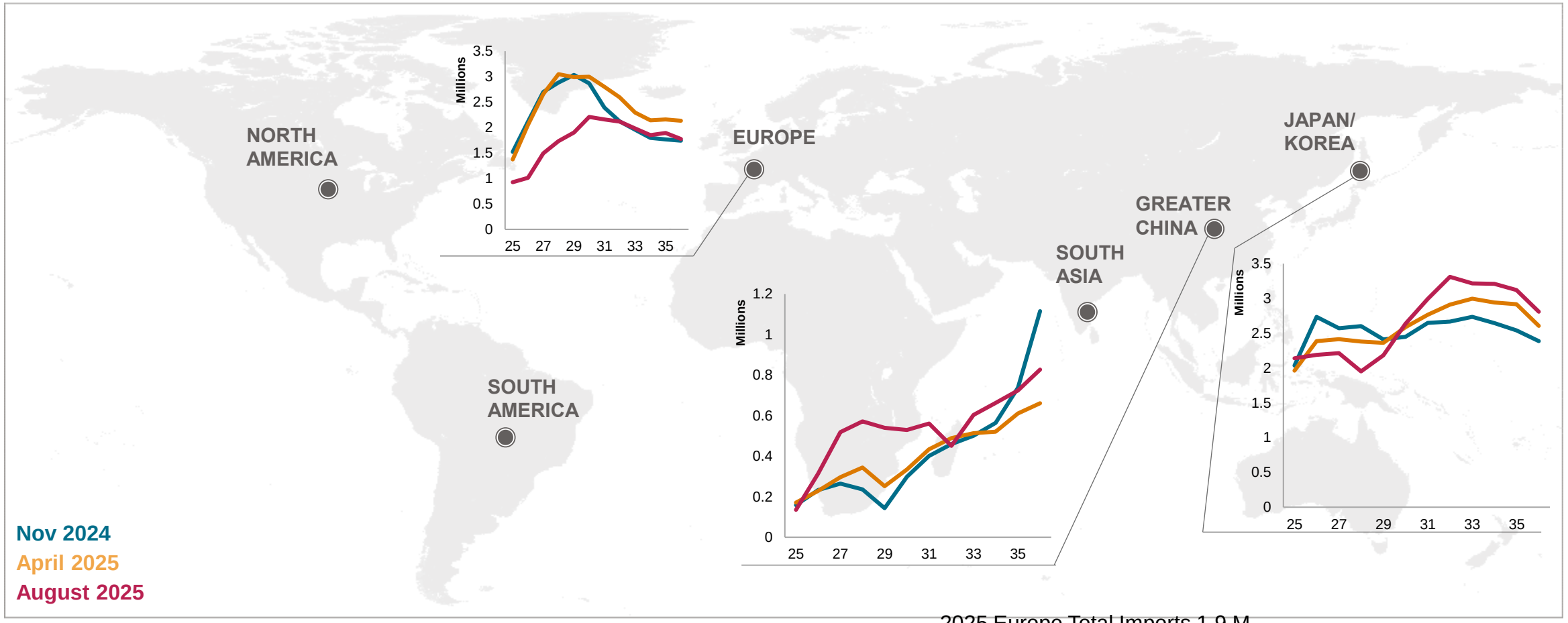
NA E-Motor Import Regional Breakdown

Still NA is going to heavily rely on Japan, Korea and Europe, and we can see an impact on China Imports to NA.

NA Regional Import of E-Motor



Date compiled Aug 2025
Source: S&P Global Mobility

2025 NA import around 3,202,187 E-Motors
2035 NA import around 5,737,528 E-Motors

2025 Europe Total Imports 1.9 M
2025 China Total Imports 1.8 M
2025 Japan/Korea Total Imports 375 K
2025 South Asia Total Imports 1.7 M

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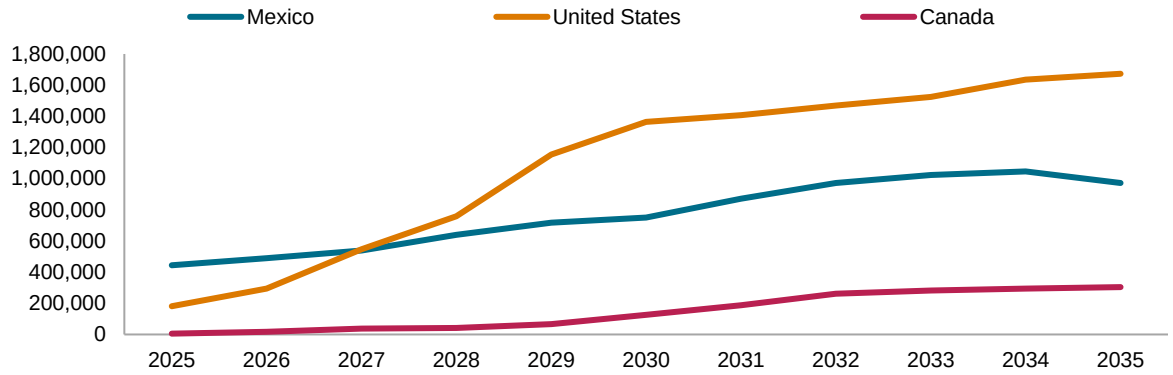
Mexico Landscape near USMCA revision

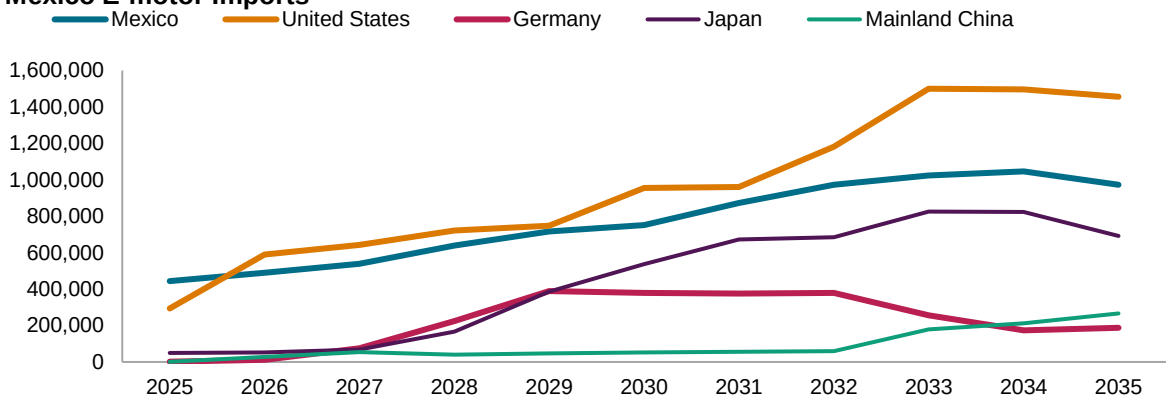
Mexico don’t have a lot of E-motor Imports from outside the Region, Mexico production has been always controlled by USMCA

Mexico E-Motor Production for NA



Data compiled: Sep 2025
Source: S&P Global Mobility.

Mexico E-motor Imports



Data compiled: Sep 2025
Source: S&P Global Mobility.

- Mexico historically has been a manufacturing HUB for NA constantly increasing thanks to NAFTA and USMCA.
- However lately, tariffs, tensions and global problems have unstable this growth.
- USA, Mexico and Canada are **preparing** for **USMCA revision** next year.
- Mexico already start to do some movement to protect the regional agreement with NA like Tariffs to China vehicles (and other products).
- We are expecting to see more of this reinforcement movements on the USMCA revision to align with the Region production and Supply Chain.

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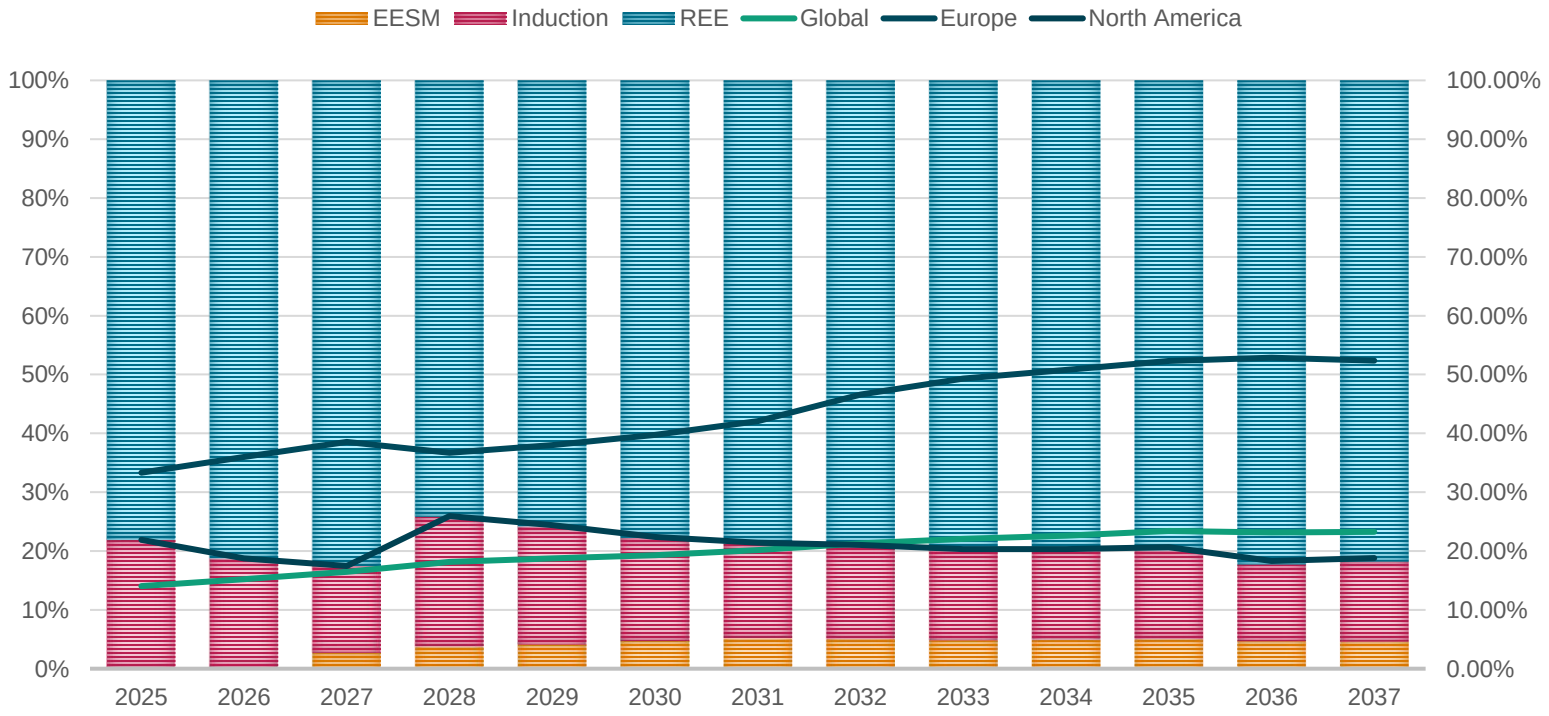
Rare Earth Free motor uptake North America

There is a concern in the industry around potential supply chain constraints on **rare earth materials & technology** in the future

There is already shift away from rare-earth dependency technology, various OEMs and Suppliers are exploring alternative technologies that make use of more common materials such as copper.

Rare earth free motor uptake North America



Data compiled Aug. 19, 2025.

Source: S&P Global Mobility.

- The global **Rare earth free motor** penetration increases from **14%** in 2025 to **23%** to **2037,** primarily driven by uptake in Europe.
- In North America, **Rare earth free motor** penetration remains relatively flat and ranges from **18%** to **21%** over the next twelve years.
- **Induction motors** find major use as **secondary drive units** with the market volumes in **2037** expected to be **5x** of the market volume in **2025**
- **What remains to be seen in North America is the speed and success of magnet production lines and if they force a bigger switch to EESM or Rare Earth free motors**

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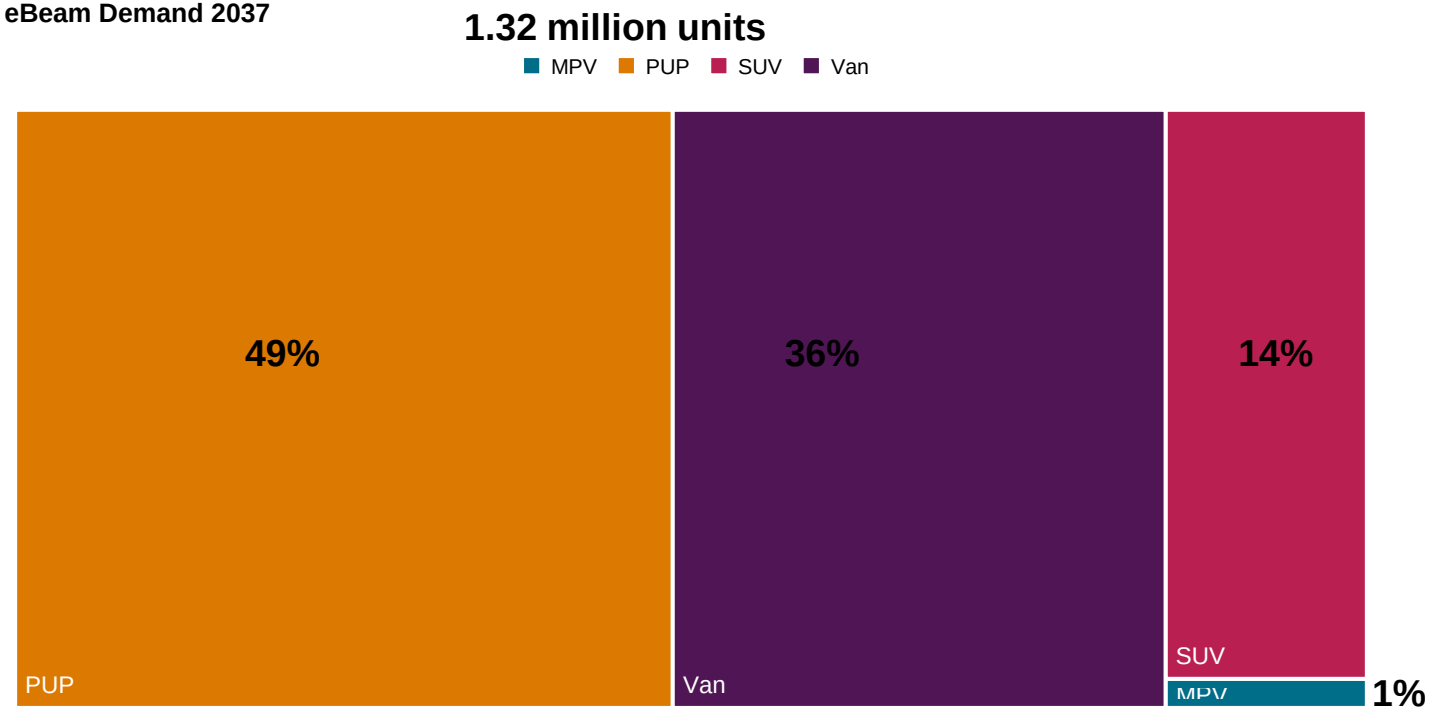
eBeam demand

With the anticipated **growth in Electric Vehicle adoption** over the coming years, **use cases will expand** across various vehicle segments. Notably, **vans** and **pickup trucks** are projected to demand over **11.4 million** drive units by **2037**.

Several suppliers are actively **advancing eBeam technology** to meet the rising demand for **enhanced towing capabilities** for electric pickups and vans

eBeam Demand 2037



Data compiled Aug. 19, 2025.
Source: S&P Global Mobility.

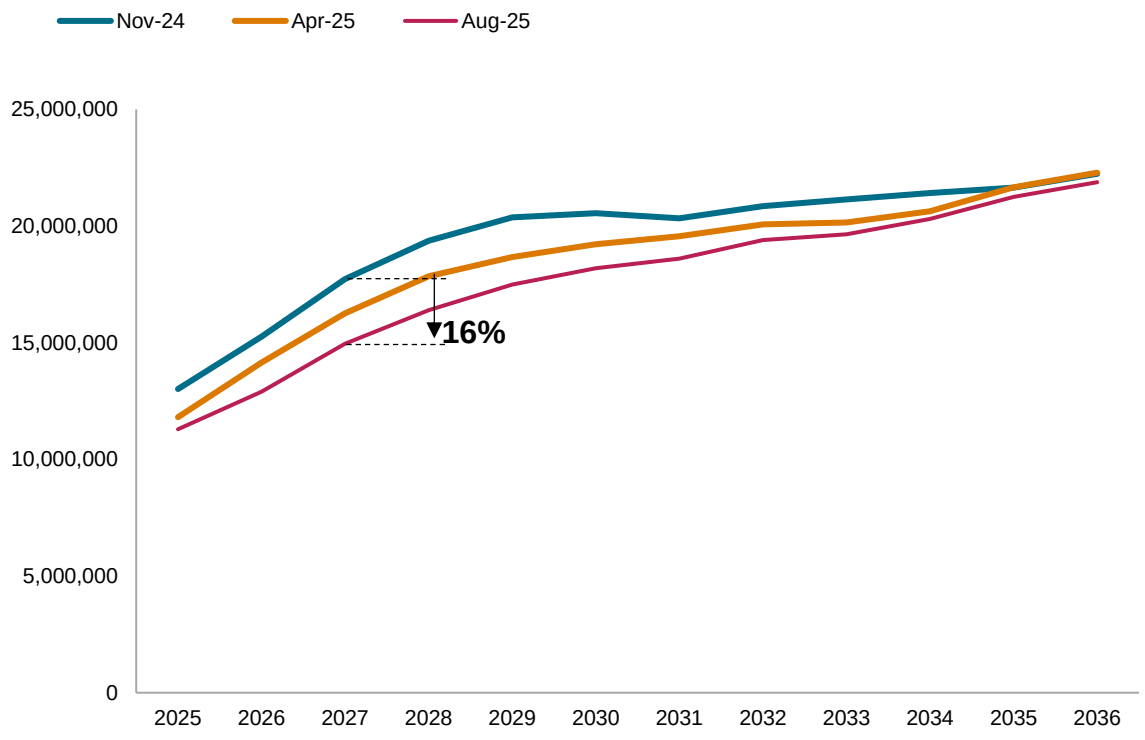
- **eBeam technology** operates similarly to a **solid beam axle** found in internal combustion engine vehicles, featuring an **integrated e-motor within the axle**.
- Given the **loading and towing demands**, the **pickup truck segment** is anticipated to be a key driver of this market, with North America leading the charge.
- **Pickup trucks** in North America are expected to account for **40%** of the total demand of **eBeams** in **2037**
- Moreover, there is **significant potential** for the **van market in Europe**, as well as the **pickup and van segments in Greater China**, to follow suit.

Europe

Global Forecast Comparison vs EU Forecast Comparison (E-Motor Production)

The decline in electric vehicle (EV) adoption has resulted in a **decrease in the projected volume** of electric motors, with an **11% reduction** expected by 2029. However, this discrepancy is expected to **narrow to 6%** in the long term.

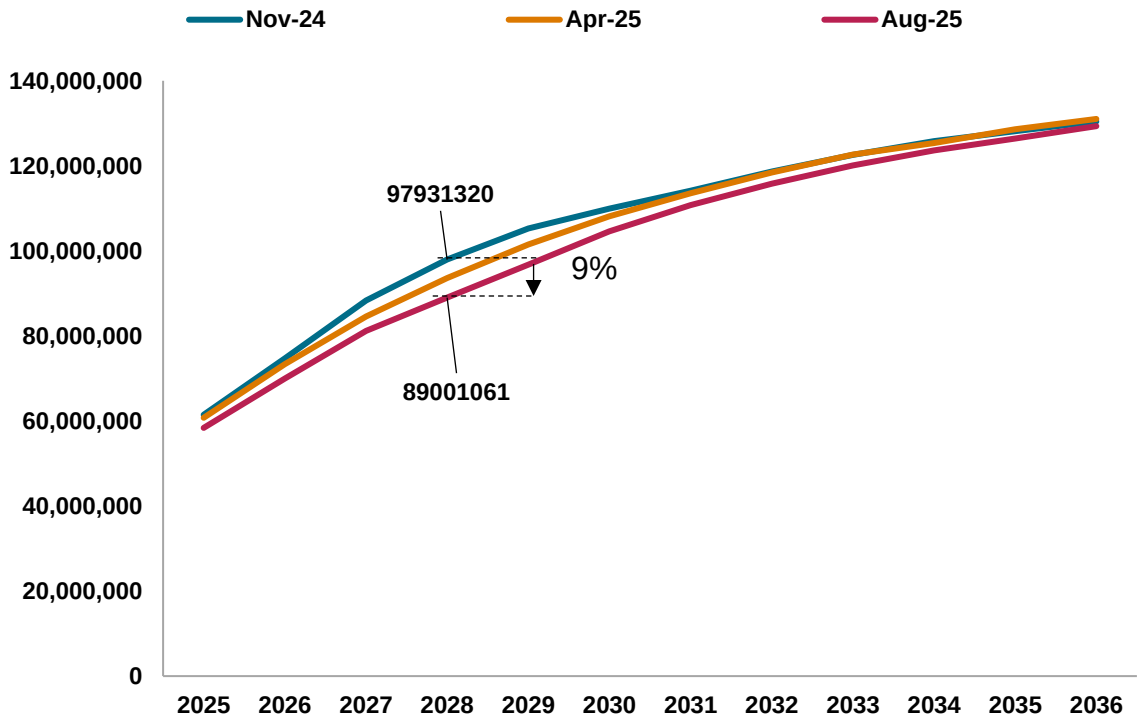
Europe E-motor Forecast Comparison



Data compiled Aug. 19, 2025.

Source: S&P Global Mobility.

Global Forecast Comparison (E-Motor Production)



Data compiled 08. 27, 2025.

Source: S&P Global Mobility.

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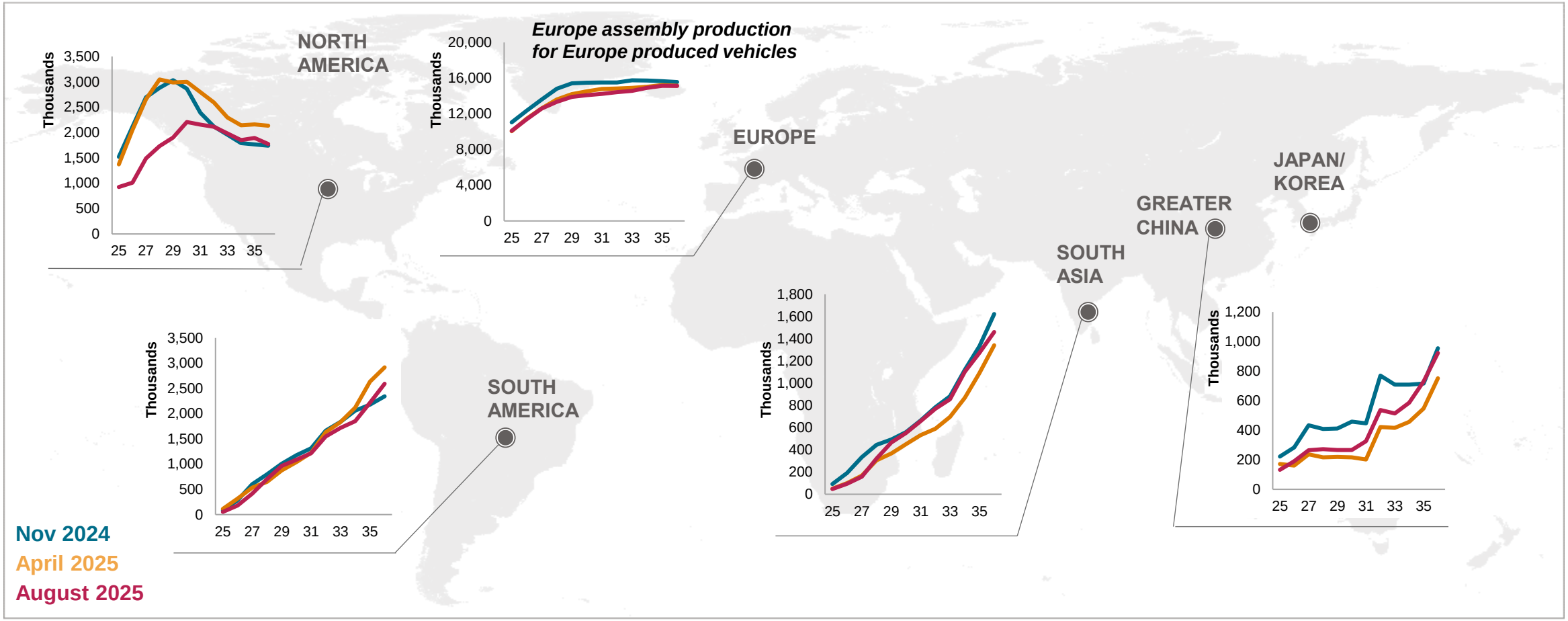
EU E-Motor Export Regional Breakdown

We anticipate a steady **increase in local production** of electric motors in Europe, starting from approximately **10.1 million units** in **2025** and rising to around **15.1 million units** by **2036**. Furthermore, **EU exports** are also expected to **rise substantially**, from about **1.2 million units** in **2025** to approximately **6.8 million units** in **2036**, indicating a **strong demand** in international markets for European-manufactured electric motors.



Date compiled Aug 2025
Source: S&P Global Mobility

2025 EU exports around 11,95,634 E-Motors
2035 NA exports around 61,18,206 E-Motors

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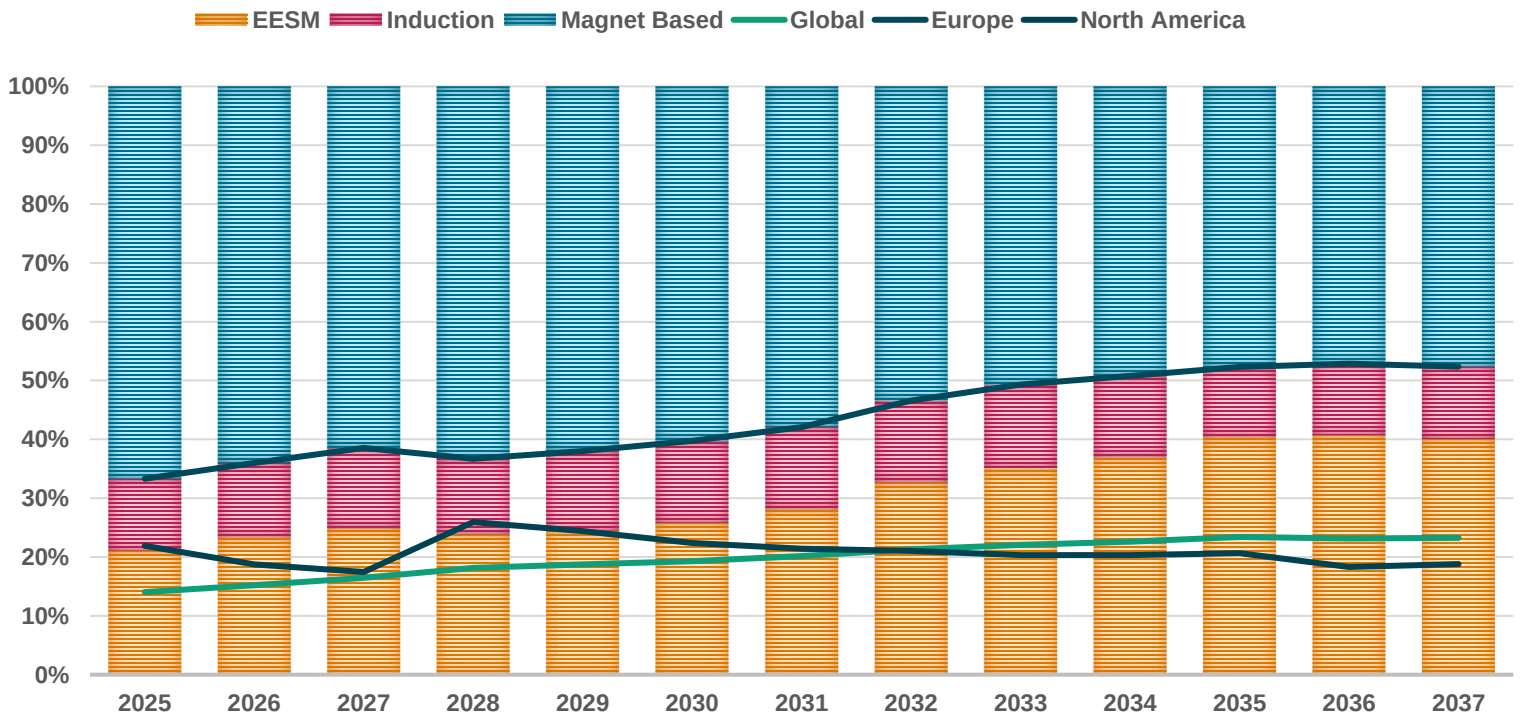
Rare Earth Free motor uptake Europe

There is a concern in the industry around potential supply chain constraints on **rare earth materials & technology** in the future

There is already shift away from rare-earth dependency technology, various OEMs and Suppliers are exploring alternative technologies that make use of more common materials such as copper.

Rare earth free motor uptake Europe



Data compiled Aug. 19, 2025.

Source: S&P Global Mobility.

- The global **Rare earth free motor** penetration increases from **14%** in 2025 to **23%** to **2037,** primarily driven by uptake in Europe.
- In Europe, **Rare earth free motor** penetration increases from **33%** in 2025 to **52%** to 2037.
- **EESM** dominates the rare earth free motor volumes as it is the **preferred source of primary drive** in electric vehicles. In **2025**, **EESM** has a penetration of **63%**. This increases to **76%** in **2037**.
- **Induction motors** find major use as **secondary drive units** with the market volumes in **2037** expected to be **5x** of the market volume in **2025**

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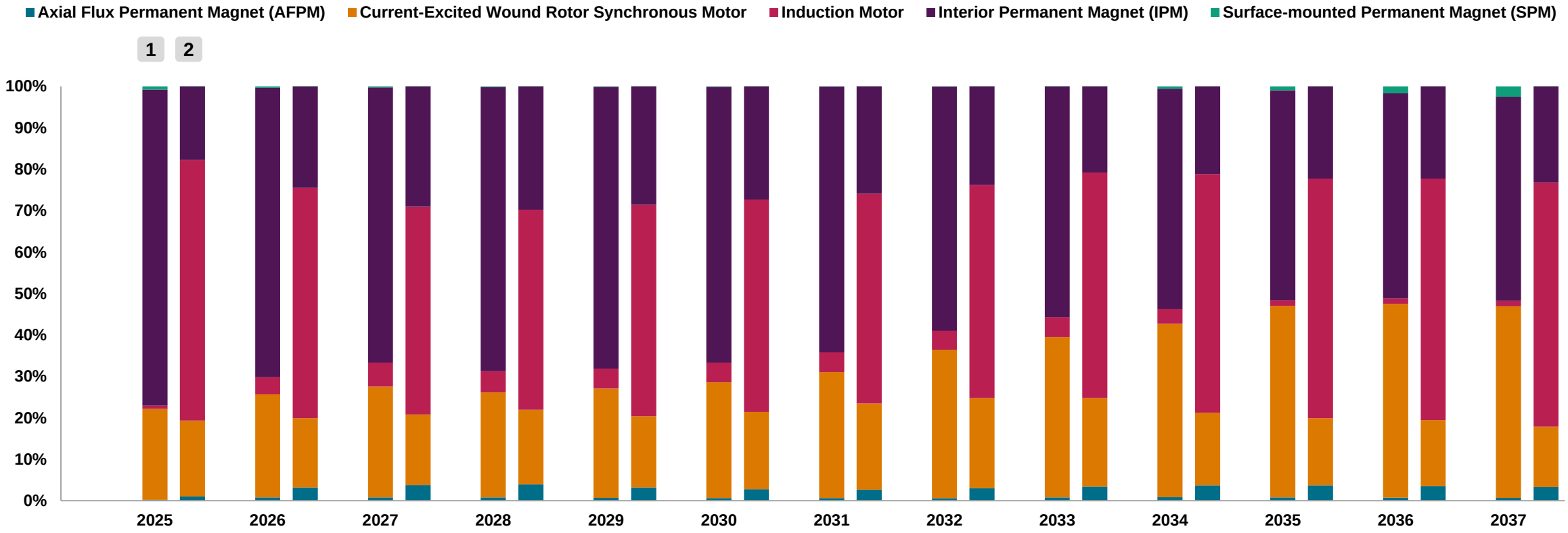
Primary vs Secondary drive breakdown

Induction motors will maintain a **significant role** as a **secondary drive source** in **Europe**. Meanwhile, **Electrically Excited Synchronous Motors** (EESMs) are **anticipated** to become the **leading choice for primary drive sources**, as **advancements** are bringing their **performance closer** to that of **Permanent Magnet Synchronous Motors (PMSMs).**

Drive source breakdown by Emotor Type



Data compiled Sept. 20, 2025.

Source: S&P Global Mobility.

1 Primary Drive Source

2 Secondary Drive Source

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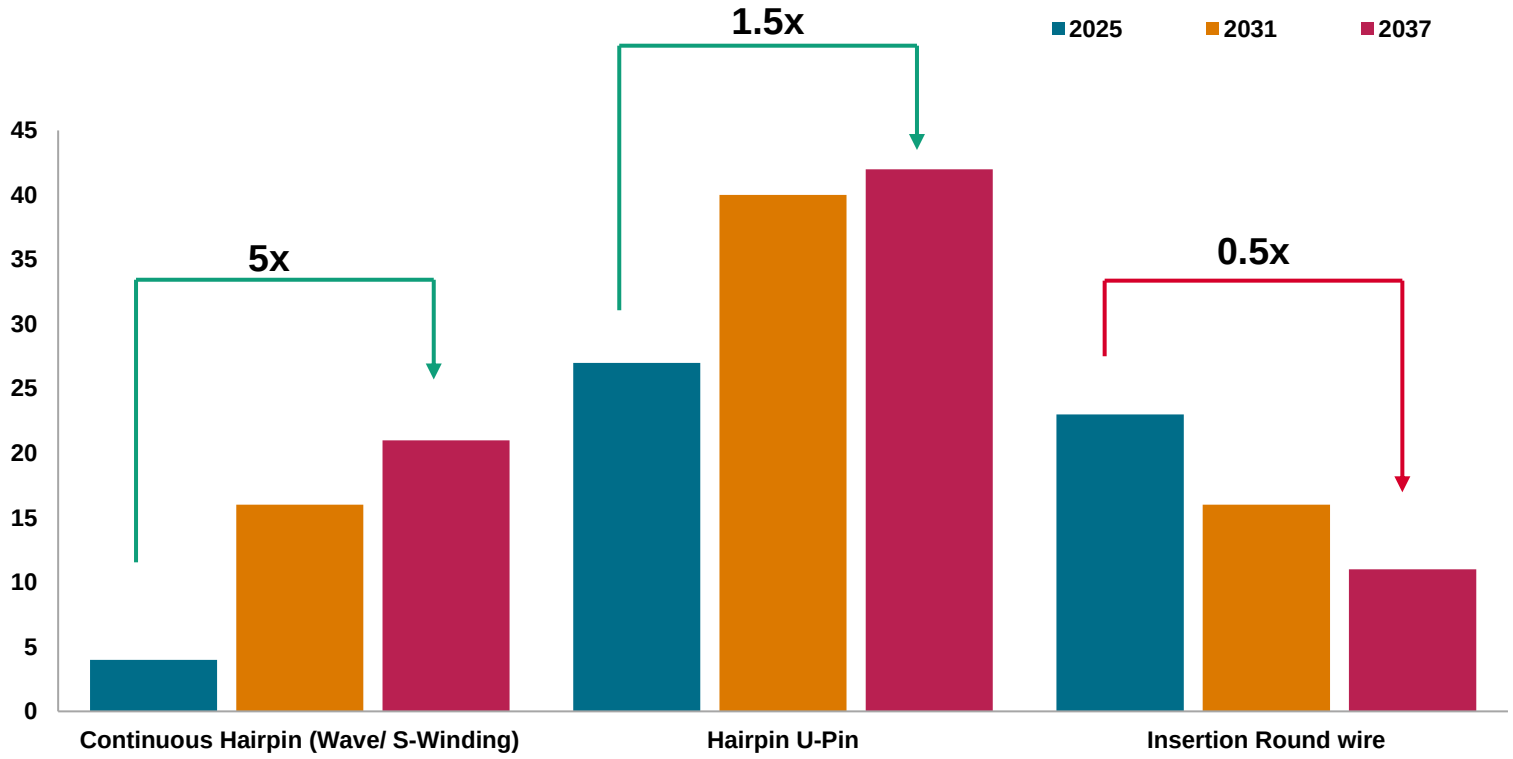
Winding Technology Outlook - EU

Accelerating Innovation: The Rise of Hairpin Technology in Electric Motor Production

Hairpin winding strikes a balance between **high performance** and **cost-effectiveness**, thus positioning itself as the go-to solution for winding technology

Supplier Count based on Winding Technology Adoption



Data compiled Aug. 19, 2025.

Source: S&P Global Mobility.

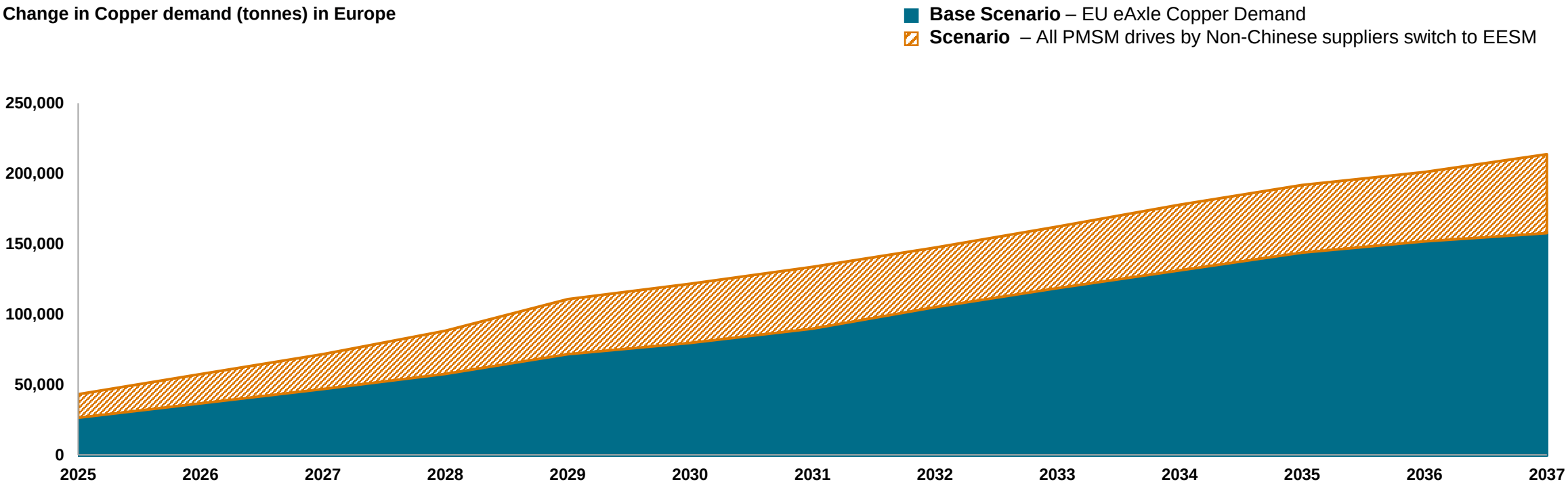
- Hairpin technology is poised for substantial growth in the coming years, particularly as the demand for eAxle applications increases. **Europe** is expected to experience a **rapid ramp-up** in **hairpin production lines in the short term**.
- **Hairpin winding technique** is expected to account for **~70%** of the stator winding market by **2037**.
- The number of suppliers manufacturing **continuous wave winding** is projected to **rise fivefold** from 2025 to 2037, whereas those **producing hairpin winding** are expected to **increase by one and a half times**, as it has emerged as the **preferred winding technology**.
- Additionally, over **50% of suppliers** that are involved in the production of **insertion round wires** in **2025** will **no longer be engaged** in this winding technology by **2037**.

EU Copper demand for eAxles – Scenario Analysis

Growth of **hairpin production** and **EESM** will increase their copper demand throughout the next decade. As markets shift towards **new motor topologies**, expect these numbers to potentially fluctuate further.

eAxle eMotor Copper demand to exceed **157k tons by 2037.** Alternate scenario indicates a situation where in if all **non-Chinese eaxle suppliers** were to **switch to EESM** in Europe, the **copper demand** would **increase by 35%** to **213k tons** in **2037**.

Change in Copper demand (tonnes) in Europe



Data compiled Sep. 20, 2025.

Source: S&P Global Mobility.

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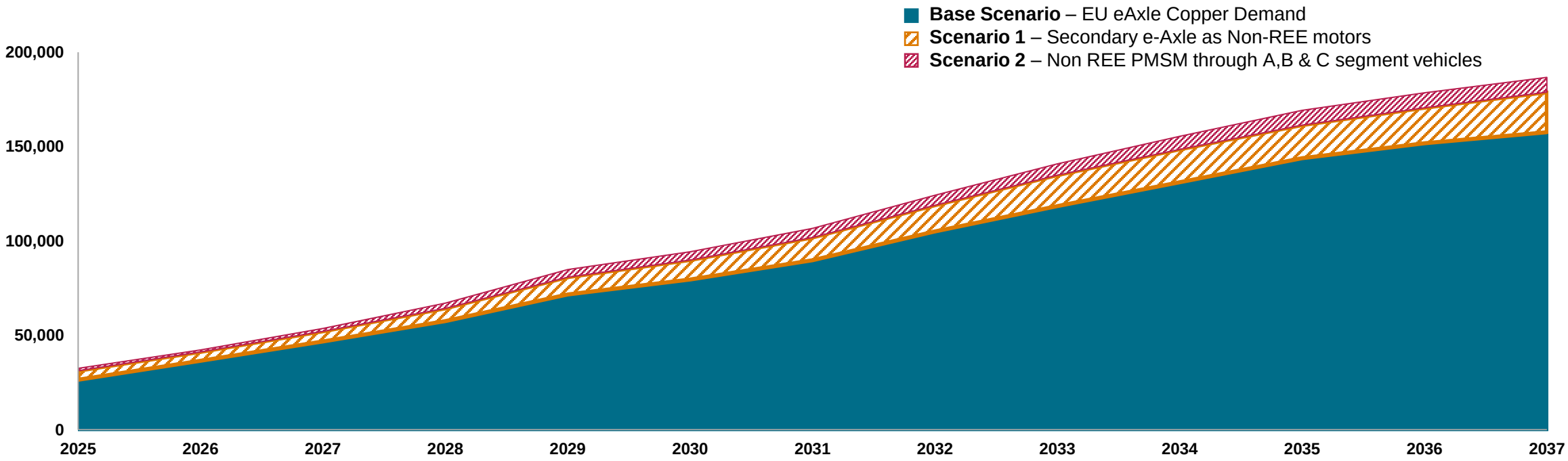
EU Copper demand for eAxles – Scenario Analysis

eAxle eMotor Copper demand to exceed **157k tons by 2037.** The installation of non-rare earth-based motors in each **secondary e-Axle** is projected to yield an increase of 13% i.e. **21k tons** in Copper consumption in 2037. Further **8k tons** increase possible in Copper consumption is possible if Non-REE based motors are used in A,B & C segments vehicles with lower power requirements by **2037.**

Change in Copper demand (tonnes) in Europe



Data compiled Sep. 20, 2025.

Source: S&P Global Mobility.

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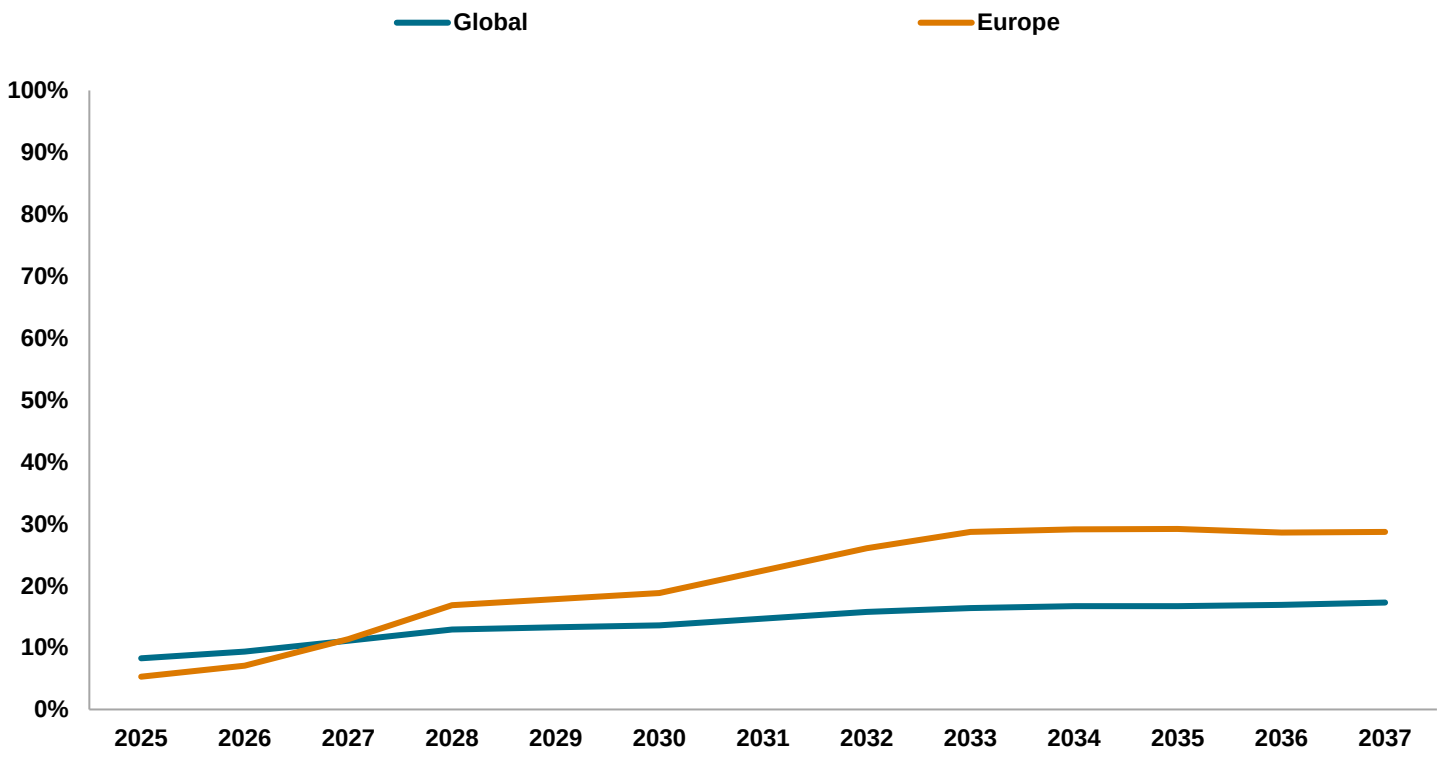
E-Motor Speed Trend

This advancement not only boosts vehicle efficiency and performance but also underscores Europe's leadership in sustainable mobility, driving innovation

Market penetration of high speed motors



Data compiled Aug. 19, 2025.

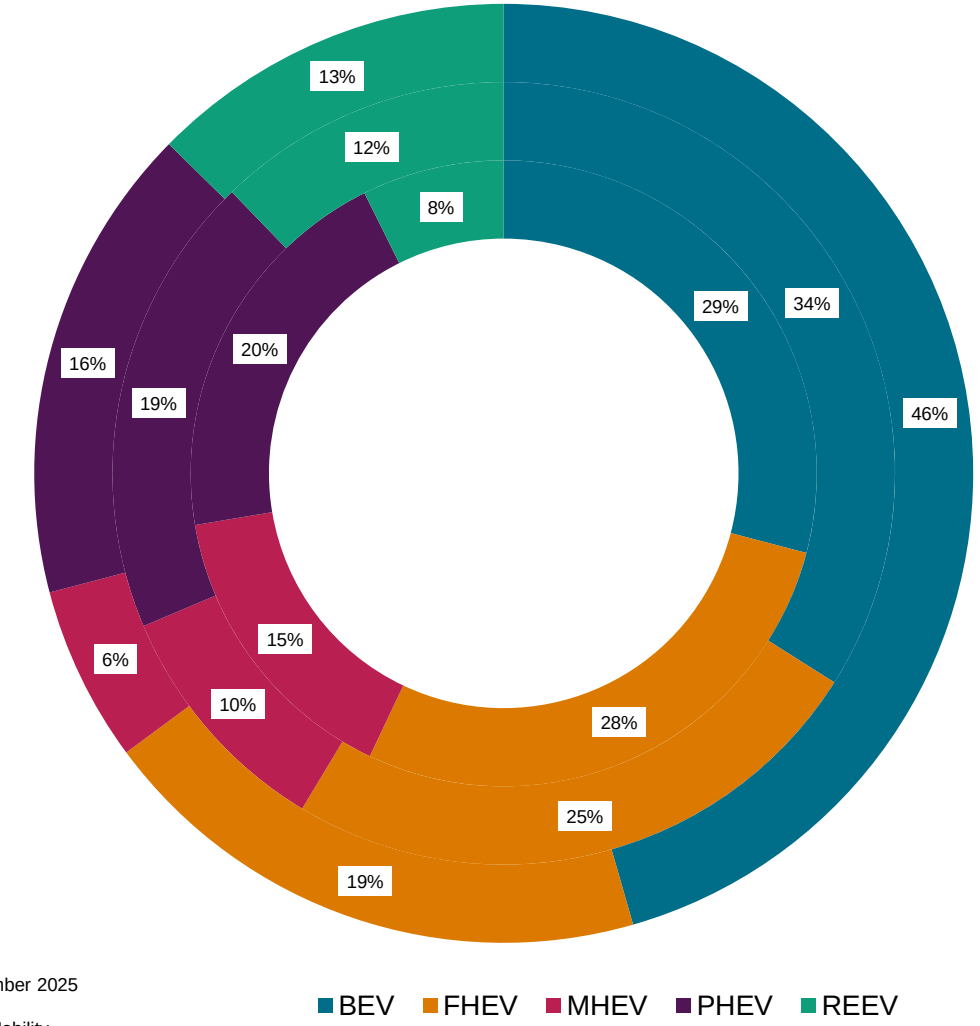
Source: S&P Global Mobility.

- **Market Growth:** Europe is leading the charge, with penetration rates for high-speed motors expected to rise from 5.30% in 2025 to 29.10% by 2034, highlighting a **robust commitment** to **advanced electric motor technology**.
- **Sustainability Goals:** The adoption of high-speed motors aligns with Europe’s sustainability goals, driving manufacturers to innovate and meet consumer demand for cleaner transportation solutions.
- **Competitive Advantage:** As European OEMs and suppliers invest in high-RPM motor technology, they position themselves at the forefront of the electric vehicle market, enhancing their competitive edge in the global automotive industry.

Greater China

Growth of REEV motors

Chinese motor production by propulsion type



Data compiled September 2025

Source: S&P Global Mobility.

China occupies **47.3%** of all motor production in **2025**, only seeing a small market share drop in the coming years

REEV emerging, with **13%** of Chinese production for REEV vehicles in **2037**

As a percentage of propulsion split, **83.5%** of Chinese production will be **electrified** in 2037

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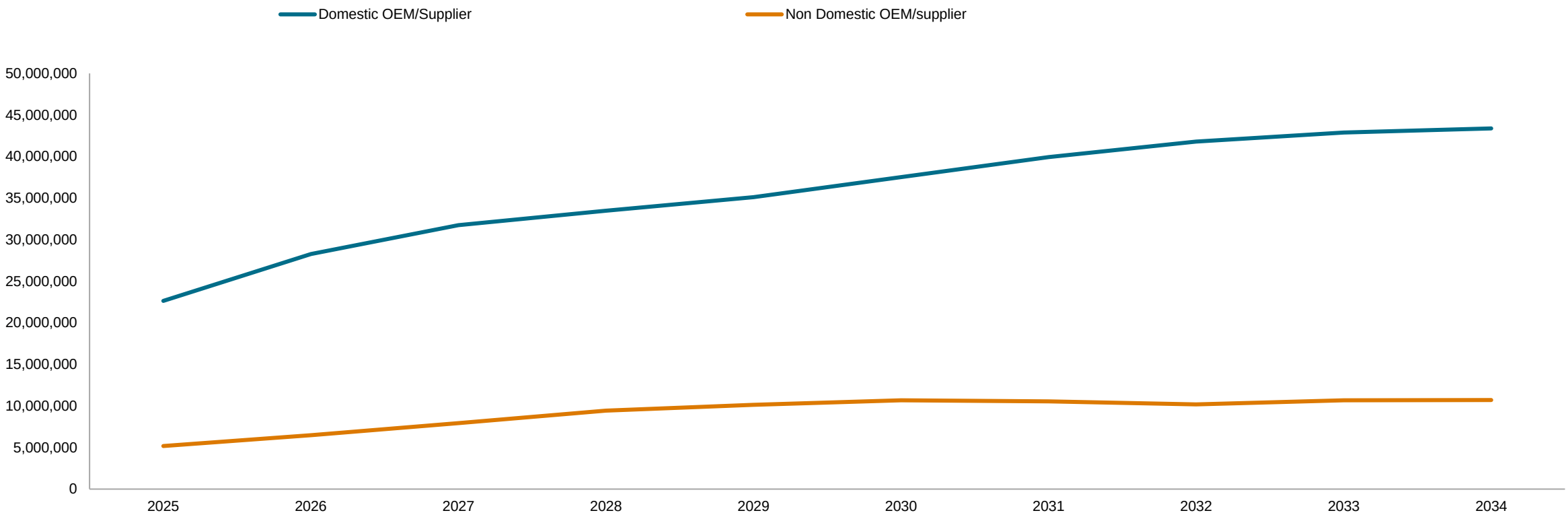
Chinese production vs Non-Chinese

Cost is crucial in the emerging EV market and domestic Chinese producers have shown their ability in this area. Over the coming decade, expect an even bigger ramp up in domestic eMotor production.

Motor production levels in Greater China



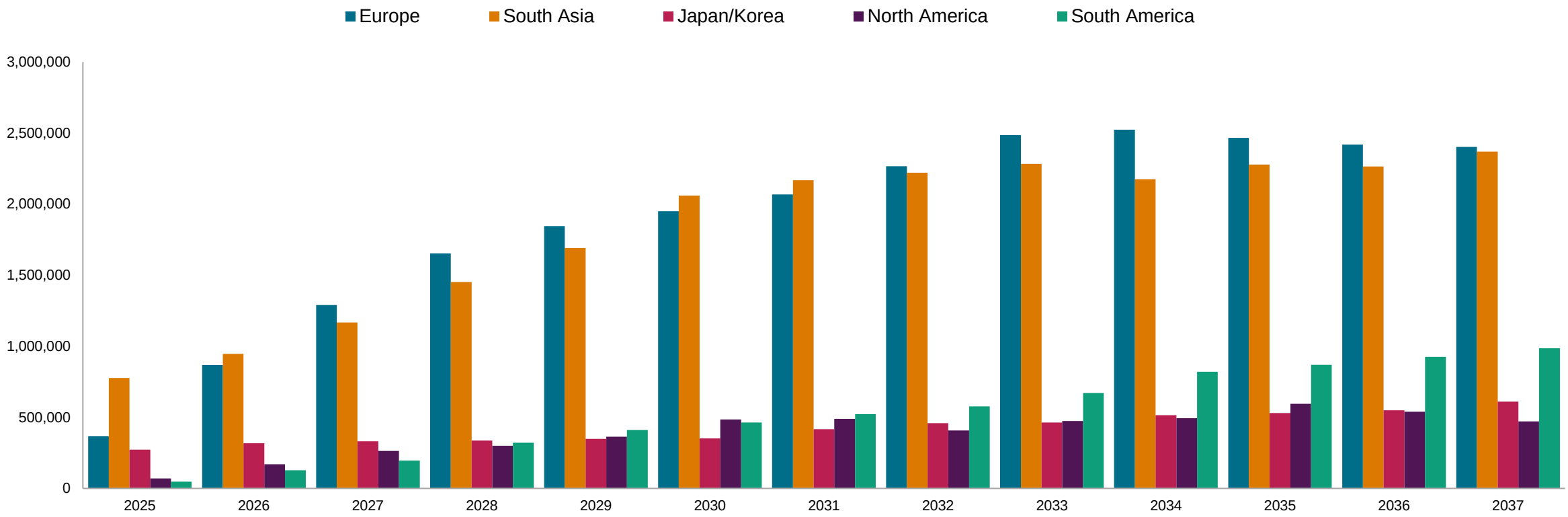
Data compiled September 2025

Source: S&P Global Mobility.

Exports of Motor, where to

Europe and South Asia are expected to see a sharp rise in imported motors from Greater China in the coming years. By 2031, 15% of European demand is imported from G China, and 33% in South Asia.

Growth of Motor exports to global regions



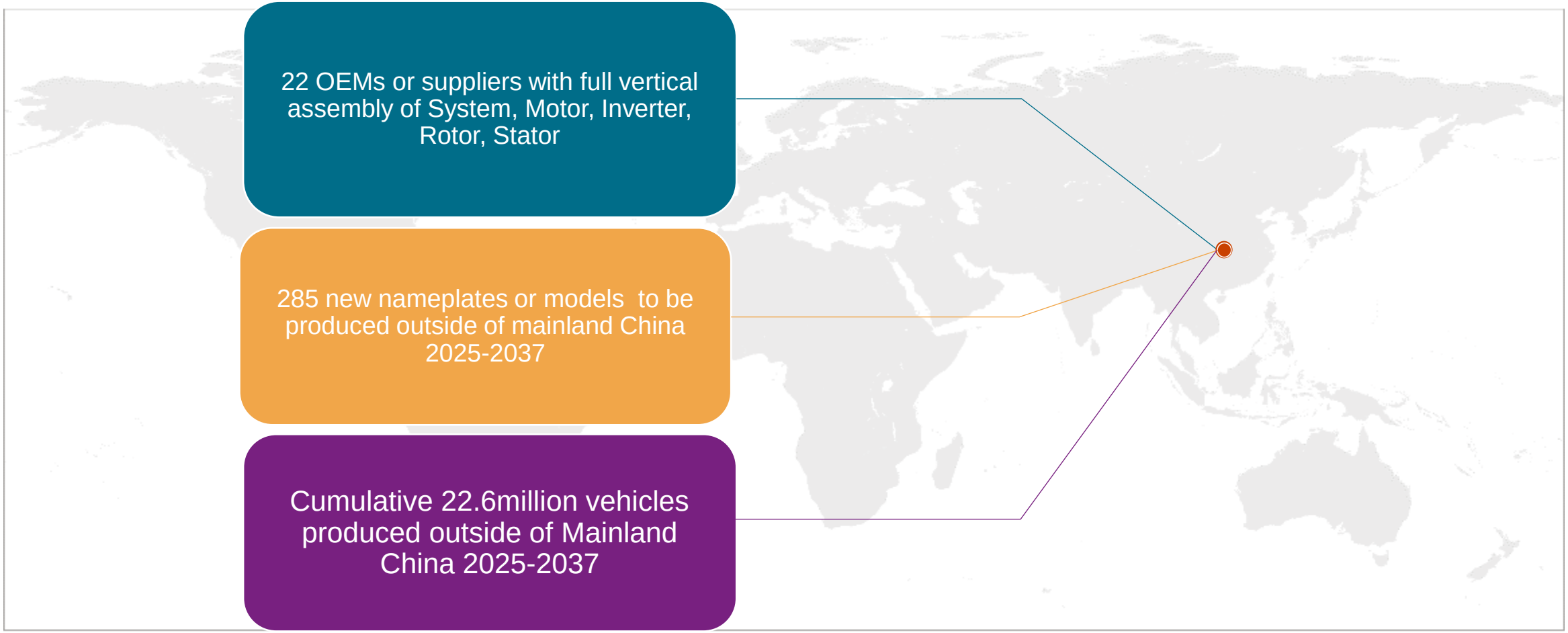
Data compiled September 2025

Source: S&P Global Mobility.

S&P Global Mobility

China global ambitions in the electric motor supply chain

China’s ambitions within the industry will require significant ramp up. Can they achieve it in such a short time?



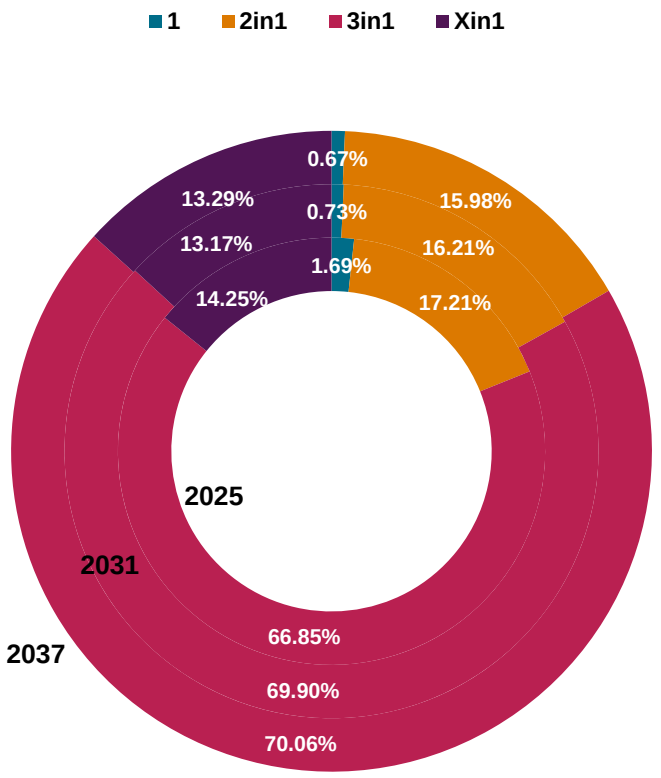
Date compiled September 2025
Source: S&P Global Mobility

S&P Global Mobility

System Integration Trends - Xin1

Level of integration dependent on components offered by suppliers, suppliers with know-how in propulsion and power electronics components are expected to bring in higher **Xin1** systems

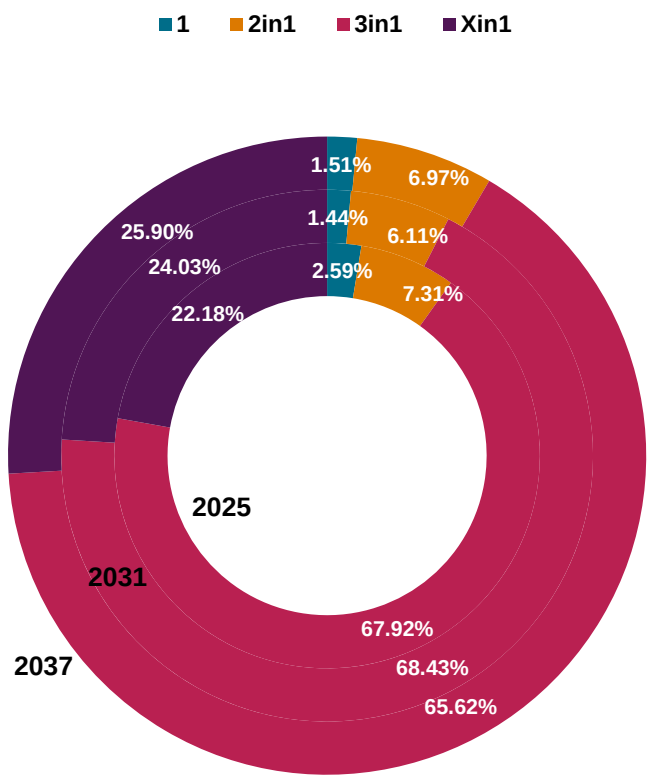
Global (incl. China)



Data compiled Aug. 19, 2025.

Source: S&P Global Mobility.

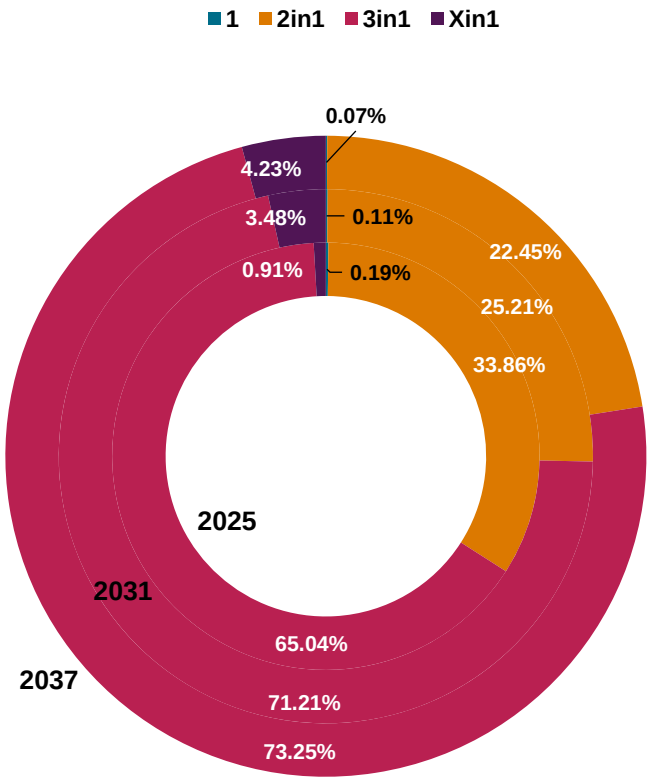
Greater China



Data compiled Aug. 19, 2025.

Source: S&P Global Mobility.

Global (excl. China)



Data compiled Aug. 19, 2025.

Source: S&P Global Mobility.

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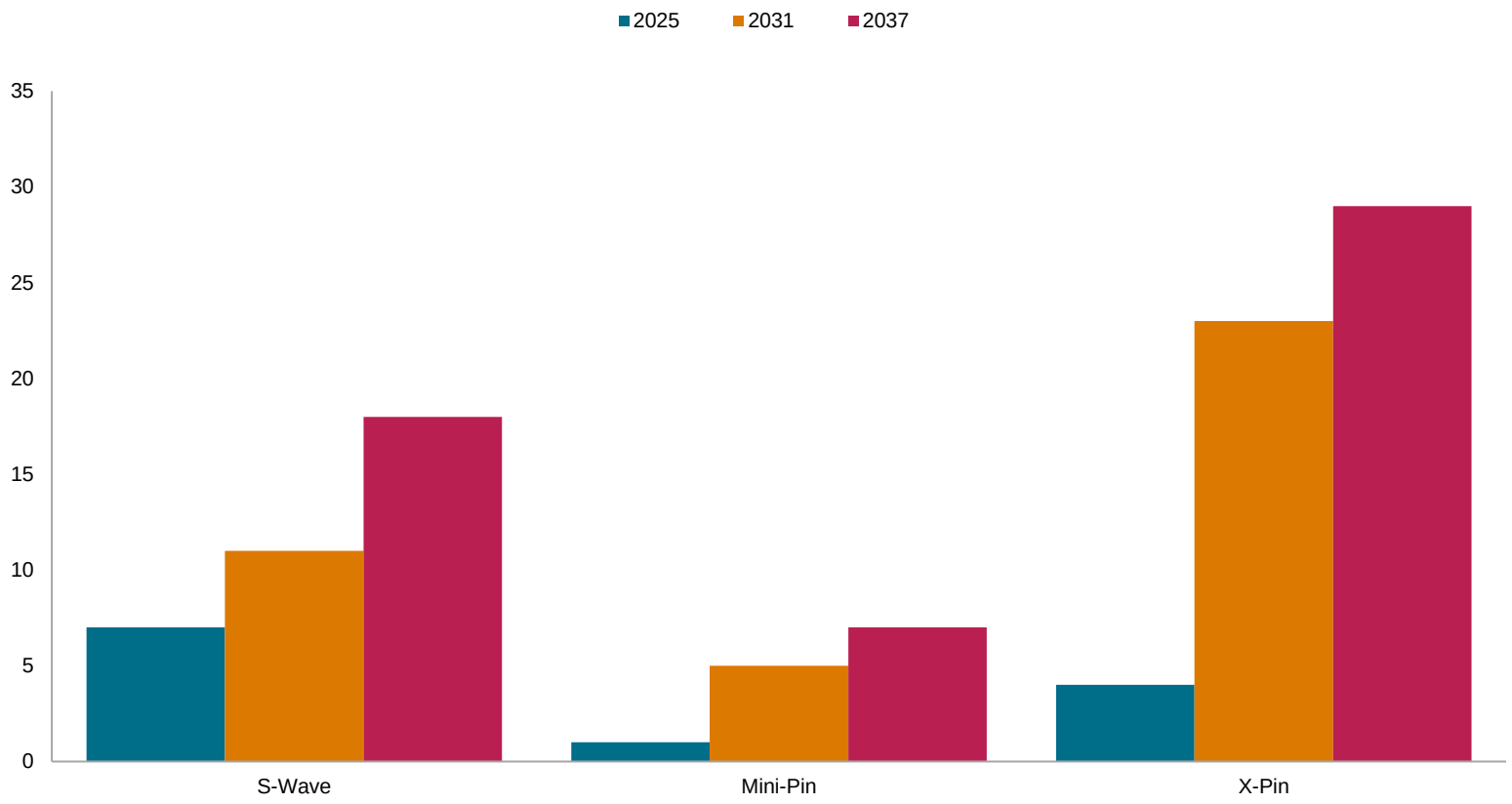
Winding Technology

Ongoing R&D to continue motor performance.

Platform count of emerging winding technologies



Data compiled September 2025

Source: S&P Global Mobility.

Whilst hairpin is the dominant choice of winding type in G. China now (**71%)** and in 2031 (**80%**), alternatives are emerging

Increasing fill factor, improved packaging and reduced tooling costs are all amongst the reasons for looking to improve on hairpin, and **G. China is leading the way**.

In the coming years, **S-Wave, mini-pin and X-Pin** will be launched, with X-pin featuring on **23 platforms** in G. China by the time we get to 2031.

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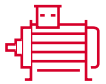
Summary

Summary



Global traction motor market forecast to grow from 59million units to over 130million units by 2037

Consumer sentiment towards electrified vehicles at a global scale continues to diminish with range, charging experience and cost still lingering major issues among consumers.

The United States has seen a significant political and consumer shift in the past 11 months, the industry is settling down and longer term clarity is needed for both OEMs & suppliers

G. China at the forefront of innovation and development with their work on integration and winding technology

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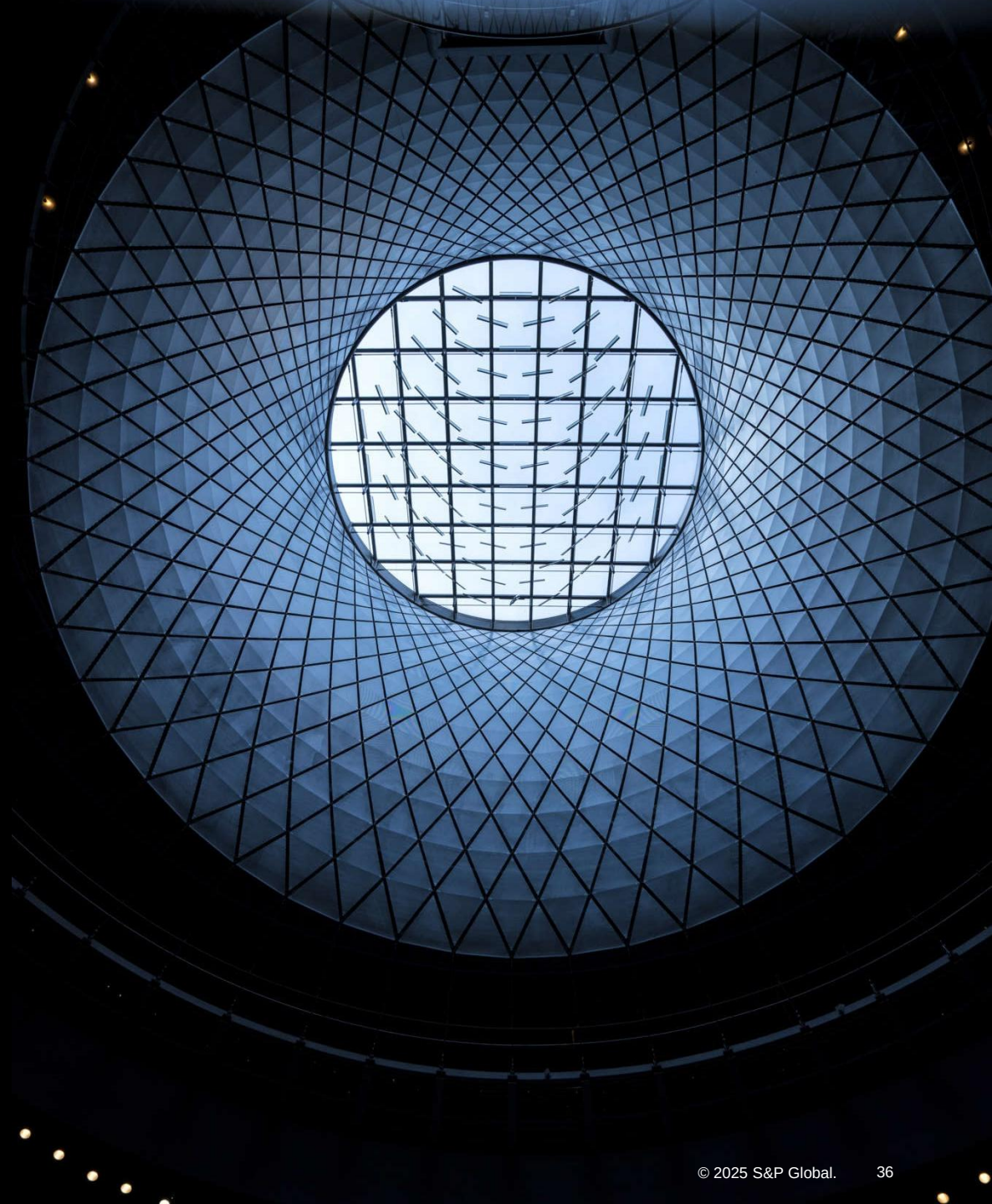

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