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Policy Brief

Towards a minimum recycled steel content in passenger cars:

Setting an initial target

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Towards a minimum recycled steel content in passenger cars: setting an initial target

Policy brief – March 2025

The EU has around 286 million motor vehicles, out of which 6.5 million vehicles are scrapped every year. If the steel scrap from these end-of-life vehicles (ELVs) are not managed well, valuable resources are wasted, harming the environment.

The planned EU ELV Regulation will attempt to tackle this problem by setting a minimum target of recycled steel content for the production of passenger cars.

Apart from increasing circularity and reducing emissions, setting minimum recycled content targets for the steel used in passenger cars could drive improvements in the secondary scrap market. By increasing the demand for higher quality scrap, carmakers and steelmakers would be more willing to pay a premium for better treated materials, unlocking investment in advanced post-treatment facilities that would otherwise be unprofitable. For example, scrap that might previously have been limited to applications such as steel beams could, with additional treatment, be used for flat Advanced High-Strength Steels (AHSS), including automotive applications.

Achieving higher levels of post-consumer scrap in the production of high-quality metal grades requires careful attention to impurities. Having analysed options for lightweighting and possibilities for mitigating impurities, **we believe that the targets should be split by product category and propose the following minimum scrap content requirements** (see chapter 4: Target proposal):

- **5-10%** post-consumer scrap in **flat AHSS,**
- **10-15%** in **flat carbon steel,**
- **70%** in **long AHSS**

1. Lightweighting in modern automotive design

To understand the role of steel in vehicle design, it is essential to recognise two primary drivers: safety and environmental concerns.

Historically, safety requirements have led to bulkier vehicles, while the growing need for fuel efficiency and environmental sustainability has increased the importance of reducing vehicle weight. Hence, **lightweighting strategies** have re-emerged as a critical focus in vehicle design, driven by the need to balance sustainability, cost and performance objectives. The aim of these strategies is to **design vehicle structures that minimise the use of materials while maximising their strength and utility**.

High-Strength Steels (HSS) and AHSS have played a transformative role in achieving lightweighting goals. In particular, **AHSS has become the fastest growing material in this area** due to its unique ability to combine weight reduction, cost efficiency and robust performance. By switching from low carbon steel to AHSS, component weight can be reduced by up to 25%.

While other lightweight materials, such as light alloys and carbon fibre composites, can offer even greater weight savings, AHSS remains a cost-effective alternative with significant strength advantages. One challenge with AHSS is its tendency to accelerate die wear during production compared to lower grade steels. However, its cost and performance benefits often outweigh these drawbacks, making it a cornerstone material for modern vehicle design.

2. Challenges of recycling steel in cars

The recycling rate of steel from end-of-life vehicles (ELVs) is around 90%[1]. However, much of this recycled steel is downcycled into construction applications rather than being reused in new vehicle production. As a result, only 6% of recycled steel from ELVs finds its way back into car manufacturing[2], highlighting the **limited closed-loop recycling of automotive steel within the circular economy**.

This limited re-use of steel scrap in automotive applications is not due to a lack of supply, but to **1) relatively stringent quality requirements of automotive alloys** and **2) the fact that European flat steel**

[1] European Commission. (2024). "End-of-life vehicle statistics". Eurostat.

[2] European Federation for Transport and Environment. (2024) *Cleaning up steel in cars: why and how?*

products are made through the BF-BOF route, which faces technical limitations in scrap intake. With the BF-BOF route, the proportion of scrap that can be used in steel production depends on the specific application within the vehicle and ranges from 5% to 85%. For exterior components, sheet steel must meet high standards of cleanliness, particularly with minimal copper contamination. Typically, only 5-10% scrap can be used in these applications, with a maximum of 20% for exceptionally clean scrap, which suggests that better management of scrap would allow to increase scrap contents. In contrast, structural parts, such as interior trim, are more tolerant of impurities and can contain 80-85% recycled steel.

2.1 Lightweighting complicates steel recycling

While **lightweighting** efforts optimise performance and material use, it **complicates the incorporation of recycled content**. This challenge arises from the precise alloy composition and low impurity tolerance required for advanced lightweight materials.

In a typical internal combustion engine (ICE) vehicle weighing 1,440 kg, steel accounts for 830 kg - 665 kg in flat products and 165 kg in long products[3]. For electric vehicles (EVs), which do not require components such as crankshafts or pistons, the demand for long products is significantly reduced. The share of long steel in EVs is estimated at 100 kg per vehicle, a 40% reduction compared to ICE vehicles. Meanwhile, the weight of flat components remains unchanged at 665 kg. As a result, the total steel weight in EVs is approximately 765 kg, compared to 830 kg in ICE vehicles.

2.2 Copper contamination

Copper contamination in recycled steel is a major challenge, as copper acts as an impurity that limits the applications of the final product. Approximately 60% of the copper in a car is found in its wiring and motors. While large electric motors can be efficiently separated during shredding, finer copper wires are more difficult to isolate. Removing the motors during the dismantling phase significantly reduces copper contamination - 62% of the copper is removed immediately and 90% overall, compared to 71.5% without motor removal. Similarly, removing electronics such as sensors and wiring harnesses before shredding helps to further minimise copper contamination.

During shredding, magnets are used to separate ferrous from non-ferrous materials, but some ferrous components remain attached to non-ferrous materials, contaminating both streams. For example,

[3] European Commission: Directorate-General for Environment, Baron, Y., Kosińska-Terrade, I., Loew, C., Köhler, A. et al., *Study to support the impact assessment for the review of Directive 2000/53/EC on end-of-life vehicles – Final report*, Publications Office of the European Union, 2023.

copper wires attached to ferrous parts can remain in the steel scrap. While manual removal can reduce some of this contamination, some still requires additional processing. These complexities underline the importance of accurate ELV dismantling to improve the recycling of automotive steel.

At the steelmaking stage, copper contamination is managed by dilution - mixing contaminated scrap with primary iron or cleaner scrap sources. However, it is far more effective to minimise copper contamination earlier in the process, such as during pre-shredding dismantling, than to rely on dilution during steelmaking. Prioritising early intervention can significantly improve the quality and reusability of recycled steel.

Scrap quality is likely to face further challenges with the expansion of the electric vehicle fleet. EVs tend to have more embedded copper wiring which is also harder to separate than in ICE vehicles. The difficulty of separating copper from steel should be addressed additionally by setting requirements for car design to improve the dismantling process.

3. Estimating a recycled content target

This section aims to clarify the rationale for setting targets for recycled content by examining the types and forms of steel used in cars. Automotive steel can be divided into two main types of steel: AHSS and carbon steel. These types are available in both flat and long product categories.

3.1 Target design

A key question is whether the minimum recycled steel content should be a single overarching target for all types of steel or split into separate targets for flat and long products. A single target offers carmakers greater flexibility in compliance but could have unintended consequences. Manufacturers may resort more to long steel to meet the target, as it is easier to produce with higher recycled content. This approach could lead to them increasing the weight of cars and achieve results opposite to the climate objectives.

Meeting a given recycled content target is generally easier for ICE vehicles due to their higher proportion of long products. If the target is designed with EVs in mind (which use fewer long products), it may inadvertently become too lenient for ICE vehicles, creating an imbalance in expectations and outcomes.

When setting this initial target, it is important to not set the target too high to enable inclusion of BF-BOF operators. In addition, it is currently not possible to predict how many EAFs will be operational for flat products, it is therefore unrealistic to assume that all flat steel for car manufacturers will come from EAFs. Therefore, this approach leaves room for future, more ambitious targets that could drive a gradual shift away from BF-BOF processes.

3.2 AHSS metrics in cars

Of the total steel used in a car, 40% - equivalent to 332 kg - is found in body-in-white components (the structural frame of the vehicle). Within these components, 60% - or 199 kg - is classified as AHSS due to its strength and weight-saving properties. The remaining 466 kg of flat steel is classified as carbon steel. It is important to note that these proportions and categorisations are consistent across all ICE vehicles.

In ICE vehicles, long steel products account for 165 kg. While long steel can be divided into both AHSS and carbon steel categories, we adopt the conservative assumption that all long products are AHSS. For EVs, the total weight of long steel is reduced to 100 kg due to the absence of components such as crankshafts and pistons, but the categorisation remains the same as for ICE vehicles.

Hence, the literature suggests that the proportion of AHSS in automotive applications could increase to 60% from the current levels of 44% for ICE vehicles and 39% for EVs.

Table 1: Current (baseline) and possible increase of ratios of Advanced High-Strength Steels in internal combustion engine (ICE) vehicles and electric vehicles (EVs).

Ratio type	ICE	EV
Baseline ratio AHSS	**44%**	**39%**
Higher ratio AHSS	**60%**	**60%**

This predicted increase is expected to be concentrated in flat products, as long products are already predominantly AHSS. In the future, flat AHSS applications could expand beyond body-in-white components to include some non-exposed parts and even chassis components.

3.3 Post-consumer scrap content in steel categories

- **Flat AHSS (0-5% post-consumer scrap):** This is a highly specialised steel grade with little or no tolerance for impurities. Maintaining 0% post-consumer scrap is currently the most realistic scenario, as even 5% post-consumer scrap would be a significant step forward. Typically, steelmakers rely on pre-consumer scrap to produce this grade.

- **Flat carbon steel (5-10% post-consumer scrap):** Compared to AHSS, carbon steel generally has a higher tolerance for impurities, making a 5-10% post-consumer scrap rate a conservative but reasonable assumption. It can be further inferred that the remaining scrap capacity within the 20% BOF limit is typically filled with pre-consumer scrap.
- **Long AHSS (50% post-consumer scrap):** It is likely that different long steel grades are used. However, it is assumed that these grades should still meet the 'high quality' standard. As it is neither feasible nor practical to identify the exact long steel grades used in automotive production, all long steel products in a car are categorised as AHSS here, which enables a conservative target proposal.

4. Target proposal

For the individual steel categories used to build cars, the post-consumer scrap proposed target is summarised in Table 2.

Table 2: Proposed minimum target for post-consumer scrap content in passenger cars.

Product	Proposed target
Flat AHSS	5-10%
Flat carbon steel	10-15%
Long AHSS	70%

Setting a minimum recycled content target within a 10-year timeframe could stimulate investment in advanced scrap post-treatment. This would work towards ensuring that higher quality, contaminant-free scrap could be processed into automotive grade steel in the required proportions, while leaving room for future, more ambitious targets that could drive a gradual shift away from BF-BOF processes.

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