

Position Paper

on the inclusion of Recycling of Fuel Cell Stacks from Fuel Cell Vehicles (FCVs) in the EU Directive on End-of-Life Vehicles (ELV Directive)

by the International Platinum Group Metals Association (IPA)

Recommendation

- The Platinum Group Metals (PGMs) industry strongly urges the European Commission to include provisions for the recycling of fuel cell stacks in the current review of the ELV Regulation.
- The PGM industry proposes that the ELV Regulation Annex VII, Part C is amended to include provisions for mandatory removal of fuel cell stacks from ELVs prior to shredding as part of the broader vehicle recycling process.
- This will not only help the EU achieve its sustainability goals but also ensure that valuable PGM resources, as well as other important materials used in fuel cell stacks, are efficiently collected, recovered and reused.

Motivation

FCVs are an important part of the EU's strategy to reduce CO₂ emissions and transition to cleaner mobility solutions, particularly for commercial and heavy-duty vehicles. Platinum, as a catalyst in fuel cells, is essential for the efficient operation of these vehicles; some fuel cells may also contain small amounts of iridium and/or ruthenium to enhance performance. The value of recoverable PGM generally makes stack recycling economic, and indeed, a value chain for recycling fuel cell stacks is already evolving today. This then allows for the co-recovery of other useful materials in the stack, such as titanium, stainless steel, and the advanced ionomer in cell membranes.

But relying solely on the value of PGM to ensure recovery creates a risk of imperfect collection as the FCV market scales up, as has been seen in the past with catalytic converters. Moreover, the recycling of PGM-containing fuel cell stacks is currently not addressed in the EU's ELV Regulation. This imposes a risk to the systematic retrieval of materials listed as "strategic materials" in the Critical Raw Materials Act and contrasts with the PGM-containing automotive catalytic converter used in internal combustion engine vehicles which is already listed as a part that needs to be removed and collected from ELVs.

Fuel cell stacks from FCVs contain approximately 10–55g of platinum¹, which is significantly higher than the amount around 5g of PGMs on average used in catalytic converters of vehicles with internal combustion engines, currently also regulated under the ELV Annex VII, Part C.

¹ U.S. Department of Energy. (2023). *Critical Materials Assessment 2023*

The FCV fleet continues to grow globally, with 90,000 FCVs on the road in 2023—an increase of 20% from 2022.² In Europe, the fleet expanded significantly from just 78 vehicles in 2014 to 5,939 in 2023, demonstrating sustained progress despite a temporary dip in new registrations.³ This emerging technology is too relevant to leave it unregulated.

Reasons for the recommendation

- **The Value of PGMs:** The EU Critical Raw Materials Act rightly emphasises that PGMs are critical and strategic raw materials, hence, it is imperative that the platinum (and any iridium/ruthenium) used in fuel cell stacks be recovered to maximize its value and minimize environmental impact. The efficiency of platinum use in fuel cells is increasing, leading to a continual reduction in the platinum content of stacks, known as ‘thrifting’. This is necessary to allow scale-up of FCV production to mass-market levels within available platinum suppliers, but thrifting will not be sufficient on its own: it must be coupled to efficient recycling and reuse of platinum from ELVs to support the longer-term growth of the FCV market. Thus, maximising PGM recovery will continue to be a crucial aspect of the vehicle end-of-life process.
- **Circular Economy:** By ensuring that fuel cell stacks are removed from ELVs, the EU can ensure that recycling of valuable and critical materials in these stacks will take place – including but not limited to PGMs. Furthermore, recycled precious metals offer a massive CO₂ saving potential compared to primary metals, reducing the carbon footprint by up to 98%.
- **Ensuring Resilience in PGM Recycling by Leveraging Europe’s Strengths:** Europe has a well-established industrial capability in recycling catalytic converters and refining PGMs from secondary materials. A robust materials system already exists, supported by skills, knowledge, and advanced recycling technology. It is crucial to fully utilize this infrastructure to prevent missed opportunities in securing waste streams – *“don’t waste valuable waste.”* The PGM recycling infrastructure in Europe is a key asset that can be further leveraged to achieve circular economy goals. Fuel cell stacks represent a new feedstock that can diversify recycling streams, ensuring that existing PGM recycling technology remains within the EU and continues to provide a strong demand for recovered materials.
- By keeping recycling expertise and infrastructure within Europe, the region can protect jobs, ensure uninterrupted material flows across borders, and attract continued investment in recycling innovations – *“use it or lose it.”*

² Hydrogen Council & McKinsey & Company. (2024). Hydrogen Insights 2024.

³ Clean Hydrogen JU. (2024). The European hydrogen market landscape.

- **Regulatory Support for PGM Recycling:** Europe's existing PGM recycling capabilities are already being utilized to process end-of-life fuel cell stacks. Including fuel cell stack recycling in the ELV Regulation would provide certainty and clarity to the PGM recycling industry, thereby supporting investment, innovation, and long-term sustainability in Europe's circular economy.
- **The Automotive Industry Perspective:** The European automotive industry has already made significant investments in PGM-based technologies. To ensure a sustainable supply of critical materials, systematic fuel cell stack recycling is essential. As fuel cell adoption grows, manufacturers are expected to improve design for end-of-life processing. For example, Bosch already plans to repurchase and recycle its fuel-cell stacks when their useful life expires. In Germany, research projects under the National Action Plan for Fuel Cell Production (H2GO) as well as individual projects such as ReStack or Fraunhofer Stack2P aim to improve product design of stacks before the start of large-scale industrial production in order to facilitate non-destructive disassembly and to develop concepts for automated and easier disassembly of PEM fuel cell stacks.
- If fuel cells are excluded from recycling efforts, Europe's automotive sector risks losing long-term material security, making it less future-proof. A sustainable, closed-loop recycling system must be in place to ensure that PGMs from end-of-life fuel cell stacks are recovered and reintegrated into the supply chain. This is also critical for Environmental, Health, and Safety (EHS) regulations, ensuring that these valuable materials remain properly managed and regulated until the end of their lifecycle.
- **Preventing the release of PFAS to the environment:** typically, the membranes used in PEM fuel cells consist of ionomers containing perfluoroalkyl substances (PFAS). When fuel cells are recycled today to recover PGMs, the refiner ensures complete incineration of the membrane to prevent any PFAS release to the environment. However, innovative recycling concepts come in place, that even enable the recovery and reuse of the ionomer. For all means, professional recycling will ensure that no PFAS material is treated inappropriately or ending up in landfills. This is a crucial reason to ensure that fuel cell stacks are recycled at very high efficiency.
- **EU Leadership in Green Technology:** By incorporating fuel cell stack recycling into the ELV Regulation, the EU can maintain its leadership role in green technology, ensuring that fuel cell vehicles remain a key part of the region's sustainable mobility strategy.

Proposed Amendments to the ELV Regulation

The PGM industry recommends the following changes to the EU's ELV Regulation:

1) GENERAL AMENDMENT

Fuel cell stacks from FCVs should be explicitly included as part of the vehicle's end-of-life management process, with clear guidelines on how these stacks should be processed for PGMs recovery.

2) SPECIFIC AMENDMENTS

- The ELV Regulation Annex VII, Part C is to include provisions for mandatory removal of fuel cell stacks from ELVs prior to shredding as part of the broader vehicle recycling process.
- Also considered for mandatory removal due to safety reasons should be elements of the fuel cell system in a vehicle such as the hydrogen tank which is from high-strength carbon fibre composite materials (CFC) to withstand the extremely high pressure at which hydrogen is stored (up to 700 bar).

About IPA

The International Platinum Group Metals Association (IPA) represents the worldwide leading mining, recycling and fabrication companies in the global platinum group metals (PGMs) industry, comprising platinum, palladium, iridium, rhodium, osmium and ruthenium.

The IPA provides a platform to address issues of common concern and to jointly engage with stakeholders at the international level.

The association represents over 80% of the global PGM industry.

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