European Aluminium

# Surging Aluminum Usage in European Cars

Salema Webinar

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# Agenda

1 Scope and methodology

2 Automotive market assumptions

3 Aluminium content

4 Conclusions

# Ducker has been providing EA with analyses of the Aluminum Content in Cars since 2012. The 2022 edition of this study considers the market in its entirety and highlights the evolutions linked to the electrification of the car market

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EUROPEAN ALUMINIUM represents the aluminum industry in Europe, encompassing primary aluminum producers, downstream manufacturers, producers of recycled aluminum and national aluminum associations.

European Aluminium

**European Aluminium - Automotive & Transport Group Members**

Alcoa, AD, ALCOMET (CREATING SUSTAINABLE FUTURE TOGETHER), AMAG (AUSTRIA METALL), AssanAlüminyum, BOHAI TRIMET, Constellium, EURAL GNUTTI S.p.A., HAI, Hydro, Novelis, RAFFMETAL, RioTinto, speira

Source: Ducker Carlisle

Project Scope

# In order to reflect the strong electrification trend, the 2022 European assessment of the Aluminum Content in Cars includes all powertrain variants and all electric vehicle models

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**PROJECT SCOPE**

## Geography

**EU27 + UK**

OEM passenger car production taking place in EU27+UK

CKD assembly is not part of the scope

## Vehicle Segment

**Passenger Vehicles**

- All powertrain variants (ICE only, MHEV, FHEV, PHEV, BEV, FCEV)
- All car size segments (A to F)
- All car body types

Light commercial vehicles are not part of the scope

## Component Families

1. Body-in-white (BIW)
2. Brakes
3. Chassis
4. Closures
5. Driveline
6. EV-Specific
7. Powertrain
8. Steering
9. Thermal management
10. Transmission
11. Trim
12. Wheels

Extra category “Other miscellaneous parts” accounts for the aluminum weight associated with small parts that are difficult to track

## Product Forms

**Aluminum:**

- **Castings**
- **Sheet**
- **Extrusions**
- **Forgings**

Aluminum foil is not part of the scope

Source: Ducker Carlisle

# The European Automotive industry is slowly recovering from the Covid crisis and supply chain disruptions. It still suffers from high uncertainties and the energy crisis linked to the Ukraine war

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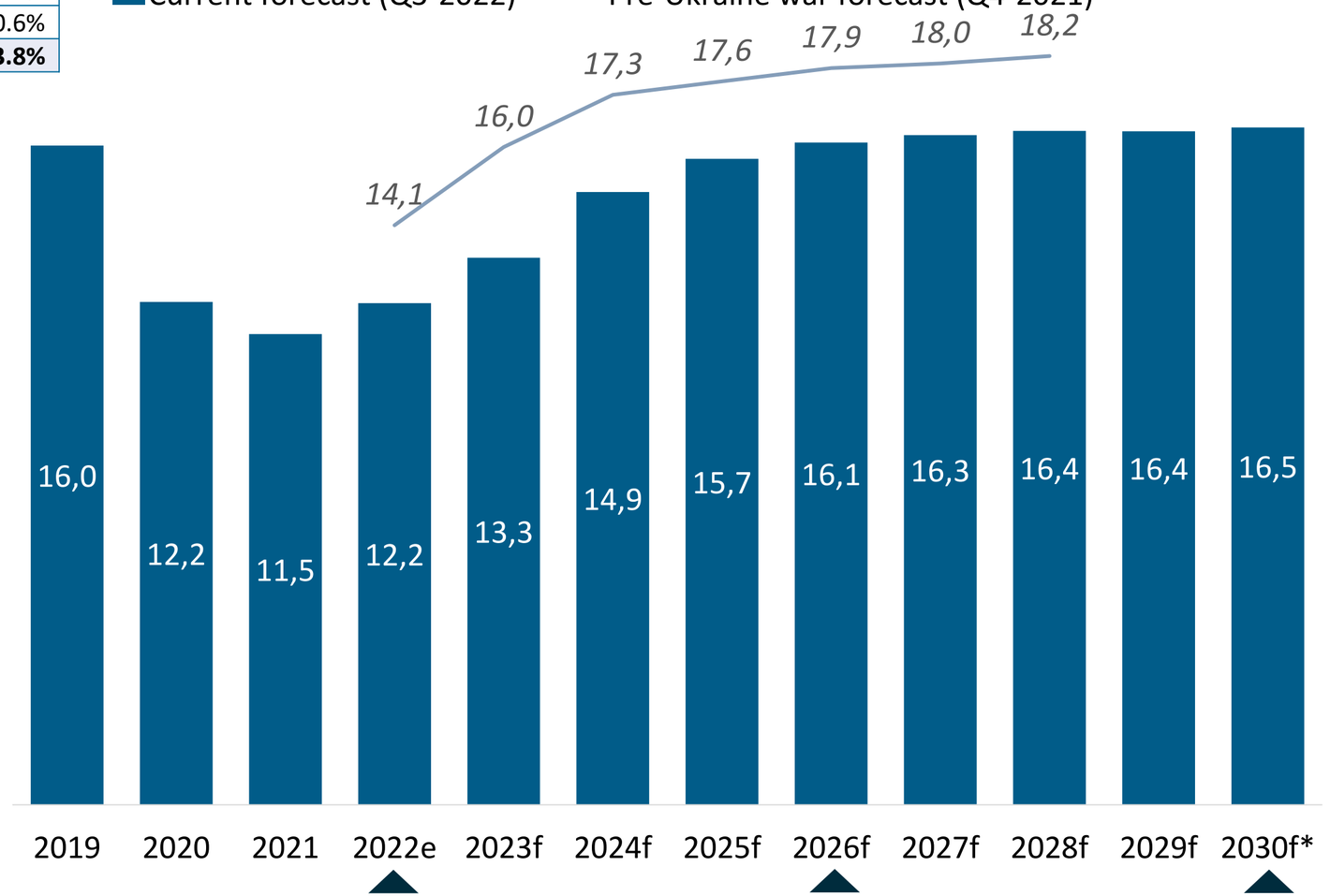
| CAGR | |
|---|---|
| 2022-2026 | 7.2% |
| 2026-2030 | 0.6% |
| **2022-2030** | **3.8%** |

## EU27+UK Passenger Vehicle Production Forecast

*Million Units of Passenger Cars (Light Commercial Vehicles excluded)*




- **2020-2021**: COVID-19 made the industry stall
- **2020-onward**: Semiconductor shortage causing major sourcing issues, leading to supply chain disruptions
- **2022-onward**: Ukraine war having a significant impact on European economies and Automotive industry

➡ European Automotive production not expected to reach back to 2019 production level before 2026 earliest

Sources: Ducker Carlisle, LMC Automotive Q3-2022, Q4-2021; *Ducker Carlisle applied the 2026–2029 CAGR to estimate the 2030 production volume which is not yet available in LMC forecasts

# Driven by regulation, the electrification trend has strongly accelerated in the last few years. 31% of EU passenger car production is forecasted to be BEVs in 2026, potentially up to 60% by 2030

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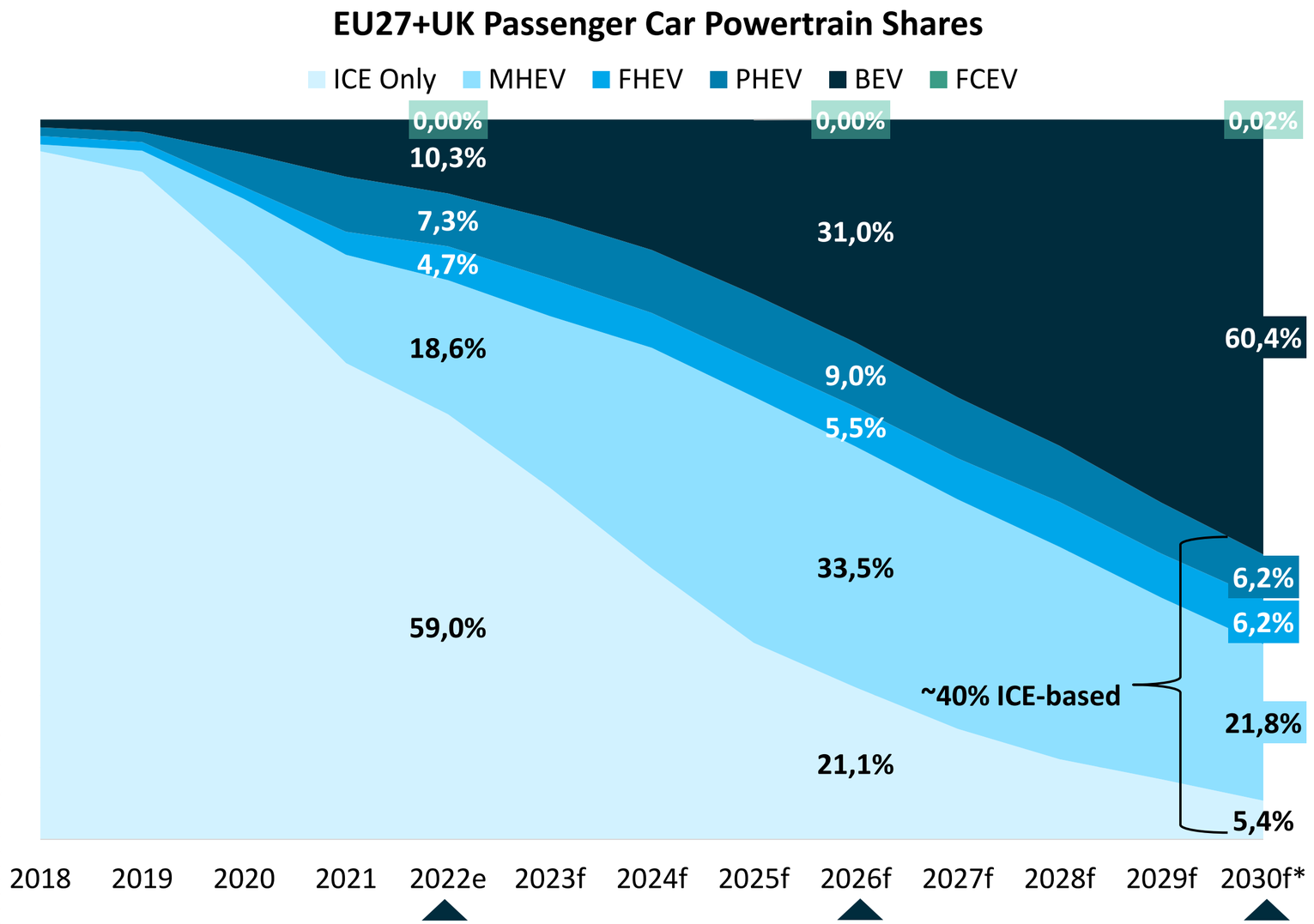


**EU CO2 emission targets drive a BEV strategy:**

- **2025 onward:** 15% reduction compared to 2021
- **2030 onward:** 55% reduction compared to 2021 **- NEW TARGET**
- **2035:** Zero emission
- **2050:** Climate neutrality

Sources: Ducker Carlisle, LMC Automotive Q3-2022; *Ducker Carlisle applied the 2026–2029 CAGR to estimate the 2030 production volume which is not yet available in LMC forecasts

# BEVs produced in the EU are positioned in higher size segments than ICE-based vehicles (significantly more D and E) and are more premium-positioned than ICE-based vehicles. This will continue to be the case through 2030, even though BEV production will grow the most in the B and C size segments

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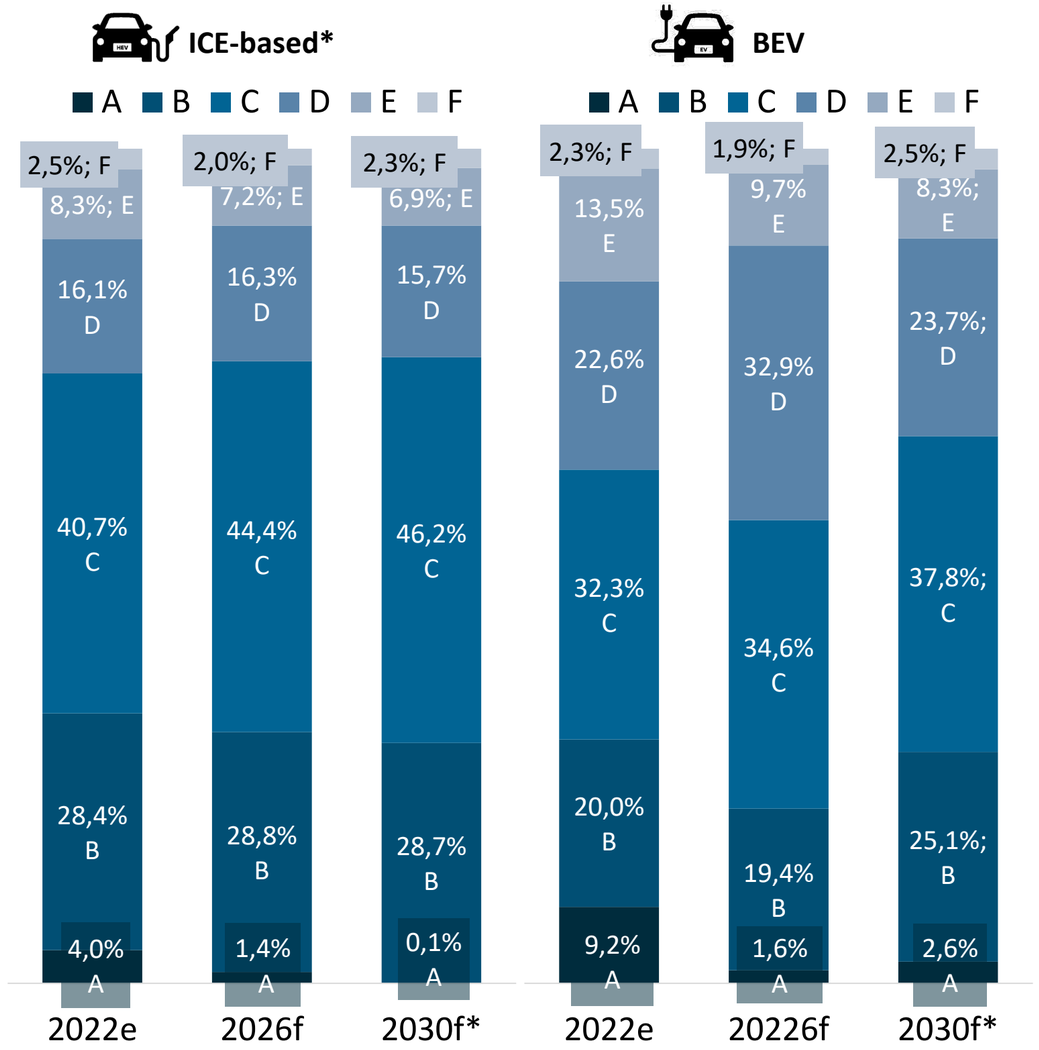
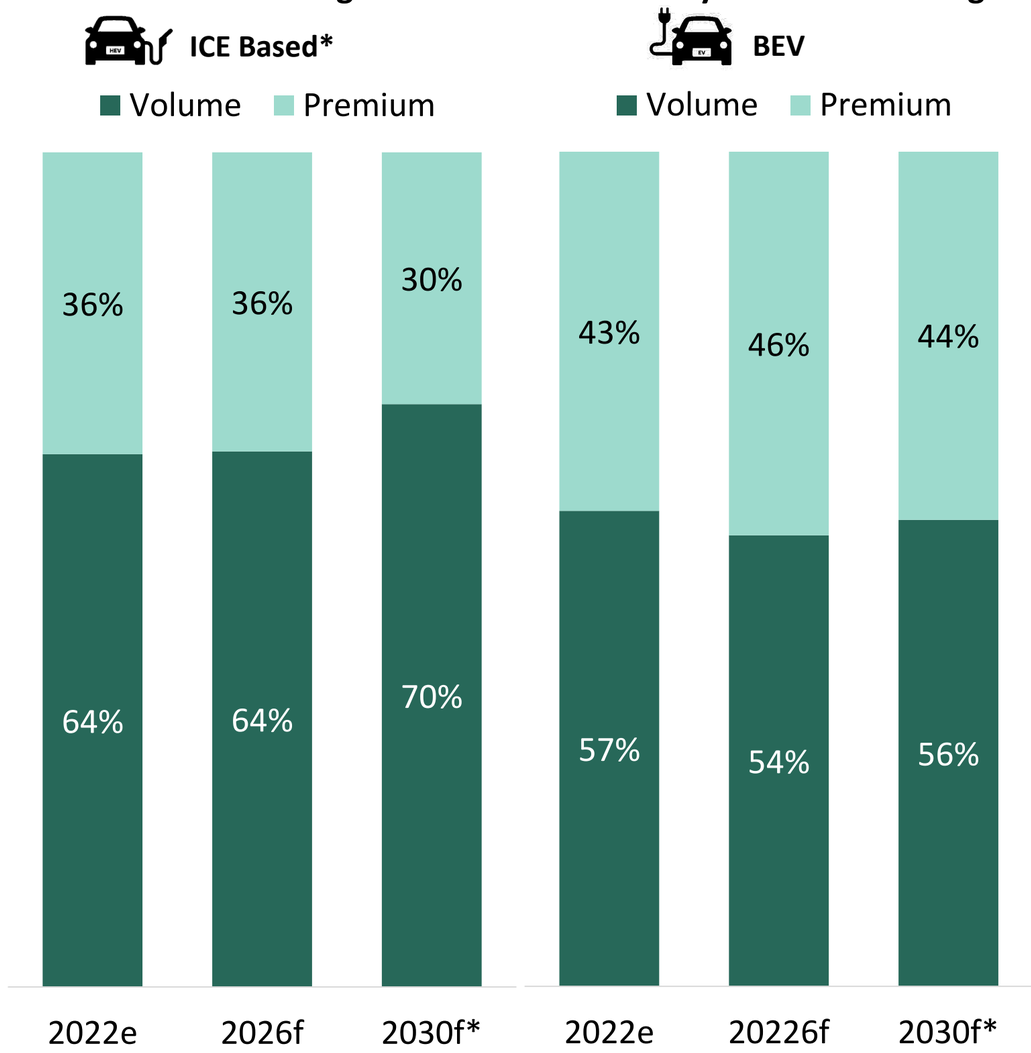
## EU27+UK Passenger Vehicle Production by Size Segment



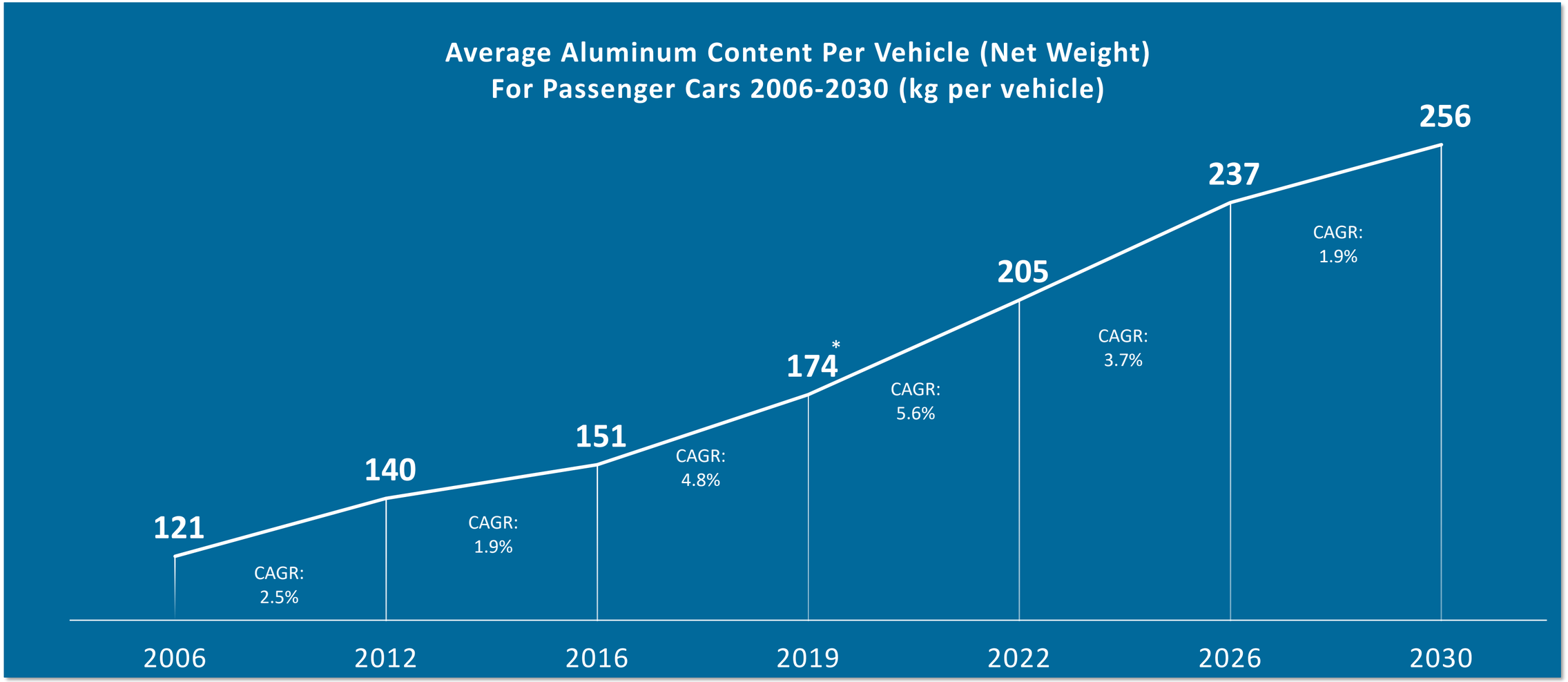

## EU27+UK Passenger Vehicle Production by Brand Positioning




Sources: Ducker Carlisle, LMC Automotive Q3-2022; *Ducker Carlisle applied the 2026–2029 CAGR to estimate the 2030 production volume which is not yet available in LMC forecasts; *ICE-based= FHEV, ICE, PHEV, MHEV

# Regardless of vehicle production volume growth, the average aluminum Content Per Vehicle (CPV) has steadily been increasing in passenger cars since 2006 (time when Ducker started monitoring the CPV in the EU). The CPV increase has accelerated driven by further lightweighting needs, electrification and a rising share of larger as well as premium vehicles






Sources: Ducker Carlisle; *CPV of 179 kg in EA study 2019 as second set of OE wheels was included

Aluminum Gains/Losses 2022-2030 by Component Family

# The highest aluminum gains will come from the 'EV Specific' family - nearly 54 kg more aluminum per vehicle will be needed in 2030 compared to 2022 for EV specific components. The need for additional aluminum content in BIW will also be significant - more than 15 additional kg

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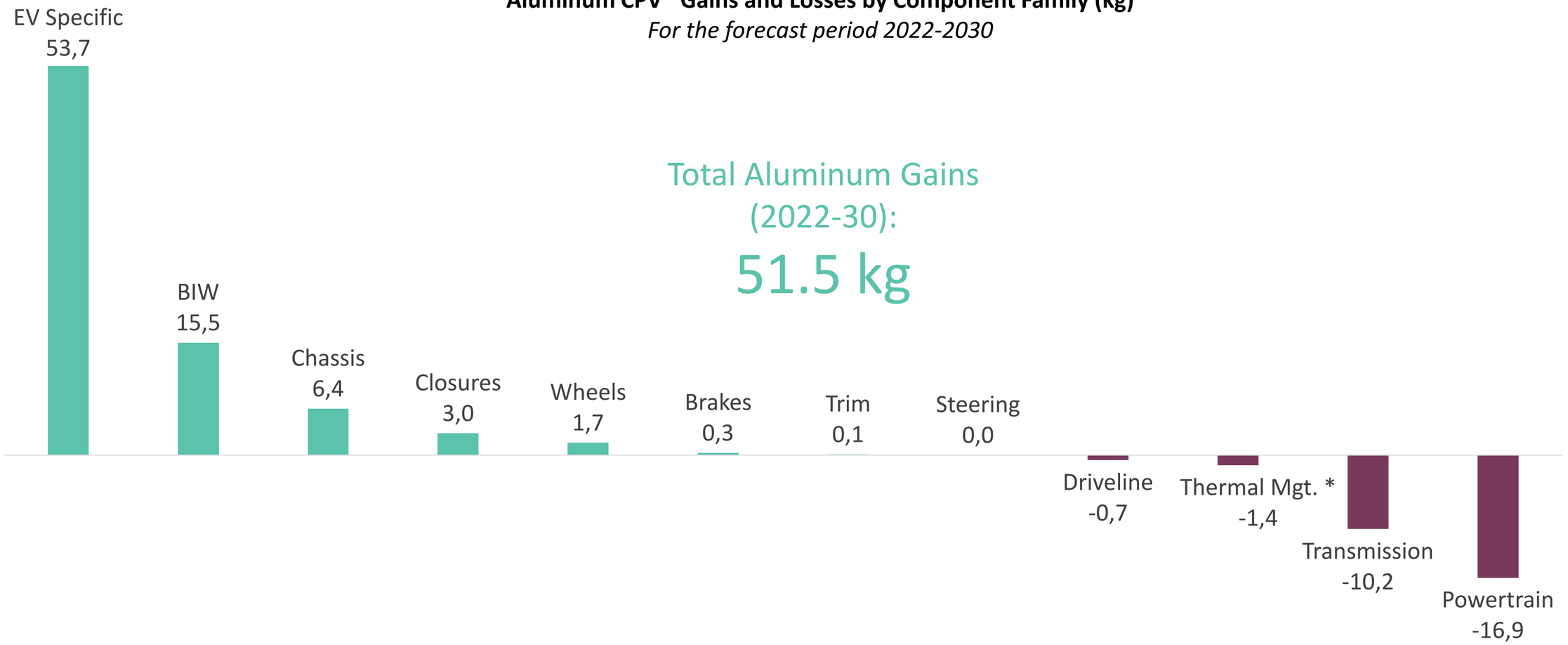
**Aluminum CPV* Gains and Losses by Component Family (kg)**

*For the forecast period 2022-2030*




* The component family ‘Thermal Management’ does not include battery cooling plates, which are accounted in the component family ‘EV Specific’. If battery cooling plates were included in the ‘Thermal Management’ component family, the Thermal Management CPV would show a growth from 20.5 kg in 2022 to 24.1 kg in 2030 (2.1% CAGR)

Sources: Ducker Carlisle; *CPV = Content Per Vehicle; *Ducker Carlisle applied the 2026–2029 CAGR to estimate the 2030 values

# All aluminum product forms will see their CPV increase by 2030. Castings will benefit from the highest aluminum gains: 22 kg between 2022 and 2030. Extrusions and sheet will achieve significant content gains as well (14-15 kg each). Sole forgings will have a limited gain of 0.5 kg by 2030

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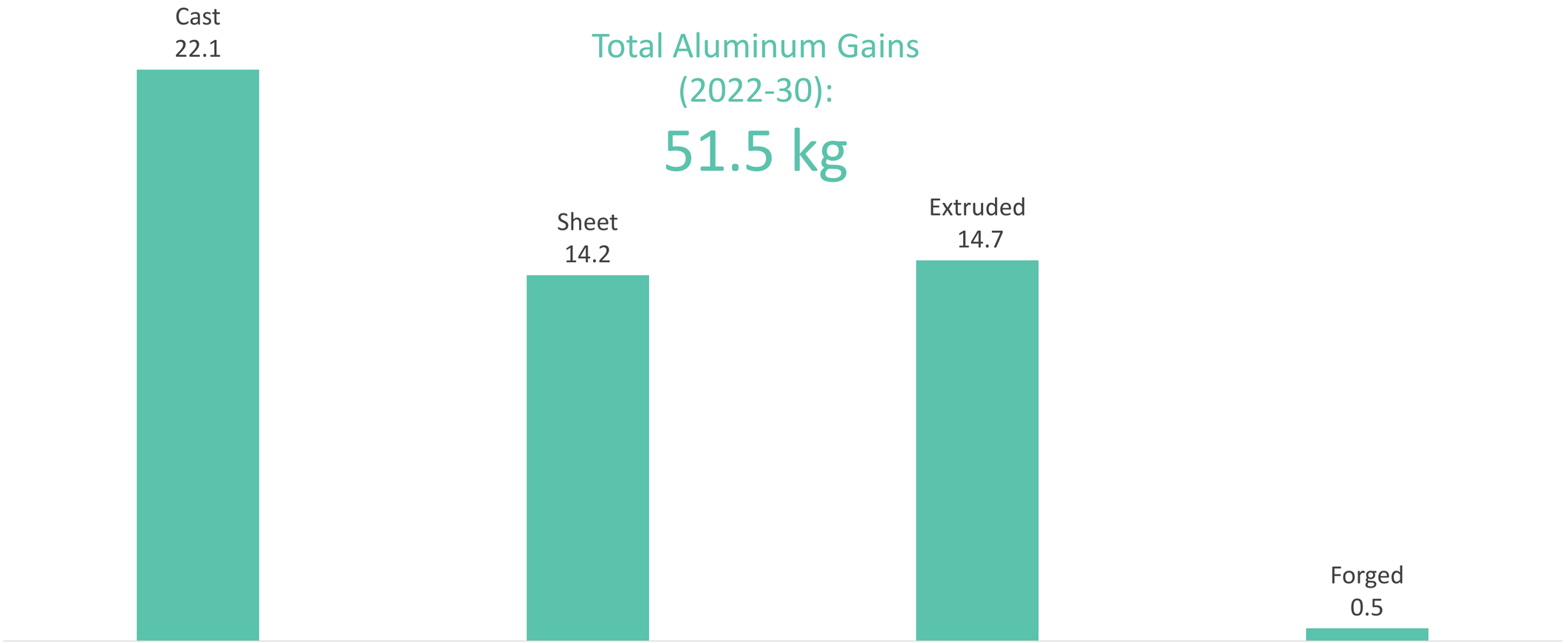
**Aluminum CPV* Gains by Forming Process (kg)**

*For the forecast period 2022-2030*




Sources: Ducker Carlisle; *CPV = Content Per Vehicle; *Ducker Carlisle applied the 2026–2029 CAGR to estimate the 2030 values

# Castings are by far the largest aluminum product form with 123 kg per vehicle, expected to reach 145 kg per vehicle in 2030, and drive the strongest growth in kg per vehicle. The most dynamic CAGR is expected from extrusions due to increasing penetration in EV Specific, BIW and Brakes

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## Average Aluminum Content per Vehicle in 2022

Sheet (+14 kg by 2030)

45 kg

CAGR 2022-30: 3.5%

123 kg

CAGR 2022-30: 2.1%

Castings (+22 kg by 2030)

Extrusions (+15 kg by 2030)

27 kg

CAGR 2022-30: 5.6%

10 kg

CAGR 2022-30: 0.6%

Forgings (+0.5 kg by 2030)

Sources: Ducker Carlisle

AL Content Addition/Loss by Powertrain Type

# While the average aluminum CPV will remain about stable for PHEVs through 2030, it will increase for BEVs by 2026 before going down due to the BEV mix evolving toward smaller and non-premium models. FHEVs have the lowest AL CPV as the model range mainly relates to B and C segments, and to Japanese or Korean OEMs with low AL usage

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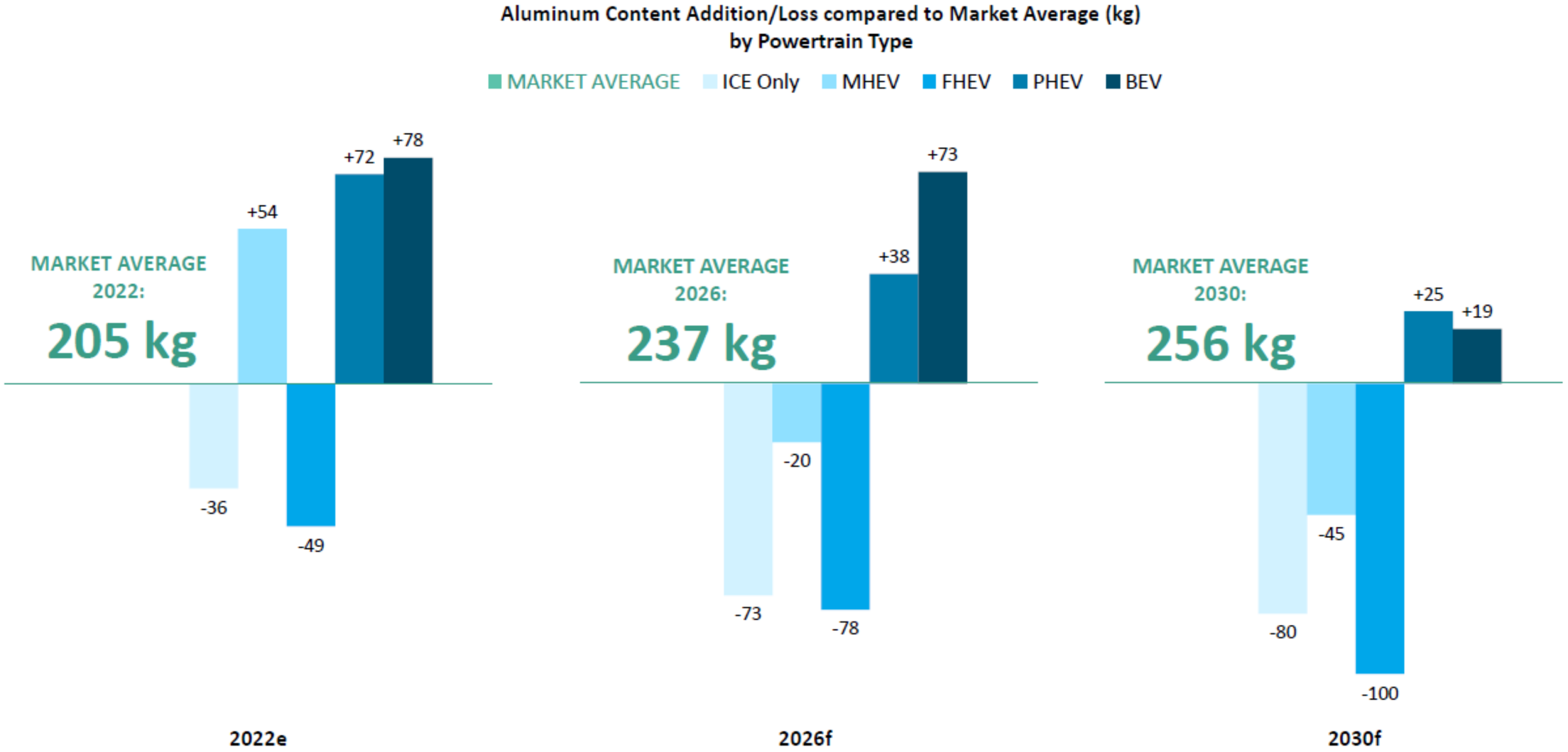


Sources: Ducker; *CPV = Content Per Vehicle; *Ducker applied the 2026–2029 CAGR to estimate the 2030 values

# The higher the size segment, the higher the aluminum intensity. B and C segments will experience the strongest CPV growth by 2030. Castings will remain the leading aluminum product form in cars and continue to grow

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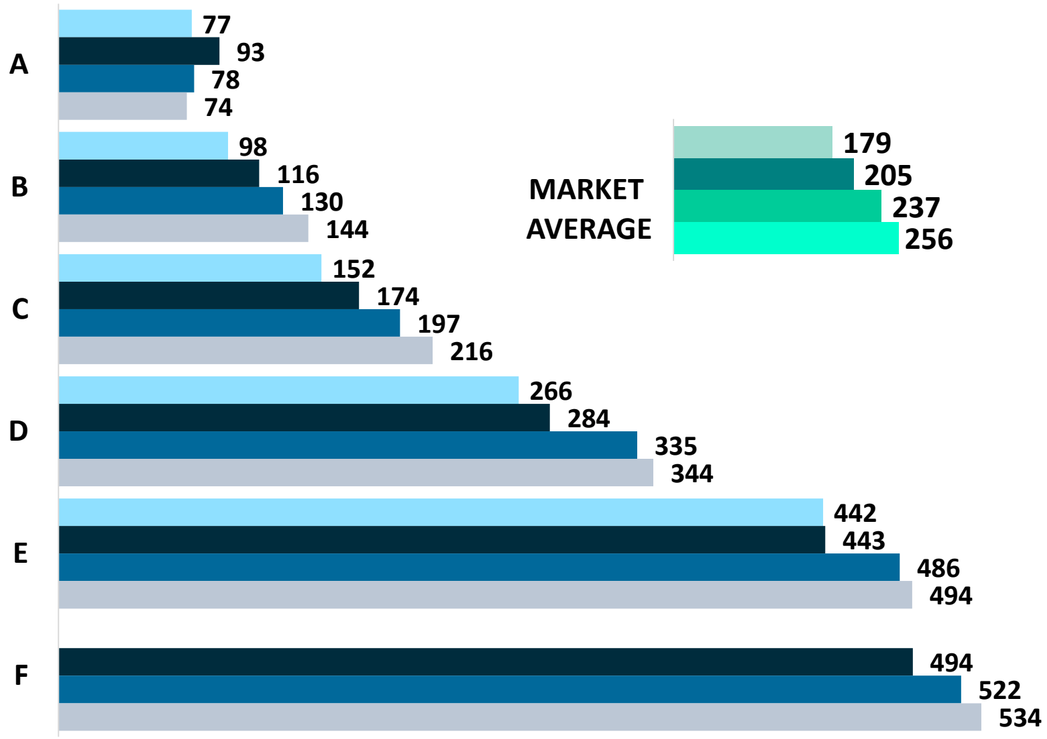
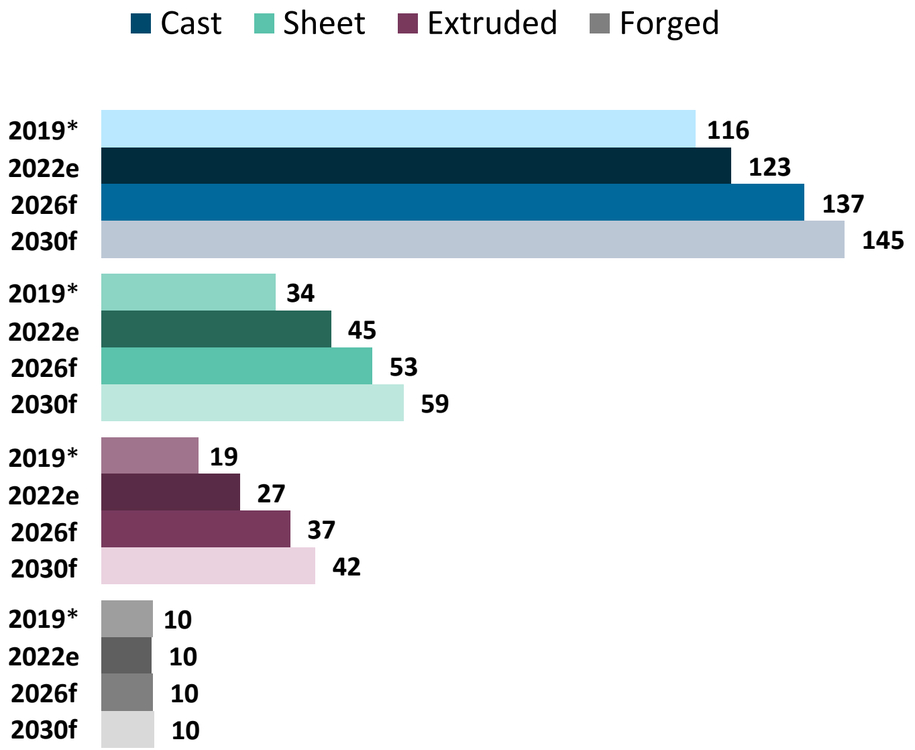
## Aluminum CPV* by Size Segment (kg)




## Aluminum CPV* by Forming Process (kg)




Sources: Ducker Carlisle; *CPV = Content Per Vehicle / *In the EA 2019 study, E and F segments were combined; *Ducker Carlisle applied the 2026–2029 CAGR to estimate the 2030 values; *EA study 2019 included second set of OE wheels

# The component family ‘EV Specific’ will skyrocket and reach, already by 2026-2027, the CPV level of Wheels, before pursuing its tremendous growth. BIW will also experience steep growth by 2026

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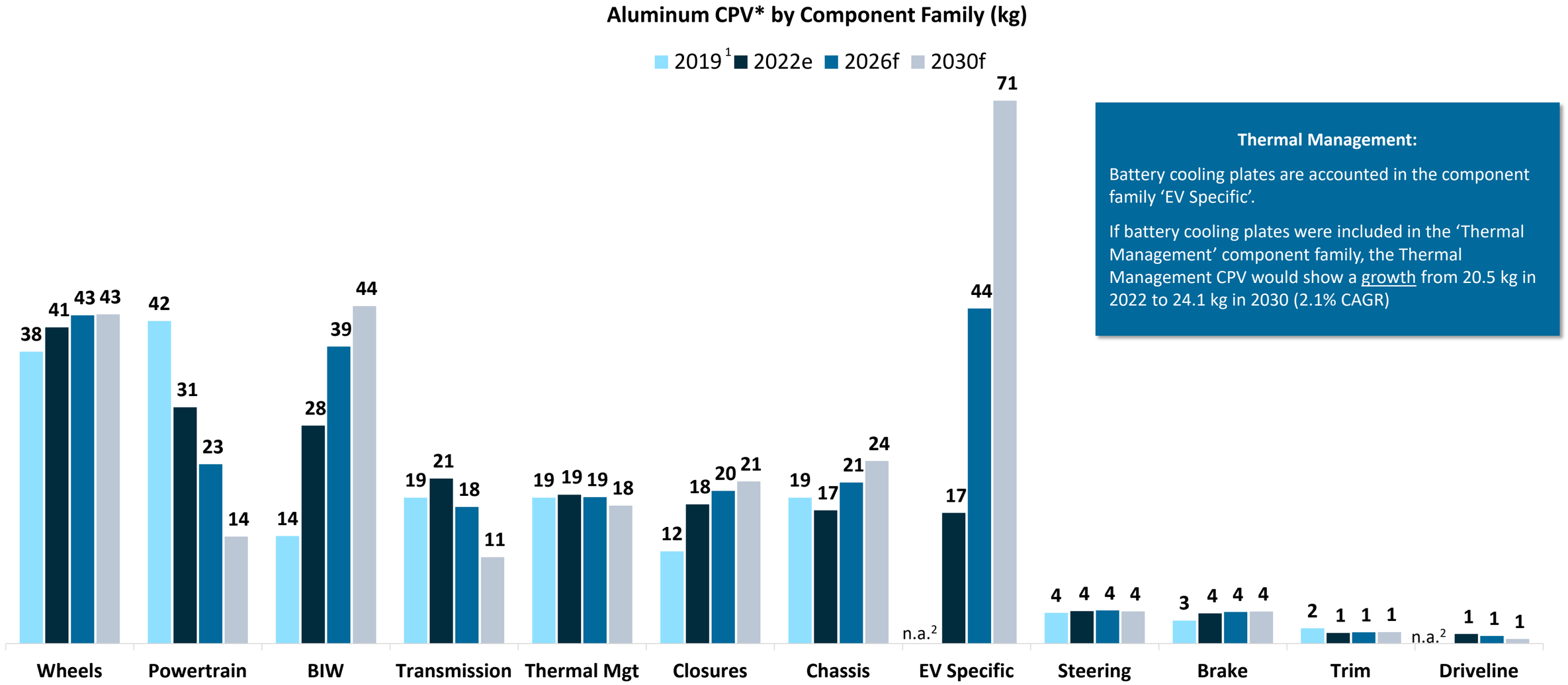


**Thermal Management:**

Battery cooling plates are accounted in the component family ‘EV Specific’.

If battery cooling plates were included in the ‘Thermal Management’ component family, the Thermal Management CPV would show a growth from 20.5 kg in 2022 to 24.1 kg in 2030 (2.1% CAGR)

Sources: Ducker Carlisle; *CPV = Content Per Vehicle

[1] EA study 2019 included the potential second set of OE aluminum wheels; [2] n.a. stands for ‘not available’; in the 2019 EA study the EV-Specific components were only assessed for a sample of 10 BEV models, and ‘Driveline’ is a new component family in the 2022 study

Overall AL CPV & Gross Demand

# Driven by electrification and further lightweighting requirements, the average aluminum Content Per Vehicle (CPV) will keep on increasing. The period 2022-2026 will show strong growth in both CPV and gross demand. Growth is expected to slow down after 2026

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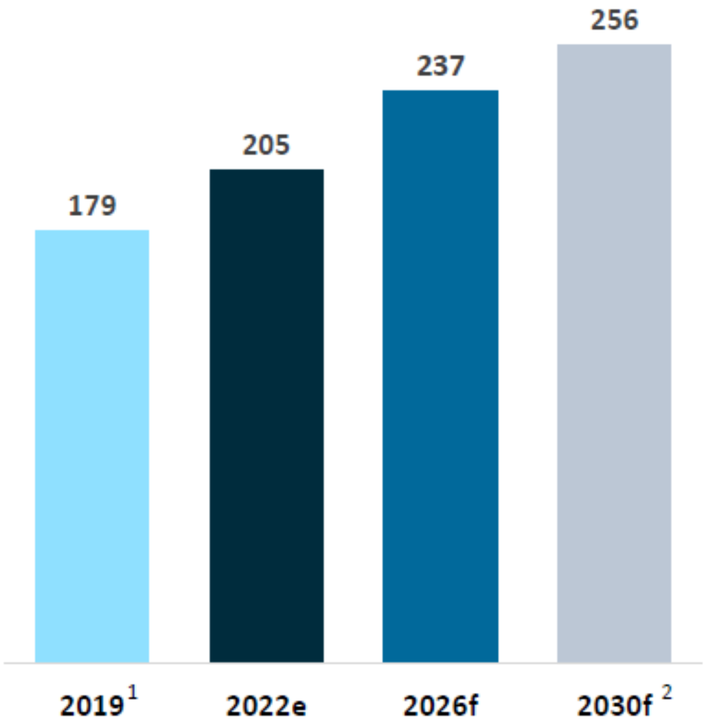
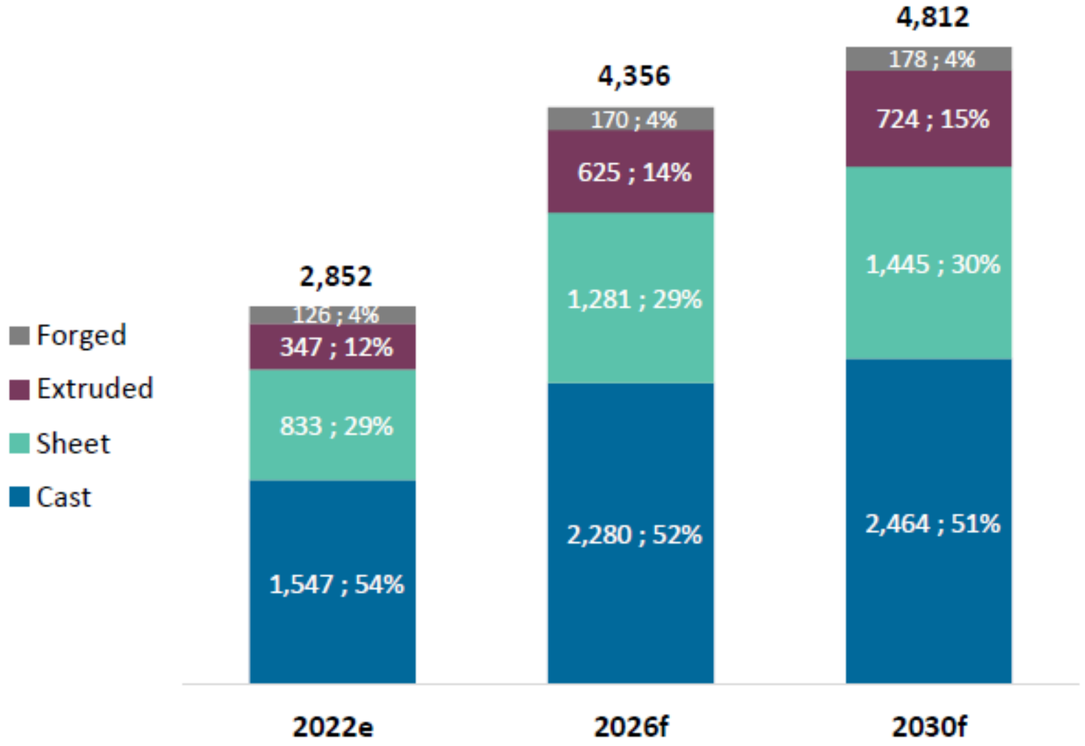
## Total Aluminum CPV* (kg)




| Total | AL CPV Growth (kg) | | | | CPV CAGR | | | |
|---|---|---|---|---|---|---|---|---|
| | 19-22 | 22-26 | 26-30 | **22-30** | 19-22 | 22-26 | 26-30 | **22-30** |
| **Market** | +26 | +32 | +19 | **+51** | 4.5% | 3.8% | 1.9% | **2.8%** |

## Total Aluminum Gross Demand by Forming Process (kT)

*incl. machining scrap as well as blanking/stamping scrap for sheet [3]*




| Forming Process | GROSS AL Demand Growth in kT | | | Tonnage CAGR | | |
|---|---|---|---|---|---|---|
| | 2022-26 | 2026-30 | 2022-30 | 2022-26 | 2026-30 | 2022-30 |
| Cast | +733 | +184 | +917 | 10.2% | 2.0% | 6.0% |
| Sheet | +448 | +164 | +613 | 11.4% | 3.1% | 7.1% |
| Extruded | +278 | +99 | +377 | 15.8% | 3.8% | 9.6% |
| Forged | +45 | +7 | +52 | 7.9% | 1.1% | 4.5% |
| Market | +1,504 | +455 | +1,960 | 11.2% | 2.5% | 6.8% |

Sources: Ducker; *CPV = Content Per Vehicle

[1] EA study 2019 included second set of OE wheels; [2] Ducker applied the 2026–2029 CAGR to estimate the 2030 values; [3] Average machining scrap does not exceed 5%, while blanking/stamping scrap can reach up to 60% for sheet components

# The Top 5 growth components driving the highest aluminum content increase are E-drive housings, battery pack housings, large and mega castings, ballistic protection and battery cooling plates - all of them linked to electrification

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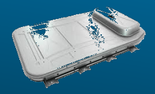
**1** E-drive Housings

**+22.7 kg 2022-30**

**2** Battery Pack Housings



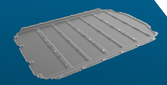
**+11.8 kg 2022-30**

**3** Large/ Mega Castings

**+8.4 kg 2022-30**

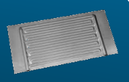
Large and mega castings in BIW will allow to decrease assembly complexity, reduce costs and achieve weight saving

**4** Ballistic Protection



**+7.0 kg 2022-30**

**5** Battery Cooling Plates



**+5.1 kg 2022-30**

EV Specific components drive tremendous aluminum content increase – their aluminum-intensity contributes to compensate the weight of the EV battery

Sources: Ducker Carlisle

# Aluminum will continue its uninterrupted growth path in Automotive. Regulatory requirements for CO2 emission reduction pave the way to electrification, which contributes to higher aluminum intensity

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## A. Continuous aluminum growth

- **Continuous aluminum growth** - from average 205kg per vehicle in 2022 to 256kg in 2030
- **New applications drive the growth** (incl. electrification and large/mega castings)

## B. Regulation drives growth

- **EU CO2 emission targets foster a BEV strategy**

## C. Electrification benefits aluminum

- **Electrification positively impacts aluminum content**
- **Lightweighting remains key to optimize BEV range** and lower adjacent costs

## D. Production mix impacts content

- Supply chain disruptions made OEMs prioritize **larger and higher-margin car models**
- Shift towards **more higher car segments and premium brands contributes to aluminum content increase** by 2030

## E. Slow car production recovery

- **COVID 19, supply chain disruptions, Ukraine war and energy crisis** negatively impact production volumes
- European car production expected to **return to 2019 level by 2026 earliest**

## F. Sustained competitive pressure

- In a dynamic and competitive environment, **innovation is steadily required for all materials**
- **Focus on sustainability** incl. low-carbon production, increased share of recycled content, and high-quality scrap

Sources: Ducker Carlisle; *CPV = Content Per Vehicle

# THANK YOU

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ANYTHING BUT BASIC

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