

PLATINUM PERSPECTIVES

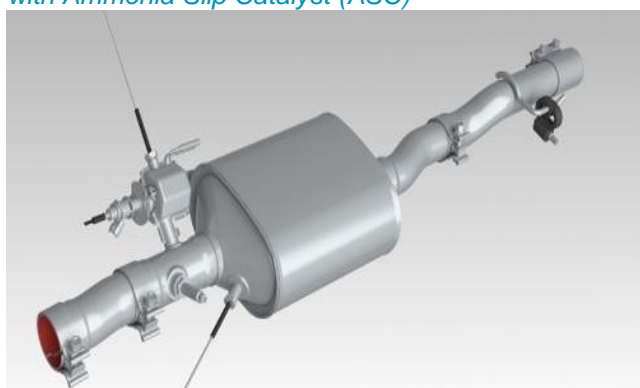
Surprisingly, platinum demand will grow from the COVID-19 pandemic and climate change imperatives

The unprecedented negative fiscal impact on national governments due to the COVID-19 pandemic is likely to significantly restrict funding of the power grid and charging infrastructure necessary to support the mass roll out of Battery Electric Vehicles (BEVs). However, reducing climate change remains paramount, perhaps even heightened by the improved air quality experienced during lockdowns. This makes it essential to reduce CO₂ from internal combustion engine (ICE) vehicles at the lowest overall cost. Diesel vehicles, whether new sales or the existing fleet already on the road, emit between 20% and 35% less CO₂ than equivalent gasoline vehicles. Encouraging new diesel sales, which are now low NO_x, and low CO₂, and preserving the CO₂ benefits of the on-road diesel fleet are both essential. **By addressing high NO_x emissions of older diesel vehicles on the road, their CO₂ benefits can be retained.**

The momentum for partial or complete bans of diesel cars remains due to the excessive levels of NO_x still being emitted by the on-road fleet. From September 2019, the German cities: Berlin, Darmstadt, Hamburg and Stuttgart banned relatively new Euro 5 diesel vehicles. A further 9 German cities have pledged to introduce similar bans.

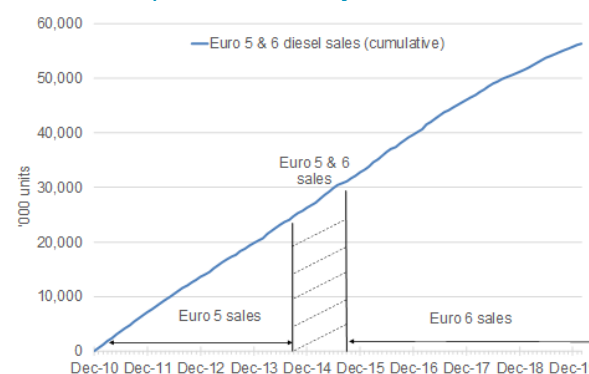
In March 2019, Germany passed a federal law exempting Euro 5 diesel vehicles from city bans provided they emitted less than 270 mg/km of NO_x. The Bosal Euro 5 retrofit system* adds a Selective Catalytic Reduction (SCR) system with an Ammonia Slip Catalyst (ASC) to the vehicle's existing Lean NO_x Trap (LNT) system. In Germany c.90% of the cost (c. €3,300) is funded by automakers. This prevents the total collapse of diesel vehicle re-sale values, reduces NO_x by up to 80% and importantly, maintains the diesel CO₂ benefits. **Each ASC contains c.1g of platinum.**

BOSAL Euro 5 retrofit: Selective Catalytic Reduction (SCR) with Ammonia Slip Catalyst (ASC)



Source: Bosal, Pley GmbH, WPIC Research

A total of 56.7 m Euro 5 and 6 diesel cars have been sold in Europe since January 2011



Source: LMC Automotive, OICA, ACEA, WPIC Research.

We estimate there are 26.2 m Euro 5 diesel cars on Europe's roads with 6.2 m of these in Germany. Assuming only 30% have re-sale values that merit retrofitting, this represents c.250 koz of potential platinum demand in Europe with 60 koz of that more likely in the short term in Germany.

More importantly, low emission zones are likely to be ineffective in reducing urban NO_x levels because of the large pre-RDE Euro 6 fleet sold before September 2019 that are allowed in and still emit NO_x well above the German ban threshold of 270 mg/km. **This makes Euro 6 retrofitting unavoidable but more appealing as it secures the lower diesel CO₂ emissions. A far higher portion of the 27.6 m Euro 6 cars will require retrofitting, with 60% representing just over 530 koz of platinum demand.**

Retrofitting the relevant portion of Europe's c.54 m Euro 5 & 6 diesel cars lifts platinum's demand growth potential by c.780 koz

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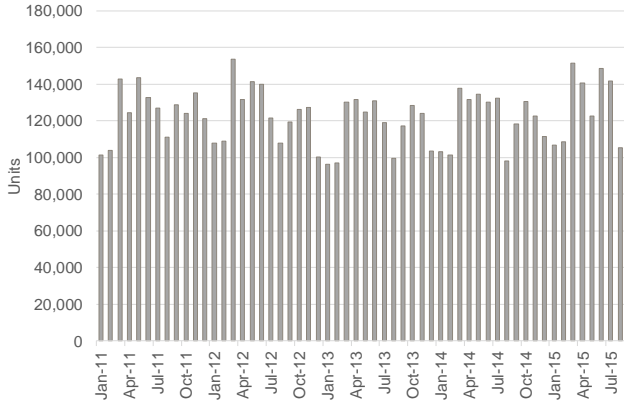
24 April 2020

**The German type-approval authority (KBA) and test organisation TÜV certify the hardware retrofits*

Platinum's attraction as an investment asset arises from:

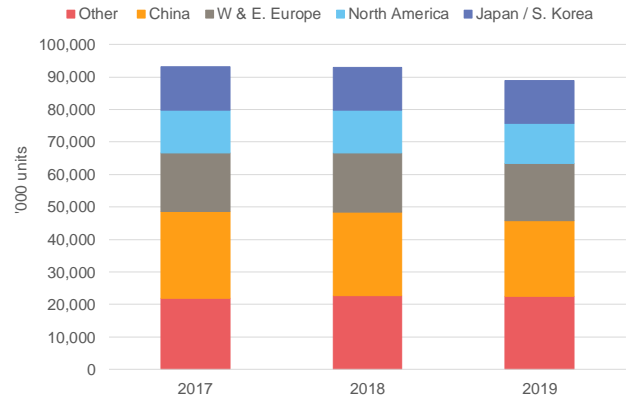
- Supply is relatively constrained with limited investment in new platinum group metal (PGM) mines
- Platinum price is near all-time lows relative to gold and at record lows relative to palladium
- Total PGM demand growth should continue due to increasingly restrictive emissions rules
- Market balance and price mismatches between palladium and platinum argues for substitution
- Investment demand has surged as institutions begin to factor low price and positive fundamental outlook

Figure 1: Monthly sales of Euro 5 diesel cars in Germany. 90% (6.2m) remain on the road and eligible for retrofitting



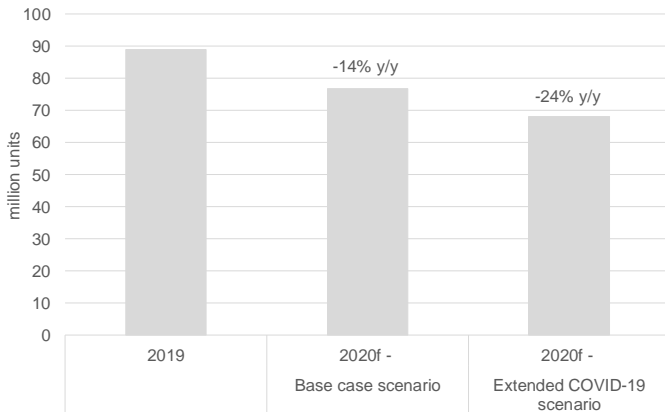
Source: LMC Automotive, OICA, ACEA, WPIC Research

Figure 2: Annual production of light duty vehicles. 88.9 m in 2019



Source: LMC Automotive, WPIC Research

Figure 3: Annual global light vehicle production with COVID-19 scenarios y/y, base: - 14%, extended: - 24%



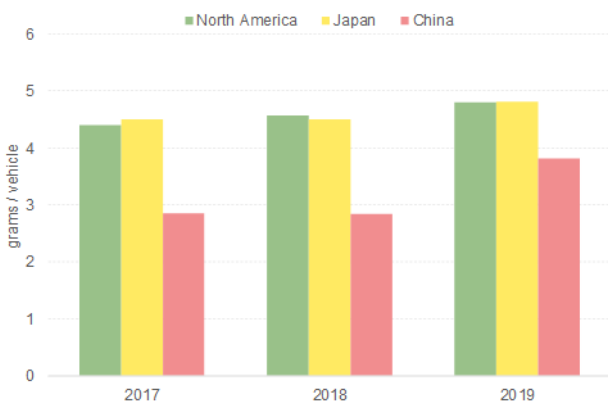
Source: LMC Automotive, WPIC Research

Figure 4: Chinese car production. Down 86% m/m in Feb, but recovery commenced in March



Source: China NBS, WPIC Research

Figure 5: Platinum Group Metal (PGM) loading per vehicle. Rising loadings to meet tighter emission standards will partially counter COVID-19 related vehicle sales loss



Source: Johnson Matthey, LMC Automotive, WPIC Research

Figure 6: PGM loading per vehicle. Euro 6d Temp or RDE introduction increased PGM loadings in Europe in 2019, also offsetting some COVID-19 related demand loss



Source: Johnson Matthey, LMC Automotive, WPIC Research

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