# PLATINUM PERSPECTIVES

World Platinum Investment Council

## Iridium availability is not a bottleneck to PEM electrolyser ramp-up; platinum demand from PEM electrolysers could reach >500 koz p.a. within 10 years

***Allaying market fears, we do not expect iridium supply to impede the roll out of PEM electrolyser capacity. Electrolyser capacity is forecast to expand from <1GW to ~4,000 GW by 2050 (IEA). PEM technology is expected to achieve a >30% market share, facilitating the transition to green hydrogen. Despite the use of critical metals, thrifting, recycling and viable substitution in other applications will result in iridium supply being sufficient to meet identified demand and support cumulative installed PEM capacity of 1,550 GW by 2050.***

Iridium's annual supply of ~250 koz is roughly in balance with existing demand. However, the scale of planned electrolysis growth implies that there will be substantial iridium deficits, assuming a >30% PEM market share and current loadings of 400 kg/GW. Indicatively, the ~20 GW of planned PEM commissioning in 2030 alone would require ~250 koz of iridium, consuming total annual supply. Considering iridium is ~20 times scarcer than platinum, a supply side response from PGM miners is impractical, therefore we highlight that **substitution, thrifting and, recycling** can address market fears of a perceived iridium bottleneck.

In Figure 1, overleaf, we provide a summary of iridium demand segments alongside feasible substitution options. Economic returns should drive substitution decisions, considering iridium prices have outperformed its sister metals over the past three years. The automotive (i.e. spark plugs) and electronics (i.e. crucibles) sectors are reportedly already substituting some iridium. Cumulatively, we estimate 20% of existing demand is substituted by 2030 and 30% by 2040, freeing up annual iridium supply of 45 koz to 67 koz over the next decade (see Fig. 2).


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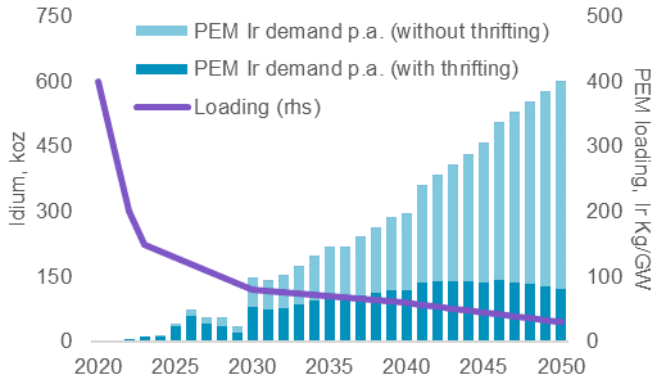
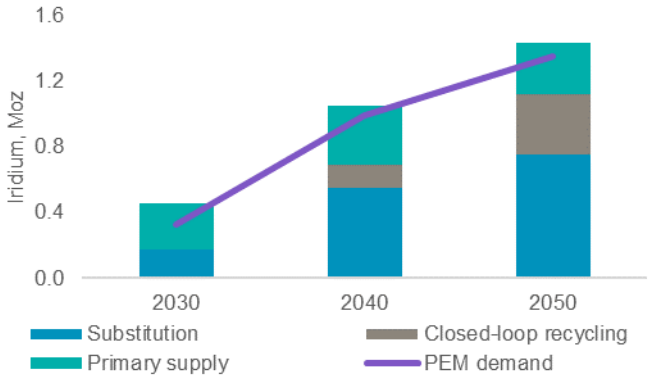
**Improving technology (thrifting) will substantially reduce iridium demand from PEM electrolysers. The timing of demand is based upon Hydrogen Council projections.**




*Source: Hydrogen Council, McKinsey, Johnson Matthey, Heraeus, WPIC forecasts*

**Cumulative iridium demand from PEM electrolysers is met in the next three decades, with 1.6 TW capacity by 2050.**




*Source: WPIC Research*

Iridium thrifting and design efficiency will underpin reductions in iridium loadings per installed gigawatt. OEMs are already pre-marketing 100 kg/GW catalysts, implying a 75% thrift. While thrifting will slow, Johnson Matthey believes 80 kg/GW loadings are feasible by 2030 and Heraeus cites the next generation of technologies is targeting further reduction of iridium loadings to 30 kg/GW by 2050.

Recycling is the third pillar necessary to meet iridium's future demand needs. The US's clean hydrogen roadmap targets a 99% recycling rate of PGMs within electrolysers by the 2030s. As spent catalysts are refreshed with more efficient designs (i.e. lower loadings), we illustrate in Figure. 4 that secondary iridium supply net of closed-loop replacements should occur from ~2030 (PEM electrolyser's have a 7- to 10-year lifecycle). While some consecutive years of iridium deficits could arise from the mid-2030s, we estimate that recovering ~10% of non-PEM iridium from markets like spark plugs (at a 10-year lag) would sufficiently fulfill supply deficits. **Nevertheless, evaluating cumulative iridium requirements over three ten-year periods to 2050, we believe the combination of substitution, thrifting and recycling will result in a balanced market, thereby preventing any bottlenecks. Accordingly, we estimate incremental platinum demand from PEM could reach ~500 koz per annum by the early 2030s.**

***Platinum demand could increase by an incremental 500 koz in the early 2030s as iridium is not expected to encumber the hydrogen economy, particularly the roll out of PEM electrolysers.***

**Platinum's attraction as an investment asset arises from:**

- WPIC research indicates platinum market entering a period of consecutive deficits from 2023.
- Platinum can be considered a proxy of investing in the growing hydrogen economy given its use in PEM and fuel cell technologies.
- Platinum supply remains challenged, hampered by electricity shortages in South Africa and sanctions against Russia.
- Automotive platinum demand growth should continue due principally to substitution in gasoline vehicles.
- The platinum price remains historically undervalued and significantly below both gold and palladium.

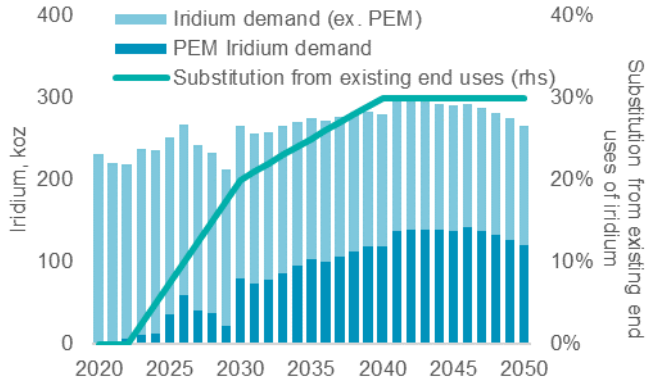
**Figure 1:** The tripling of iridium prices since 2020 (outperforming other PGMs) is incentivising substitution of iridium with other metals, with a number of opportunities to use alternative PGMs in current end uses.

**Iridium demand snapshot, 2023f**

| Sector | Applications | Substitute | Demand (Koz) |
|---|---|---|---|
| | PEM Electrolysers | Ruthenium (Voltage & Acid Limited) | |
| Electochemical | Ship Ballast Treatment | UV/Chemical treatment | 104 |
| | Ultra-thin Copper Foil | Physical rolling | |
| Other | Long life Spark Plugs | Platinum/Other PGM mix | 64 |
| Electronics | Crystal manufacturing | Platinum (Currently size restricted) | 40 |
| Chemical | Acetic Acid | Rhodium (Limited to new plants) | 30 |
| | | **Total** | **238** |

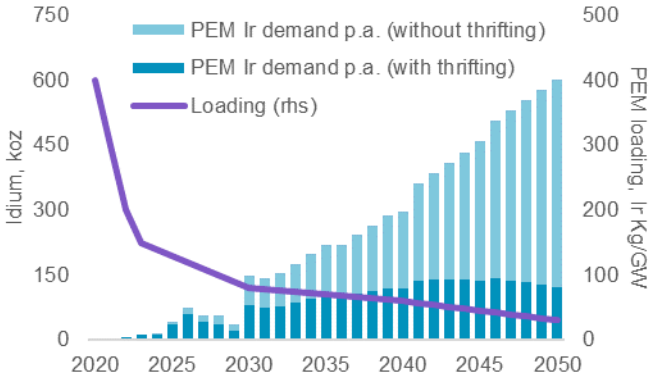
*Source: Johnson Matthey, WPIC Research*

**Figure 2:** High iridium prices are resulting in substitution of iridium from traditional end uses, freeing up supply for PEM electrolysers. Substitution is expected to be possible for up to 30% of existing end use demand for iridium.



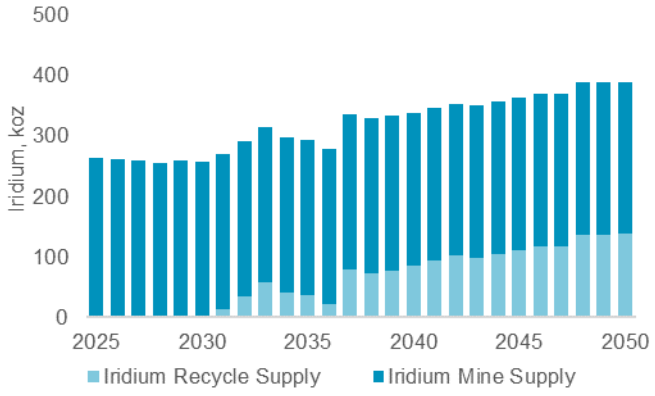

*Source: Hydrogen Council, McKinsey, WPIC Research*

**Figure 3:** Developing more efficient technology (thrifting) will substantially reduce iridium demand from PEM electrolysers. The timing of demand is based upon Hydrogen Council projections for PEM electrolyser capacity additions.



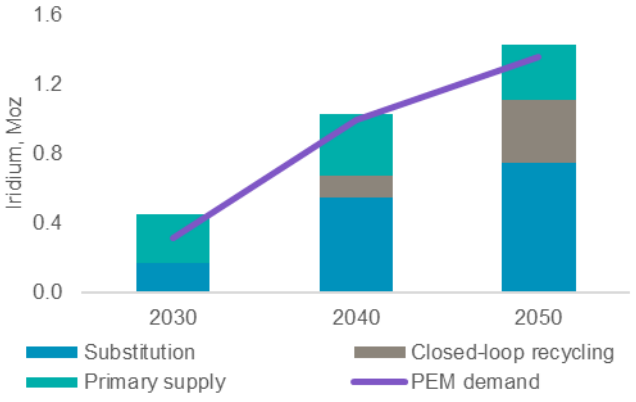

*Source: Hydrogen Council, McKinsey, Johnson Matthey, Heraeus, WPIC forecasts*

**Figure 4:** Less efficient catalysts are recycled with more efficient/lower loaded technology. Recovered iridium can be returned to the market, increasing supply.




*Source: WPIC forecasts*

**Figure 5:** Cumulative iridium demand from PEM electrolysers is met in the next three decades, with 1,550 GW of projected capacity by 2050.




*Source: WPIC forecasts*

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