MetalBulletin Events

29th International Aluminium Conference
22-24 September 2014
The Ritz Carlton, Abu Dhabi

NA Automotive Automobile Body Sheet

Automotive Potential

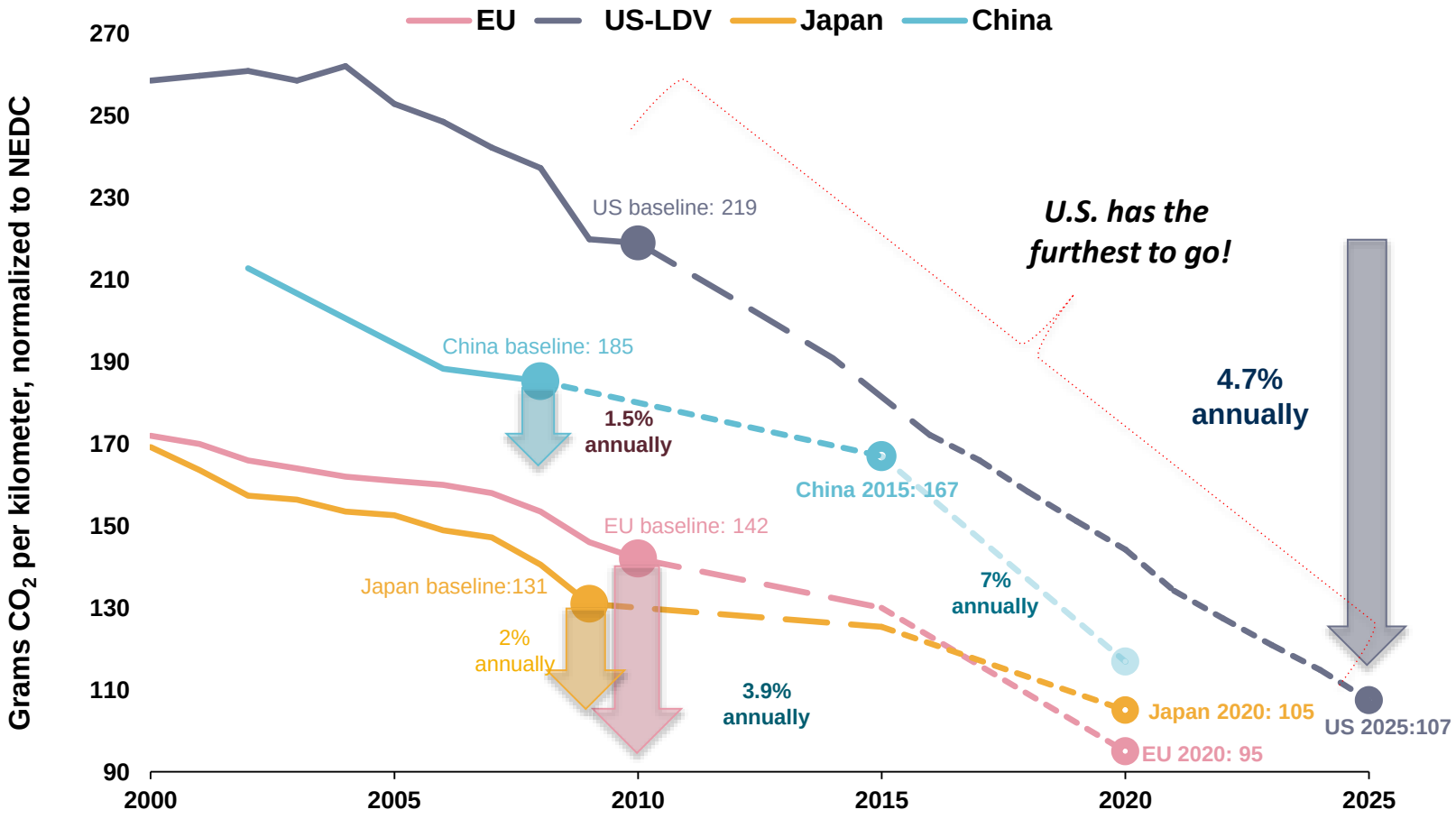
	2013	2025
• Global Auto Build	81.2 M	100 – 125M
• NA Auto Build	15.4 M	20 – 22 M
• Average AL use in NA vehicle:	364 lbs.	550-650 lbs.
• Total Auto AL NA Consumption	5.1 B lbs.	8 – 10 B lbs.
• Total NA Total AL Sheet	.7 B lbs.	3 – 5 B lbs.
• Total NA Extrusion	27 lbs/auto	49 lbs/auto

Notes:

- Some forecast 100 Global Build By 2020
- 85%+ of new application aluminum growth will be wrought alloy
- Of the wrought alloy growth 85% is sheet, 15% is extrusion
- 2013 NA auto sheet was around .3 billion pounds with F150 auto sheet may grow to .8 billion in 2014 and 1.3 billion in 2015

Global Reduction of CO2

Key Region/Country Absolute and Annual CO2 Rate Comparison



[1] China's target reflects gasoline fleet scenario. If including other fuel types, the target will be lower.
[2] US and Canada light-duty vehicles include light-commercial vehicles.
[3] Annual rate is calculated using baseline actual performance and target values.

Source: Patrik Ragnarsson** Automotive & Transport Technical Manager **Europe Aluminium Association

NA Automotive Challenge

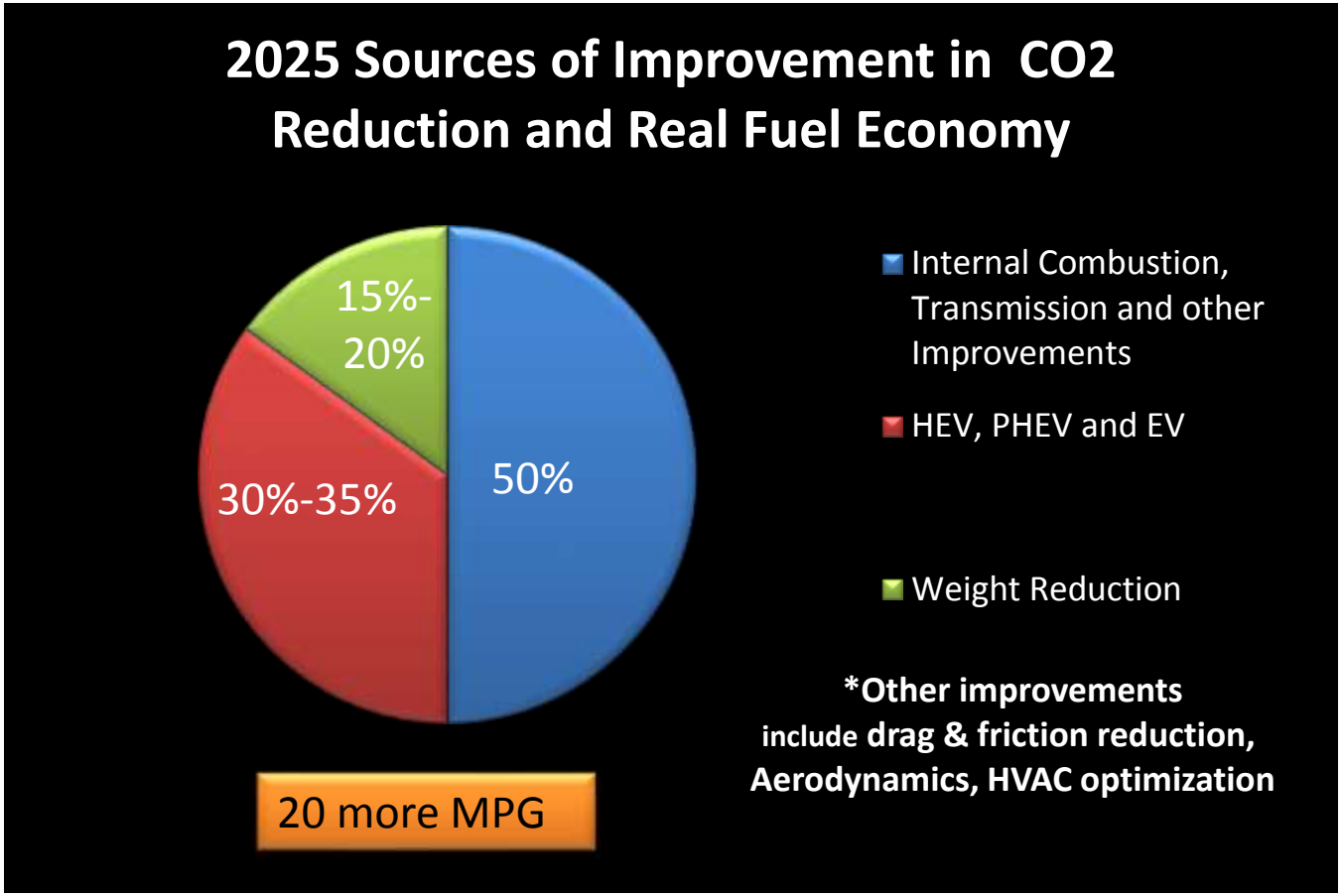
- Average Fleet 34.1 MPG By 2016 — Achievable
- Average Fleet 54.5 MGP By 2025 — Barriers

- The Challenge:

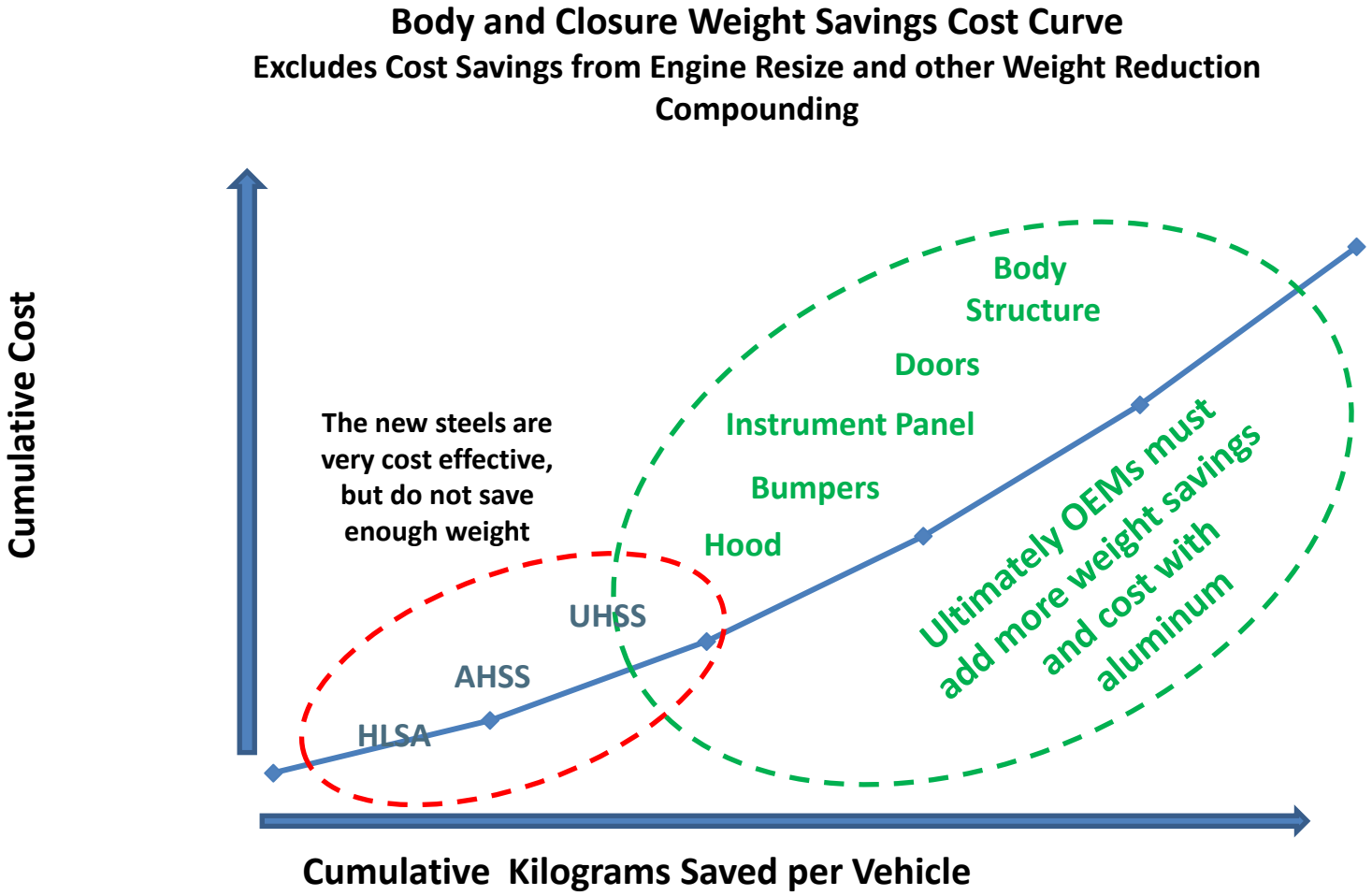
"Double MPG and cut CO2 emission by 50% by 2025 while maintaining safety, comfort, product size mix, customer features, functionality, and HP to weight ratio to maintain performance."

Weight savings is expected to provide 3 to 6 miles per gallon of fuel economy improvement by 2025. Aluminum directly or indirectly will provide much of this savings

Ducker Worldwide (adjusted)



OEM View of Savings Weight



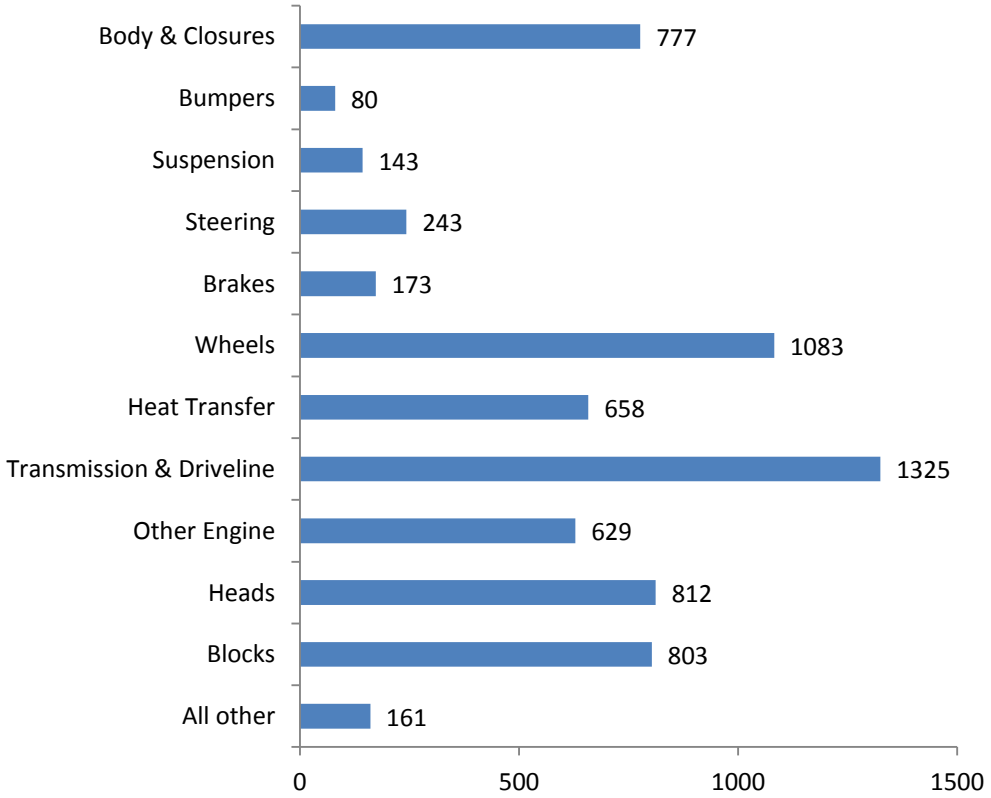
Last 30 Years Aluminium Auto Parts

Potential Automotive Growth

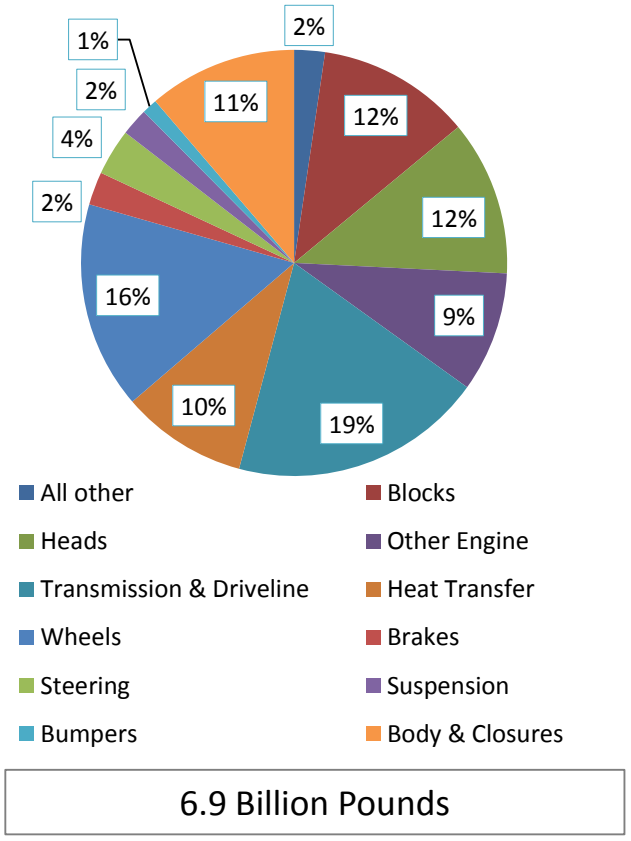
- Hoods/Doors/Roofs/Deck Lids/Closures
- Bumpers
- Steering/Chassis/Suspension Components
- Increased Wheel Penetration
- Increased Powertrain Applications
- Frames with compounding value

- In 2015, the total aluminum content for the 17.46 million vehicles of expected production will equal nearly 7 billion pounds
  - Body and closure parts will be 11% of the total
  - 33% of the content will be for engine parts

Millions of Net Al Pounds by Component/System



Component/System Share of Al Consumption

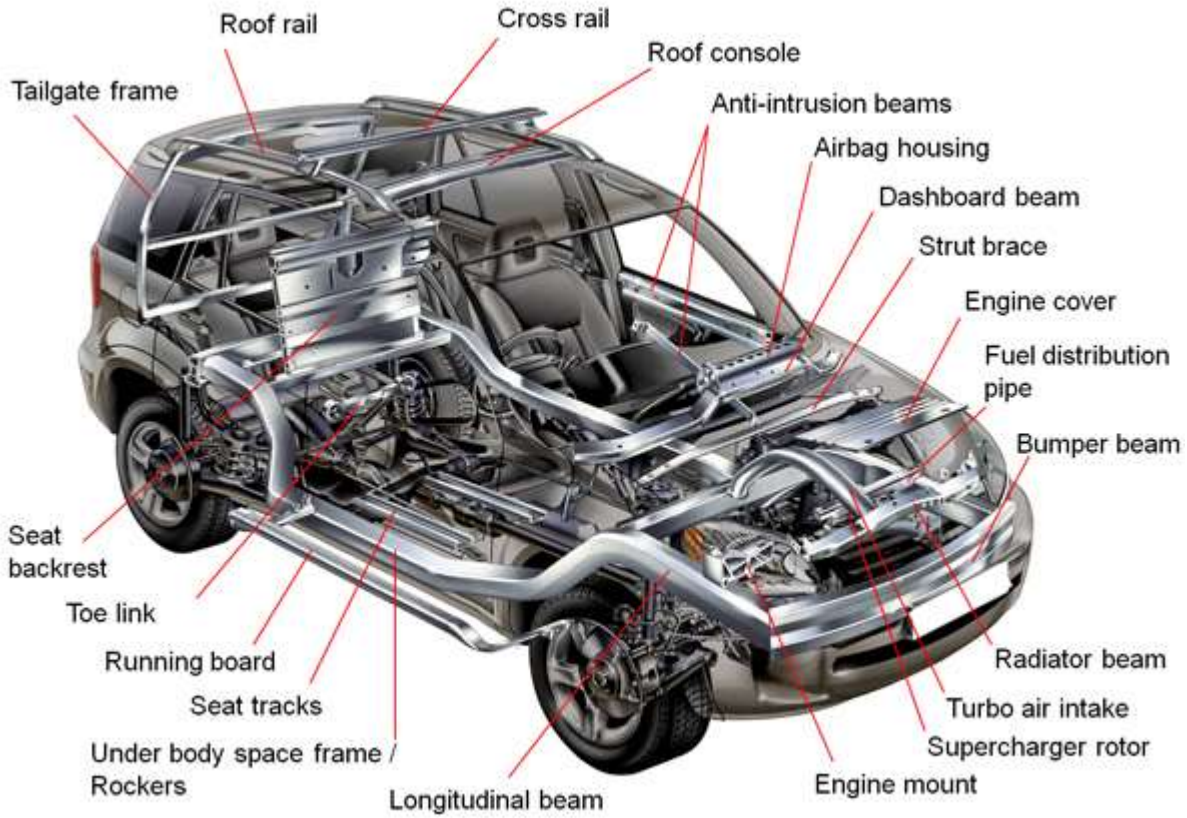


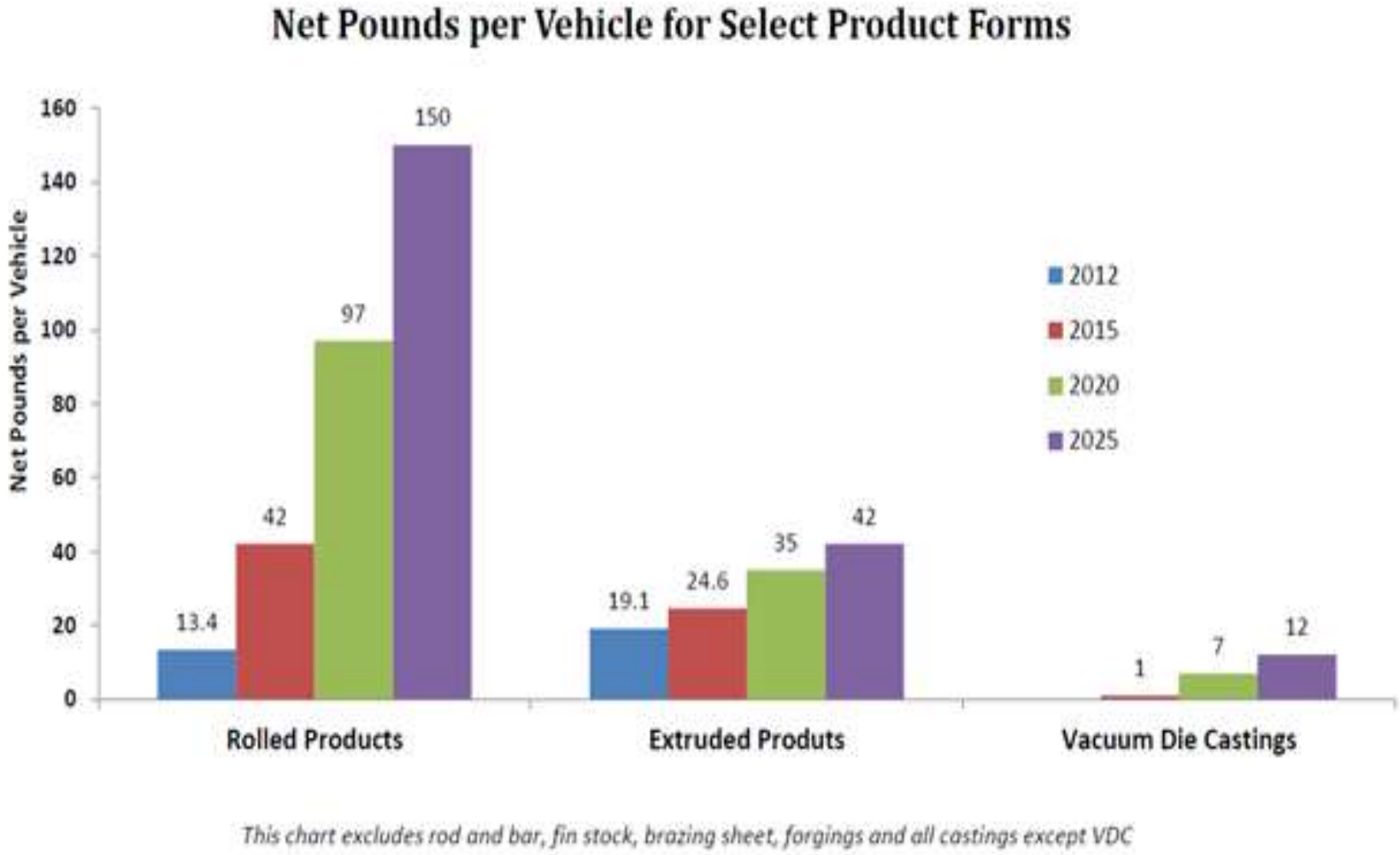
6.9 Billion Pounds

Primary Aluminum parts will be 85% of all automotive growth in next decade

Automotive Aluminum Extrusions

aec Aluminum Extruders Council





Source: Ducker Worldwide

Critical New Programs

- 2013 Range Rover
  - Aluminum Body
  - 31.4 MPG Fuel Economy
  - Over 900 lbs. weight savings

- 2015 Model Ford F150
  - Aluminum Body
  - 570 pounds of finished sheet
  - 1000 lbs total aluminum
  - ?? MPG/20 %
  - 700 lbs. weight savings
  - **"Ford: 2015 F-150 most patented truck in company history"** (May MICHIGAN LIVE)

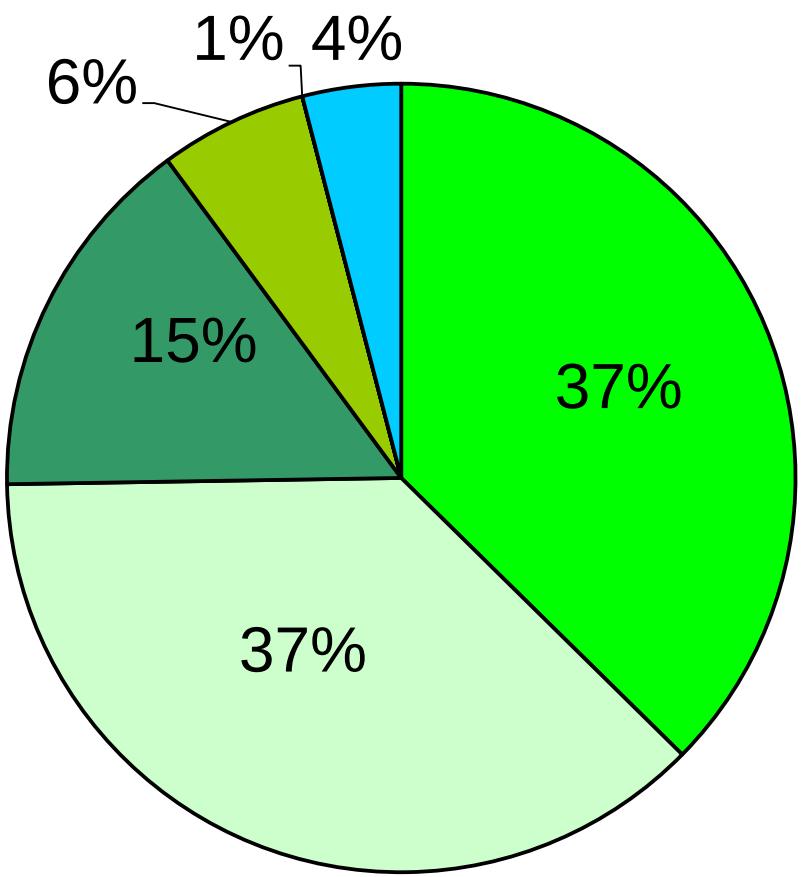
"Huge Risk"

"Big Reward"

New Range Rover

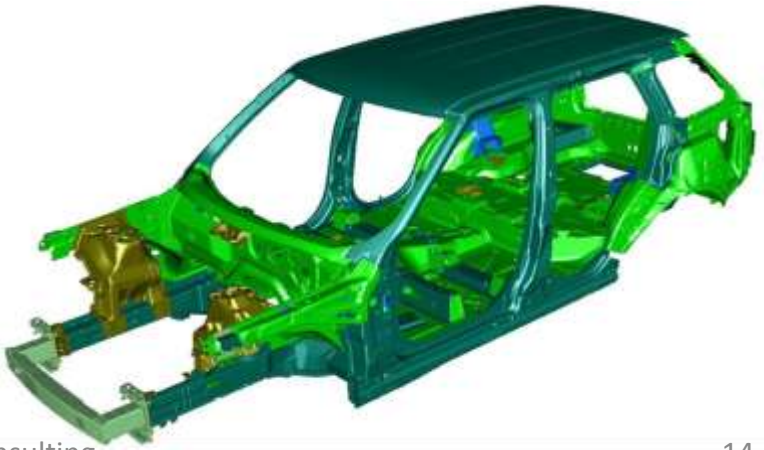
Jaguar Land Rover

Body Complete: Material Breakdown



Al sheet 6xxx
Al sheet 5xxx
Al casting
Al extrusion
HSS steel
PHS steel

by mass



Drivers/Concerns For Aluminum Use

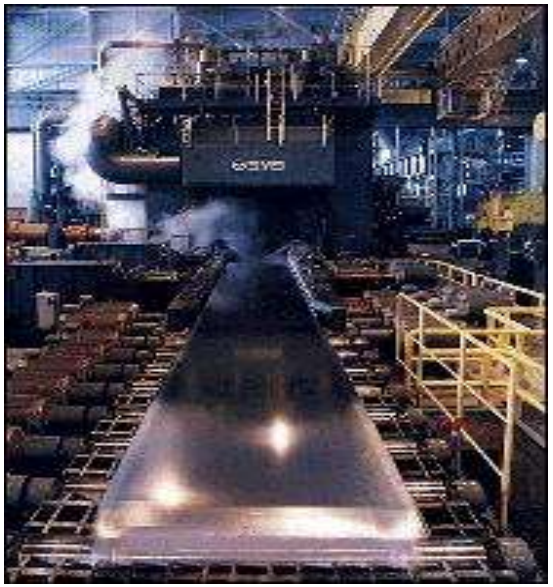
- Customer Acceptance/Perceived Value Vs. Sticker Price
  - Car Buyer
  - Design Engineers
- Cost/Supply Stability
  - New pricing structure? Supplier/Customer Commitment
- Safety/Insurance Costs
- CAFÉ Requirements Review 2017/Fuel Cost
- Closed Loop Recycle
- Compounding Savings
- Competing Materials
- Technological Advancement
- Ensure Rolling/HT Capacity

Concerns For Aluminum Use

- Customer Acceptance/Perceived Value

“There is not enough HT or Rolling Capacity!”

- “Major aluminum producers and their Boards are chomping at the bit for this Holy Grail opportunity and will ensure the capacity is available when OEM confirm programs”



Recent Aluminum Sheet Announcements

- **Novelis Announces $205 Million Investment to Further Expand Global Automotive Aluminum Capacity to 900,000 Tons Annually** PR Newswire Dec 17, 2012
- **"Toyota Tsusho Corp. And Wise Metals Group Enter A Memorandum Of Understanding** Modern Metals News Jan 2014
- **"Constellium, UACJ plan JV for auto aluminium sheet in U.S."** Rueters Jan 2014
- **"Aleris Announces Agreement To Acquire Nichols Aluminum"** PR Newswire Feb 2014
- **"GM Secures Aluminum for Trucks"** WSJ Feb 2014
- **"Alcoa Founding Member of the First Lightweight Metals Manufacturing Institute in the United States"** WSL Feb 2014
- **Constellium and UACJ form joint venture for aluminum automotive sheet.** May 13, 2014 Source: ASM International
- **Kobe Steel, Toyota Tsusho explore production of automotive aluminum sheet in the US**. Press Release May 26, 2014 Kobe Steel, Ltd. Toyota Tsusho Corporation
- **Toyota to expand use of aluminum in Camry** AMM July 14,2014

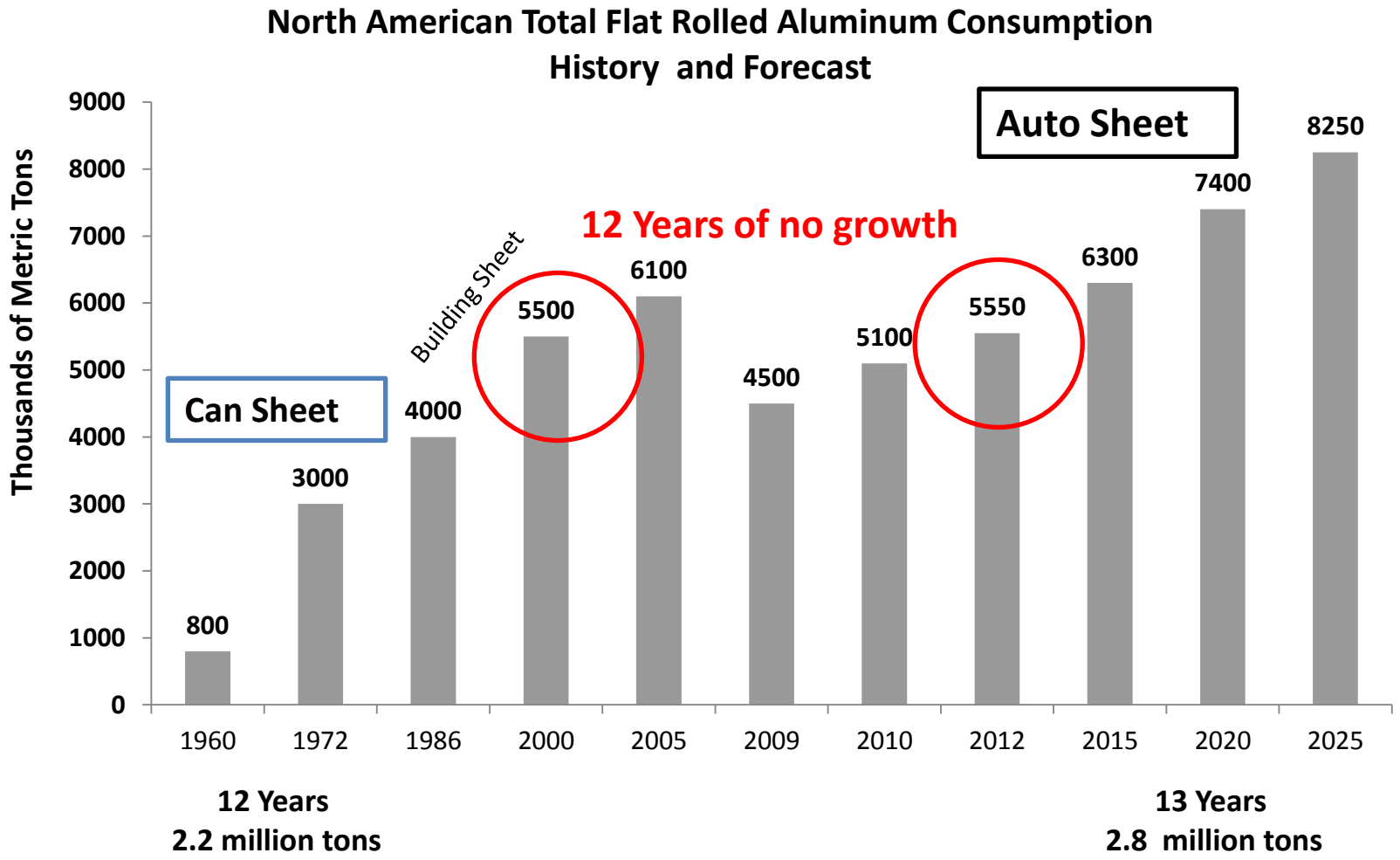
Rumors:

- **ME aluminum producer(s) considering auto sheet**
- Kobe importing China auto sheet to Mexico
- Nissan will convert major program to all AL
- **Middle East is considering production of auto sheet**
- **Middle East is considering automotive production**

North American Perspective

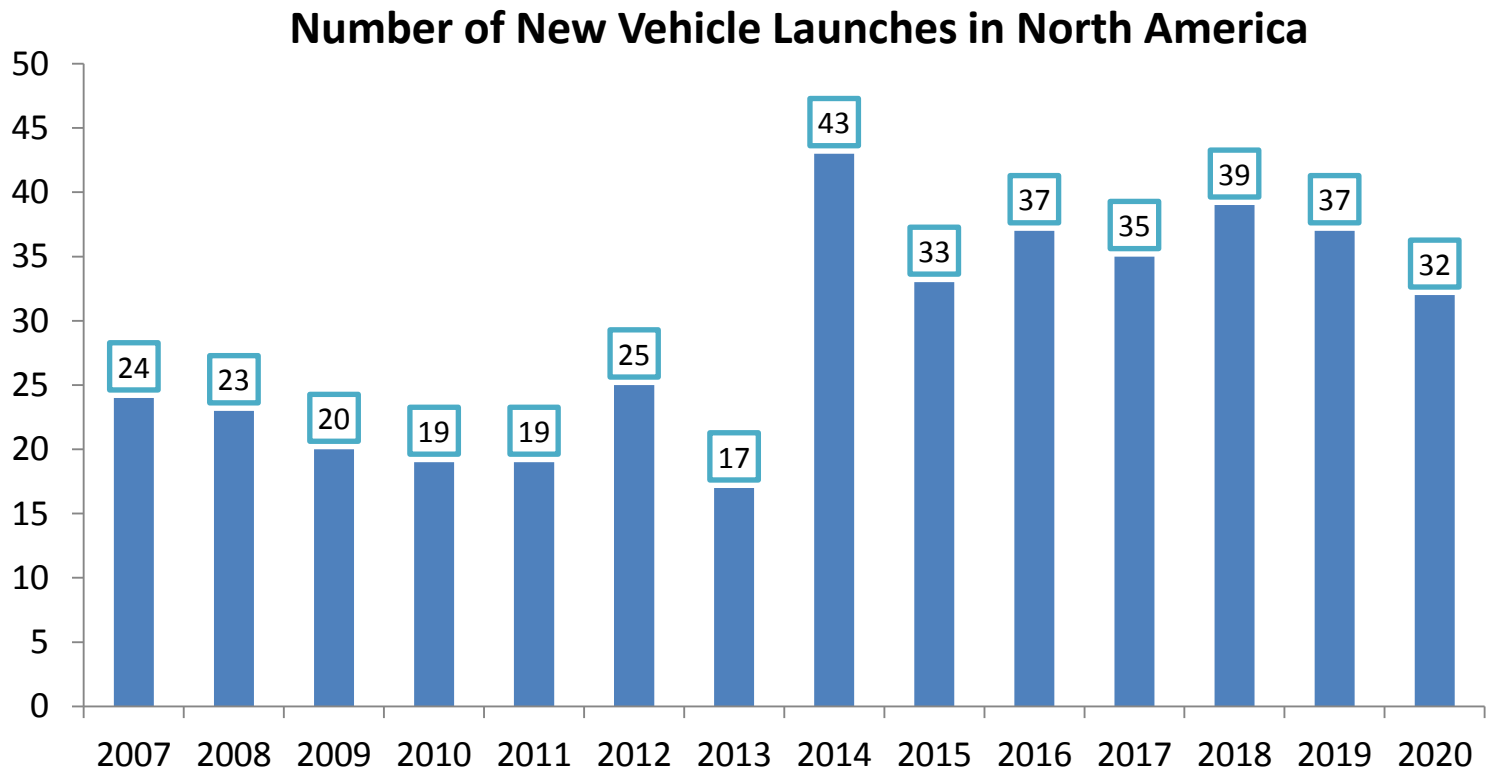
The expected growth spurt for aluminum sheet penetration for light vehicles is not unprecedented in the aluminum history in North America

Source Ducker Intelligence

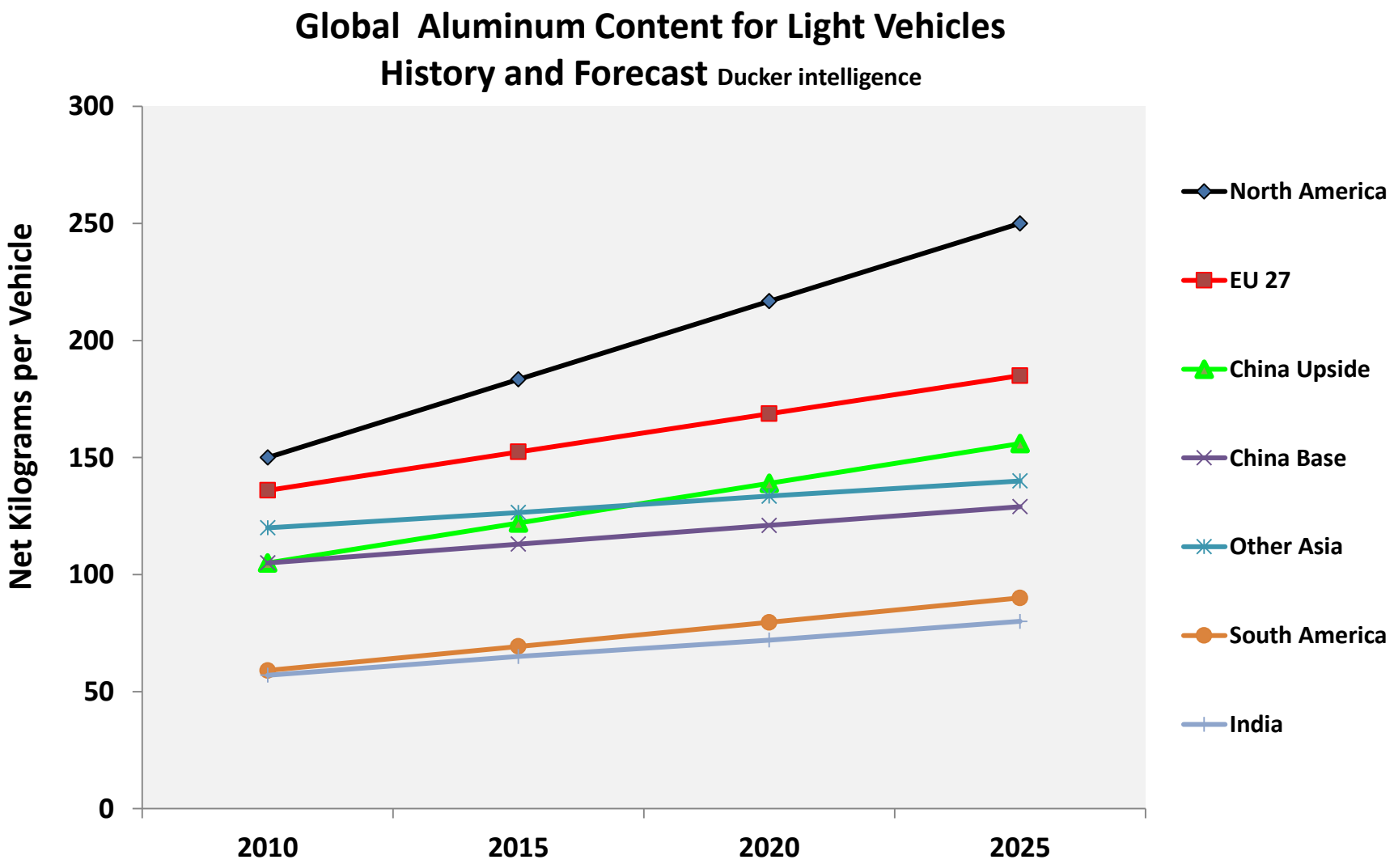


North American Perspective

- The number of new launches from 2014 to 2020 is unprecedented. The biggest challenge for the aluminum industry will be in mustering the resources to support the launches of aluminum components in these vehicles



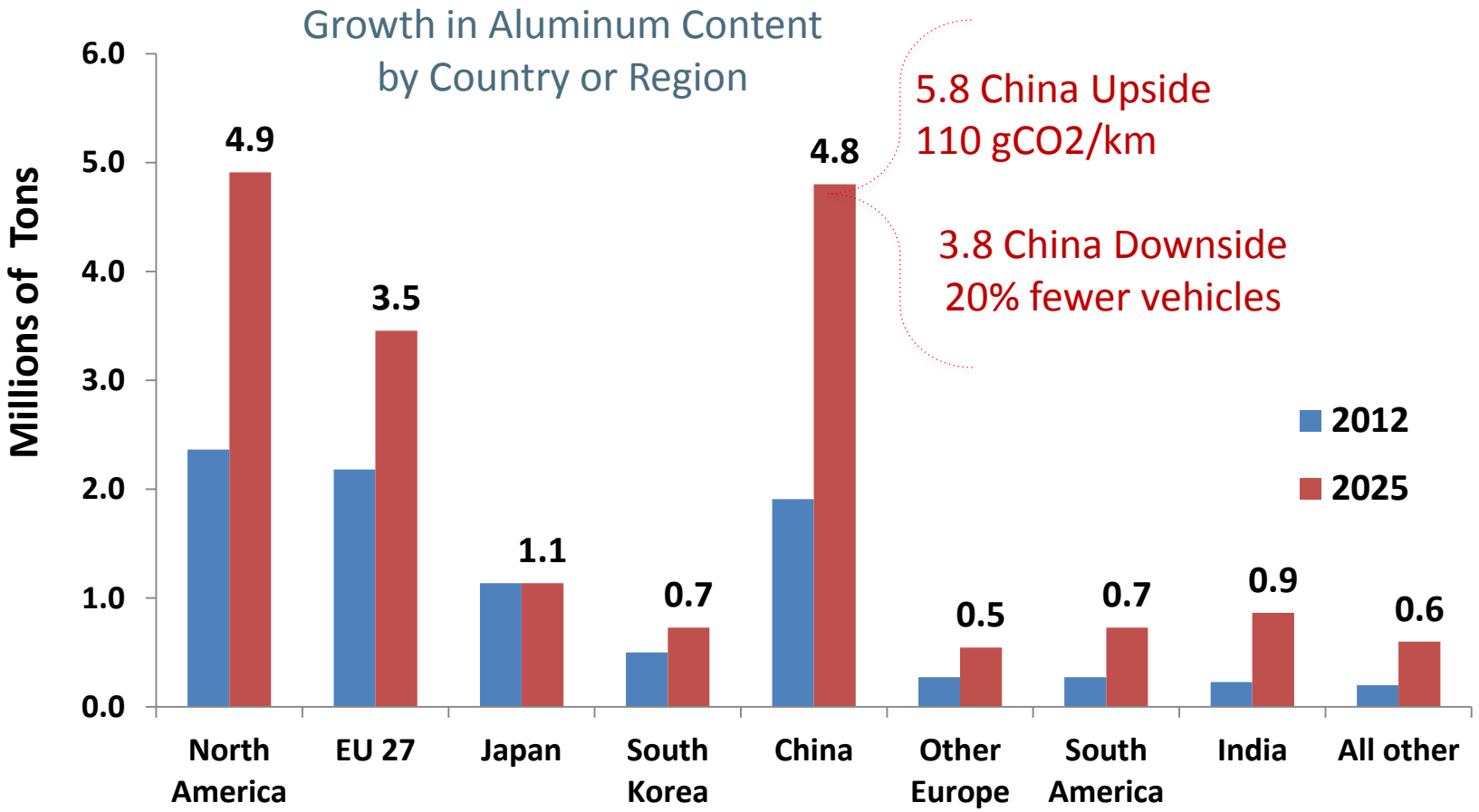
Global Perspective



Global Perspective

Total Aluminum content for light vehicles will more than double in most regions by 2025. North America and China will use over 50% of the aluminum required for light vehicles in 2025. China is a wild card and could be plus or minus one million tons from the number shown

Ducker intelligence



NA Most Probable Outcome Next 10 Years

- Significant penetration for Al and AHSS in large, premium and many mid-priced vehicles
- Mild steel use will retain some of the high value small vehicle market especially Europe and Asia
- Battle for scrap will intensify, supply is finite
- Rolling capacity constraint, resulting in significant rolling value added price pressure for all forms of sheet
- Maybe significant deficit in P1020 production
- Global demand growth impact will be “surprise” to the industry

- “Will political environment change taking pressure off CAFÉ and light weight solution?”
- **“Will consumers pay for the higher cost of light weight vehicles?”**

Aluminum Opportunity for Middle East

- *Can Sheet*
- *Foils/fin stock/brazing sheet*
- *Extrusions*
- *Automotive Sheet*
- *Component production:*
  - *Wheels*
  - *Chassis and steering components*

- *Auto Manufacturing ???*

Middle East Auto Sales 2013

• *Saudi Arabia*	*713,410*
• *Oman*	*139,781*
• *Egypt*	*184,887*
• *Iran*	*790,141*
• *Kuwait*	*154,689*
• *United Arab Emirates*	*343,079*
• *Total (including others in regions)*	*+ 2,500,000*

Thank You

Kevin Moore
All Raw Materials Consulting
kevin.moore74@aol.com
248 534 7217