JM

# Why platinum is crucial to a successful energy transition

## Six takeaways for policy makers

**As the clean energy landscape evolves, we will see unprecedented demand for numerous metals and materials, with many of these classed as critical raw materials (CRMs).** Meanwhile there is a growing recognition of the crucial role hydrogen, and therefore PGM (platinum group metal) catalysed technologies such as fuel cells and electrolysers, will play in the transition to net zero. As platinum's role in the energy transition is magnified, debate surrounding its availability, cost, supply, and circularity continues.

Here we present six takeaways for policy makers explaining why platinum presents a valuable opportunity as a sustainable solution for the energy transition.

### 1. Fuel cell demand will not stress the platinum market

Today, platinum's largest market is catalytic converters for new vehicles, which will steadily decline as the internal combustion engine (ICE) is phased out. Its jewellery market has also been in decline for the last decade. Platinum benefits from long-standing supply chains, with well-established mines in southern Africa, operated almost exclusively by large, publicly listed mining companies with exceptional ESG (environmental, social, and governance) profiles, recycled supply, and substantial above-ground stocks. Therefore, with robust supply and a changing demand profile, platinum is well positioned and ready for a major new market: fuel cell vehicles. The growing fuel cell market will come in as replacement demand for platinum and will not stress the platinum market.

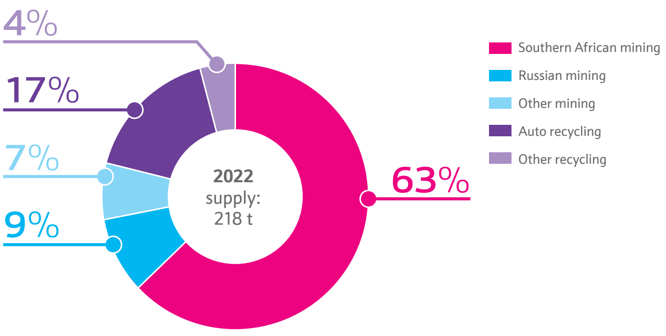


Figure 1: Platinum supply to the market by source

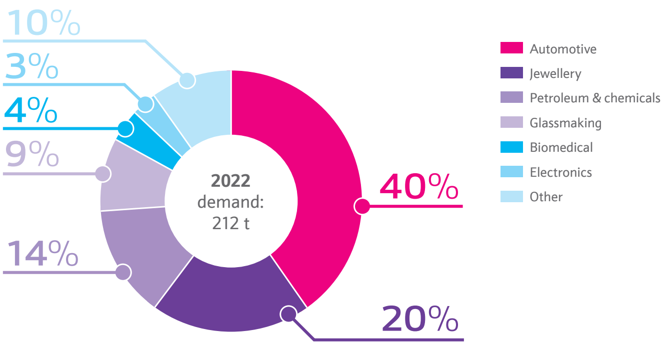


Figure 2: Platinum demand by sector (NET of closed loop recycling)

### 2. Circularity in platinum already exists with opportunity for further improvements

End-of-life catalytic converters have supplied recycled metal to the market for many years and will continue to do so for decades to come. However, this market represents only a portion of the total amount of platinum recycling taking place globally. Unseen to the market is the considerable level of routine 'closed loop' recycling for a wide range of industrial uses, where the recycled metal goes back into the same application, meaning that the total amount of platinum recycled every year is much higher than the reported recycled metal supplies to the market. Incentivised by both metal value and the lower carbon intensity of recycled metal, there is no doubt that circularity of PGMs in PGM-catalysed clean energy technologies will be similarly established and leverage today's long-standing global recycling network.

However, there is scope for further improvements. Whilst the technical recyclability of platinum is extremely high once it reaches the refinery, the challenge to regulators is to address inefficient collection of end-of-life material, with an estimated 30% of platinum in spent catalytic converters currently lost before it can be refined. Regulators can therefore further enhance platinum circularity through measures such as producer responsibility that boost collection rates.

## 3. Europe and North America already benefit from mature platinum supply chains and significant recycling infrastructure

Four of the largest global PGM recyclers are based in Europe (EU and UK), with operations also located in the USA. Furthermore, the four global trading hubs for 'good delivery' platinum are in the UK (which hosts two hubs), USA and Switzerland. These mature supply chains and the established recycling infrastructure have served existing platinum markets for decades, facilitating the global movement of platinum between suppliers, fabricators, end-users, and recyclers located in all regions and countries. Outside of Western markets, trade and export barriers do exist in some cases and are an important consideration, particularly for countries such as China and India, placing restrictions on moving metal. For the rest of the world, however, cross-border movements of PGM ingot, sponge (powder), product, and end-of-life material are a normal and important part of the functioning of PGM supply chains. These mature supply chains and existing recycling infrastructure will be leveraged for platinum's new uses in the energy transition.

## 4. Platinum's use in fuel cell vehicles will support iridium supply for electrolysers

Platinum group metals are never mined in isolation. In fact, the vast majority (>90%) of global iridium supply is produced as a minor by-product of platinum mining in southern Africa. With fuel cell vehicles coming in as a replacement market for platinum, this will incentivise continued mining of platinum in South Africa and Zimbabwe, crucially securing the supply of iridium for green hydrogen electrolysers. The synergies between platinum and iridium supply and demand are a further incentive to support the introduction of fuel cell vehicles alongside battery vehicles.

## 5. Incentivising fuel cell vehicles will alleviate critical raw material intensity

Battery electric vehicles (BEVs) and fuel cell vehicles are frequently compared, particularly in terms of energy efficiency. Whilst BEVs do present benefits in this area, this misses the crucial and undervalued benefit PGM-catalysed fuel cells offer – their relatively low mineral intensity. As shown in the example in Figure 1, pure battery powertrains typically require larger amounts of CRMs versus a comparable fuel cell powertrain. Given the economic and strategic importance of these finite materials to the energy transition, and to the sustainable functioning of the European economy, this vital aspect should not be overlooked. With both technologies in play, we can more easily navigate the transition to net-zero within our finite pool of mineral resources. To this end, incentivising a level-playing field for fuel cell vehicles in transportation is essential; increased regulatory support for fuel cell vehicle deployment and hydrogen infrastructure development will unlock economies of scale and bring costs down to competitive levels, thereby driving fuel cell vehicle adoption.

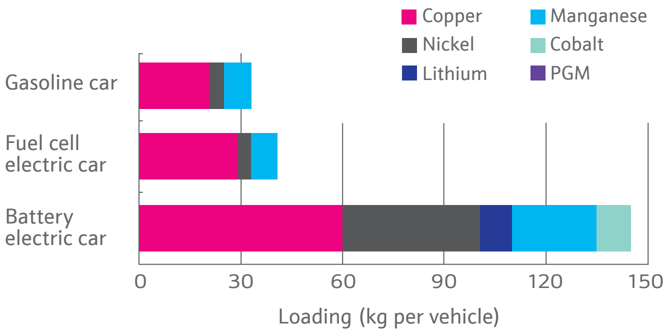


Figure 3: Typical critical metal loadings per medium sized passenger car (Source: IM analysis, FVV study, IEA)

## 6. Economies of scale, and not platinum cost, impede fuel cell vehicle deployment

Platinum is a valuable metal, leading to the common misperception that its use makes fuel cell vehicles expensive. Whilst relatively expensive on a per-gram basis versus other metals, the amount of platinum used in a fuel cell vehicle is orders of magnitude lower than, for example, the amount of base metals used in clean energy technologies such as batteries.

In our estimates, the PGM cost contribution to overall fuel cell vehicle costs are less than 5%. To use the example of a medium passenger vehicle with today's metal prices: the catalytic converter would contain ~5g of PGM (~$250) and the fuel cell vehicle stack would hold ~20g of platinum (~$600). By way of contrast, we estimate the cumulative cost of critical metals in the comparable battery electric powertrain to be over $2,000. Even accounting for base metal costs for the gasoline and fuel cell vehicles (including its small battery pack), adding ~$400, the total is still significantly lower than the pure battery equivalent. In reality, fuel cell vehicle prices are high today not because they use platinum, but because they do not yet benefit from economies of scale. Crucial regulatory support now is now needed to unlock those economies and put Europe's energy transition on a sustainable and achievable footing.


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