

# AUTOMOTIVE ALUMINUM PART OF THE SOLUTION

The Aluminum Association -  
Automotive Transportation Group  
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# Aluminum Transportation Group (ATG)



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## Discussion Outline

- Vehicle Efficiency Improvement Alternatives
- Aluminum Growth – 2025
- Aluminum Sheet Availability
- Questions



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# Vehicle Efficiency Technologies (NAS)

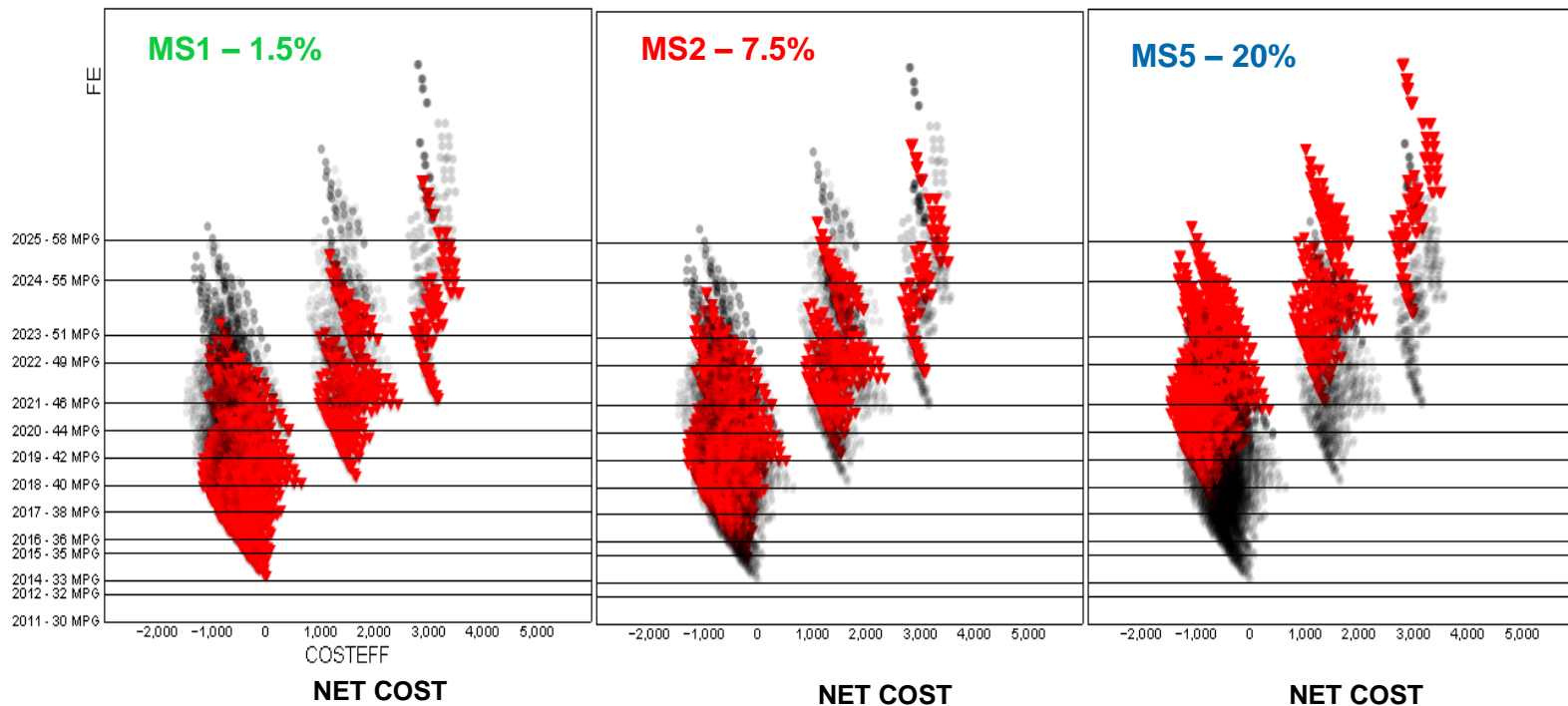
36 Leading Technologies

Technology Group	Group Members
Engine Technology Group (EngMod)	Low Friction Lubricants (LUB) Engine Friction Reduction (EFR) Variable Valve Timing type <ul style="list-style-type: none"> <li>VVT Coupled Cam Phasing on SOHC (CCPS)</li> <li>VVT Couple Cam Phasing on OHV (CCPO)</li> <li>VVT Intake Cam Phasing (ICP)</li> <li>VVT Dual Cam Phasing (DCP)</li> </ul> Cylinder Deactivation <ul style="list-style-type: none"> <li>on SOHC (DEACS)</li> <li>on DOHC (DEACD)</li> <li>on OHV (DEACO)</li> </ul> Variable Valve Lift & Timing <ul style="list-style-type: none"> <li>Discrete Variable Valve Lift [DVVL] on SOHC (DVVLS)</li> <li>Discrete Variable Valve Lift [DVVL] on DOHC (DVVLD)</li> <li>Continuously Variable Valve Lift (CVVL)</li> <li>Discrete Variable Valve Lift [DVVL] on OHV (DVVLO)</li> </ul> Conversion to DOHC with DCP (CDOHC) Stoichiometric Gasoline Direct Injection (SGDI) Combustion Restart (CBRST) Turbocharging and Downsizing (TRBDS) Exhaust Gas Recirculation [EGR] Boost (EGRB) Dieselization <sup>3</sup> (DSLCL, DSLT)
Electrical Accessory Group (ELEC)	Electric Power Steering (EPS) Improved Accessories (IACC) 12 Volt Micro-Hybrid (MHEV) Belt Mounted Starter Generator (BISG) Crank Mounted Integrated Starter Generator (CISG)
Transmission Technology Group (TrMod)	6-Speed Manual/Improved Internals (6MAN) Improved Auto. Transmission Controls/Externals (IATC) Continuously Variable Transmission (CVT) 6/7/8 Speed Transmission With Improved Internals (NAUTO)
Material Substitution Technology Group (MSM)	Dual Clutch or Automated Manual Transmission (DCTAM) Mass Reduction 1.5% (MS1) Mass Reduction 3.5 – 8.5% (MS2)
Hybrid Technology Group (HEV)	Power Split Hybrid (PSHEV) 2-Mode Hybrid (2MHEV) Plug-in Hybrid (PHEV)
Dynamic Load Reduction Technology Group (DLR)	Low Rolling Resistance Tires (ROLL) Low Drag Brakes (LDB) Secondary Axle Disconnect (SAXL)
Aerodynamic Reduction Technology Group (AERO)	Aerodynamic Drag Reduction (AERO)

# Mass Reduction with Aluminum

## Mass reduction

- Part of optimum solution – all FE targets
- Higher FE targets – greater mass reduction



# Why Automotive Aluminum?

## Mass reduction - Aluminum

**1 Lb. Al replaces 1.5 - 2 Lb. Iron, Steel**

**Average vehicle:**

**Closures 24 – 120 Lbs.**

**BIW 350 – 450 Lbs.**

**OEM 2025 Mass Reduction Objectives (Re; 2012)**

**2025 vehicle average mass reduction: 300 - 400 Lbs.**

**FE: + 2 MPG**

**CO<sub>2</sub>: - 6.5 %**

**Other benefits of mass reduction**

**Safety, Emissions, Corrosion Resistance, Ride, Handling, Braking, NVH**

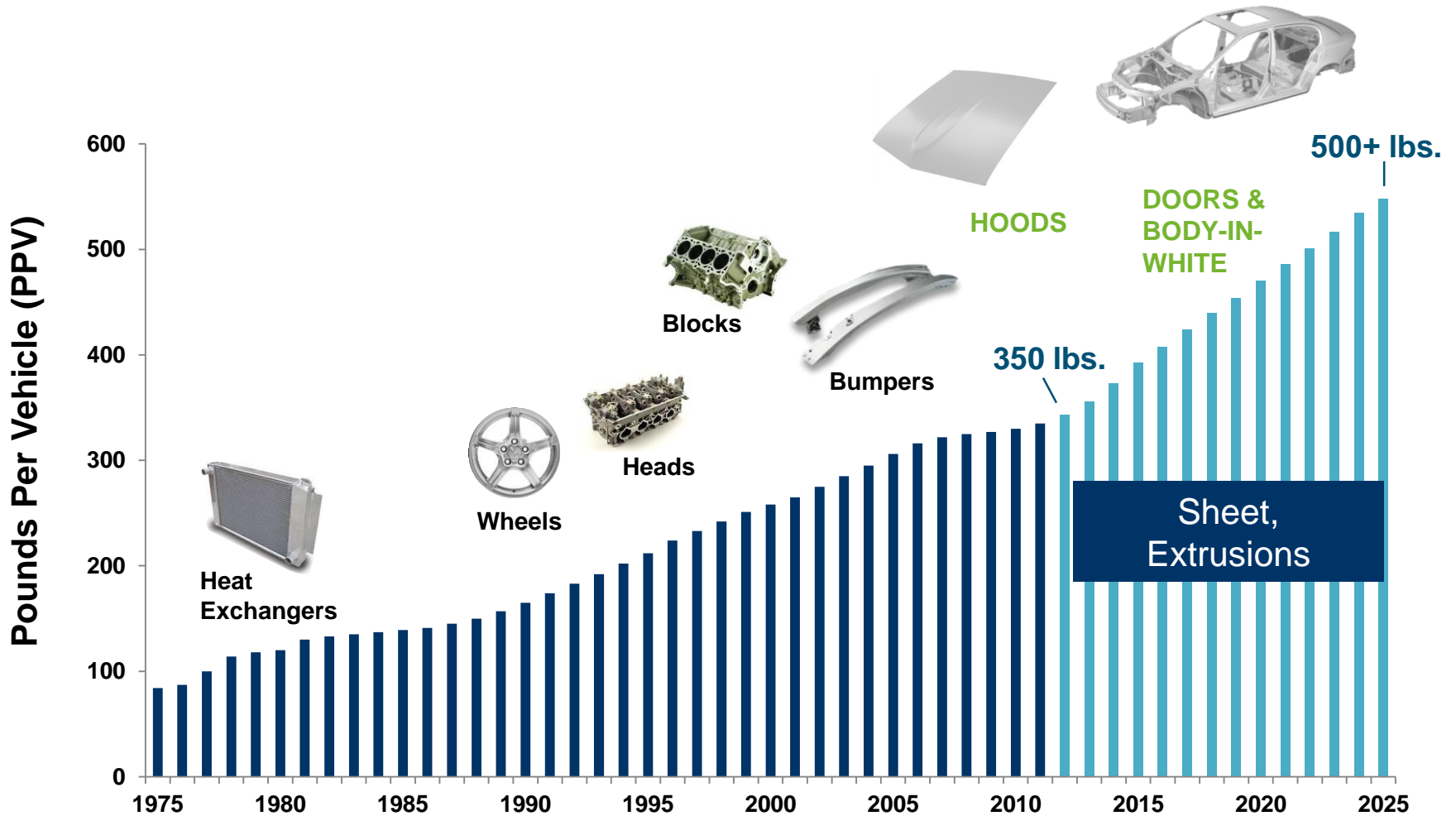
**Cost Premium – Aluminum**

**Typical Net - \$1/Lb. weight saved**

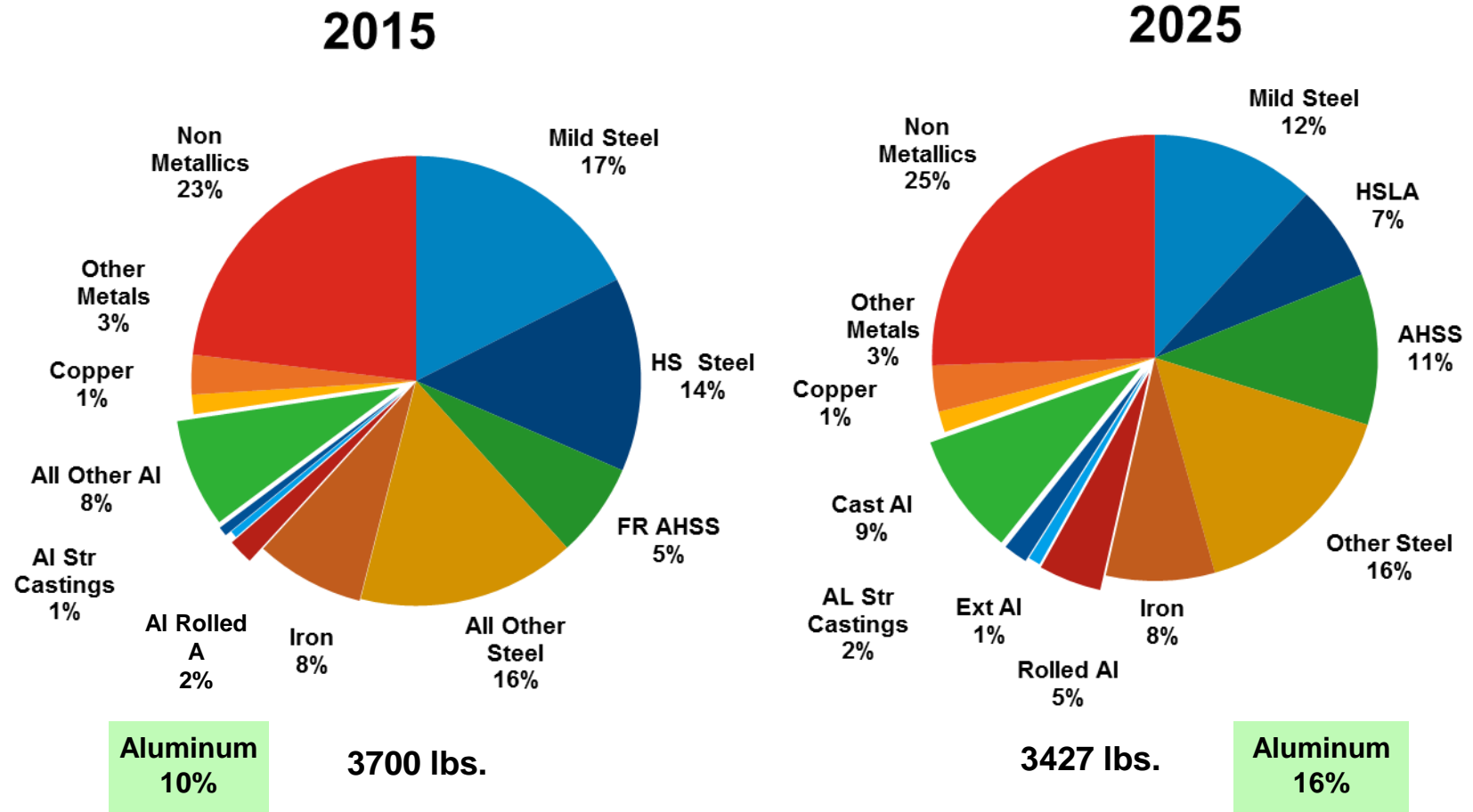
**Closed loop recycling – down-stream process**

**Net of secondary savings (engine, wheels, tires, brakes)**

# 50 Years of Automotive Aluminum Growth



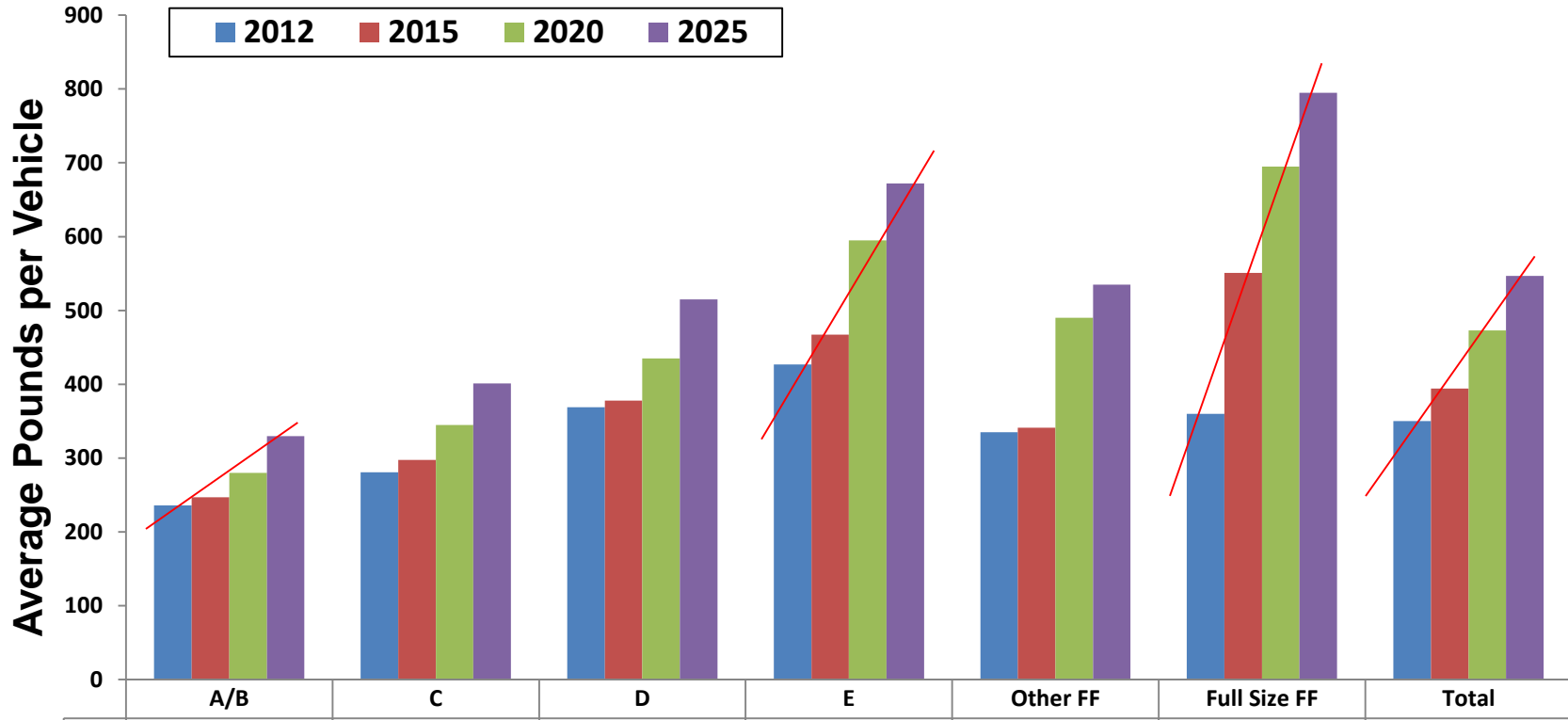
# Automotive Material Distribution – 2015:2025





# Vehicle Segment Analysis

## Aluminum Content Change by Vehicle Segment



# Will there be Enough Aluminum Auto Body Sheet?

## **Auto Sheet Demand Growth (NAFTA) - 2025**

**+ 4 B Lbs. Sheet**

## **Aluminum Demand 2014**

**All markets, all forms – 24 B Lbs.**

**Transportation – 7.5 B**

**Sheet, Plate – 10.6 B**

**Auto Body Sheet – 0.3 B**

## **Sheet, Plate Supply 2014**

**NAFTA Capacity – 11 B**

**Imports – 2 B Lbs.**

# Aluminum Availability – Body Sheet 2025

## Key Steps in Aluminum Production:

Raw material: mine, refine, smelt

Processing: roll, finish

## Mine, Refine, Smelt (2014)

Global demand            100 B Lb.s

Global capacity            120 B

## Roll (cast, hot roll, cold roll)

2025 demand                            14.6 B Lbs.

2014 capacity + imports            13.0 B

## Finishing Body Sheet (level, heat treat, coating)

2025 demand                            4.0 B Lbs.

2014 capacity                            1.1 B

# Aluminum – Automotive Sheet Commitments

Company	Operational	Capacity (Lbs.)	Accum.
Novelis	2015	0.2 B	0.2 B
Alcoa	2015	0.2 B	0.4 B
Alcoa	2015	0.3 B	0.7 B
Constellium	2016	0.2 B	0.9 B
Aleris	2017	0.5 B	1.4 B
Constellium	2018	0.2 B	1.6 B
ASA	TBD	1.2 B	2.8 B

**Note: As of December 2014**  
All new US capacity

# Upcoming Release: Aluminum Joining Manual

## ATG/EAA Announcement

Comprehensive Automotive Aluminum Joining Manual

[DriveAluminum.org](http://DriveAluminum.org)



### Chapters:

- Introduction to Joining
- Fusion welding
- Arc welding
- Beam welding
- Resistance welding
- Brazing
- Solid state welding
- Mechanical joining
- Adhesive joining
- Hybrid joining techniques
- Joining of dissimilar materials



# Questions?

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# Aluminum | The Virtuous cycle

