

PGM Demand and Outlook

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Demand and Outlook

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Platinum price performance: long term

Source: Mitsubishi from Bloomberg Professional Service

Platinum prices (US\$/toz)



Platinum price performance: medium to short term

Platinum prices (US\$/toz)

Last Price	950.83
High on 02/16/21	1339.73
Average	939.38
Low on 03/16/20	564.00
SMAVG (50) on Close	1011.72
SMAVG (100) on Close	991.03
SMAVG (200) on Close	950.75



Source: Mitsubishi from Bloomberg Professional Service

Platinum is back in the downtrend channel from 2021-2 and is below the major moving averages

Some long-term upside support

Palladium price performance: long term

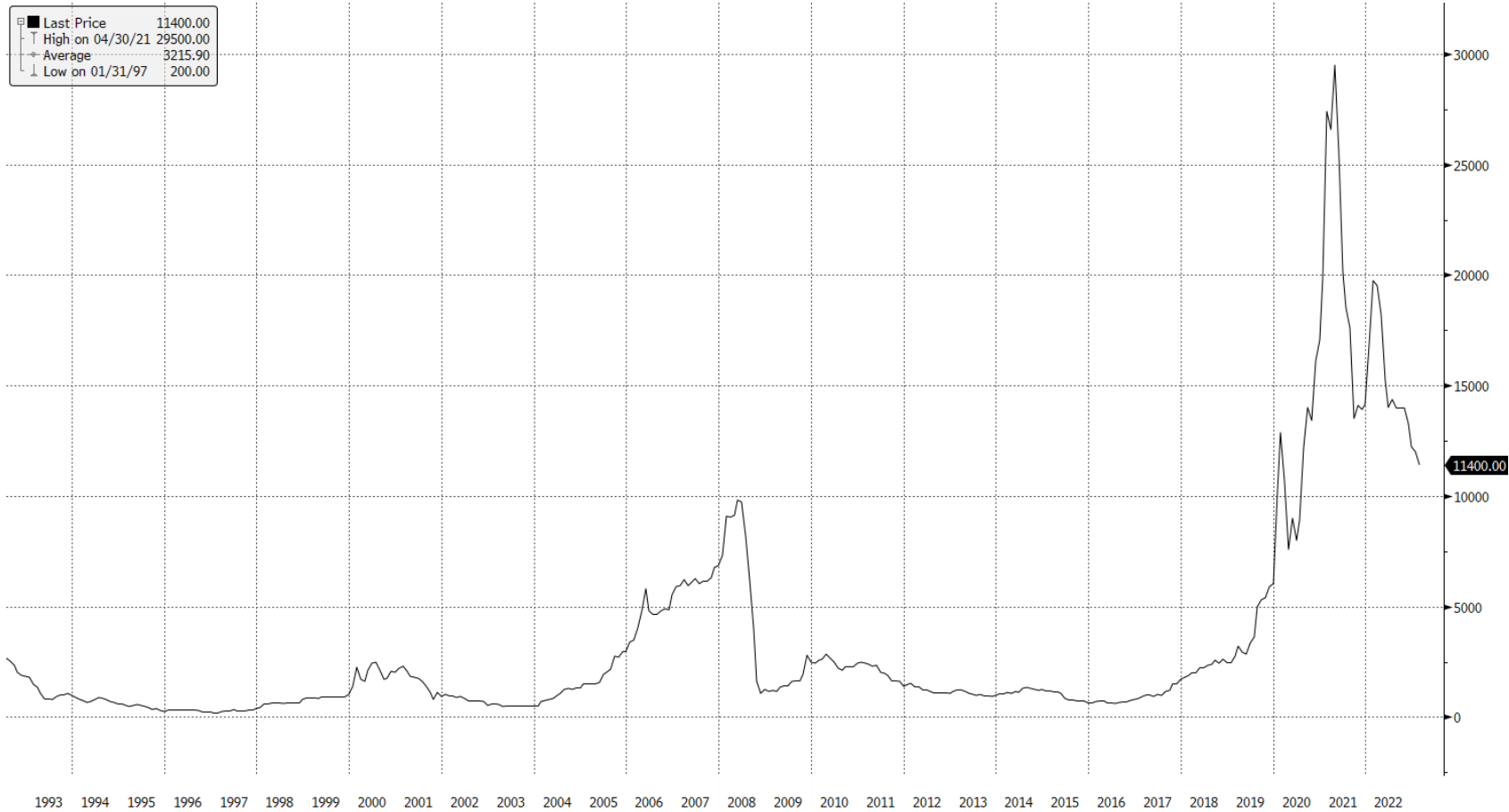
Source: Mitsubishi from Bloomberg Professional Service

Palladium prices (US\$/toz)



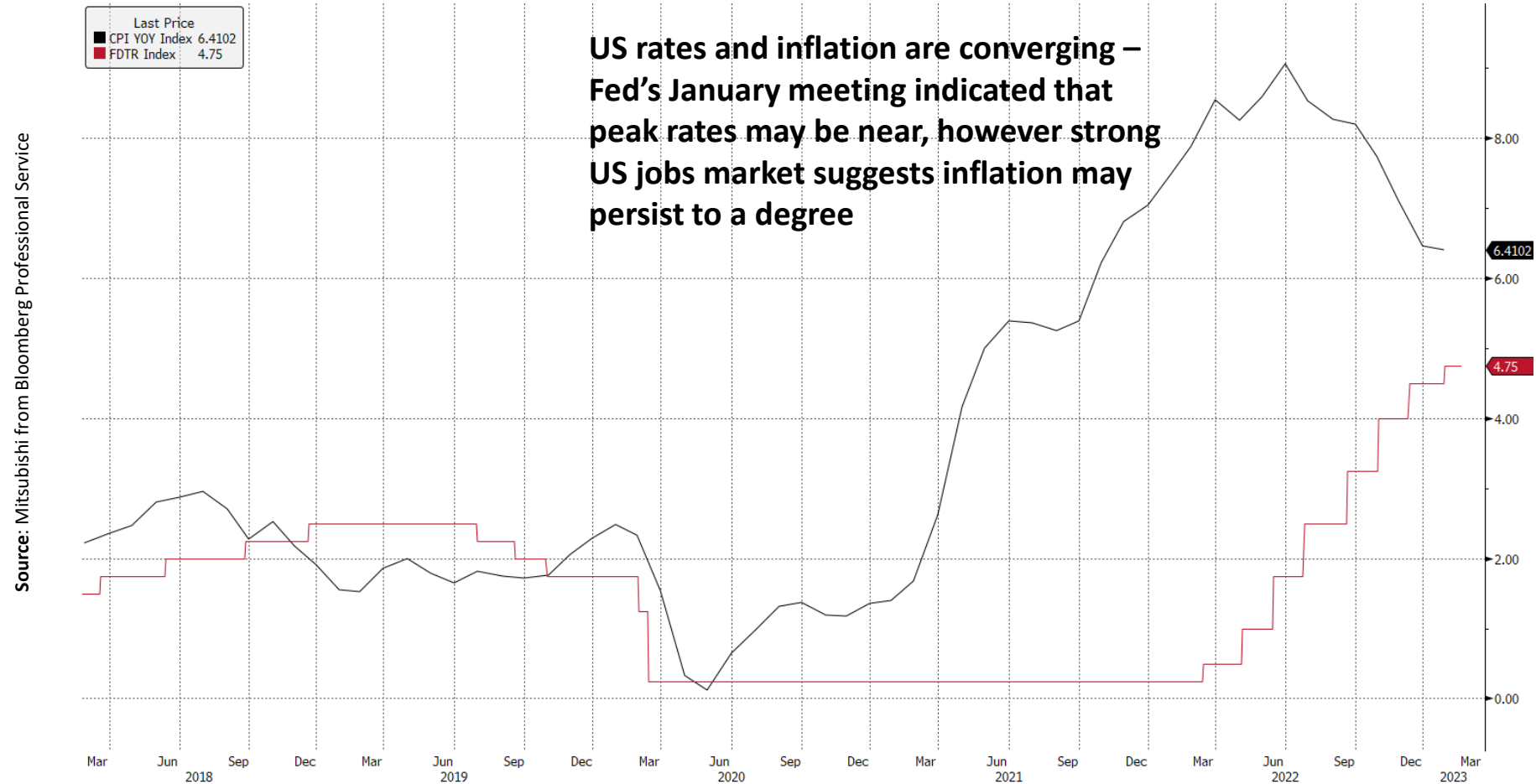
Rhodium's price performance: catching the falling knife

Rhodium prices (JM Base Price, US\$/toz)



Macros: US interest rates have been rising fast but will it continue?

US CPI Inflation (%) Fed Funds Target Rate (%)



Platinum under pressure from stronger dollar

Platinum (US\$/toz)

US Dollar Strength Index (DXY)



Lease rates have tightened substantially in platinum

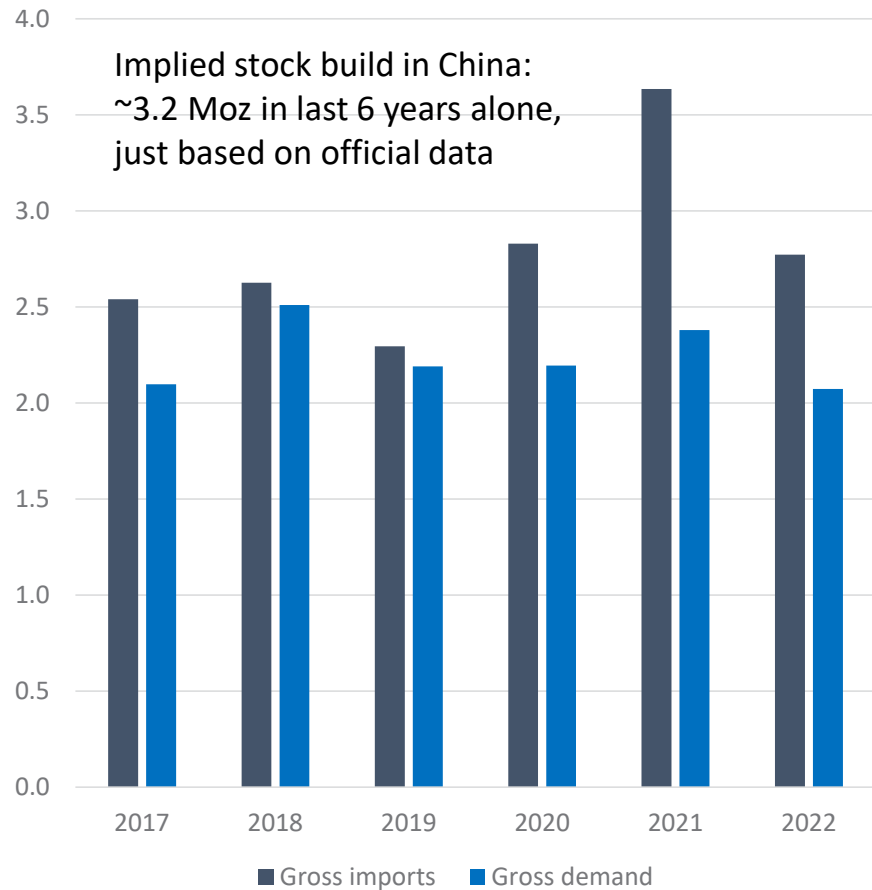
Indexed 12m lease rates (where 1st January 2018 = 100)

Platinum and Palladium



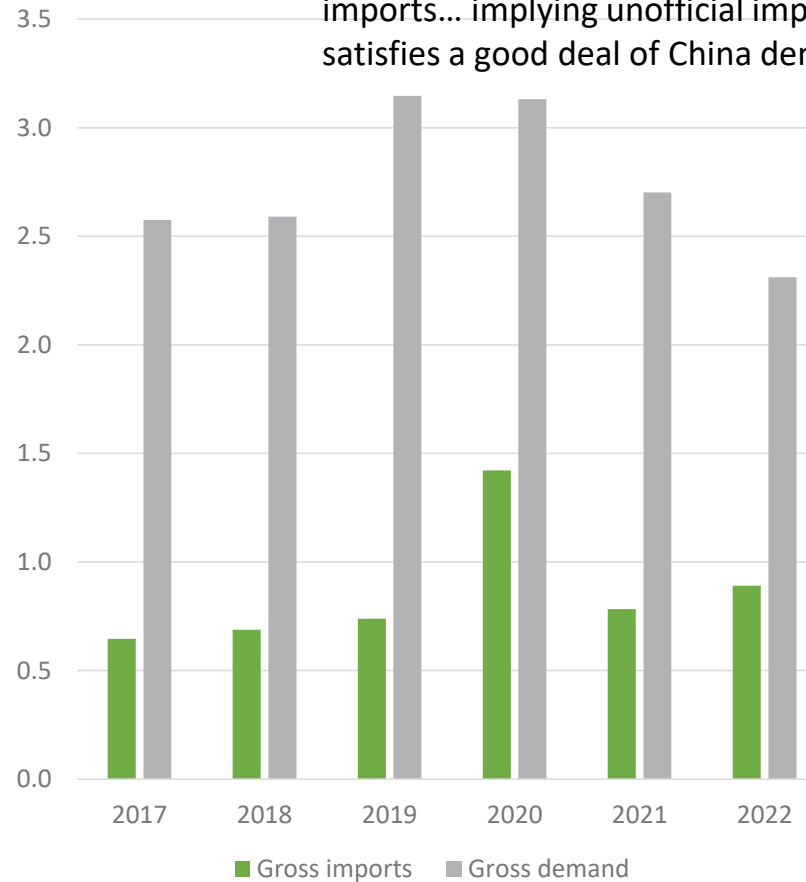
Gross imports into China vs actual demand

Platinum (Moz)



Palladium (Moz)

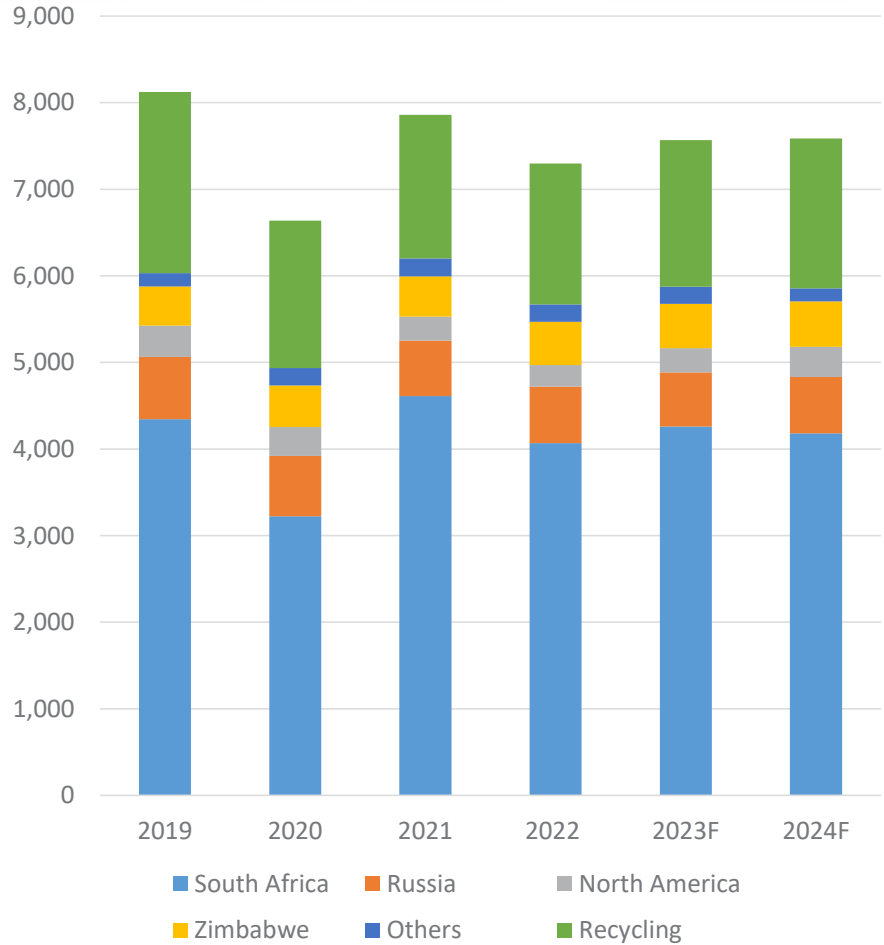
Demand runs way ahead of official imports... implying unofficial imports satisfies a good deal of China demand



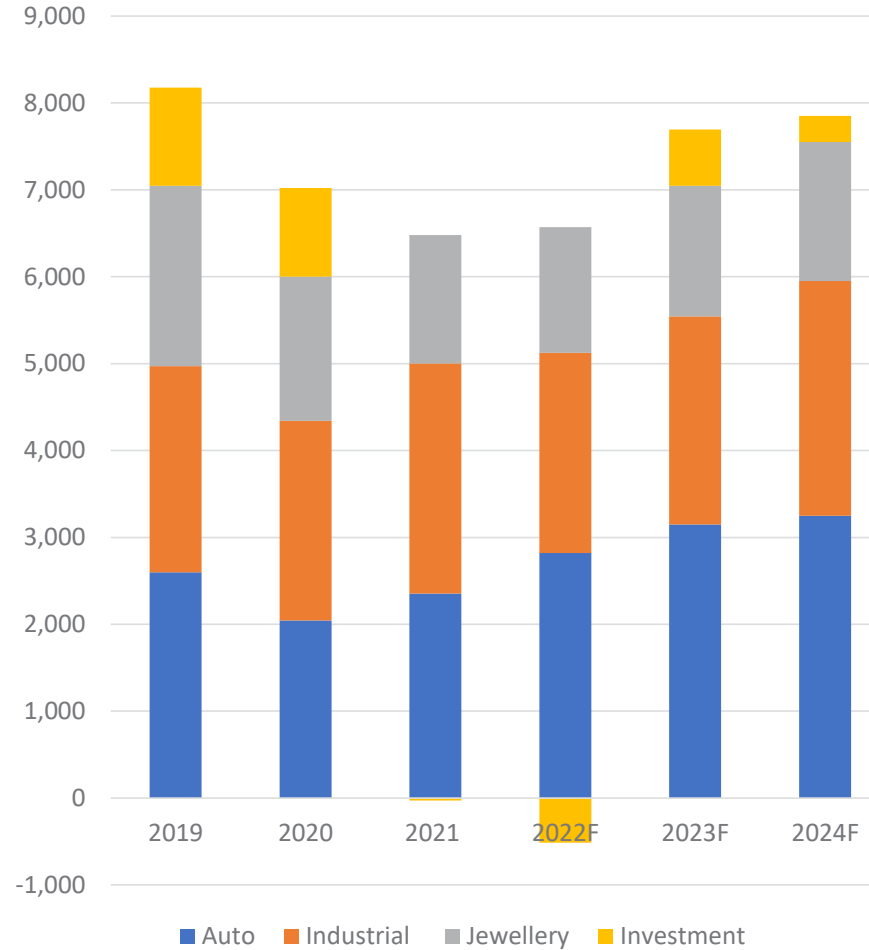
Source: Mitsubishi from China Customs administration (Gross imports), Johnson Matthey demand data (Gross demand)

Platinum: stable supply, demand recovery

Platinum supply (koz)



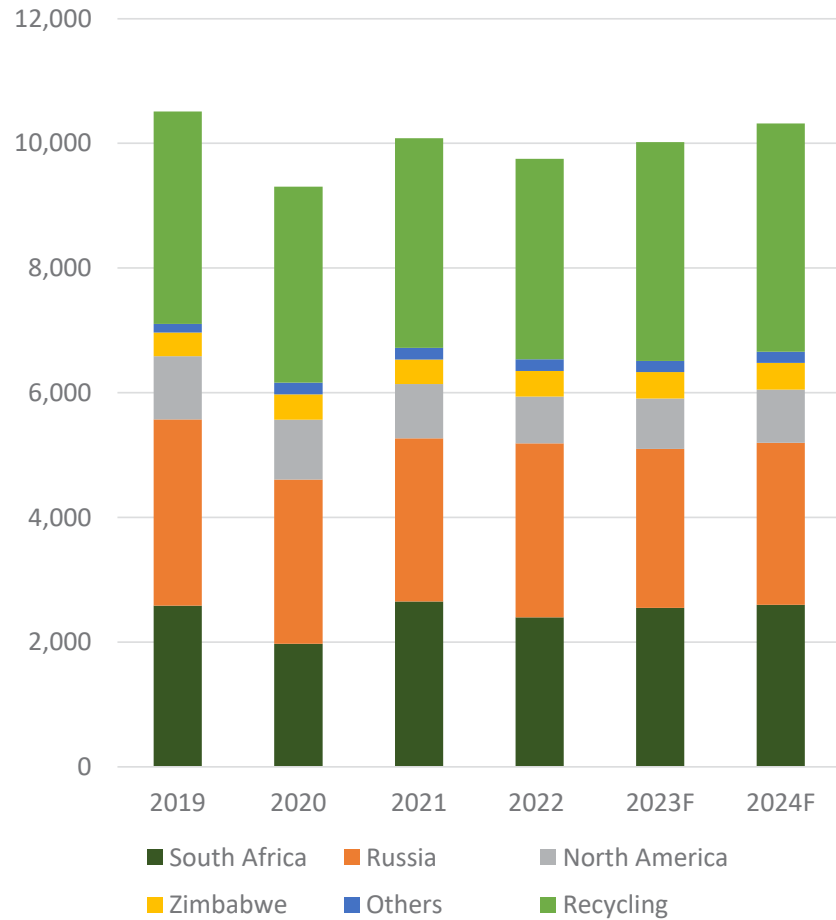
Platinum demand (koz)



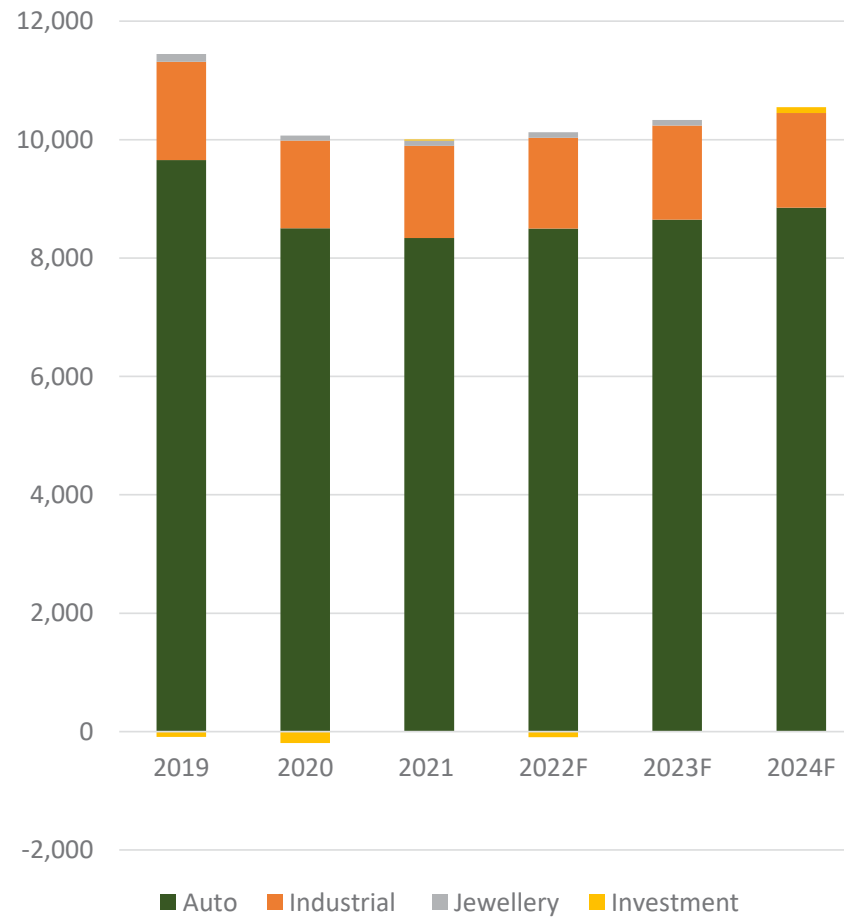
Source: Mitsubishi based on Johnson Matthey demand data (to 2022) Mitsubishi forecasts (2023 & 2024)

Palladium: stable supply, demand recovery

Palladium supply (koz)



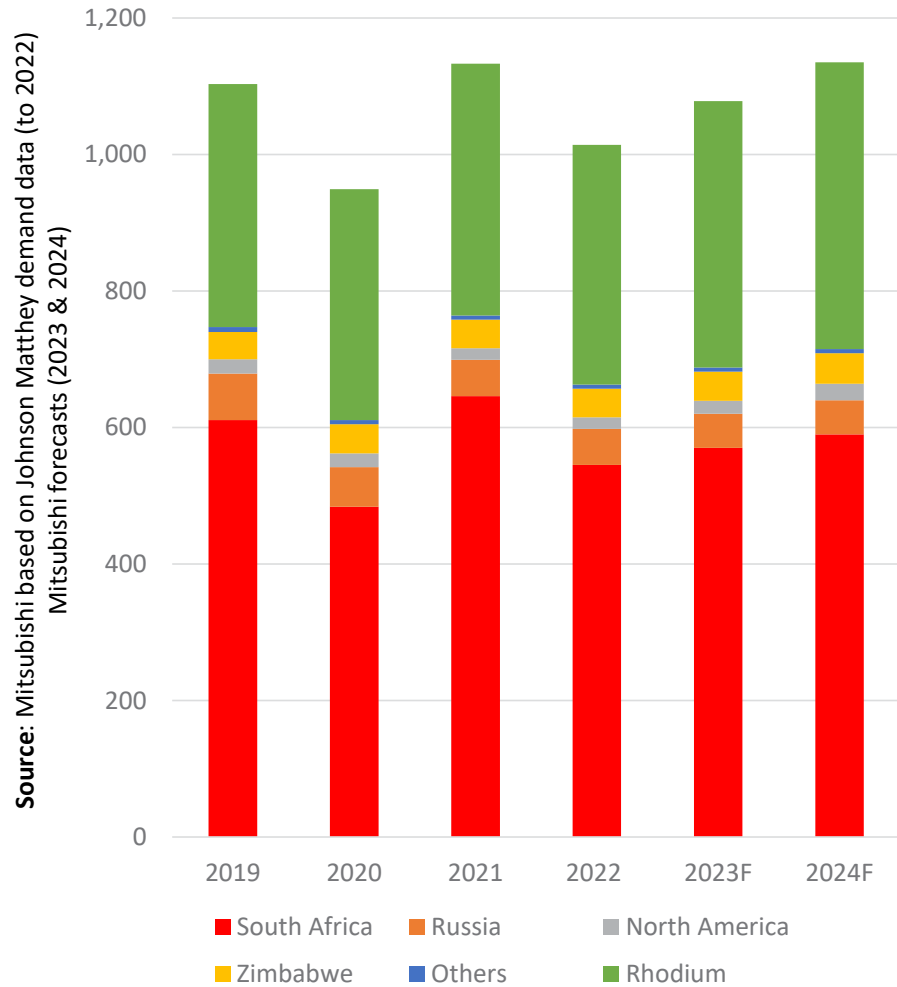
Palladium demand (koz)



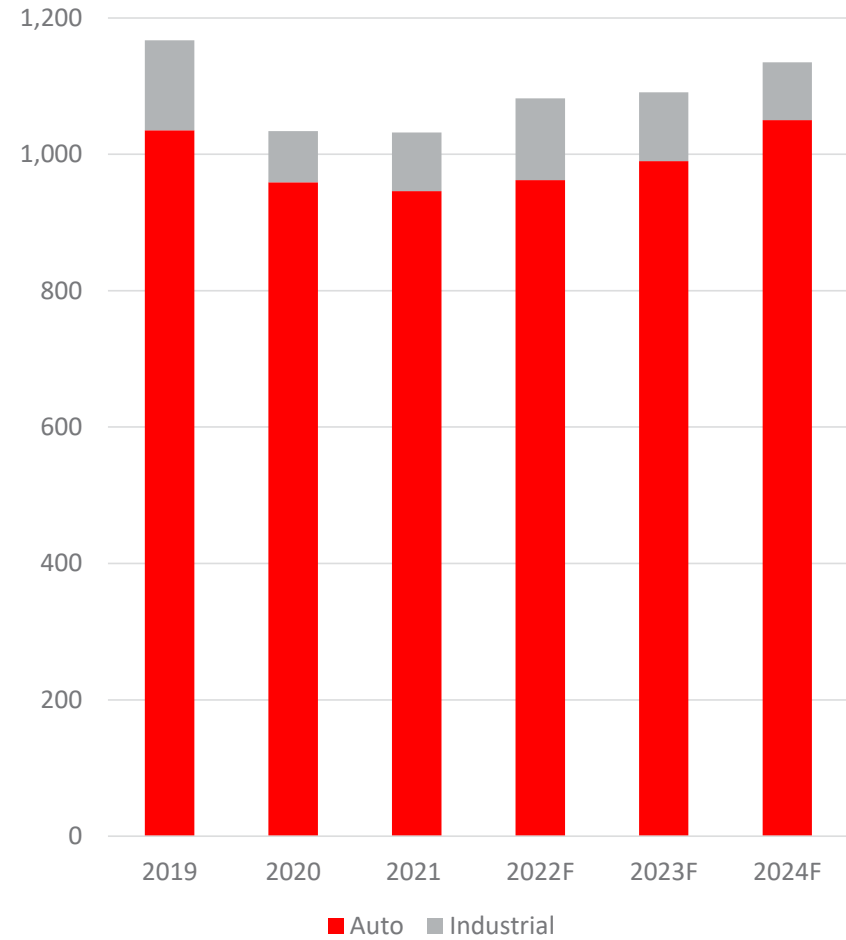
Source: Mitsubishi based on Johnson Matthey demand data (to 2022) Mitsubishi forecasts (2023 & 2024)

Rhodium: recycled supply increase, demand recovery

Rhodium supply (koz)



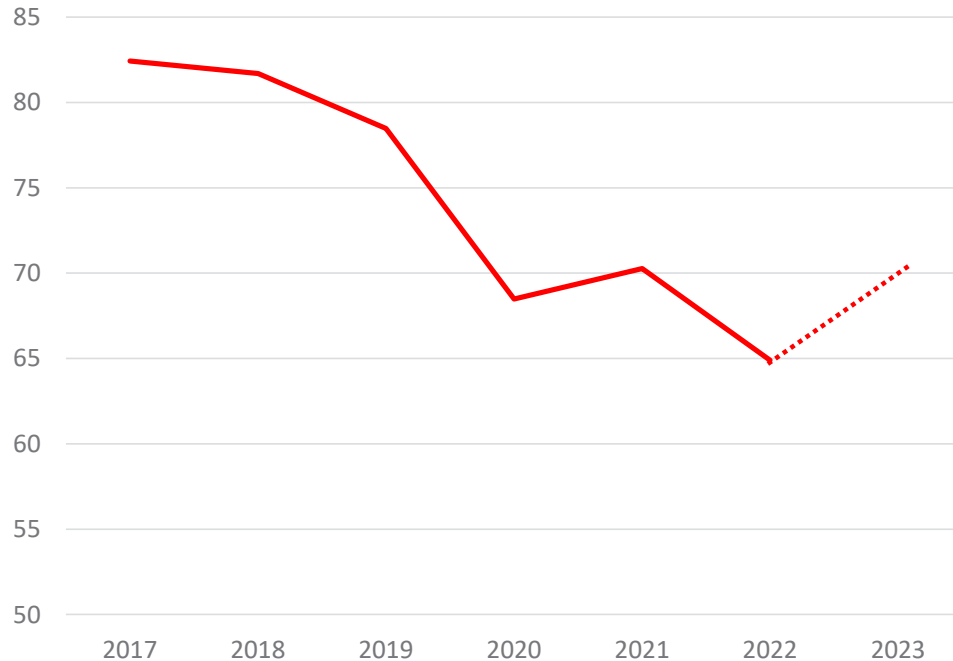
Rhodium demand (koz)



PGM Demand side: Autocatalysts



Global annual car sales (millions):



Source: Mitsubishi from various national industry data sources, IHS

Mixed regional picture:

China:

2022 YOY: +3.5%
Jan-23 YoY: -35.0%

US:

2022 YOY: -7.7%
Jan-23 YoY: +6.3%

Europe:

2022 YOY: -4.4%
Jan-23 YoY: +11.3%

Platinum remains cheap compared to palladium, though has gained lately

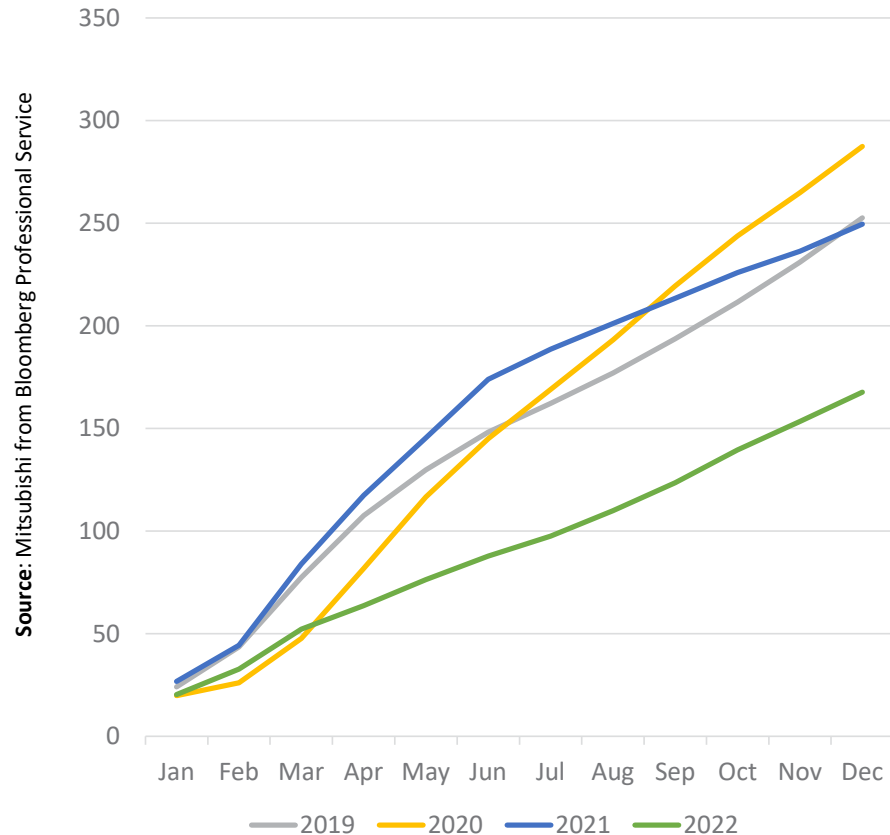
Platinum / Palladium ratio



Source: Mitsubishi from Bloomberg Professional Service

Heavy duty emissions control in China

China heavy duty truck sales ('000s)



2023 marks the full nationwide implementation of China VIb emissions legislation for heavy duty diesel vehicles

- Up to 7x reduction in NOx emissions compared with China V
- Particulate number limit
- Ammonia emissions limit
- Increase in durability requirement

India also moving to Bharat Stage 6 with particulate number limit

View from Europe: Euro 7

Euro 7 Public consultation ended on 9th February:

Updated timetable for implementation:

- Passenger cars from mid-2025 but concerns remain if this is achievable
- Commercial vehicles from mid-2027

Many OEMs oppose the targets but the catalyst industry is calling for swift adoption of the standards to enable technology development and implementation

Impact on PGM demand:

- ➔ Lower NOx limits for light and heavy duty diesel
- ➔ Particulate matter will be lowered by 13% from cars and vans, and 39% from buses and lorries
- ➔ Introduces ammonia emissions limits
- ➔ Tightens compliance by removing conformity factors

Limits For M2, M3, N2 & N3 vehicles Units: mg/kWh	Euro VI	Euro VII proposal		
		Cold 100 th percentile	Hot 90 th percentile	Budget Trips < 3xWHTC
NOx	460	350	90	150
PM	10	12	8	10
PN (#/kWh) Euro VI : PN ₂₃ Euro VII : PN ₁₀	6x10 ¹¹	5x10 ¹¹	2x10 ¹¹	3x10 ¹¹
CO	4000	3500	200	2700
NMOG	160	200	50	75
NH ₃	10 ppm	65	65	70
CH ₄	500	500	350	500
N ₂ O	-	160	100	140
HCHO	-	30	30	-

Source: European Commission / Mobility Notes

View from Europe: ICE engine ban

European ICE engine ban

On 14th February, the European Parliament approved a law that by 2035 carmakers must achieve a 100% cut in CO₂ emissions from new cars – this will **effectively ban the sale of new petrol / diesel cars in the EU**

- An **existential threat** to PGMs in ICEs? However it is unlikely to be implemented in this timescale due to challenges with battery material availability and electrical grid infrastructure
- **Europe only represents 15% of new car sales**, so impacts could be limited even if it is fully implemented
- It potentially creates opportunities for PGM-using **hydrogen fuel cell vehicles** and **green synthetic fuels**
- **The legislation threatens to distort the end of life vehicle recycling market if older ICE cars stay on the road for longer- the so-called “Cuba effect”**



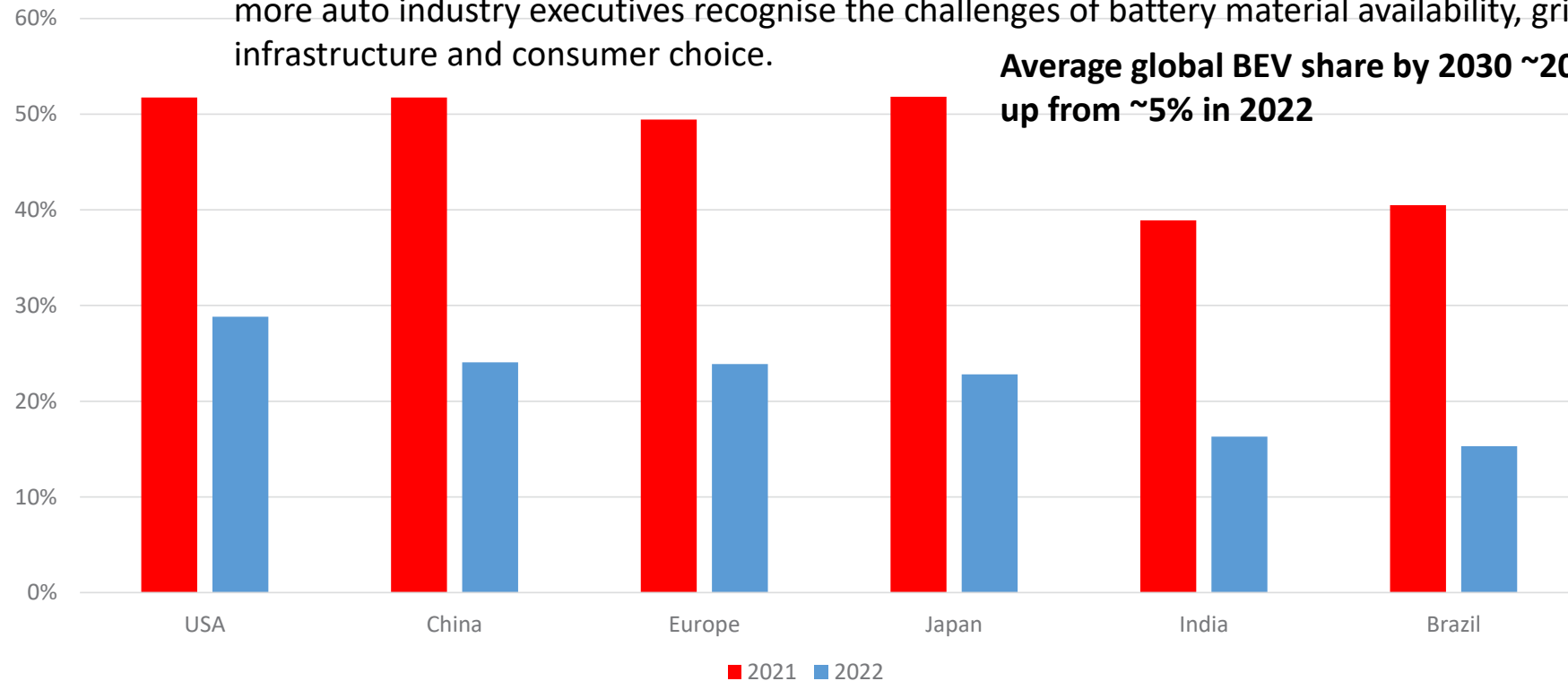
BEV adoption: longer term threat?

KPMG'S Annual Global Automotive Executive Survey: comparison of 2021 and 2022:

“By 2030, what percentage of new vehicles sales do you believe will be battery-powered (excluding hybrids) within each market?”

Expected BEV adoption by 2030 has roughly halved between the 2021 and 2022 surveys as more auto industry executives recognise the challenges of battery material availability, grid infrastructure and consumer choice.

Average global BEV share by 2030 ~20%, up from ~5% in 2022



Source: Mitsubishi from KPMG Global Automotive Executive Survey 2021 and 2022 <https://experience.kpmg.com/gaes-2022#/subpage/home>

New PGM opportunities: US IRA and EU Green Deal, and beyond

US Inflation Reduction Act:

Long term support for green hydrogen:

- **US\$13 billion committed for green hydrogen** in amongst \$369 bn of spending
- **Includes a clean hydrogen production tax credit** of \$3/kg which should make US green hydrogen the most cost competitive in the world
- Introduces tax credits for **hydrogen projects and storage technologies**

Short term PGM benefits:

- **\$7,500 tax credits** for the purchase of 'clean vehicles' including hybrids
- **\$4,000 tax credits** for plug in hybrid and fuel cell vehicles

EU Green Deal Industrial Plan:

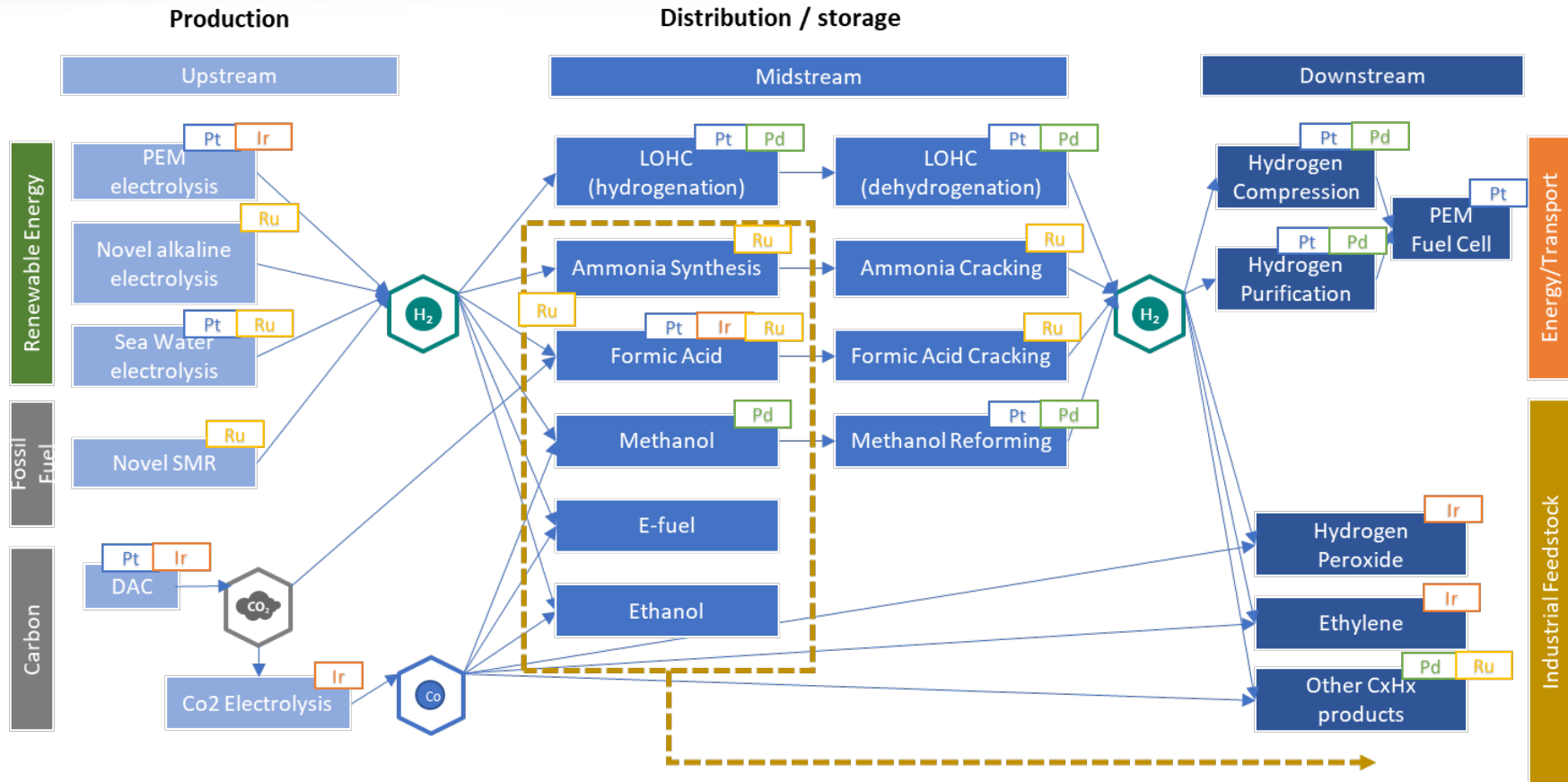
Long term support for green hydrogen

- **Direct subsidies for green hydrogen** including a fixed premium per kg of hydrogen produced
- Speed up permitting for electrolysers and relaxation of state aid rules
- **Establishment of Hydrogen Bank**
- **Investment in Hydrogen Skills Academy**

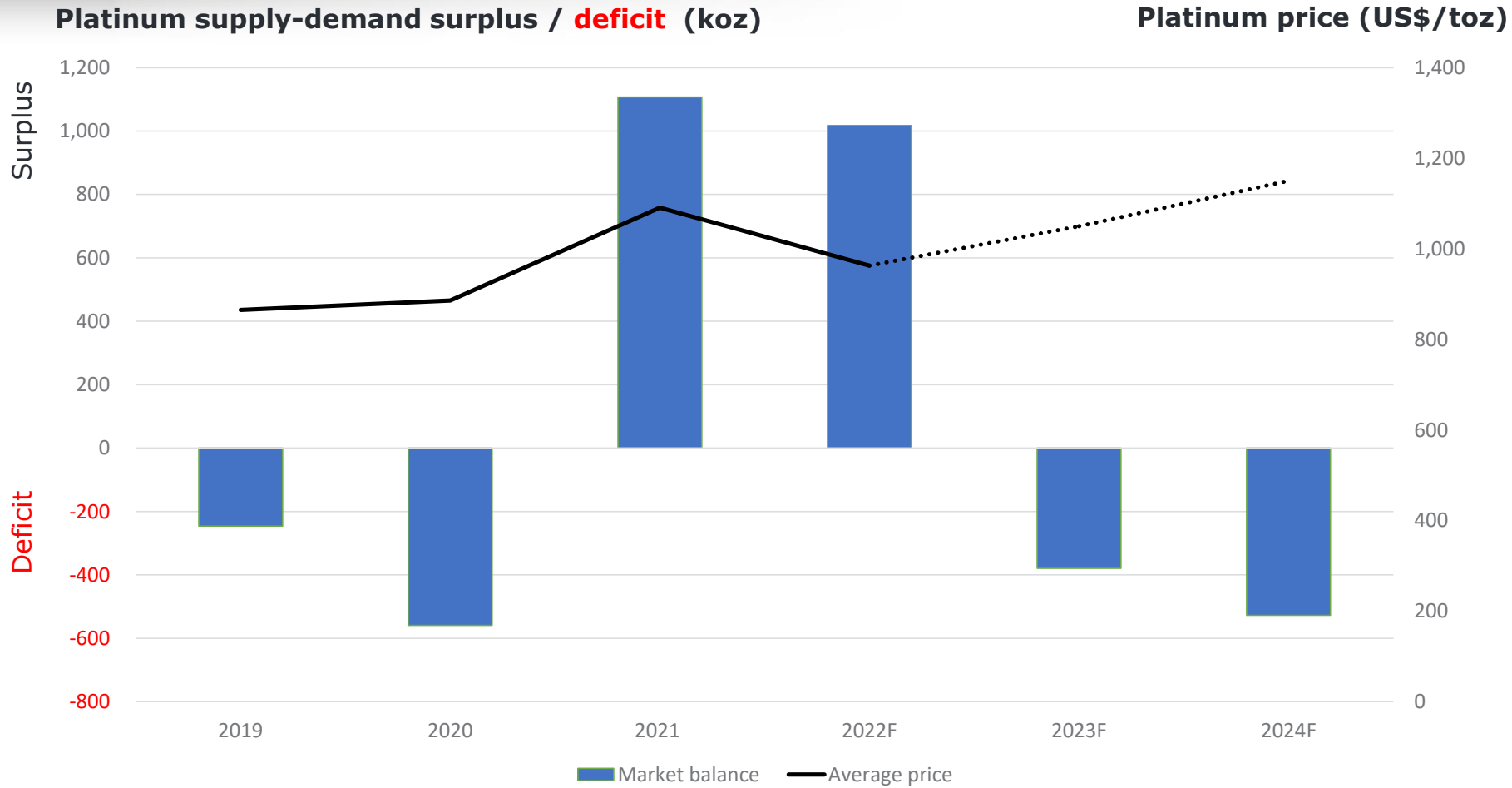
Meanwhile in China...

China State Council's New Energy Vehicle Industrial Development Plan (2021-2035) encourages the adoption of PEM fuel cell and electrolyser technologies and the securing of platinum and other strategic raw materials for the long term

Longer term opportunities: PGMs in the hydrogen value chain

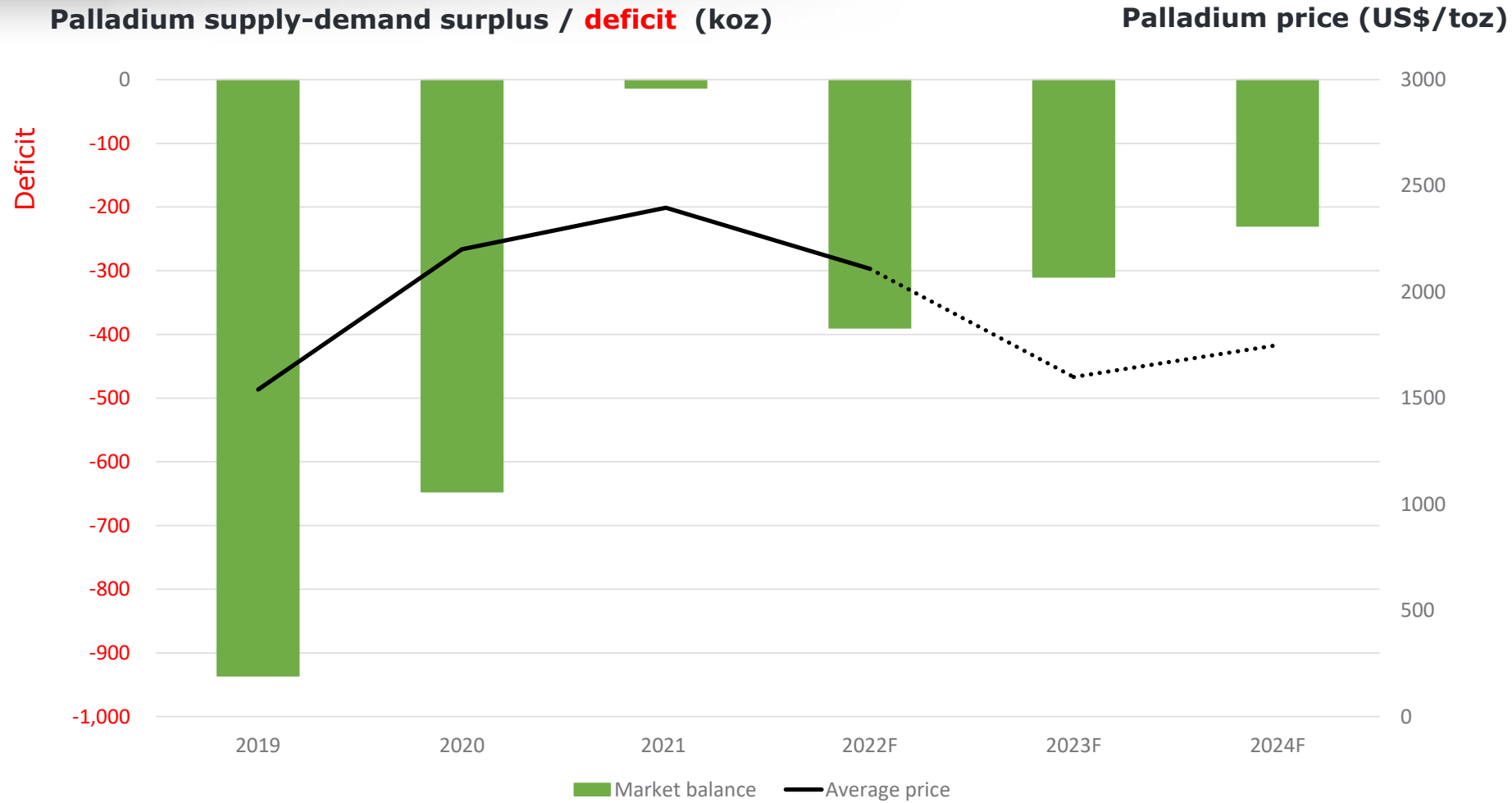


Platinum: moving into deeper deficits



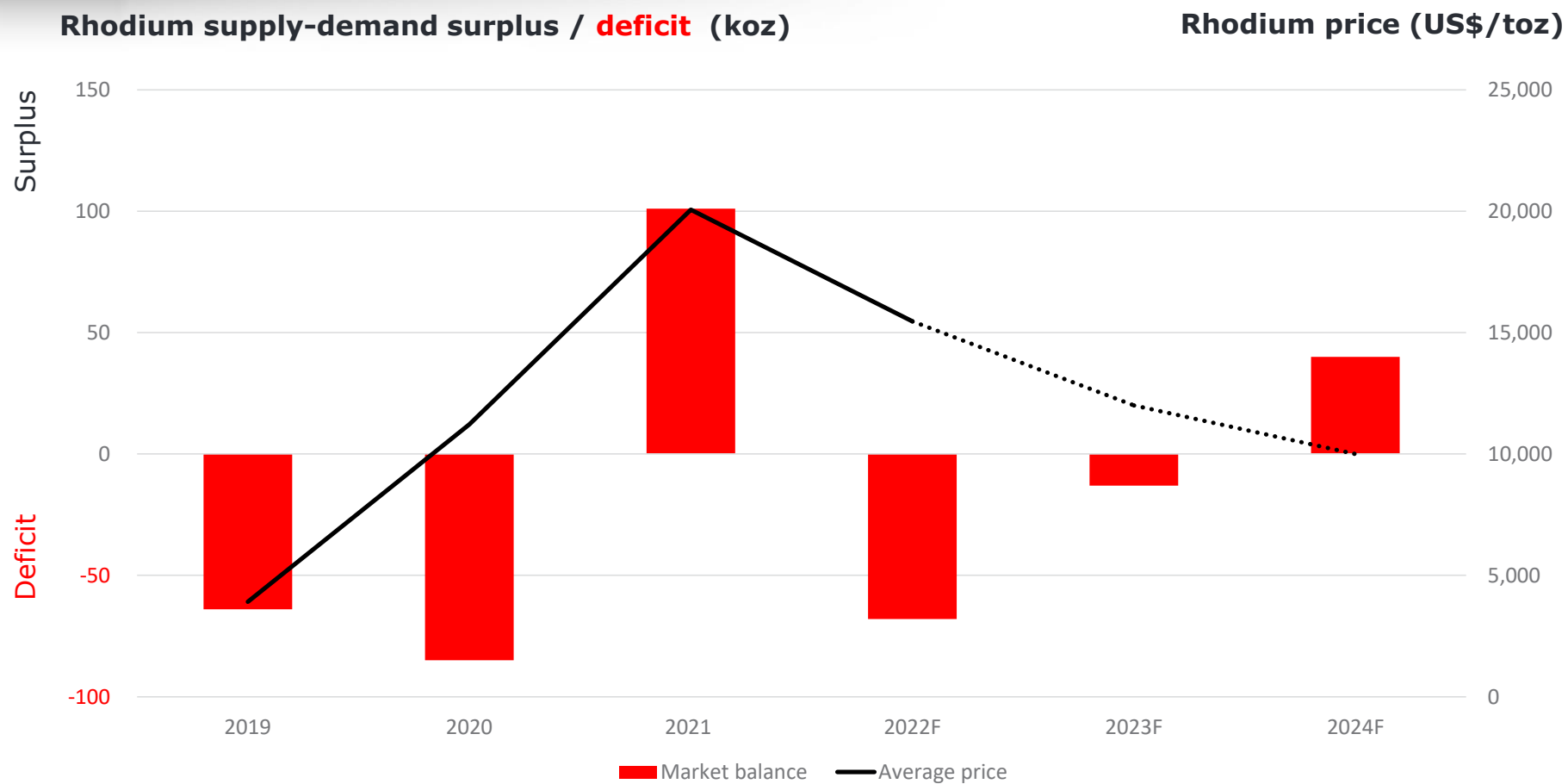
Source: Mitsubishi based on Johnson Matthey demand data (to 2022) Mitsubishi forecasts (2023 & 2024)

Palladium: moving towards surplus



Source: Mitsubishi based on Johnson Matthey demand data (to 2022) Mitsubishi forecasts (2023 & 2024)

Rhodium: moving into oversupply?



Source: Mitsubishi based on Johnson Matthey demand data (to 2022) Mitsubishi forecasts (2023 & 2024)

Thank you!

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