

Material Efficiency in the EU-Aluminum Industry

Prospects for increased circular economy

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Partially based on draft results from a research project
for the German Environmental Agency (UBA)

ECEEE Industrial Efficiency 2020 - DECARBONISE INDUSTRY!
Panel 2, Sep 15, 2020

Agenda

Aluminium Value Chain

The Demand for Aluminium in the EU

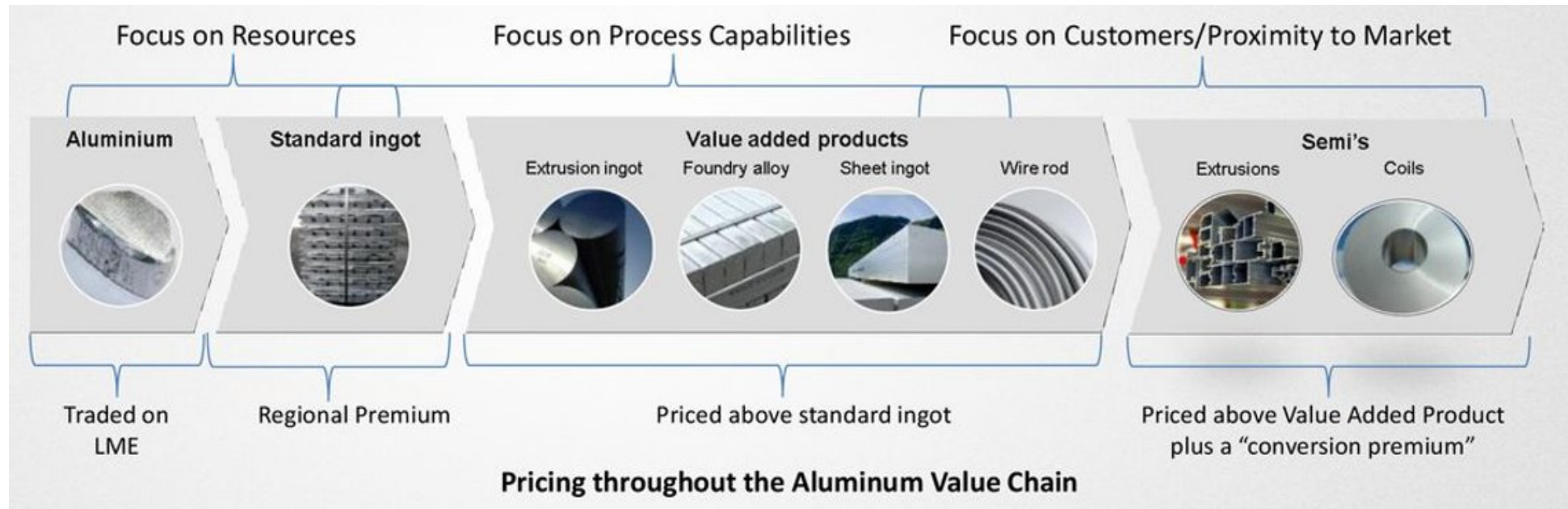
Draft results: Material Flow Analysis for EU 28

CO2 Intensity of Aluminium

Circular Economy for Aluminium (potentials and measures)

Aluminium Value Chain

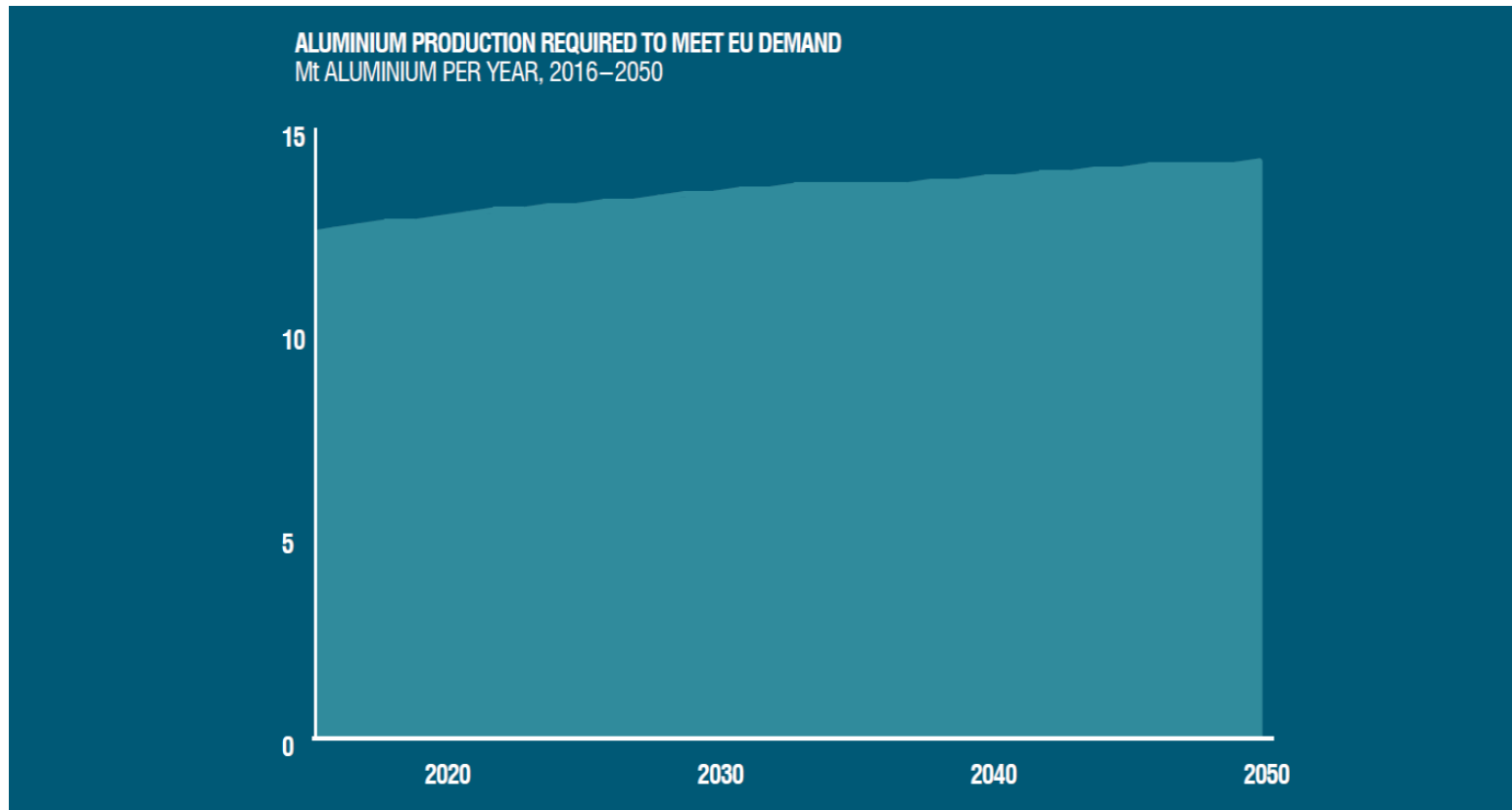
The Aluminium Value Chain goes from primary sector, to semi-finished and end products



Source: European Aluminium & Face Aluminum

The demand for Aluminium in EU

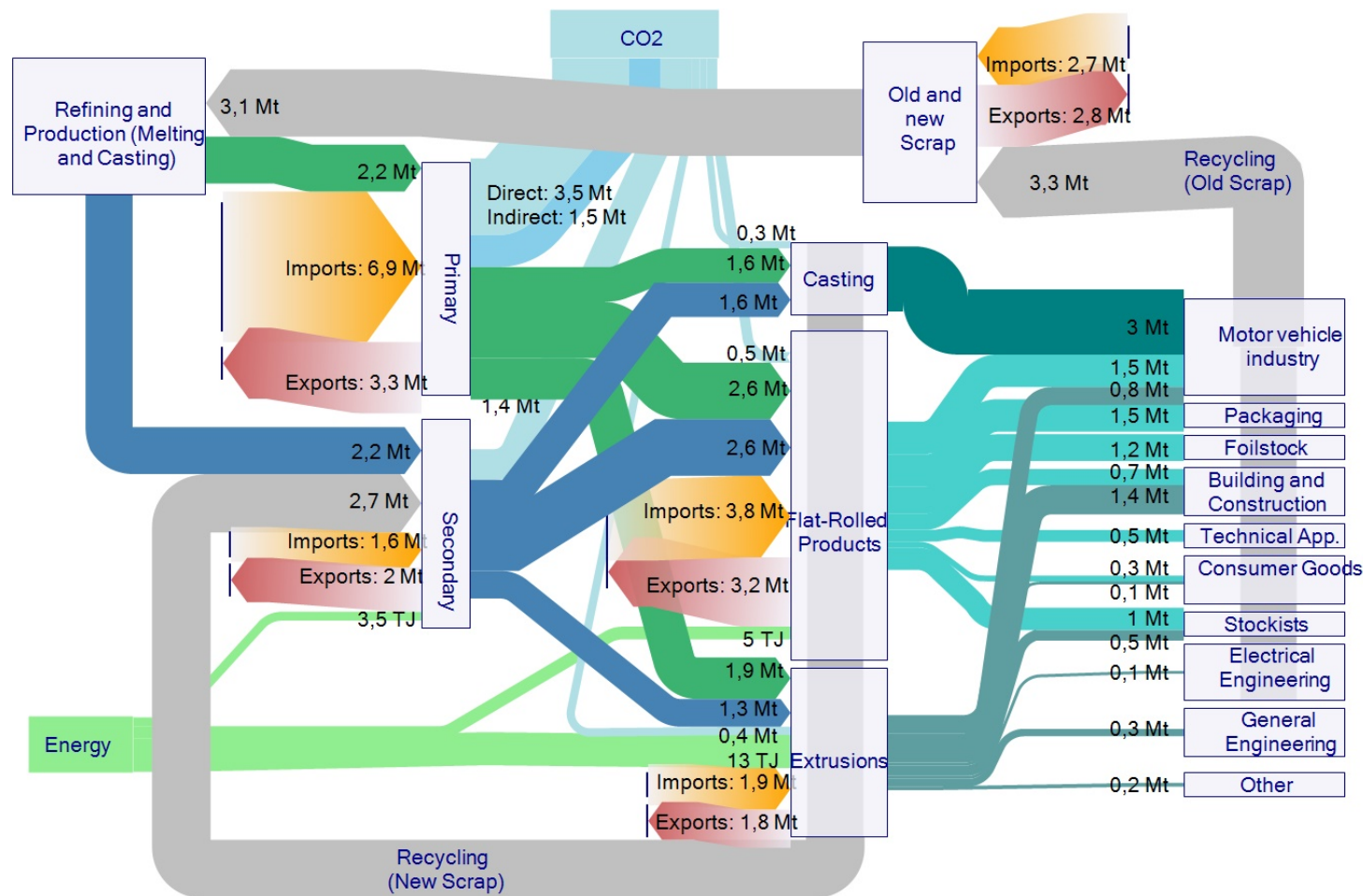
The Aluminium Value Chain goes from primary sector, to semi-finished and end products



Source: European Climate Foundation, 2019

Material flow analysis for EU28

Material flows for EU-28 (2015) – Draft model results (Toro, et. al. 2020)



The Aluminium Industry in Europe

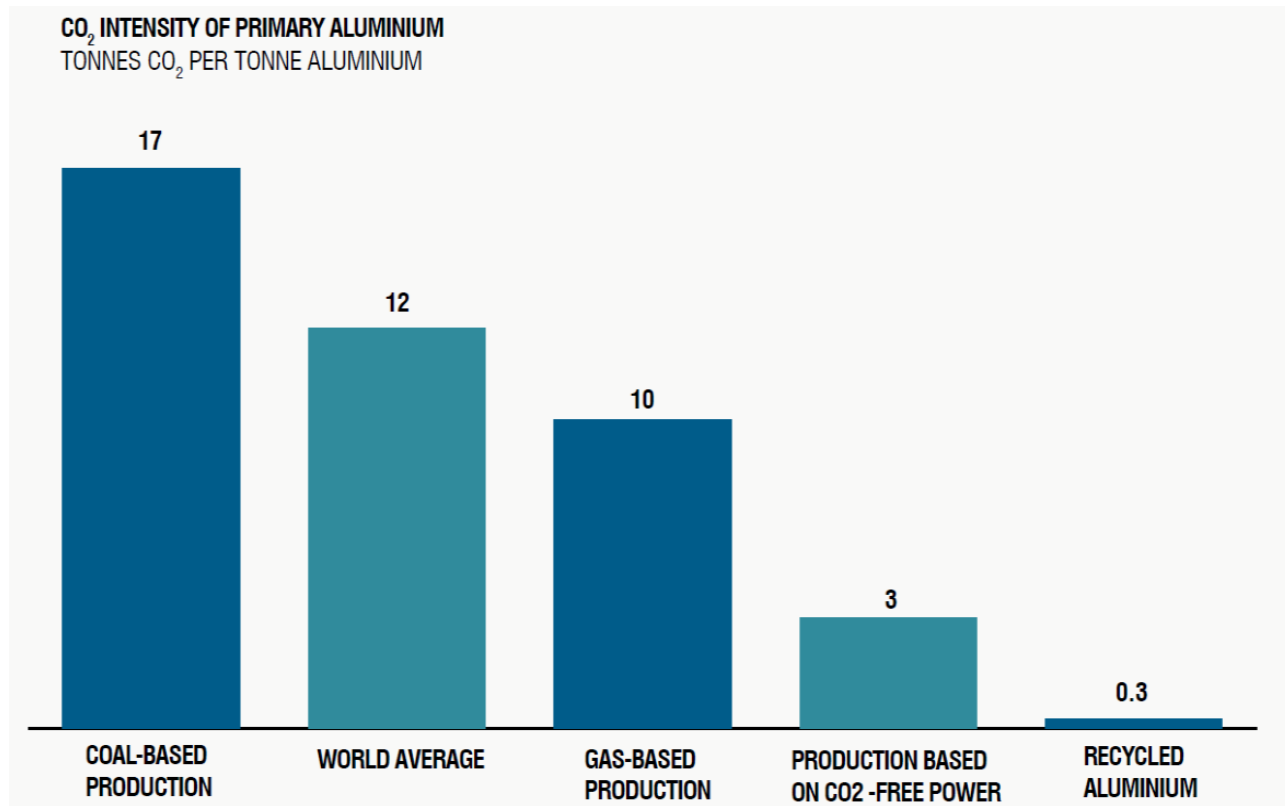
Material flows for Europe 2015 – Draft results

		EU28 2015	Unit
Primary Aluminium	Total	2.155	kt
	Mineral	3.354	kt
	Imports	6.926	kt
	Exports	3.271	kt
Secondary Aluminium	Total	2.160	kt
	Exports	2.034	kt
	Imports	1.599	kt
Downstream (Casting, Rolling, Extrusion)	Total	11.697	kt
	Castings	3.168	kt
	Flat Rolled Products	5.213	kt
	Extrusion	3.186	kt
	Others	130	kt
Scrap	New Scrap	2.690	kt
	Old Scrap	3.694	kt

Sources: World Metal Statistics, EU Aluminium, EU Prodcom Databases, EU Stat, World Aluminium

Recycled Aluminium has the lowest CO2 intensity

CO2 intensity depends on the type of fuel used for electricity



18 t CO₂/ t Al is more than 7 times the emissions associated with producing one tonne of primary steel.

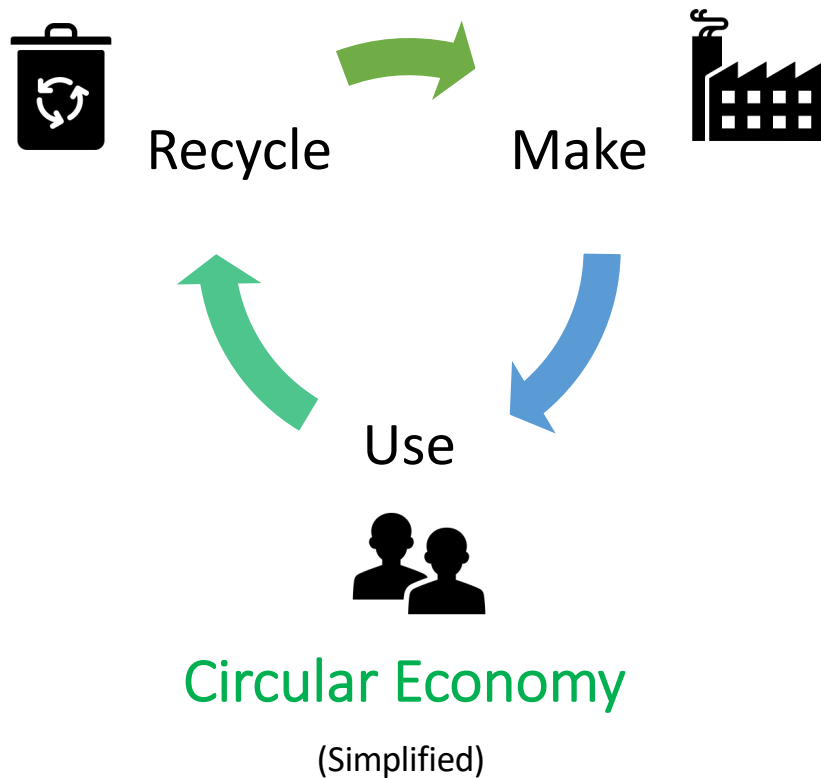
Emissions can be reduced using low carbon sources

Remelting requires just 5% of the energy for production

Sources: Different sources

Circular Economy for Aluminium

A more circular economy can cut emissions from heavy industry by 56% by 2050



Strategies:

- **Recirculating** a larger share of materials
- **Product material efficiency**: Reducing waste in production and extending the lifetimes of products
- **New circular business models**

Benefits:

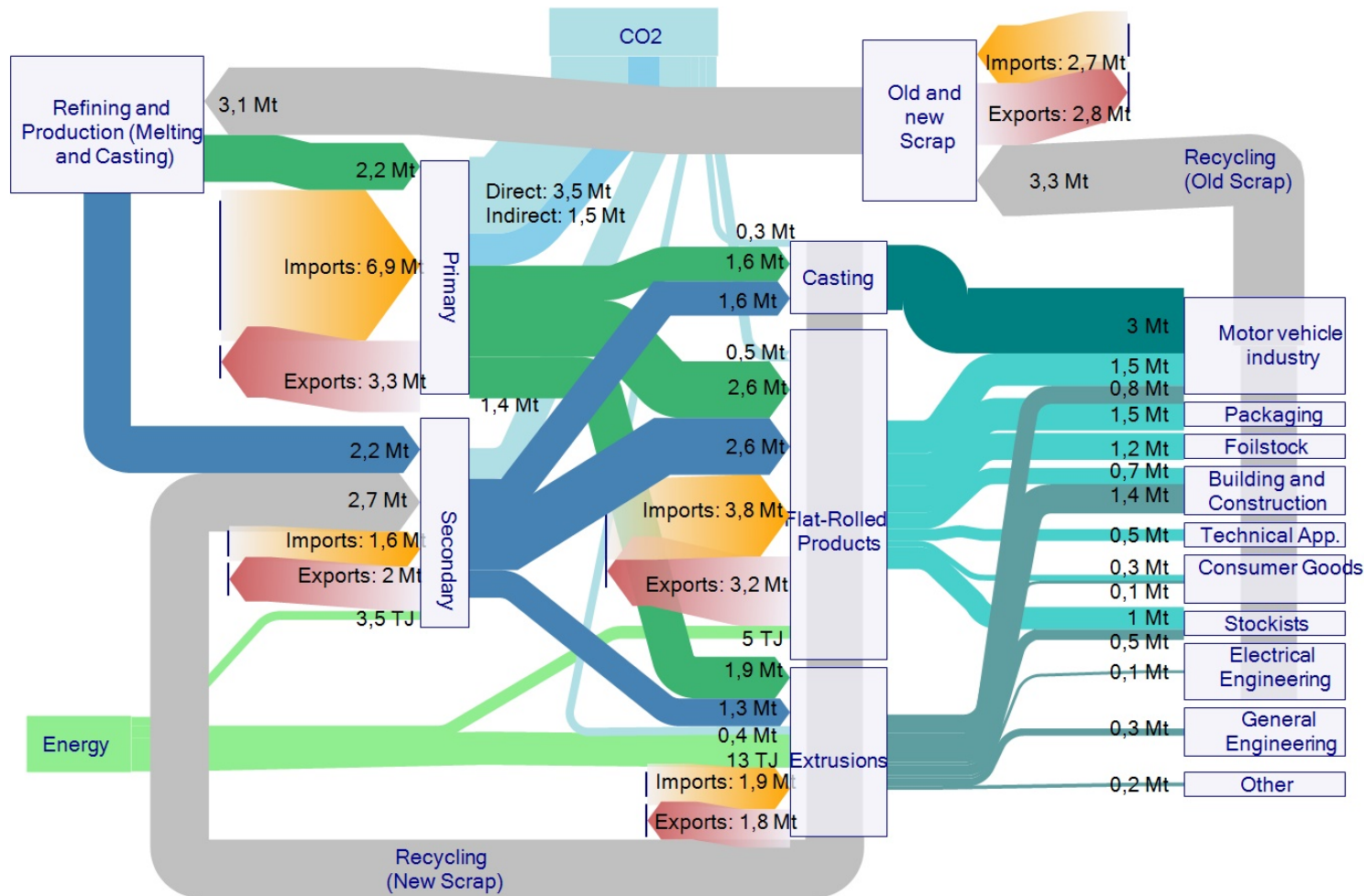
- Reduce greenhouse gas emissions
- Reduce the scale of the challenge of decarbonising materials production
- Contain the cost of achieving an industrial base compatible with a low-carbon economy.

The key conclusion is that a more circular economy can make deep cuts to emissions from heavy industry: in an ambitious scenario, as much as 296 million tonnes CO2 per year in the EU by 2050, out of 530 in total – and some 3.6 billion tonnes per year globally.

Source: European Climate

Circular Economy Challenges for Aluminium

Is downcycling of aluminium to casting sustainable?



Challenges:

- Recovering scrap for high quality secondary Al
- 77% is recycled globally, 23% -30% are losses

Measures:

- Increase post consumer collection rates
- Alloys and product specifications
- Wrought alloys to casting al.
- Separation of alloys
- Today: downcycling practice is not sustainable long run
- *If more EV are produced it means less downcycling to casting*

Recycling potential

Aluminium is a circular material, capable of being recycled without losing its original properties

Pre-consumer scrap

Scrap generated during the transformation of semi-finished products into finished products

Challenges on scrap routes:

- Data on Scrap routes contains middle to high uncertainties
- Scrap recovered in plants is based on assumptions but not statistics

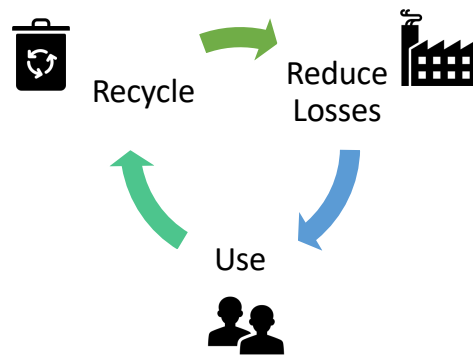
Post-consumer aluminium

Origin	<ul style="list-style-type: none">• Products reaching their end of life due to age or replacement• Products that have been on the market from all geographies and applications
Driver	<ul style="list-style-type: none">• Historical use of aluminium, with a growing demand worldwide• Existing incentives for end-users to bring back the products after product use• Amount of available post-consumer scrap depends on life-time of product and volume of metal used in society
Collection	<ul style="list-style-type: none">• Varying collection rates depending on product types• The material comes through many channels like municipal waste, collection systems and scrap yards
Sorting	<ul style="list-style-type: none">• Extensive sorting needed for efficient scrap preparation• Any alloy types can be in the mix• Some fractions are difficult to sort since they are attached to other materials• Packaging may contain food or other non-aluminium waste
Quality	<ul style="list-style-type: none">• Needs sorting as any alloy types can be in the mix• An important share of post-consumer aluminium is made into high quality cast alloys• Many streams are, however, challenged with contamination of other materials and/or metals

Source: European Aluminium (Circular Aluminium Action Plan)

Circular Economy Measures for Aluminium

Projections indicate 24% CO₂ reduction potential and 20-45 MT primary aluminium reduction



Circular Economy

(Simplified)

Reduce losses in the value chain

Collections systems for consumer products
and dedicated separation for Aluminium

Product design and material efficiency:

ensure separation of alu components

Reduce formation of new scrap

additive manufacturing leading to less

Reduce losses in the value chain

Improve post-consumer scrap

Excess scrap markets

Industrial integration and strategies

Thank you

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Senior Project Director



Main areas of work:

- Energy and Material Efficiency in Aluminium Industry
- Multiple Benefits of Energy Efficiency Investments in Industry and Buildings
- Waste heat use in energy intensive industries
- Energy Efficiency Networks in Brazil and South America

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