



We create chemistry

BASF Battery Materials

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Member of the Board of Executive Directors

BASF Investor Update, September 27, 2021

Cautionary note regarding forward-looking statements

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BASF Battery Materials

1

The automotive industry transformation is accelerating

2

Electromobility is the biggest growth opportunity in chemicals

3

CAM is key to electromobility

4

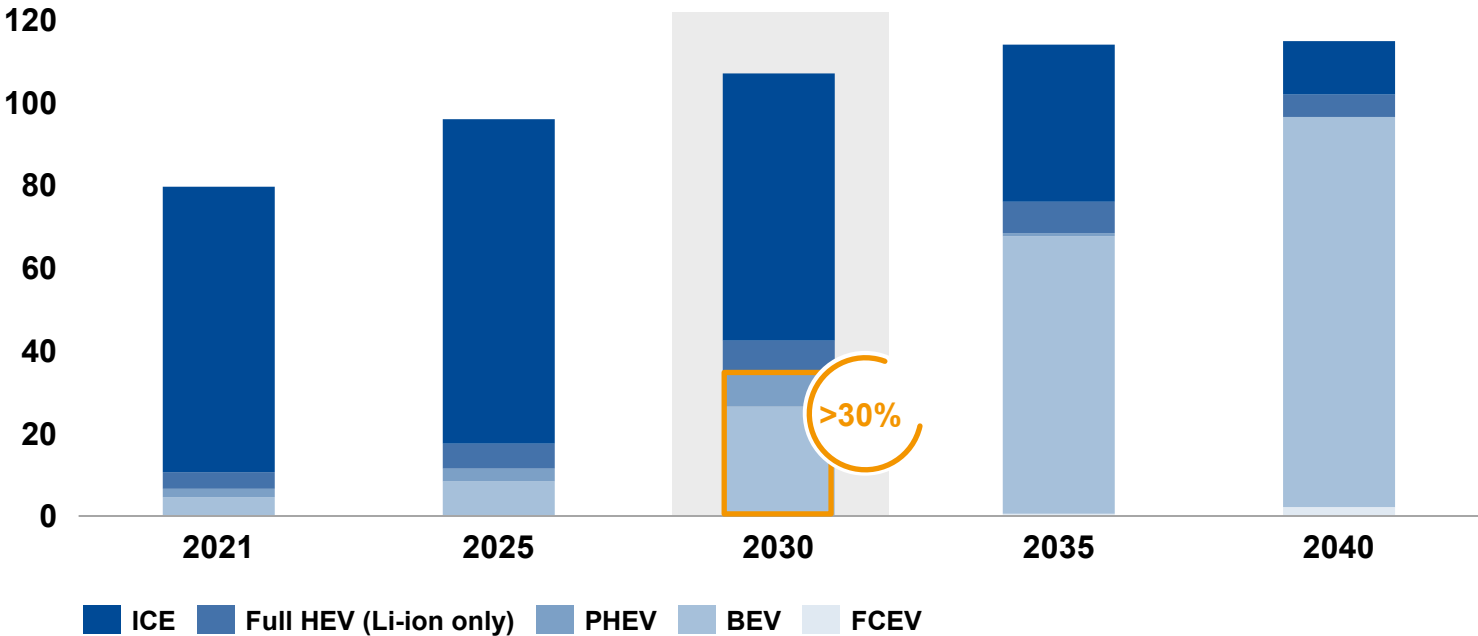
BASF has a clear strategy to become a leading CAM player

5

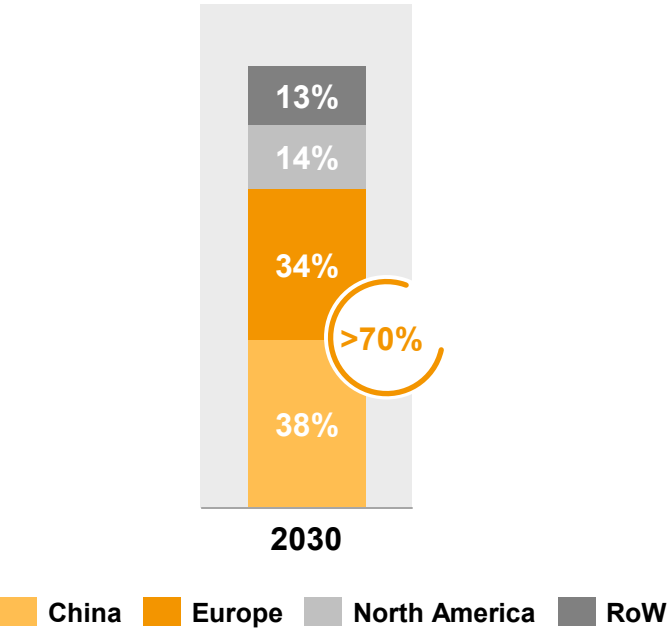
Financials and key takeaways

The automotive industry is in the middle of a major transformation towards electromobility

Powertrain development
Light-duty vehicle production volume (million units)



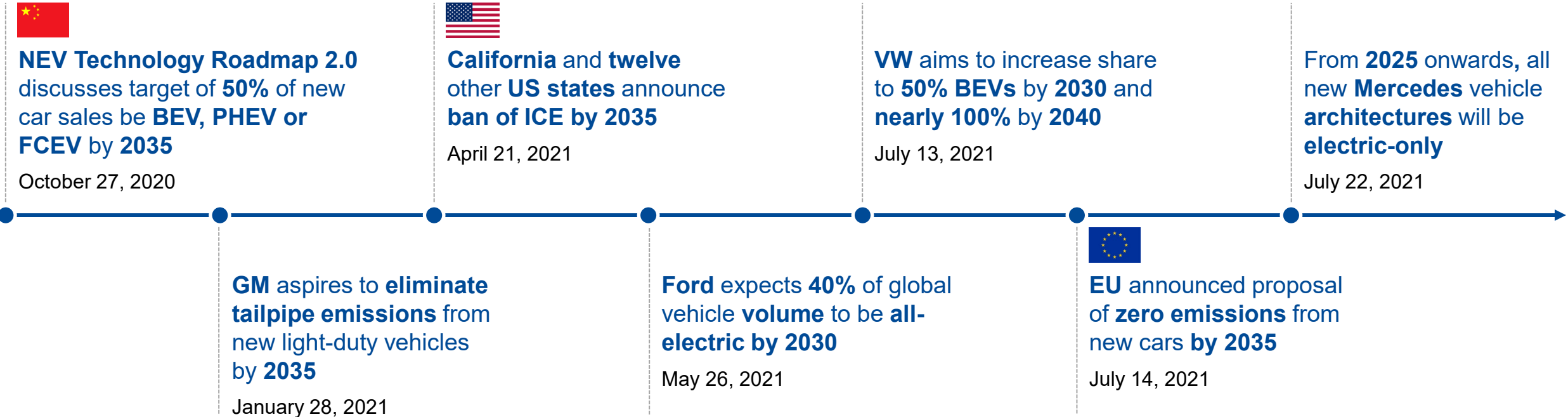
Regional BEV split
%



By 2030, we expect that >30% of all new cars will be BEVs and PHEVs with China and Europe representing >70% of global demand

Major countries and OEMs have determined that battery powered vehicles are the key technology for the next decades

Examples



Fundamental shifts in regulatory environments and consumer preferences are accelerating

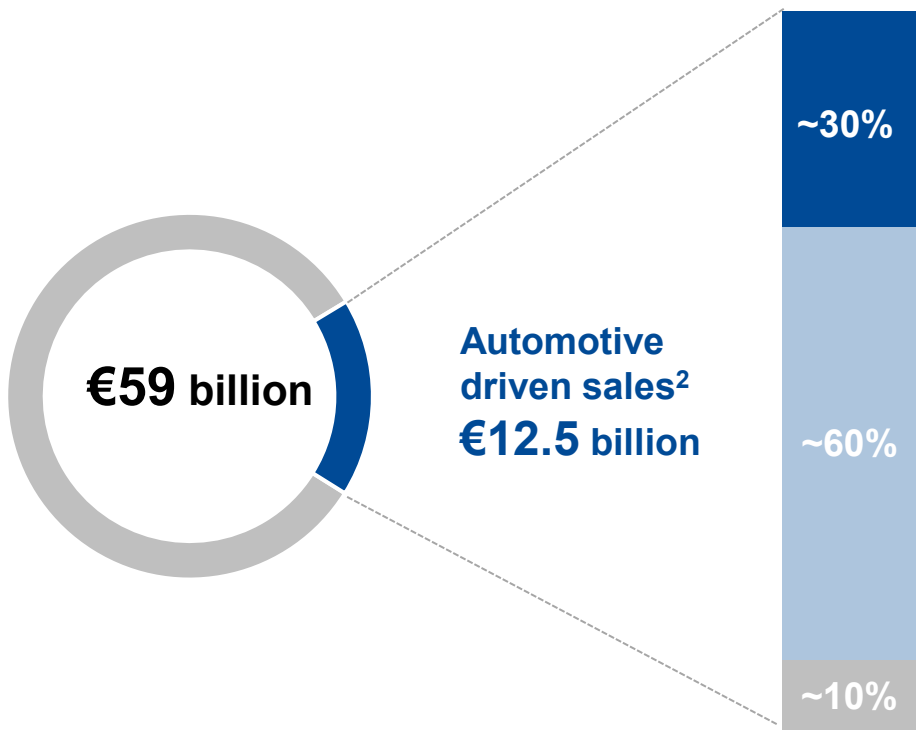


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- 3 CAM is key to electromobility
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BASF is the largest chemicals supplier to the automotive industry with a proven track record to outgrow the market

BASF Group sales 2020



Industry structure¹

OEM

Supplier

- Tier-1
- Tier-2
- Tier-3+

Aftermarket

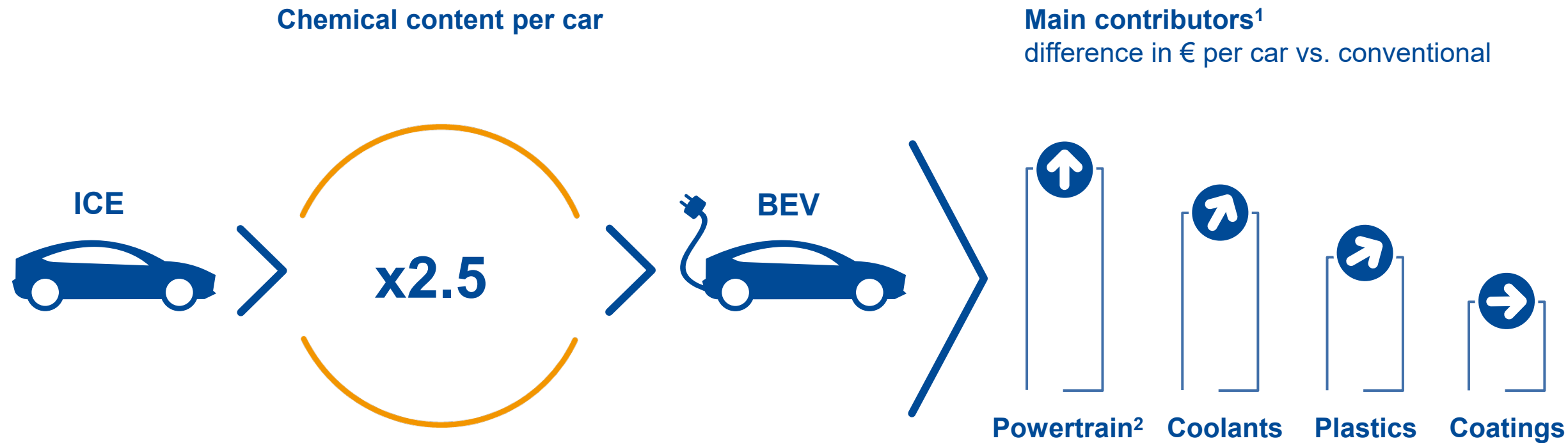
BASF products

- | | |
|-----------------------------------------|---------------------------------|
| ▪ Coatings | ▪ Fuel additives and lubricants |
| ▪ Coolants and brake fluids | ▪ Cellasto |
| ▪ Plastics for OEMs with own processing | ▪ Battery materials |
| ▪ Plastics | ▪ Battery materials |
| ▪ Catalysts | ▪ Solvents |
| ▪ Coatings for car parts | ▪ ... |
| ▪ Refinish coatings | ▪ Fuel additives and lubricants |
| ▪ Coolants and brake fluids | |

More than 20% of BASF's 2020 sales are linked to the automotive industry

¹ Based on business model, not real supply chain
² Includes precious metals

The chemical content per car is higher in a BEV compared to ICE, with CAM as the single largest growth opportunity

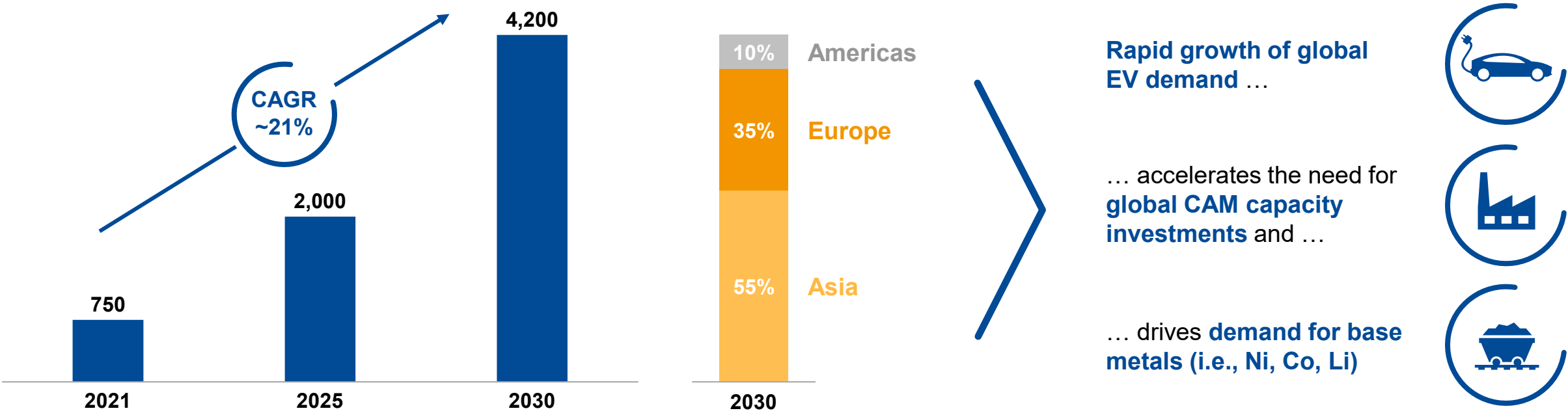


The cathode active material (CAM) as key component of any battery cell more than doubles the chemical content which can be found in today's average ICE vehicle

¹ Only representative for relative change in projected sales
² Emission catalyst vs. cathode active material (both incl. metals)

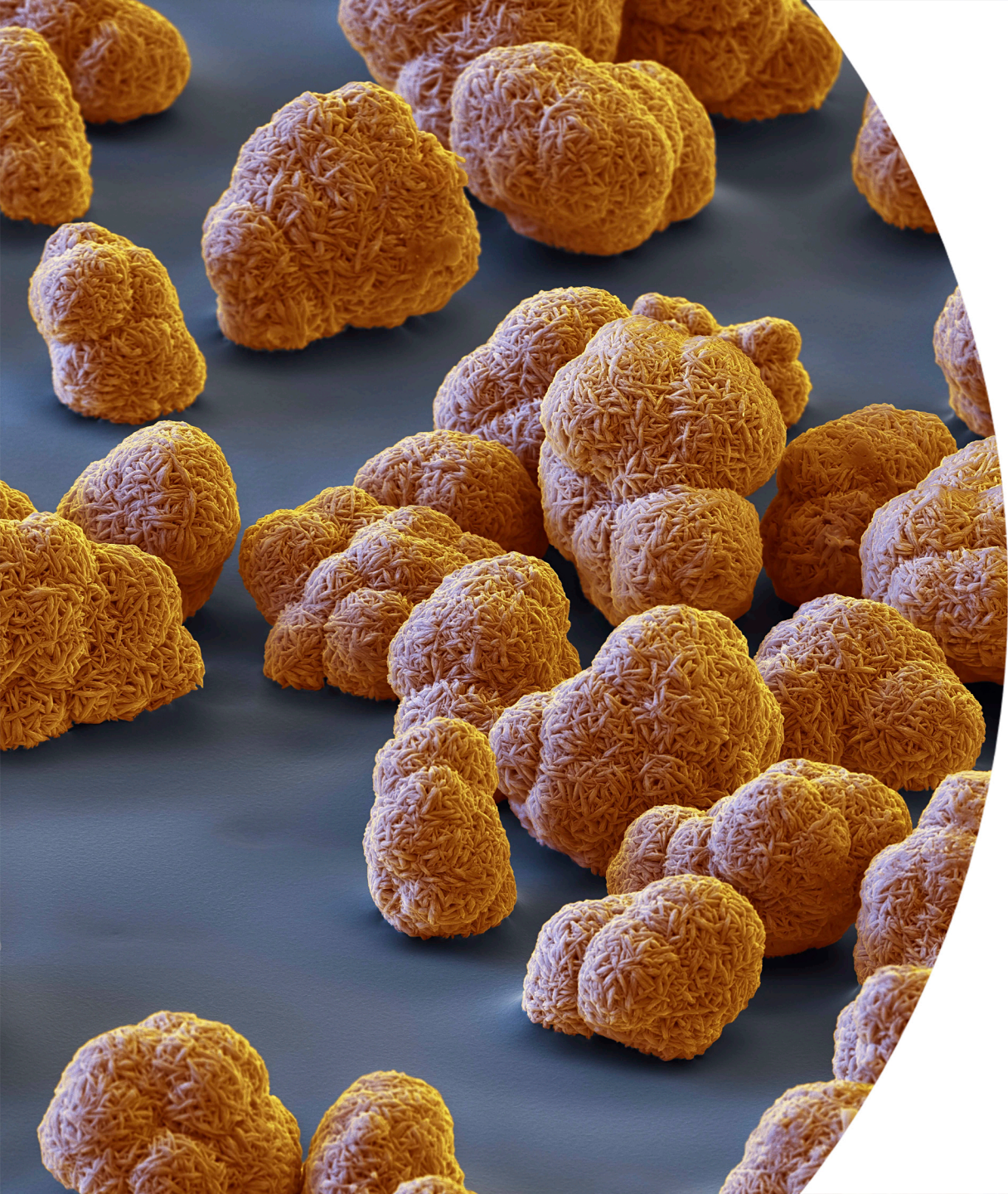
The market for CAM will grow by ~21% per year and reach a total size of 4,200 kt by 2030

Global CAM market forecast¹
kt



CAM market size expected to reach €100 billion by 2030, driven by battery performance, safety and cost aspects – which are all key parameters for BEVs

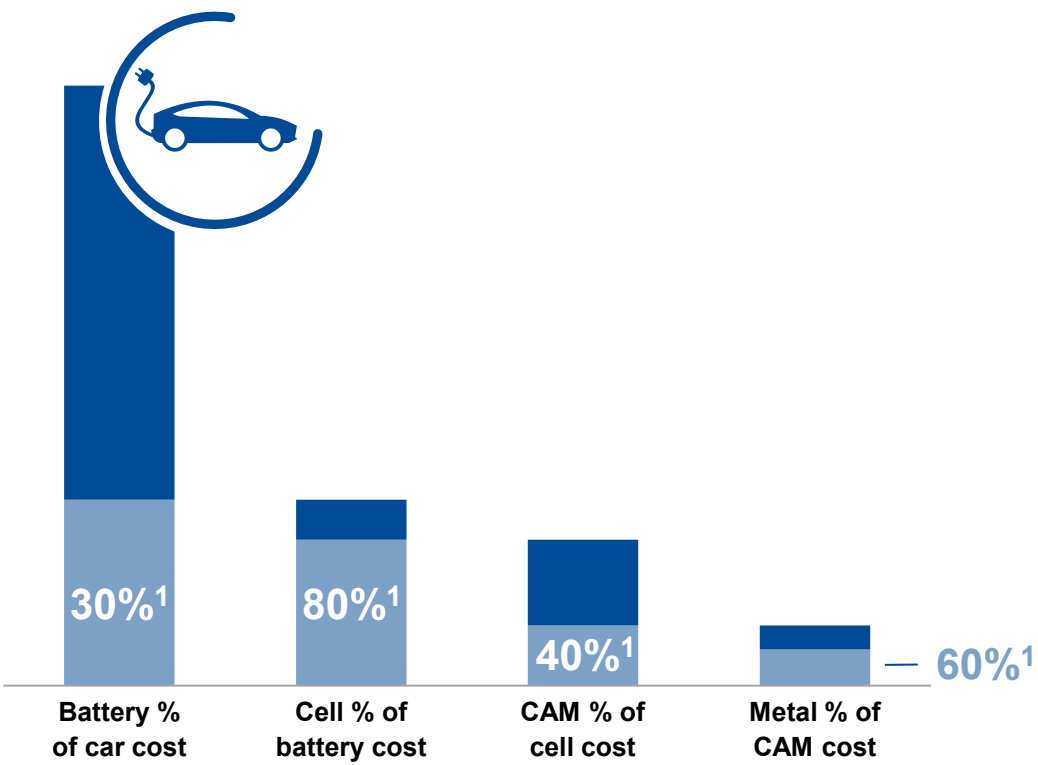
¹ All applications (e-mobility, energy storage systems, consumer electronics) and all cathode chemistries



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Within the electrified powertrain, CAM allows for the greatest level of differentiation and holds the largest material value

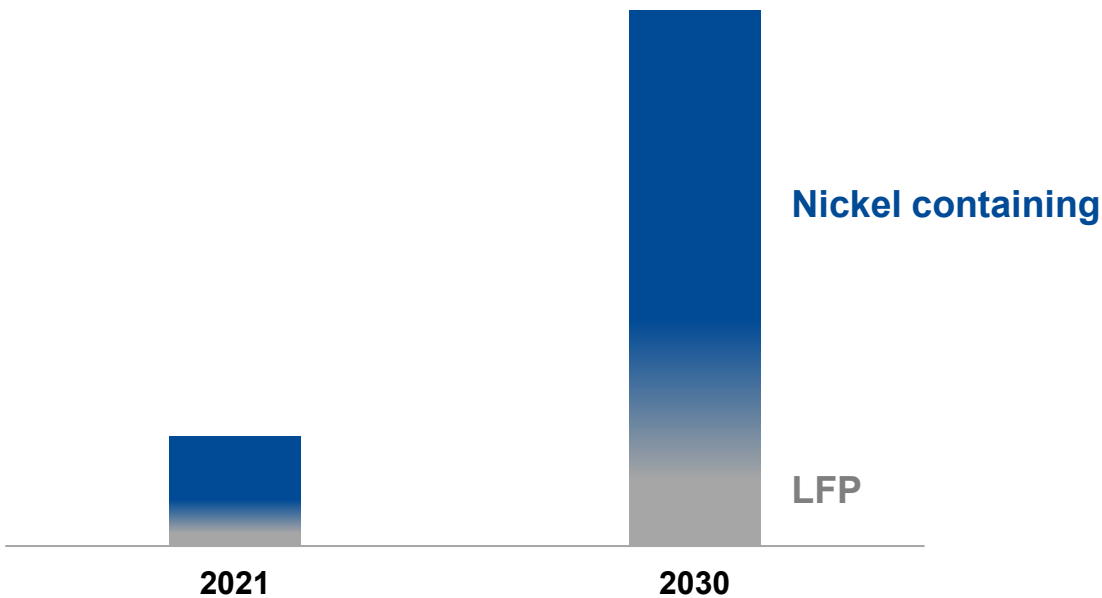


CAM performance parameters, total system cost and sustainability aspects will determine the material choice of cell producers and OEMs

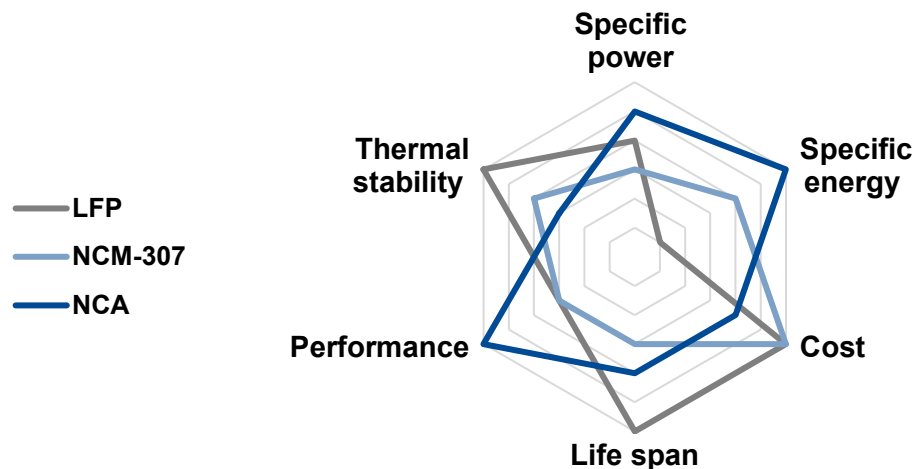
Among the CAM options, high-Ni NCM is the superior chemistry and will lead the market going forward

CAM chemistry-mix volume forecast in BEVs

kt



Cathode-type performance in BEVs¹



NCM and NCA advantages

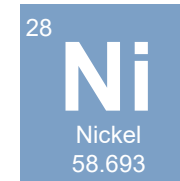
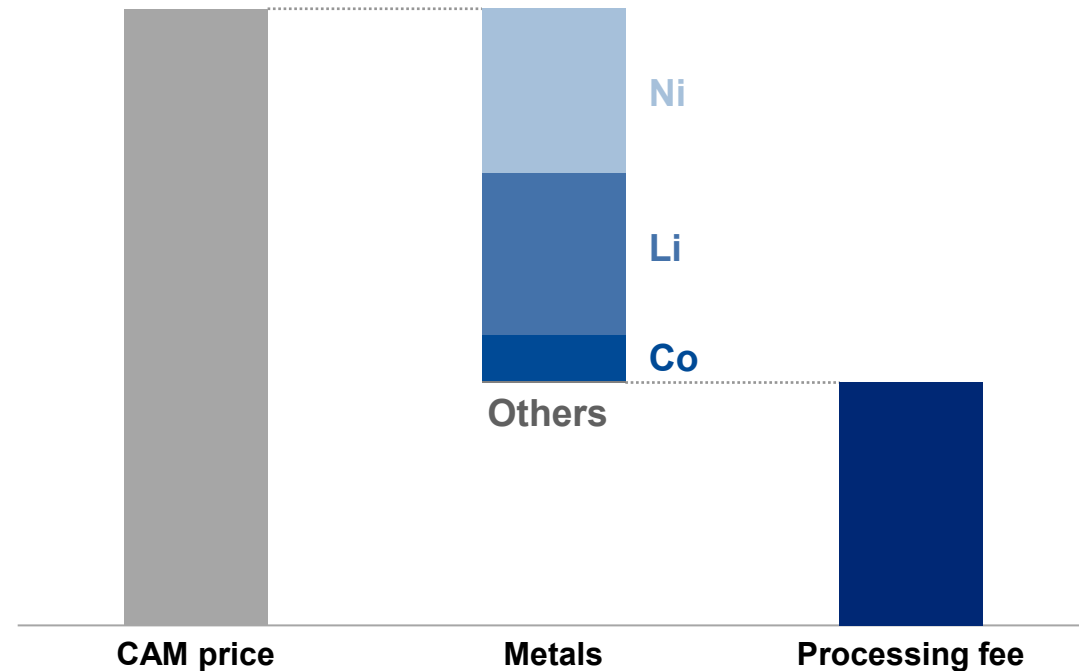
- Energy density/driving range
- Possibility for future performance/cost improvements
- Low-temperature performance
- Recyclability

NCM variants have the highest energy density today and a potential improved-cost position in the future, making them the leading CAM in 2030

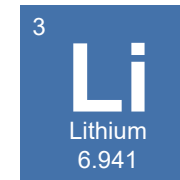
Base metals make up ~60% of the CAM cost, therefore low cost and reliable sourcing is imperative to achieve competitiveness

Cost break-out of the value chain¹

€/kg CAM



- Class 1 nickel will be short after 2025
- New projects are expensive with lengthy ramp-up times



- Tight market throughout the decade
- Advancements in anode technology key variable



- Cobalt tightening mid-decade
- Reduced demand in batteries from cobalt replacement

Competitive and secure supply of nickel and lithium are key targets



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Already today, BASF is at the forefront of CAM innovation, meeting market and specific customers' needs across the globe

+15 years

Experience in CAM development



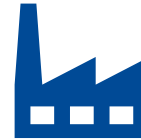
~1,900 employees¹
thereof ~300 scientists



Established business,
fully sold-out in 2021



Battery research centers
in all 4 major regions



Production capacities
totaling 160 kt across all
4 major regions by 2022



>50 commercialized
products



Extensive IP portfolio



Strong collaborations
with academia and industry

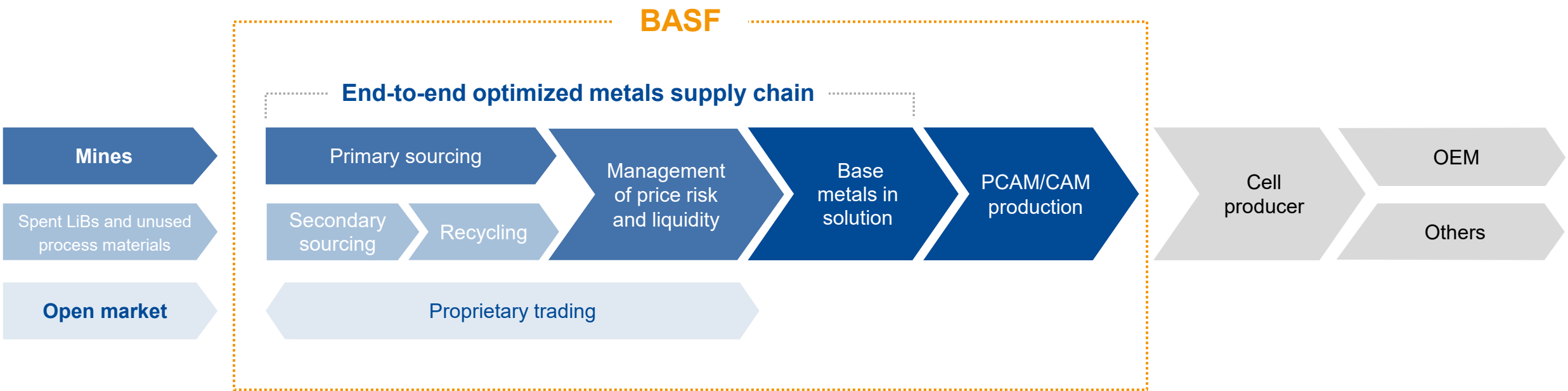
For BASF, four interdependent areas form the key elements of success in the global Battery Materials business



Sustainability will be a differentiator across all four areas

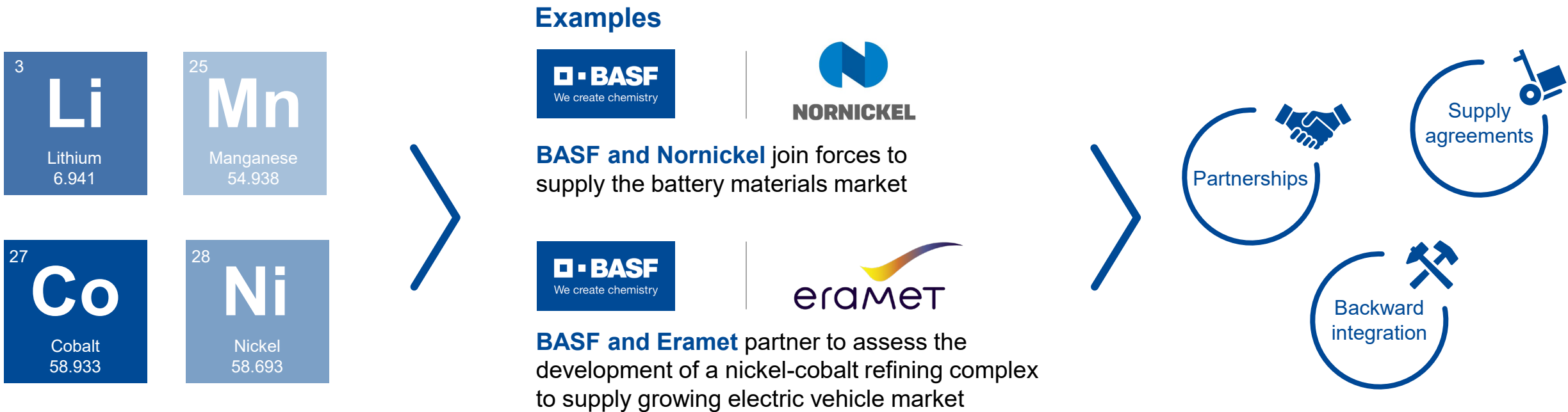
We combine metal sourcing by trading and recycling globally, copying the business model established successfully for PGMs

Optimized base metal management



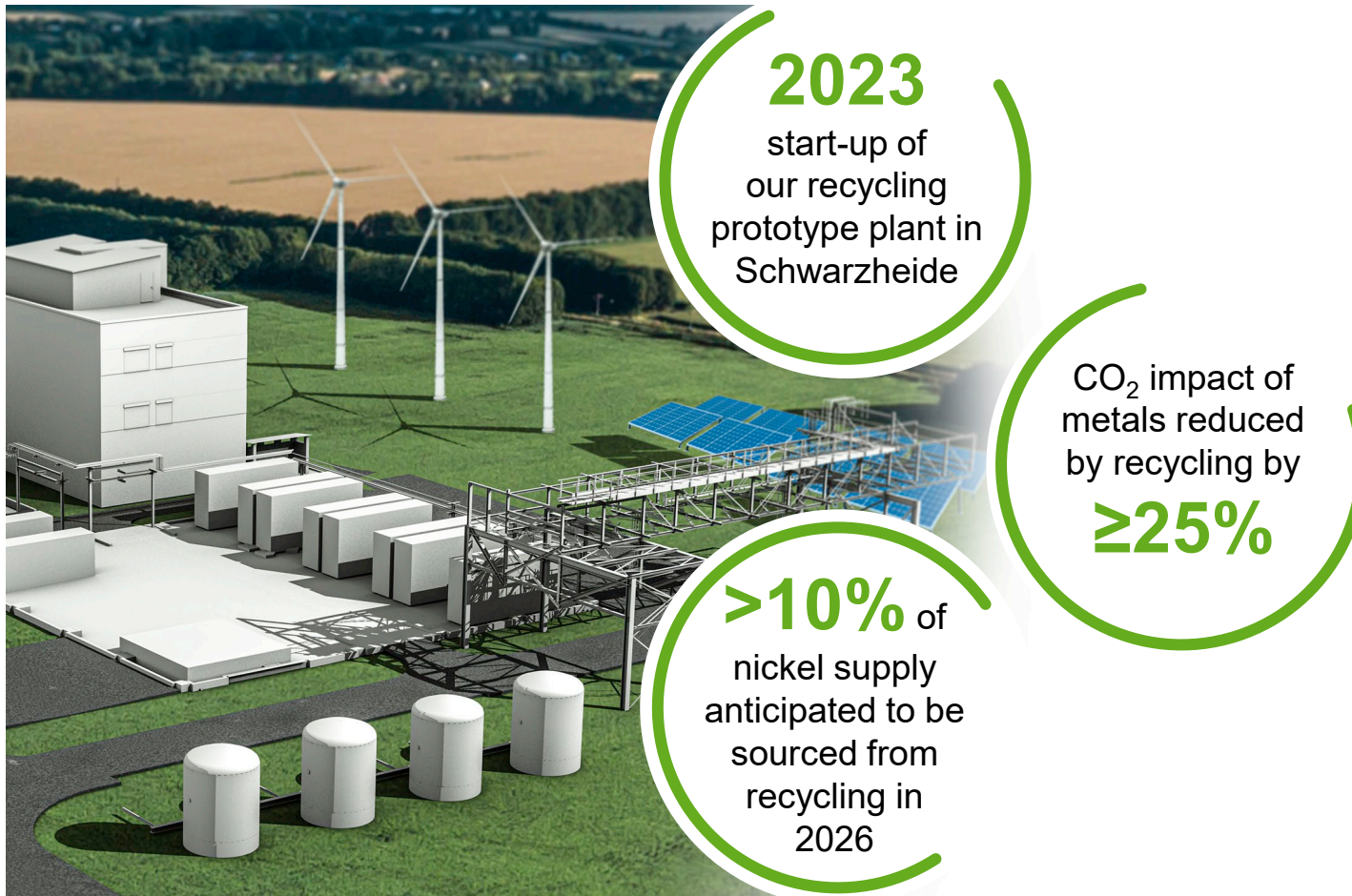
BASF offers a secure and sustainable supply, helping reduce customer risk exposure to volatile metal markets

We establish a secure supply network in close proximity to our production sites across regions



BASF has strategically engaged in partnerships with leading upstream partners, ensuring a long-term secure and responsible supply of base metals

Competitive recycling capabilities will be a key success factor

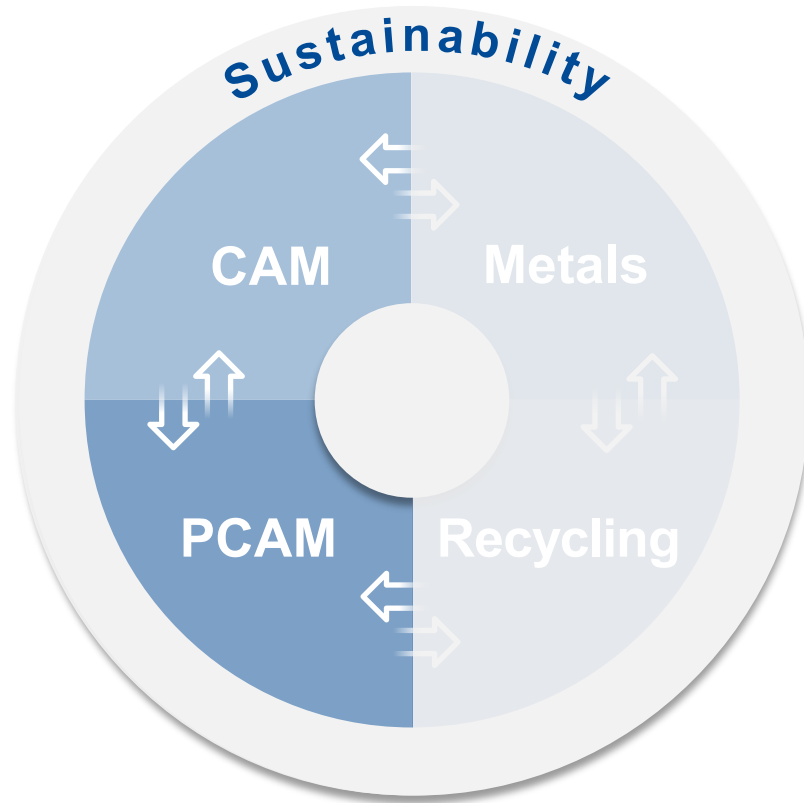


We will **close the loop** to offer a **best-in-class CO₂ footprint** while **optimizing our input costs**

- We offer **long-standing expertise** in the recycling industry.
- We form a **strong partnership network** to bundle resources.
- We will utilize end-of-life batteries¹ and **chemically extract battery grade lithium** with a **proprietary BASF process**.
- We will close the loop, **meeting growing demand** of critical metals, with an exceptional CO₂ footprint.

We will apply a proprietary BASF process with leading recovery rates and CO₂ footprint




For BASF, four interdependent areas form the key elements of success in the global Battery Materials business



We will offer our customers a **seamless integration** and a **superior value proposition** across **all major regions**




Sustainability will be a differentiator across all four areas

PCAM and CAM are high-performance materials customized for the specific requirements of each individual customer's battery system

Diversity of CAM and application area for e-mobility		
Li/Mn-rich, LFP CAM	Mid Ni CAM (60–85% Ni)	High Ni CAM (>85% Ni)
Low range Entry segment	Long range Luxury segment	High performance and mass sensitive
		



Diversity of cell design



Cylindrical cells Pouch cells Prismatic cells

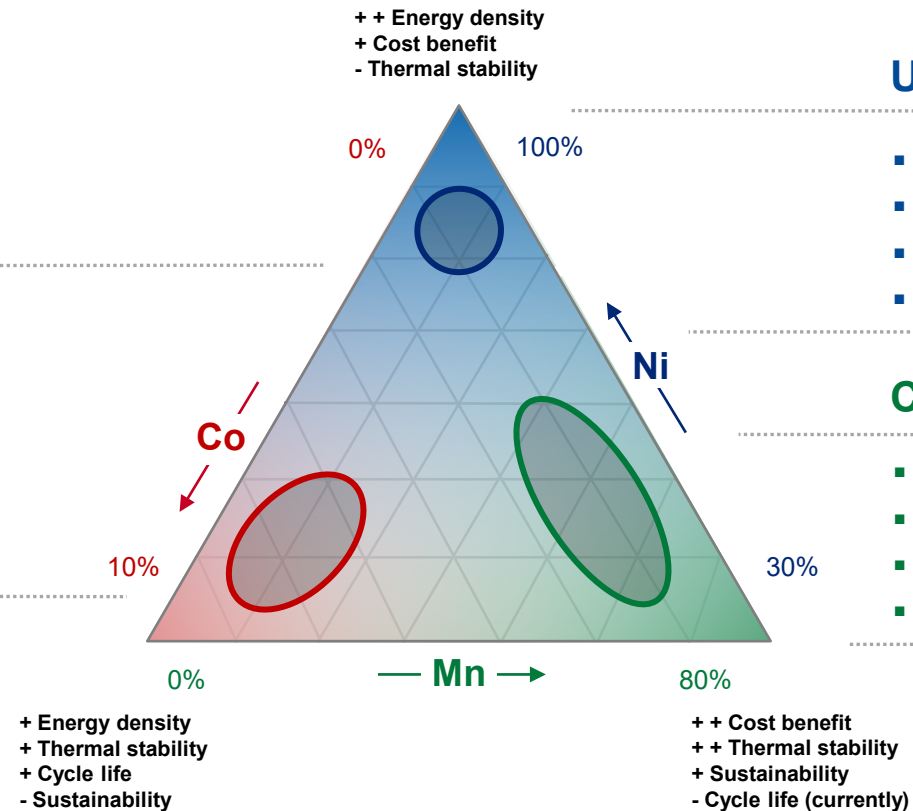
Need of customized CAM development

Close R&D collaboration with cell producers and OEMs as well as broad technology and IP portfolio are essential

Product innovation enables the broadest CAM portfolio in the industry, and we continue to add new solutions

HED™ products

- High energy density NCA and NCM cathode materials
- Ni content ranging from 60% to >90%
- Already used in xEV applications today



Ultra-high Ni

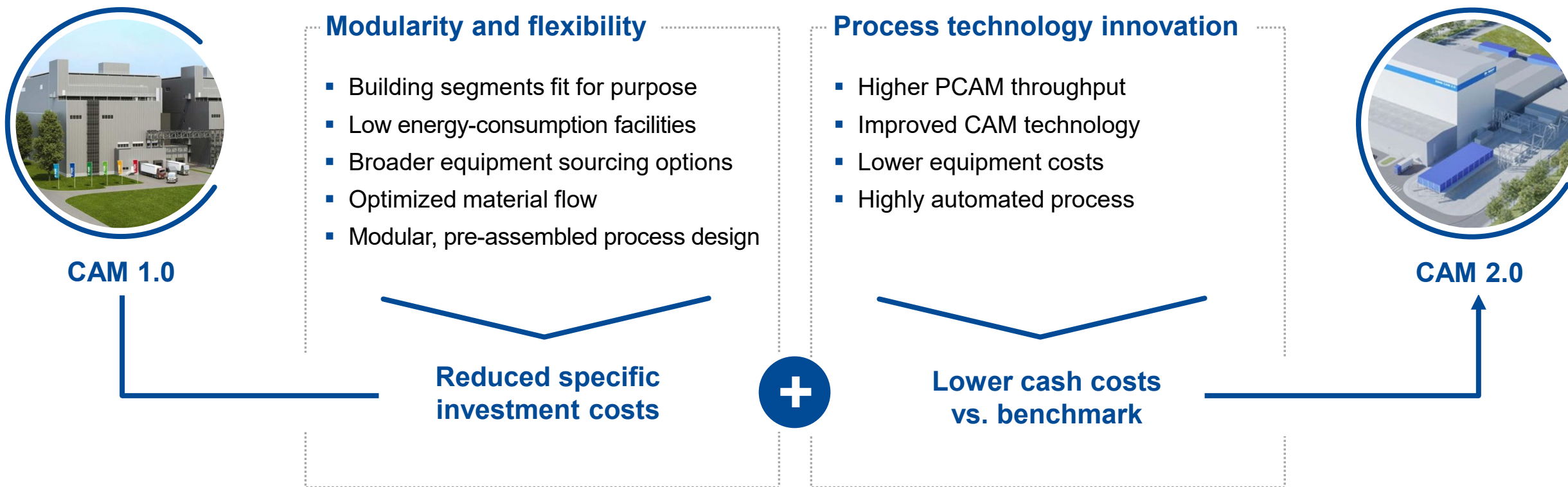
- Ultra-high Ni CAM, ≥ 220 Ah/kg
- Ni >90%, Co <5%
- Up to stabilized LNO
- Pushing boundaries for high-performance applications

Co-free CAM

- Ni-rich NMx
- Over-lithiated Mn-rich, e.g., NCM-307
- Focus on lower cost and improved safety
- Candidate for mass market entry due to price advantage

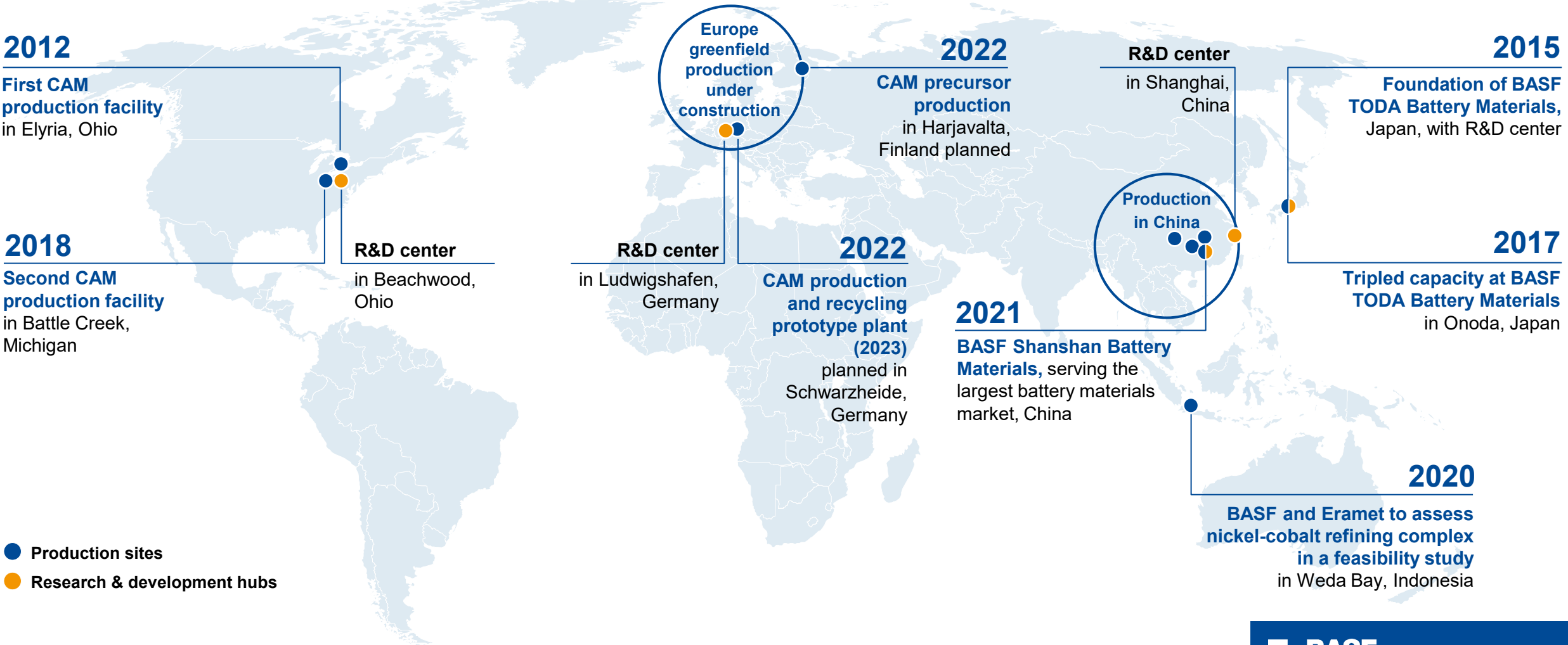
Our technology toolbox offers customized solutions for all cell formats and provides a basis for innovations beyond classical lithium-ion batteries

BASF strategies for modularization and process innovation will further drive down the cost of PCAM and CAM production



We bundle BASF's broad technology and engineering expertise to significantly drive down operating costs and future capital expenditures

BASF has production assets and R&D hubs in close proximity to the most important BEV markets in every region



Our unique European production set-up progresses well with available capacities already fully contracted to strategic customers

Refinery

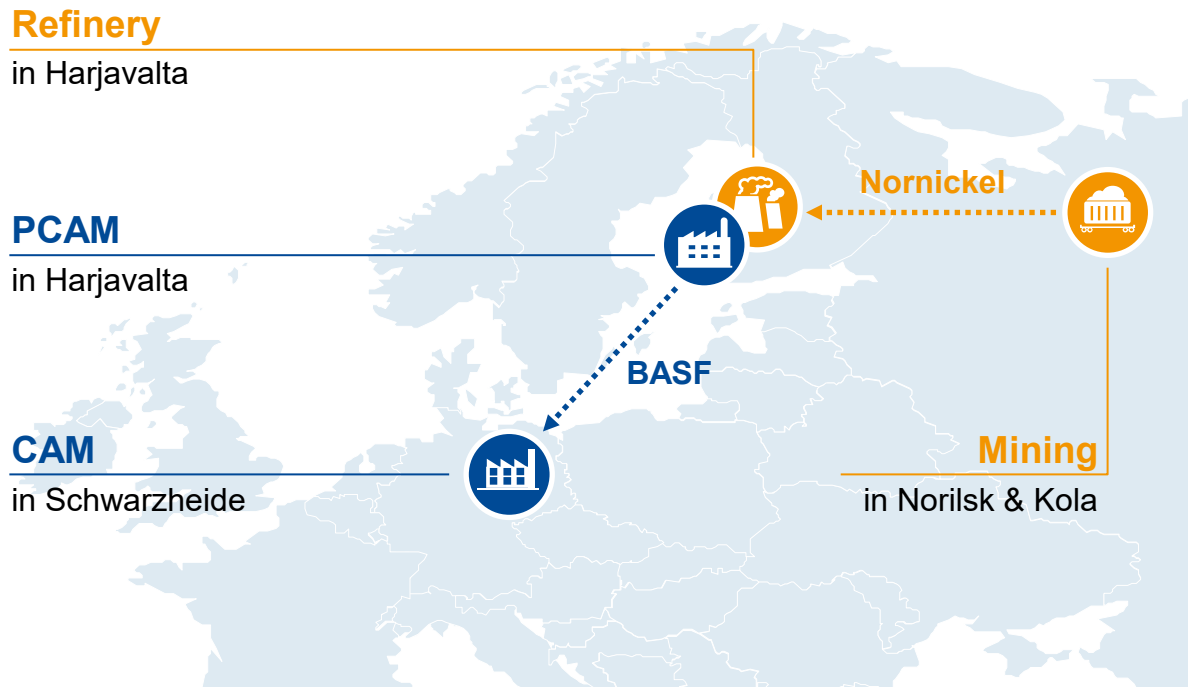
in Harjavalta

PCAM

in Harjavalta

CAM

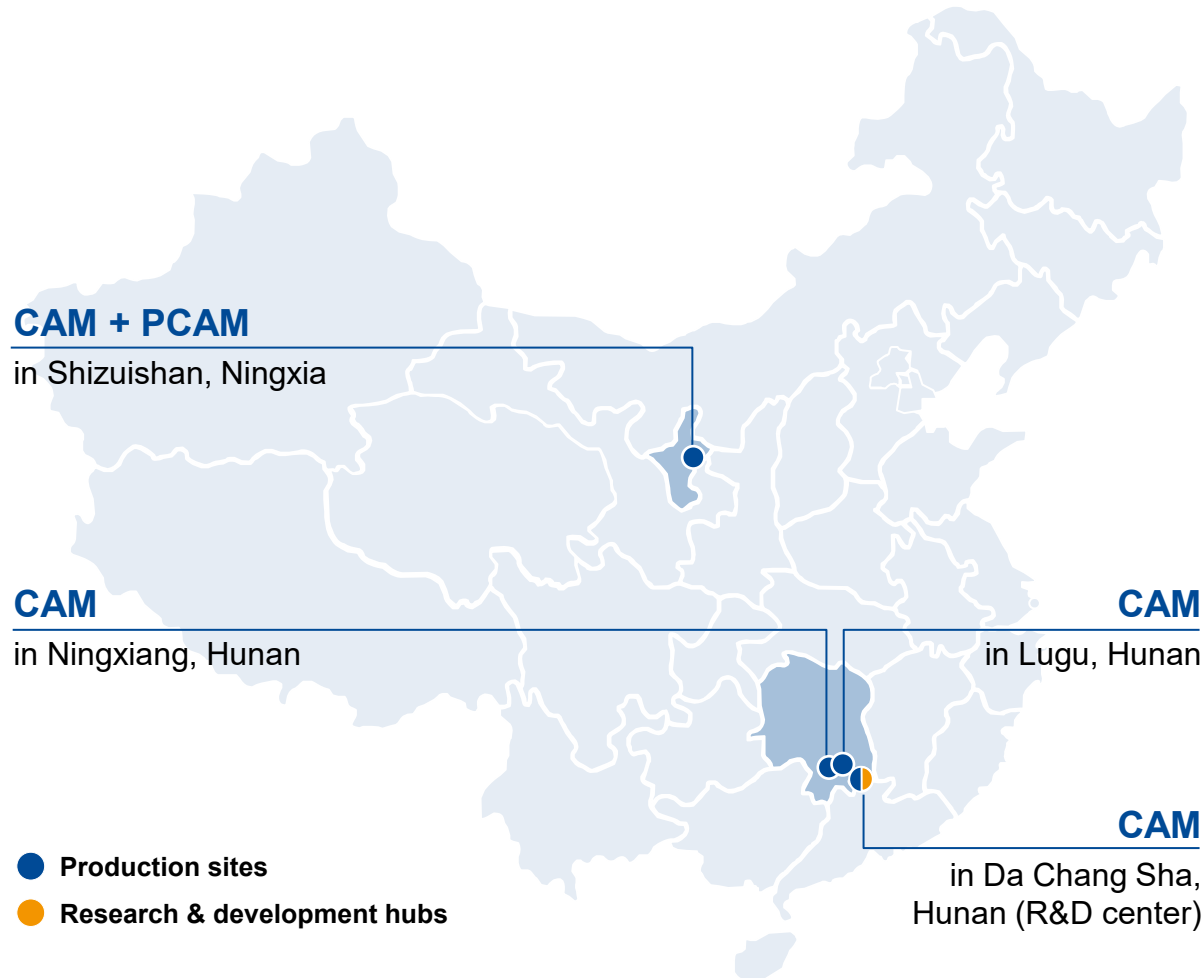
in Schwarzheide



- PCAM plant in **Harjavalta**, Finland, and CAM plant in **Schwarzheide**, Germany, will **start up in 2022**
- Initial capacity of **24 kt** has been **fully contracted to strategic customers**
- Harjavalta plant will utilize **locally generated renewable energy sources**, including hydro, wind and biomass
- High-purity, **regional metal supply of Co and Ni** through partnership with co-located Nornickel refinery secured
- BASF will offer highly efficient **‘closed loop’** solutions with a **proprietary recycling approach**

We foresee the European supply demand gap of CAM to persist (capacity shortage of >60% beyond 2023), providing further tailwind for BASF’s unique footprint

With Shanshan, we reduce our time to market, gain immediate access to further capacity and bolster our R&D capabilities



- **BASF Shanshan Battery Materials** (BASF majority-owned joint venture with Shanshan)
- **1,600 employees**, thereof ~200 in R&D
- **Four production sites** for CAM and PCAM in Hunan and Ningxia, China, with an **annual capacity of 90 kt by 2022**
- **Direct customer access** to the largest battery materials market China, and consumer electronics application fields
- Increasing BASF's **customer proximity**, generate **significant technology synergies** and enable **tailored solutions for a broad customer base**
- Further strengthens BASF's position in Asia and increasing global **annual capacity to 160 kt by 2022** with further expansions underway

We establish close customer collaborations and strategic partnerships across the entire battery value chain

CATL

Agreement on **strategic partnership** signed for collaboration on **CAM and battery recycling**

Porsche

Exclusive development and supply contract with Cellforce Group, a joint venture by Porsche and Customcells, signed

Consumer electronics

Through the formation of **BASF Shanshan Battery Materials**, we supply an extensive list of companies active in **consumer electronics** like Apple and LG

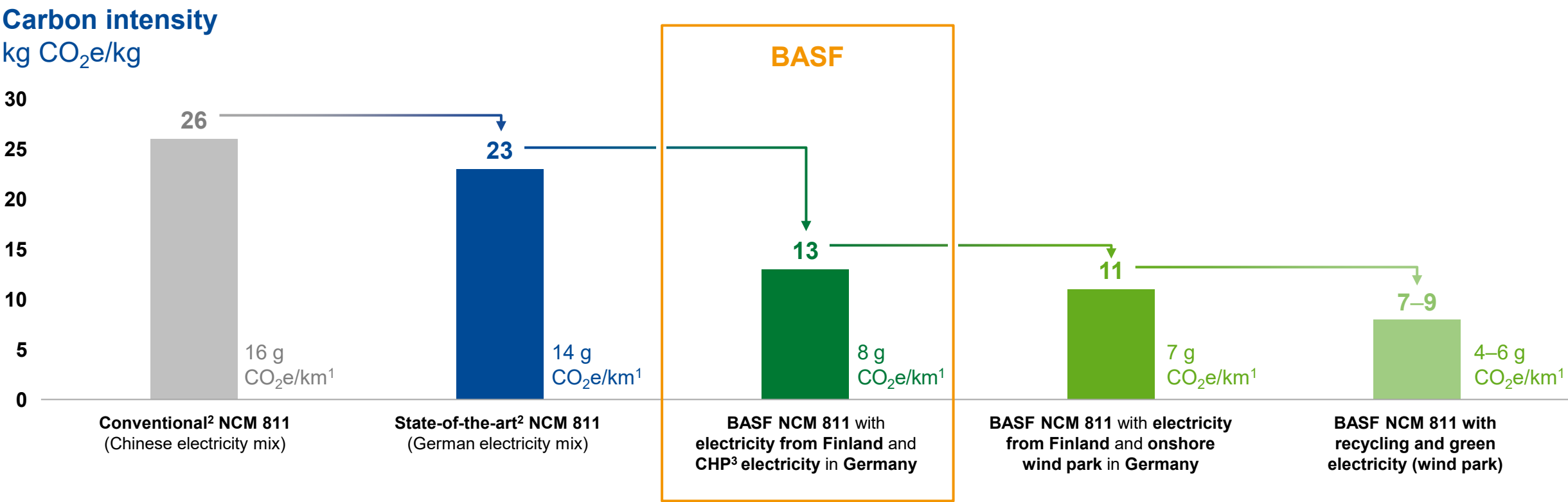
SVOLT

Strategic cooperation agreement signed for joint work on CAM

Recent examples

BASF has several long-term contractual relationships in place as well as upcoming partnerships, securing the profitable utilization of current and future capacities

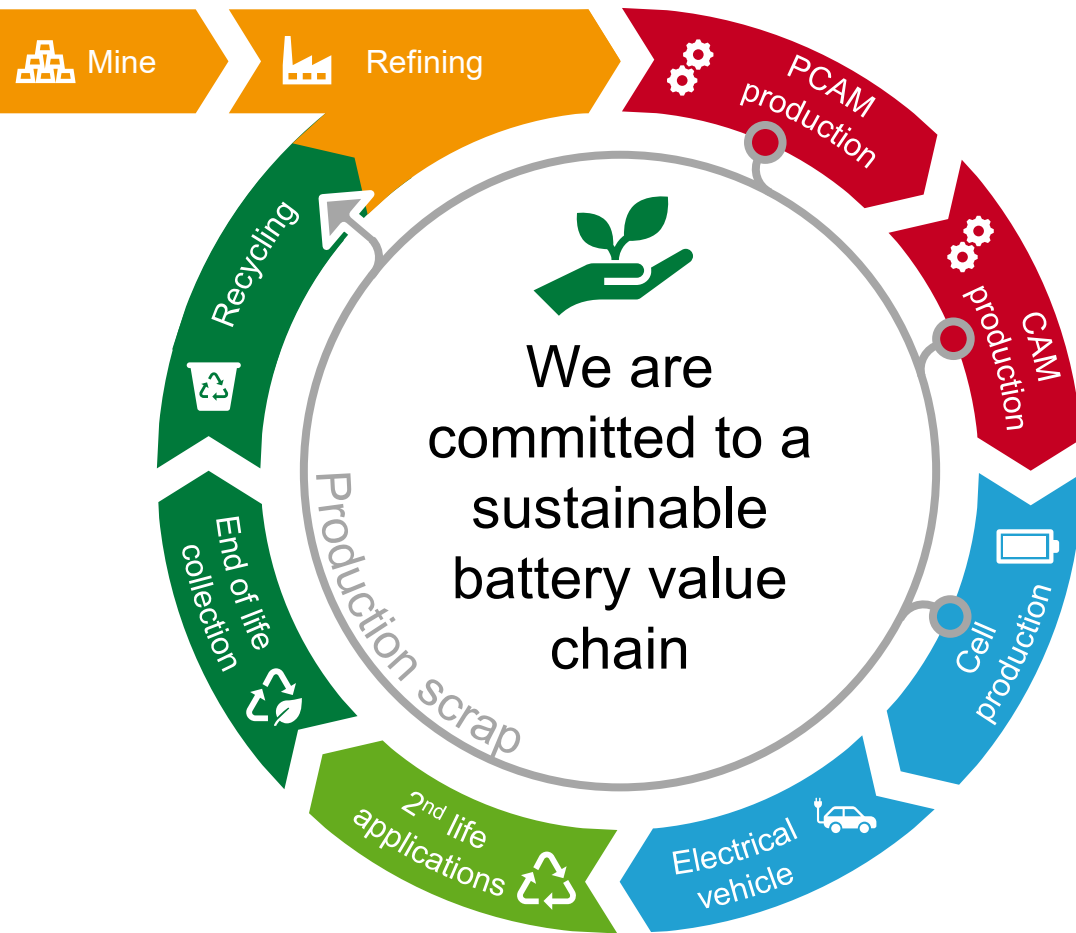
As a result of our holistic approach, we can offer CAM products with best-in-class CO₂ footprint with further reductions planned



By 2022, BASF’s CAM related CO₂ burden will be 40% below benchmark players and >70% lower than worst-in-class CAM producers once targeted set-up is in place

¹ Assumption: 100 kWh = 125kg CAM material per car and a lifetime of 200,000 km
² Conventional and state-of-the-art NCM 811 numbers are calculated based on bill-of-material data from Argonne, 2018 (GREET-model) with German and Chinese electricity grid mix datasets from Sphera
³ Combined heat and power plant, based on natural gas

We have established several projects to ensure that the value chain we are building is best-in-class regarding ESG criteria



We are **partnering globally** to ensure a **resilient** and **sustainable metal supply chain** for our customers.

Our **global production presence** ensures **customer proximity** and **energy efficient production**, minimizing the CO₂ footprint.

We are investing into **recycling** to **close the loop** and to offer a **best-in-class CO₂ footprint**.

We **engage** holistically, **locally – regionally – globally**.





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The Battery Materials business will become a significant earnings contributor to the BASF Group

>€1.5 billion sales by 2023	>10%	>30%	~€3.5–4.5 billion
>€7 billion sales by 2030	market share targeted	EBITDA bsi margin (excl. metals)	capital expenditure 2022–2030

- Continue to ramp up existing sales of the **CAM portfolio** and **secure further commercial outlets**
- Build on **customer proximity** with our **domestic production footprint** to meet customer needs
- Realize new business opportunities and further cost reductions with **continued product development**
- Utilize our broad knowledge of the industry to **support the ongoing transformation** of the sector

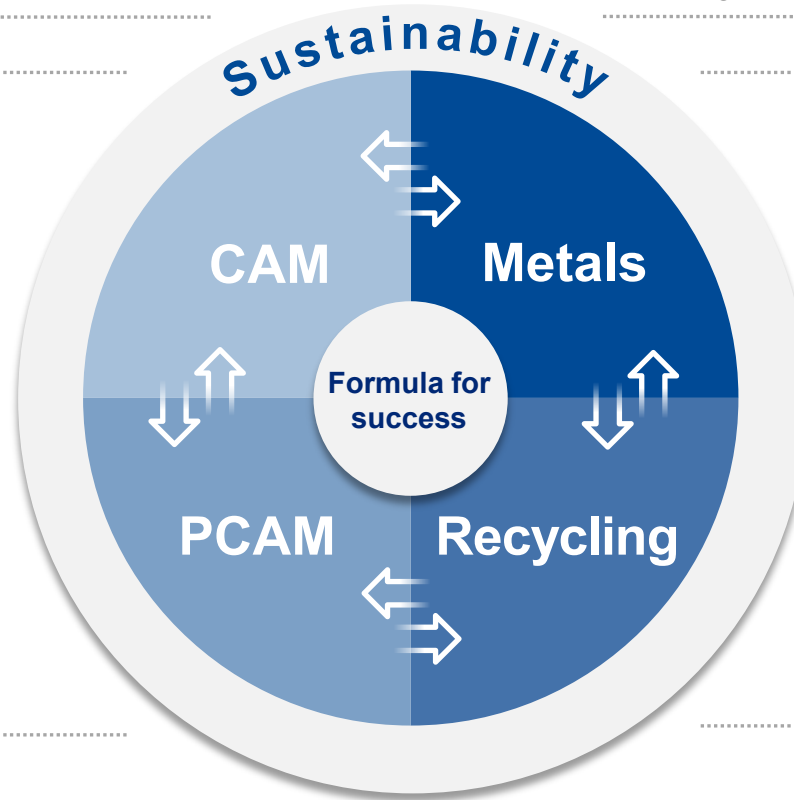
BASF Battery Materials: Key takeaways

- Best-in-class CO₂ footprint

- Closing the loop

- Broad CAM product offering
- Strong IP position
- Extensive R&D capabilities

- Unique expertise in PCAM chemistry
- Make-or-buy optionality with a global production footprint



- Domestic sourcing and production
- Secure and sustainable supply

- Recycling capabilities
- Most CO₂ competitive source for metals

Battery Materials business is set to become one of the key growth engines in BASF's portfolio, establishing a leading and profitable position



We create chemistry