



The strategic momentum of circularity

How it reshapes the automotive industry

7 October 2026



The automotive industry in midst of ongoing transformation pressures: electrification, sustainability regulation and increasing competition from new market players

Electrification

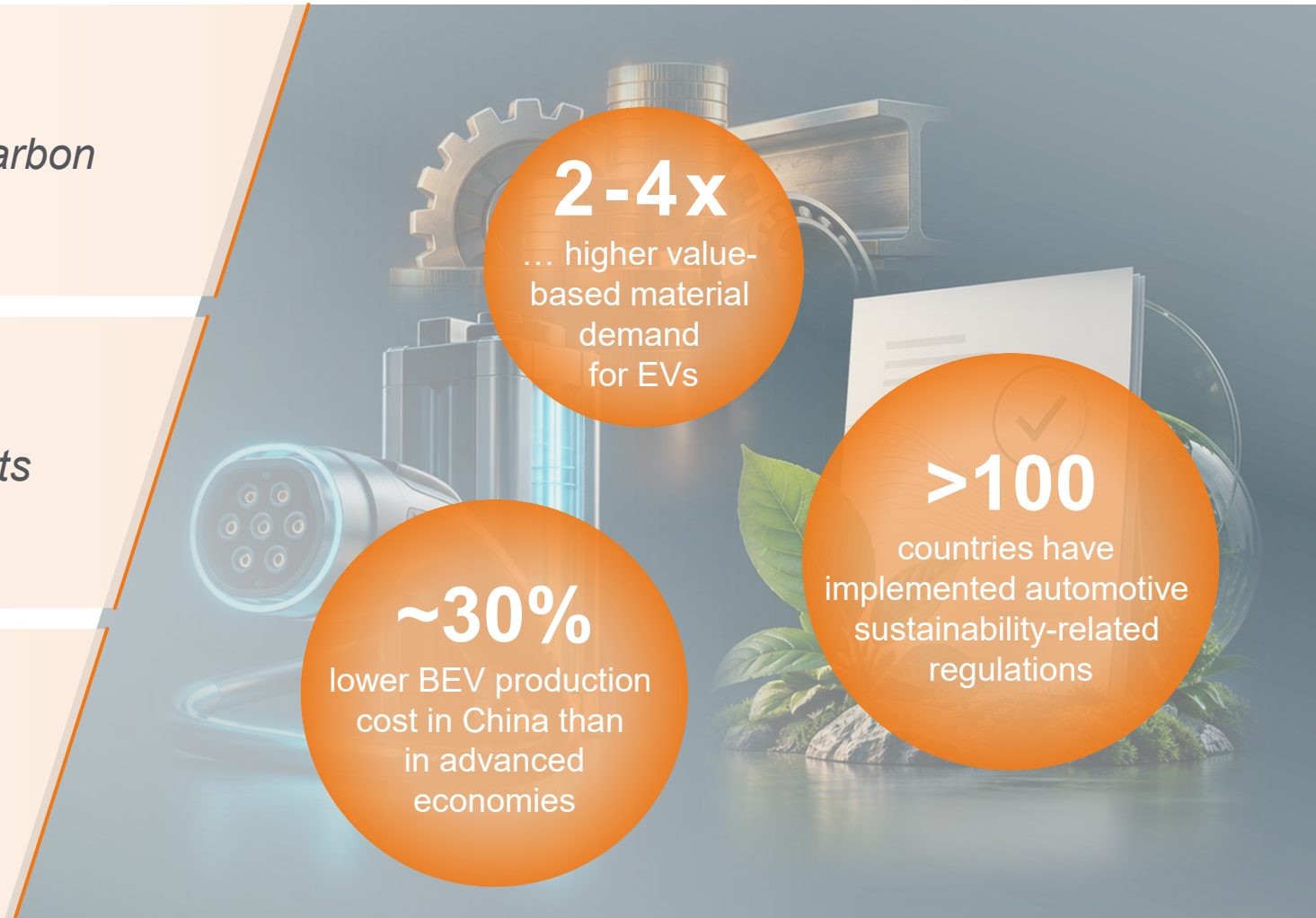
The transition toward electrification and a low-carbon economy is material-intensive

Sustainability regulation

Global regulation, albeit its dynamic, maintains its direction toward CO₂ costs & sustainability

Costs

A cost gap between OEMs and regions puts costs in focus to improve competitiveness



In result, business models and operations are facing major risks that need to be managed to sustain a competitive advantage

Raw material sourcing concentration risk

- 1 *Geopolitical tensions, export restrictions, and logistics disruptions reward the shift decreasing the dependence on primary raw material sources*



Regulatory compliance

- 2 *Critical raw material acts, battery-, and vehicle end-of-life regulation requirements increase transparency, traceability, and circularity obligations*



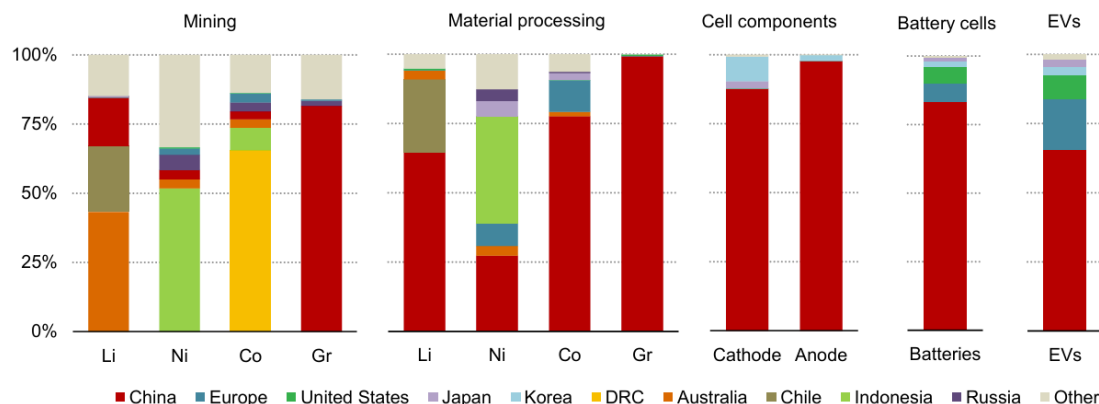
Competition for secondary raw materials

- 3 *Rising demand for sustainable and recycled materials is creating increasing pressure on availability and pricing security*



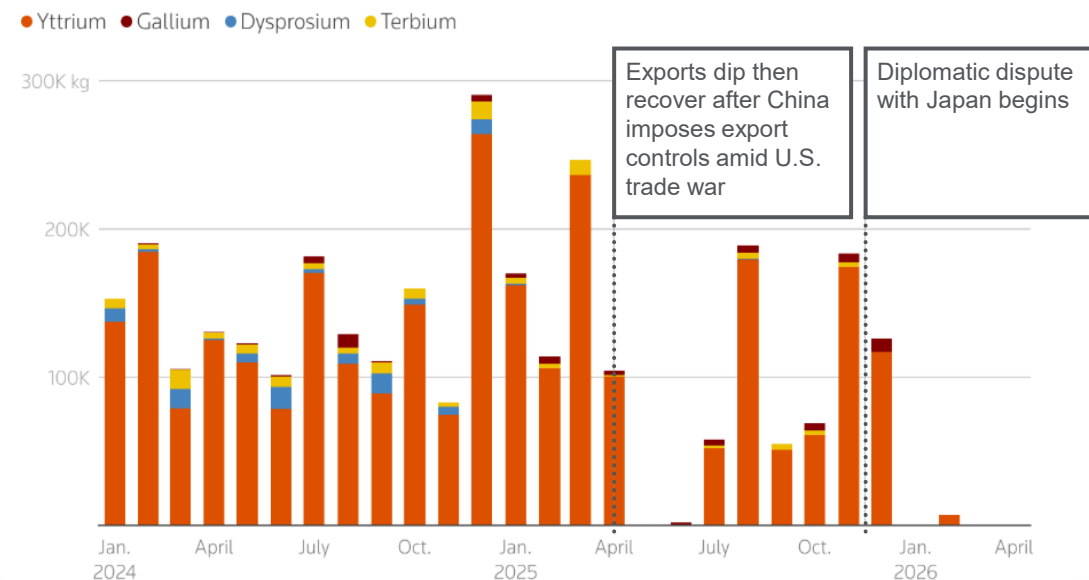
Battery raw material sourcing is highly concentrated in single countries providing little alternative sourcing scenarios and increase supply risks

Geographical distribution of global EV battery supply chain ...



- High single-country concentration of battery materials (mining)
- Sourcing & manufacturing concentration throughout the battery value chain

... impacting supply stability and planning



- Trade disputes between China and Japan causing rare earth material exports from China to Japan being interrupted

Regulation ensures that circularity is on OEMs' agendas to adapt to the cluster risk

1 End-of-life vehicle regulation (EU) 2026/1738

-  Recycled plastic in new vehicles: 15% from 2032, 25% from 2036
-  At least 20% of the recycled-plastic target must come from ELVs (or use-phase veh. components)
-  Design for dismantling: batteries, e-drive motors and key parts must be removable
-  Treatment information for repair, reuse and recycling operators from 2029
-  Extended producer responsibility and stricter end-of-life vehicle management

OEMs need to secure recycled materials & integrate dismantling and traceability

2 Battery Regulation (EU) 2023/1542

-  Battery passport for EV batteries from 2027
-  Carbon-footprint declarations and later performance thresholds
-  Minimum recycled content in applicable batteries from 2031: Co 16% Li 6% Ni 6% Pb 85%
-  Traceability, labelling and QR-code information requirements
-  Battery removal, reuse, repurposing and recycling obligations

WHAT THIS MEANS FOR OEMs

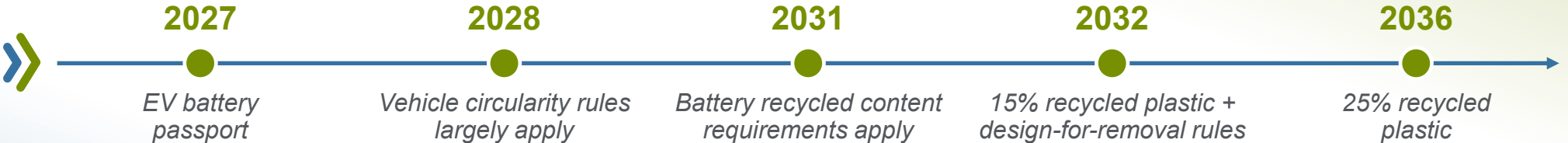
Battery lifecycle compliance becomes a condition of market access

3 Critical Raw Materials Act (EU) 2024/1252

-  Greater supply-chain mapping & resilience planning for large companies (company risk preparedness)
-  Pressure to diversify sourcing of strategic raw materials
-  EU 2030 target benchmarks: 10% extraction, 40% processing, 25% recycling
-  No more than 65% dependence on one non-EU country for a strategic raw material
-  More focus on magnet, mineral and secondary-material traceability

OEMs need to secure diversified battery and magnet supply

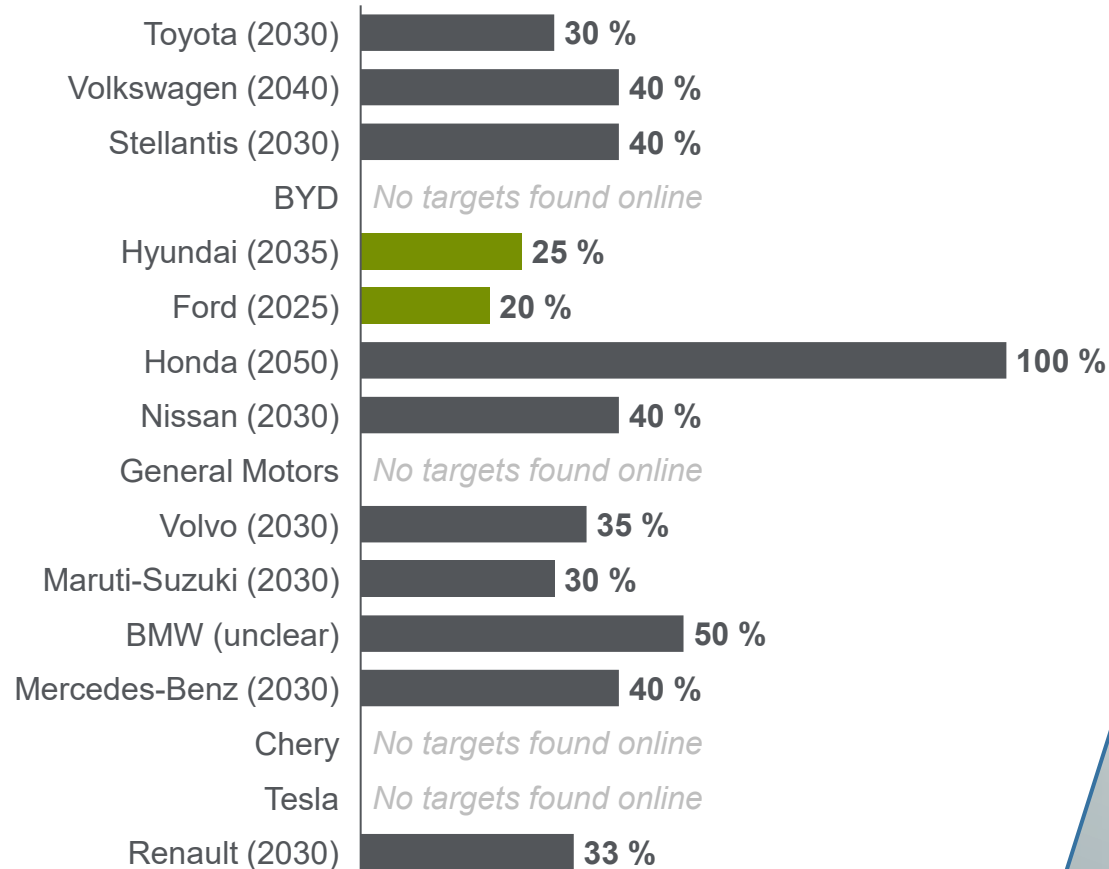
KEY IMPLEMENTATION MILESTONES



Secondary raw material demand is to increase globally, but will supply be able to match demand?

HIGH ACTIVITY AND TARGETS ...

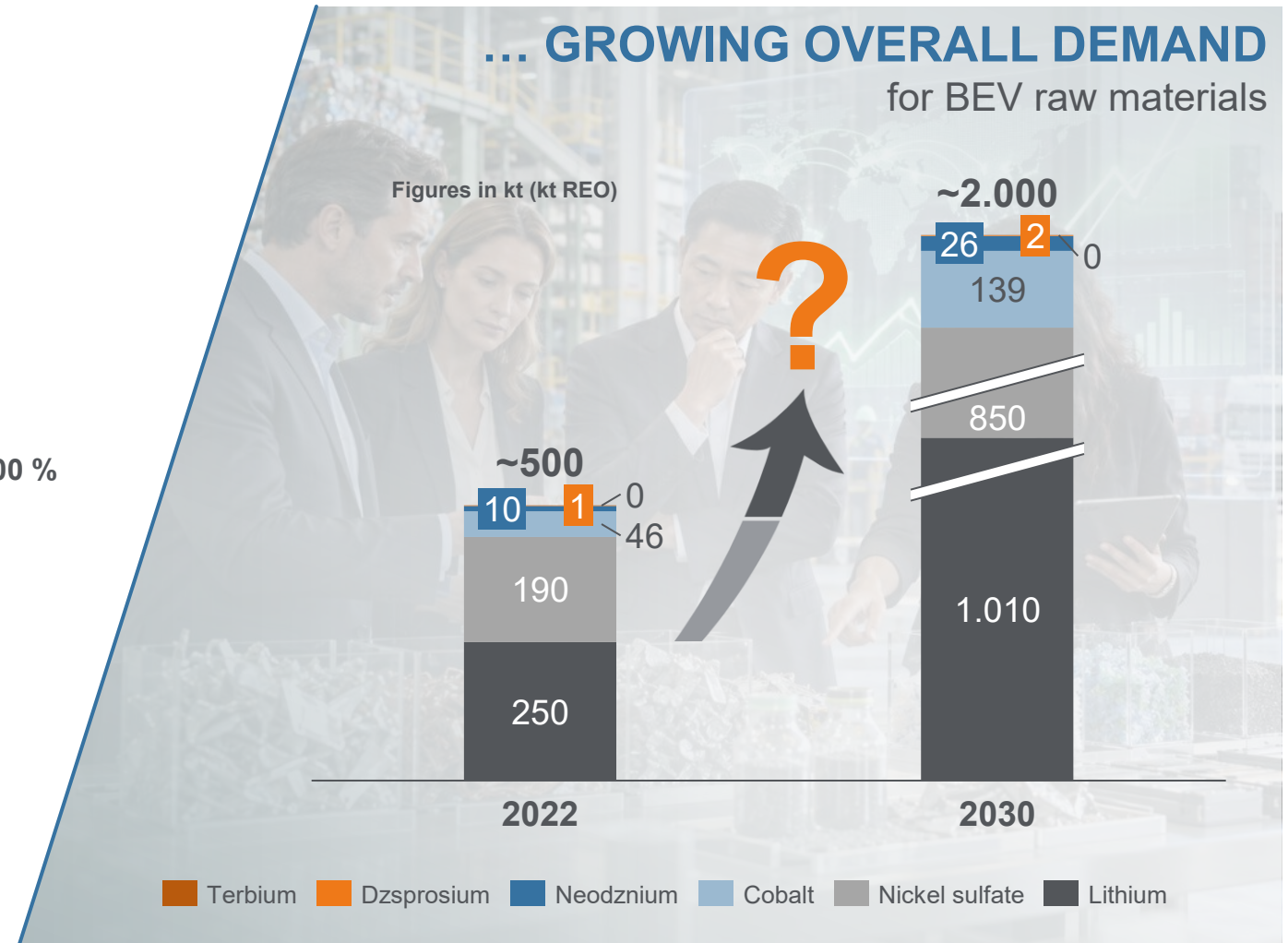
for sustainable materials by OEMs



■ Recycled / circular / sustainable / secondary materials ■ Recycled / renewable plastics

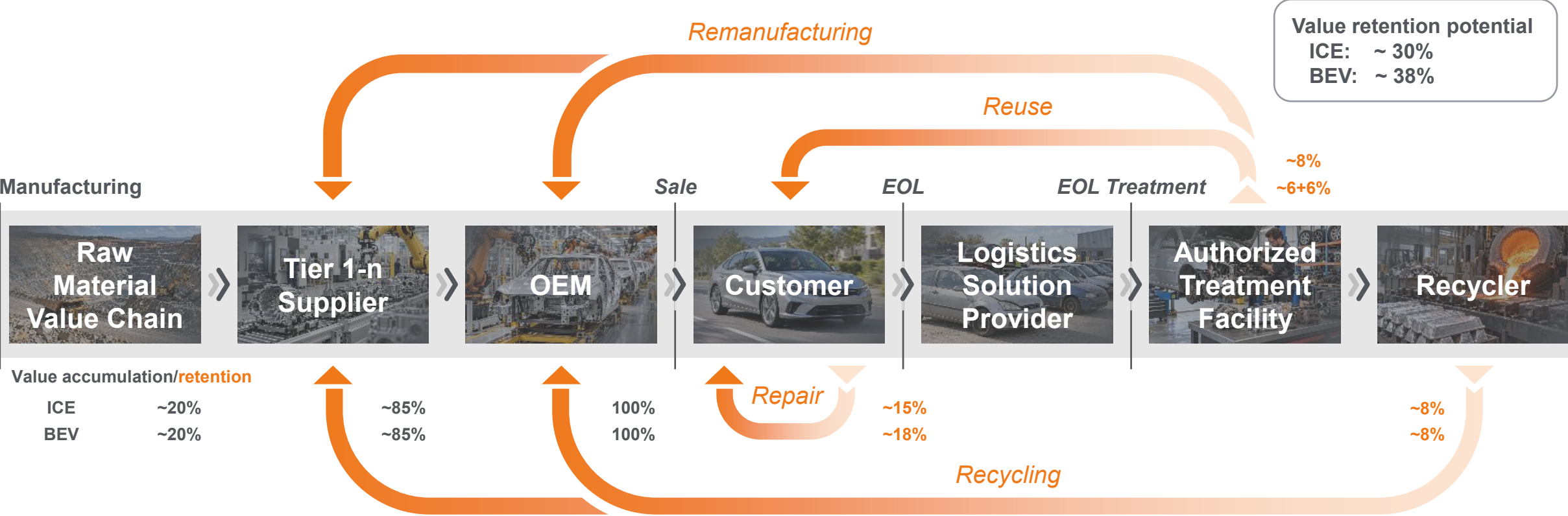
... GROWING OVERALL DEMAND

for BEV raw materials



■ Terbium ■ Dysprosium ■ Neodmium ■ Cobalt ■ Nickel sulfate ■ Lithium

Containing the risk involves accessing and closing automotive value system through circular value retention



Raw material sourcing concentration risk

Circularity can provide additional raw material streams from secondary materials



Regulatory compliance

Several regulations require OEMs to address and consider circularity in their operations



Competition for secondary raw materials

By managing the EOL value streams, OEMs can ensure supply in a challenging market



Circularity unlocks four strategic value pools

1 COMPLIANCE

Maintain market access by meeting regulatory requirements cost-efficiently

- Battery transparency and traceability
- EPR and EOL responsibility
- Recycled material content

2 REVENUE

Extend revenue models toward second life / remanufacturing until as-a service models

- Second-life services and improved customer engagement
- Battery second life
- Leasing and mobility services

3 MARGIN

Reduce costs for retrieved components & secondary raw materials

- Lower virgin-material demand
- Capture residual value from components reuse & remanufacturing
- Improve EOL value retention by design

4 RESILIENCE

Reduce exposure to volatile and concentrated material supply

- Secondary raw material feedstock
- Battery-take back and recycling
- Long-term parts availability

We see six domains where Circular Economy leaders differentiate to harness value pools

Circular Product Design

Design for durability, modularity, repair and recyclability to increase residual value and lower lifecycle costs.

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Closed Loop Operations

Recover materials, components and products to reduce input costs, supply risk and embedded carbon.

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Data & Traceability

Enable visibility across the asset lifecycle to optimize recovery rates, compliance and circular revenues.

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OEMs continue to extend their **circular product design** activities



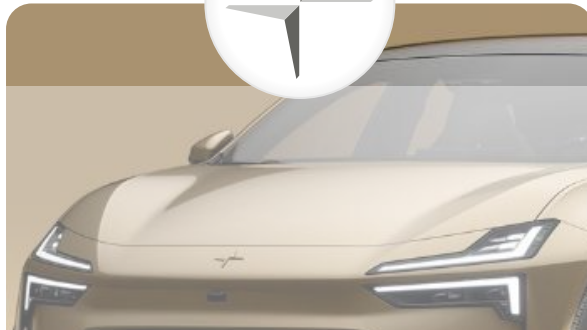
Focus on **repairable, easily dismantled components**, increases recycled content, simplifies material combinations, and closes material loops.



Secondary First: Aim for increasing the proportion of secondary materials and reducing the diversity of materials in their products



An **easy to swap battery** enables not only fast charging but easy repair and potentially vehicle upgrades



Recycled materials and **mono-material** approach increase the use of sustainable materials and facilitate recycling

OEMs use and combine several design levers to improve their cars' circularity:

ACCESS

Wear items and pack modules remain serviceable without destructive work

MODULARITY

Components are designed for easy replacement, upgrade, and remanufacturing

INTERFACES

Reversible joining and fewer fastener families enable easy replacements

MATERIALS

Increasing share of recycled materials are considered

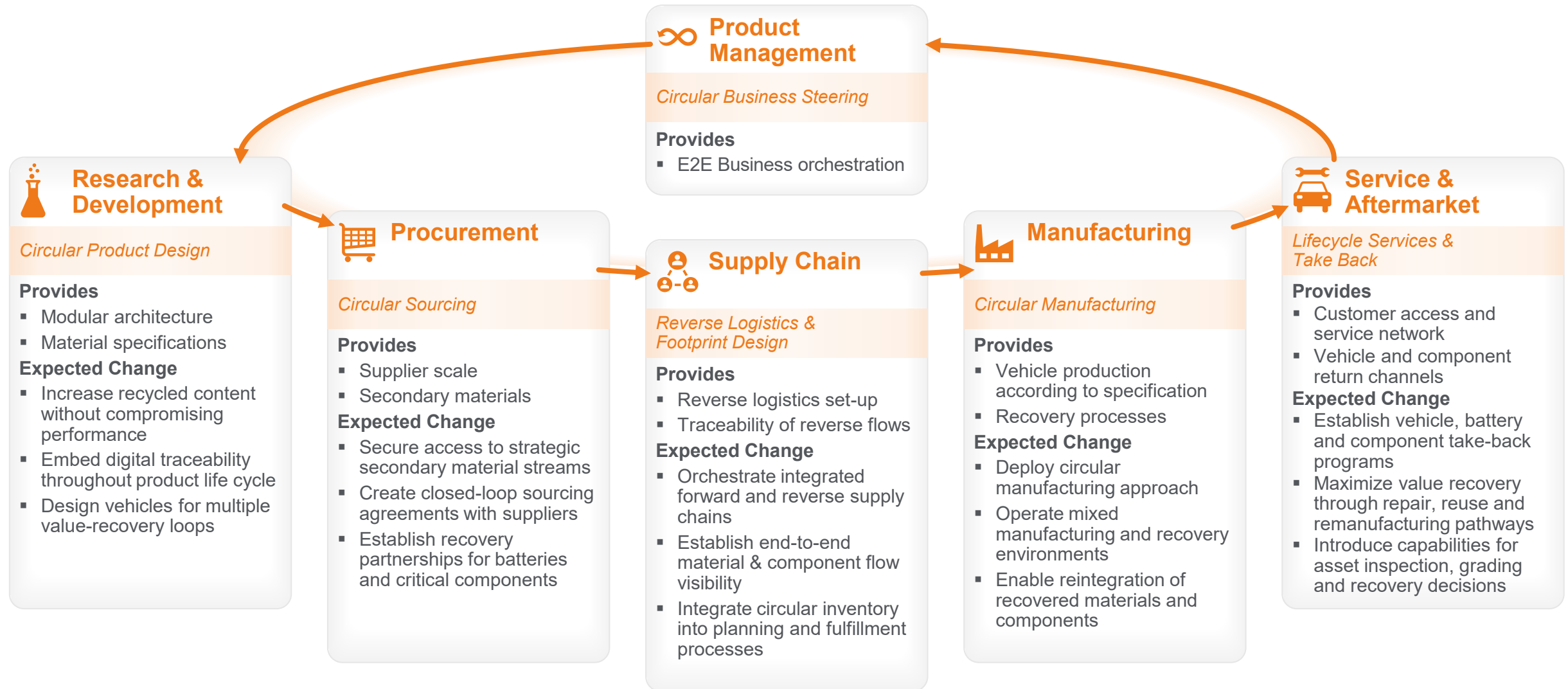
≤80%

Of a product's environmental impact is determined at design phase





Automotive companies driving circularity will extend their capabilities within six dedicated functions to implement their CE ambitions





The **EOL ecosystem** consists of various players that are required to collaborate to retrieve maximum value from EOL vehicles

INCORPORATE MORE

SOURCE MORE

EXTRACT MORE

Manufacturing

Sale

EOL

EOL Treatment



Raw Material Value Chain



Tier 1-n supplier



OEM



Customer



Logistics Solution Provider



Authorized Treatment Facility



Recycler

RAW MATERIAL PROCESSING

Automotive-grade secondary material streams
Meet OEM raw mat. spec. requirements

COMPONENTS MANUFACTURING

Multi-material components
Combined materials are difficult to separate and recover

CAR MANUFACTURING

Adhesive and permanent joining
Permanent joints make dismantling costly

Over-specification of virgin materials
Adapt specifications to match customer value with circularity

Design for circularity
Consider disassembly, parts reuse/ remanufact., and recycling in design phase

USE PHASE

Usage opacity
Limited usage data obscures condition and remaining value

Strengthened use reuse / reman components
Scale market size by driv. parts replacement beyond repair

COLLECTION

Loss of EOL vehicles
Untracked vehicles escape controlled recovery channels

DISMANTLING & PARTS RECOVERY

Low harvesting rates of components
Valuable components are destroyed rather than recovered

Lack of knowledge
Missing OEM guidance makes dismantling more cumbersome & inefficient

Parts assessment
Uncertain quality information increases reliance on expensive expert assessments

SHREDDING & RECYCLING

Material downcycling
Purity losses result in material downcycling

Shredder residue not sufficiently used
Valuable content of residue is not harnessed

EFESO circular value system model





Digital technology in place today hints towards a future with improved CE efficiency and economics, raising its attractiveness and strategic lever for business success

OBSERVABLE AI AND DIGITALIZATION TRENDS IN CE *(examples)*

INCORPORATE MORE

GenAI for circular product design

e.g., Nestlé/IBM

Predictive maintenance & asset life extension

e.g., Siemens

Digital resale and secondary-material marketplaces

e.g., Stellantis

AI-enabled repair

e.g., Lenovo

SOURCE MORE

Digital traceability in reverse logistics

e.g., CEVA

Predictive material flow forecasting

e.g., BASE

EXTRACT MORE

Battery passport & condition history

e.g., EU, China

AI-based analysis of battery diagnostic

e.g., BatteReverse

Digital twin with location data services

e.g., IFCO

AI-enabled dismantling and recovery

e.g., Apple

Computer vision and robotics for automated parts and material sorting
e.g., ZenRobotics

AI-driven recycling process optimization

e.g., greyparrot

First hypothesis on how AI & Digitalization will shape the future of CE operations

OPERATIONS



Live condition assessments will turn remanufacturing into a more predictable industrial operation



AI-assisted automation will improve the economics of disassembly

SUPPLY CHAIN



Circular flows will become part of mainstream supply chain planning



Circular operations will be required to be managed across company boundaries



Case: Renault and Stellantis show how **circular operations** can lead to top line impact



RENAULT GROUP

Flins Refactory & the Future is NEUTRAL

The Future is
NEUTRAL
2030 TARGETS

€2.3 bn
Revenue

>10%
Margin

x2
Activities

TARGETS



STELLANTIS

SUSTAINera & three dismantling centers

2030 AMBITION

>€2 bn
Revenue

2025 RESULTS



Car refurbishment, renovate & resell
Flins repairs and reconditions used vehicles

→ Earn refurbishment revenue, recover resale value

45,000

Annual vehicle capacity



Remanufacture & battery repair
THE REMAKERS restores parts, battery repair extends use

→ Sell parts & services across more of the vehicle's life

320,000

Remanufactured Parts



Recover & recycle

Recycle and sells recycled materials
→ Reach customers across the automotive industry

2 Mio. t

Recycled materials

2025 RESULTS



Remanufacture & sell

Mirafiori restores engines, gearboxes, and EV batteries

→ Capture value from returned components

>28,600

Remanufactured engines



Reuse & distribute

Bparts connects recovered spare parts with buyers

→ Expand affordable aftersales and online sales

51%

Growth vs. previous year



Recover & recirculate

Recycled parts and materials from production, maintenance scraps & ELVs fed back into the manufacturing process
→ Reduce reliance on virgin materials

1,6 Mio.

Recycled parts (2024)

Five priorities for OEMs to win in circularity

Circularity is more than a sustainability initiative.

It is a future profit and supply security strategy.

1



Design vehicles for circularity from day one

2



Secure reverse logistics and collection networks

3



Build data transparency across asset lifecycles

4



Develop profitable remanufacturing and recycling businesses

5



Orchestrate ecosystem partnerships at scale

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