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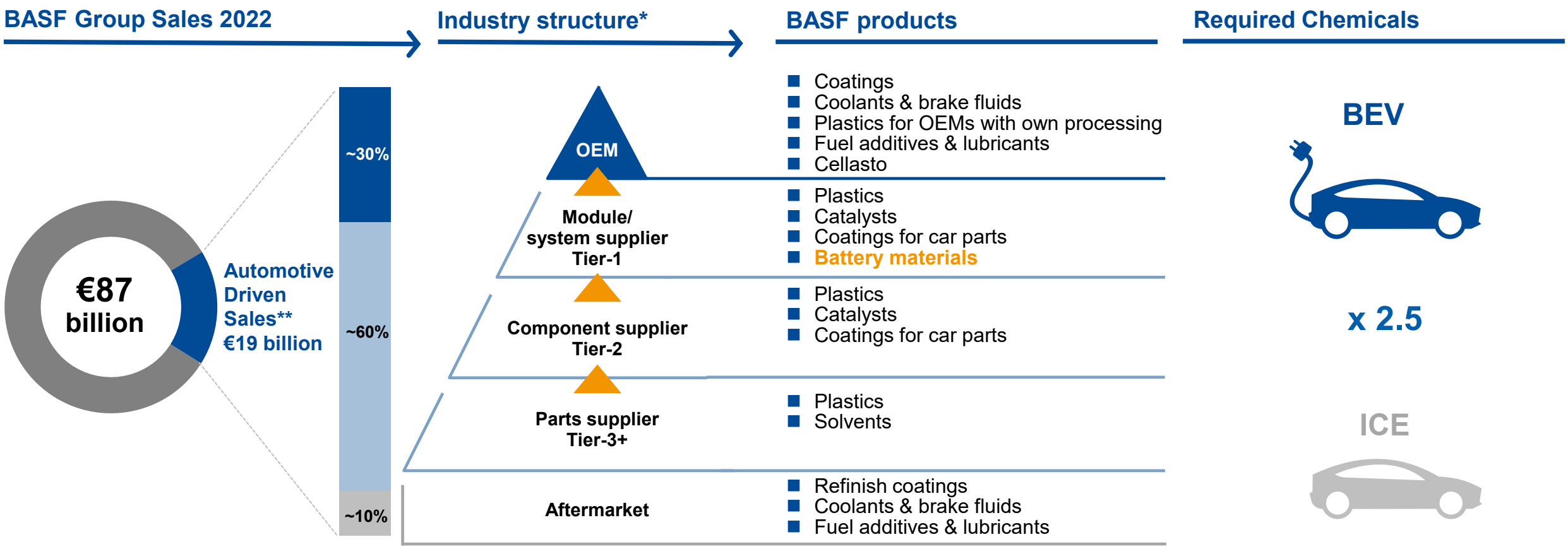
BASF closes the loop for EV batteries

April 2024

BASF is the leading chemical supplier to the automotive value chain – with excellent match to eMobility industry



* Based on business model
** Includes Precious Metals

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Our aspiration: Closing the loop for sustainable, local-for-local battery solutions

Our vision of the EV battery value chain is a closed loop, with the goal of powering a net-zero future for e-mobility

This involves a multi-step and multi-site process to feed end-of-life batteries and production scrap from cell producers into the loop, transforming them into reusable materials

Battery recycling is an important lever to reduce the CO_2 footprint of battery electric vehicles, and is key to meet ambitious, circularity-driven policy requirements, proposed by EU Battery Regulation

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Why should we recycle batteries?

Reuse of precious materials like Cobalt,, Nickel, Lithium and Copper

Saves significant amount of energy needed in the extraction and refining process

Creates resilient supply chains for critical raw materials

We are continuously investing into battery recycling to provide best-in-class recycling solutions to our customers

2021

- First contract on recycling with major OEM

2022

- BASF offerings through Partner Network
- External pilot trials for refining process development

2023

- BASF build new Battery Recycling Prototype Plant in Schwarzheide, Germany
- First activities in NA

2024

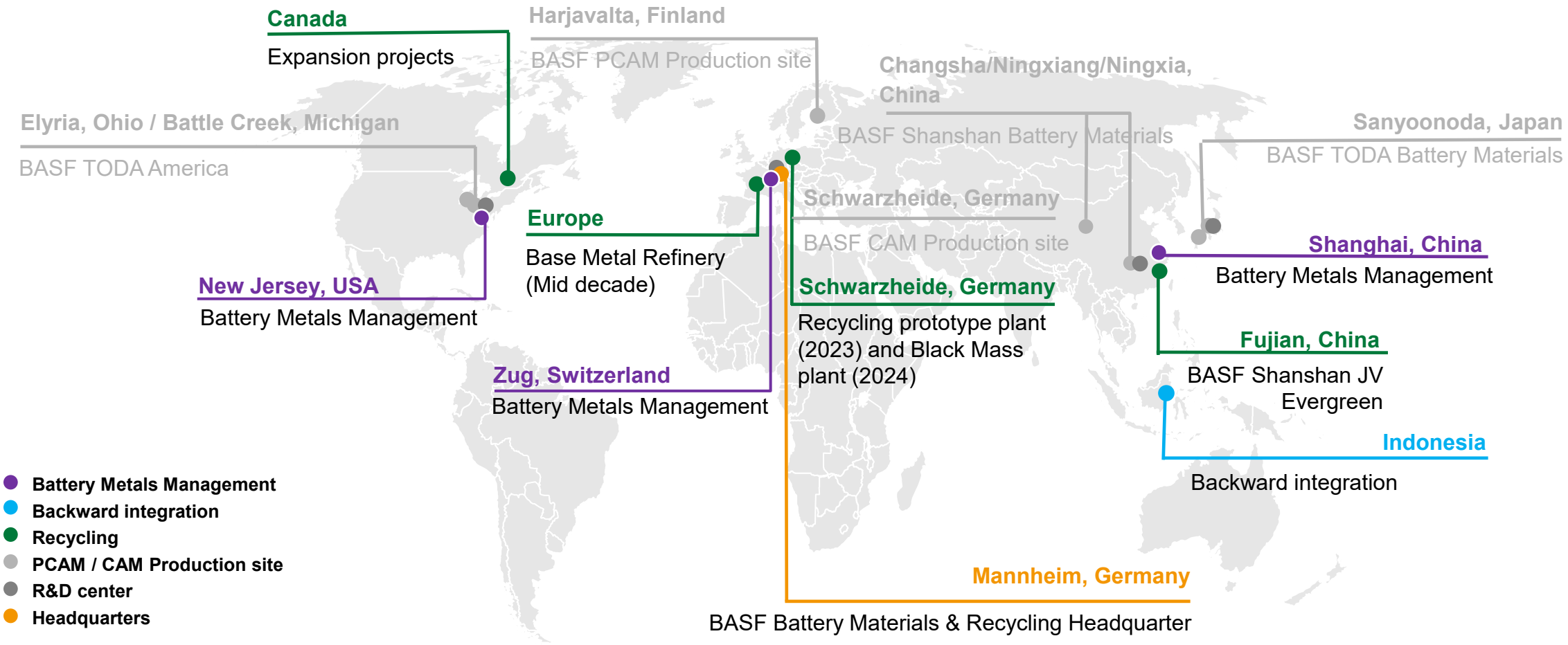
- BASF Black Mass Commercial Scale Production plant in Schwarzheide, Germany

Mid 2020's

- Expansion of Black Mass production capacity by factor ~2
- Commercial BMR plant

Global Footprint being developed in parallel

Global footprints offer closed-loop solutions in all major regions



** Map for indicative purposes, not adjusted for completeness or accuracy*

Already today we provide a full battery recycling package to our customers

Battery recycling platform

BASF developed a digital Battery recycling platform that **enables online-triggered collection** of battery packs, modules, cells and production scrap

Special transport packaging

Lithium-Ion-Batteries are classified as dangerous goods according to the UN regulation; therefore, BASF provides **special transport packaging** for all battery types including critical defective or defect cells / batteries

Collection network for Europe

BASF is establishing a **logistics collection network including discharging and dismantling all over European countries** to be able to pick up and transport battery packs, modules, cells and production scrap on demand

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The prototyping plant is a key component for the success of BASF's commercial base metal refinery

Key information

Prototyping base metal refinery plant started-up in Q1/2024

Benefits unlocked for commercial base metal refinery

Validate process	Validate and further improve BASF´s hydrometallurgical refining process to generate knowledge that is scalable	**Enhanced safety standards**	Learn from operational HAZOP studies and leverage best practices for large-scale plant
Develop operational processes	Develop operational procedures to optimize the recycling process, for example materials handling concept	**Enriched technology partner experience**	Knowledge and relationships created with several technology and engineering contractors that will be used for commercial scale refinery
Optimize input feed	Optimize blend recipes for feeding the commercial scale base metal refinery with black mass	**Train staff for commercial BMR**	Increase operational knowhow for operators and engineers on running base metal refinery

BASF is taking the next step to establish the full battery recycling value chain with a commercial scale black mass plant

Key information

The plant located in Schwarzheide, Germany will have an annual processing capacity of 15,000 tons of EV batteries and production scrap

Ready for start up scheduled in mid-2024

Benefits of commercial black mass plant

Optimized value chain	Optimized end-to-end process. Reliable source of Black Mass feed into commercial Base Metal Refinery
Economies of Scale	One of the largest capacities in Europe with option for low CapEx expansion
High EHS Standards	BASF does not compromise on safety. For example black and white areas introduced to minimize exposure to operators
Latest drying features	Dry shredding technology avoids lithium losses compared to competitor wet shredding
Ideal location	Leverage the presence of many EV car manufactures and cell producers in central Europe
High Black Mass Recovery Rates	Process optimized to ensure high recovery rates from production scrap and EOL batteries can be achieved

EOL = End of Life
CAM = Cathode Active Material
AAM = Anode Active Material


Let’s contribute to a sustainable future for e-mobility together

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