



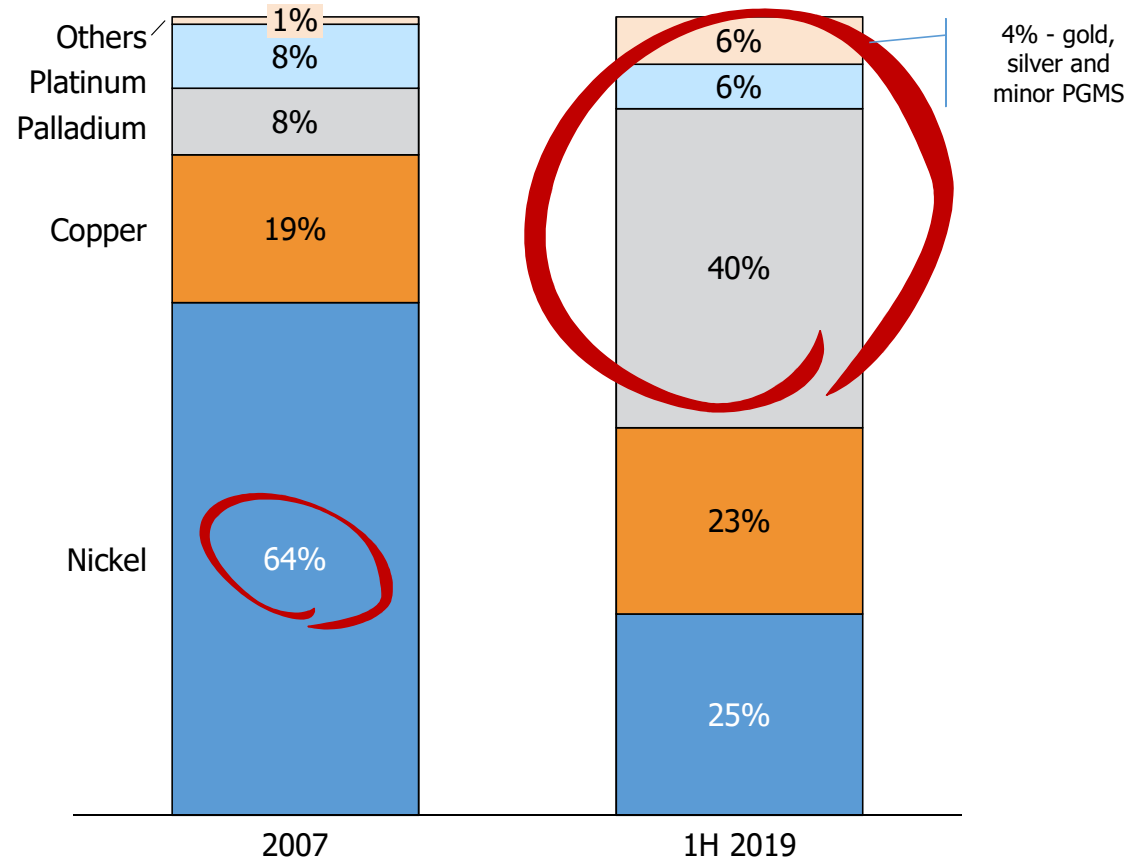
**NORNICKEL**



# **PGM Market A “New Normal” and Future Challenges**

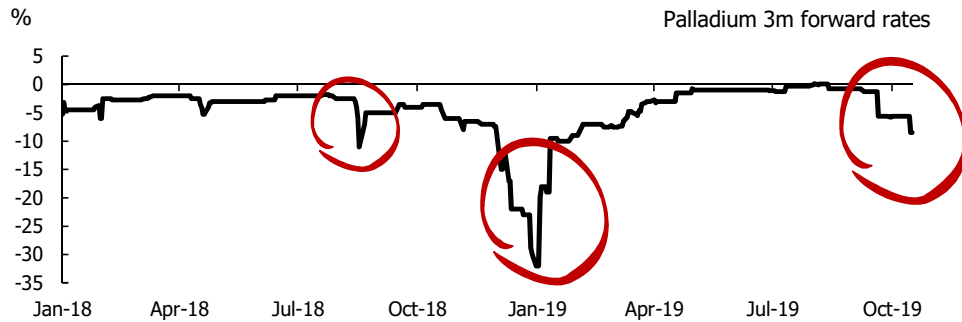
**Peter Varyushin**  
Sales and marketing specialist  
IPMI Europe Conference  
November 18, 2019

## Precious Metals Share in Nornickel Revenue Basket is nearly 50% in 1H 2019

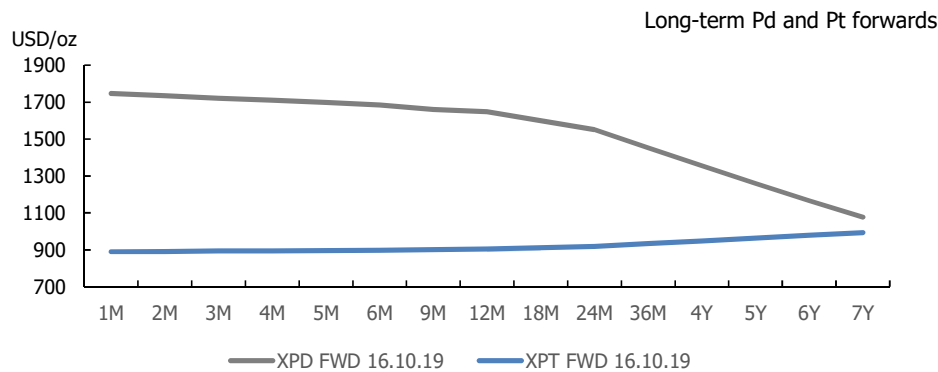


# Palladium: Spot Market Tightness Softening but Fundamentals Remain Strong

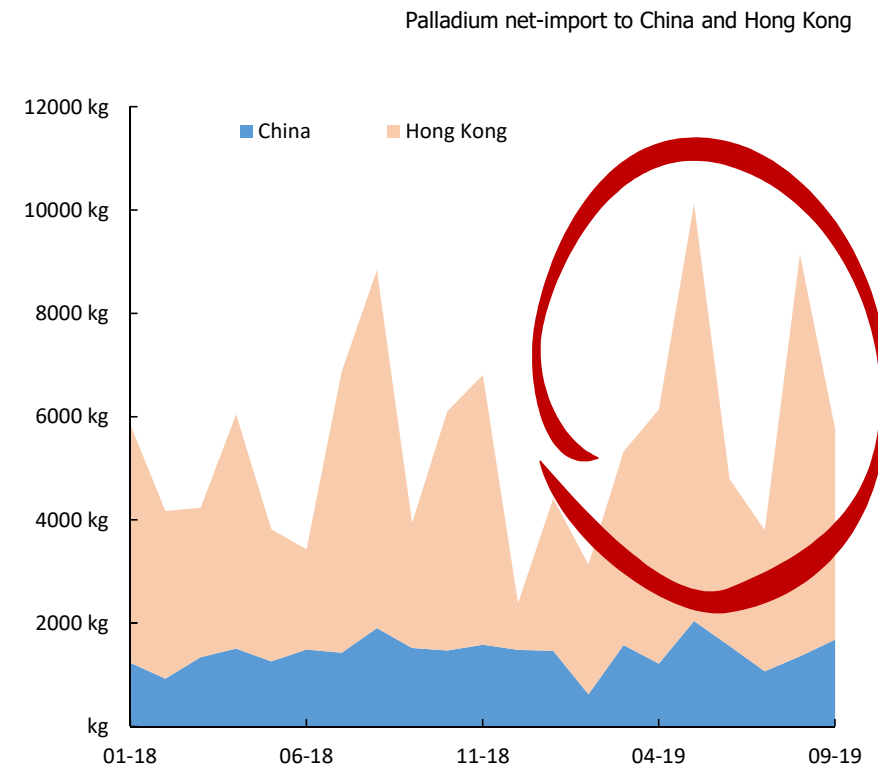
Backwardation Was Driven by Spot Market Tightness Caused by Strong Ingots Buying in China



Forwards: Palladium is Seen Traded with a Premium to Platinum for the Next 7 years

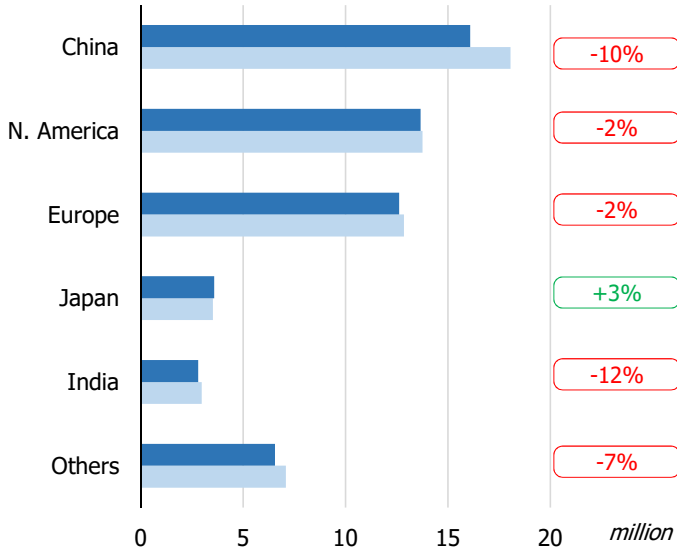


Strong Demand in China due to National 6 Introduction



# Automotive Sales Decline but PGM Loadings Increase

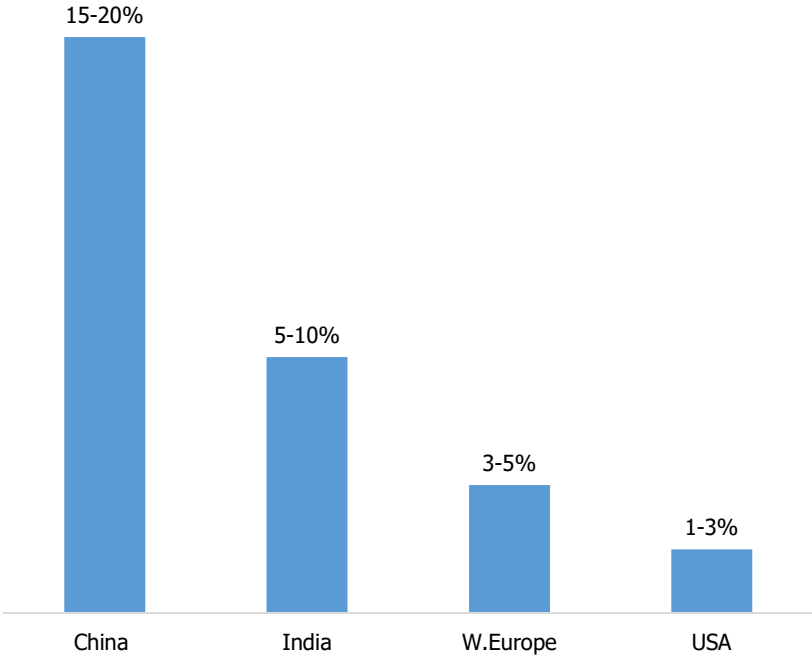
Global Automotive Sales <sup>(1)</sup> Decreased by 6% in Jan – Sep 2019 Y-o-Y



■ Jan – Sep 2018  
■ Jan – Sep 2019  
xx% Change, Y-o-Y

Expected Increase in Pd Loadings in 2019 due to Stricter Emission Regulations and Introduction of RDE Despite Engine Downsizing

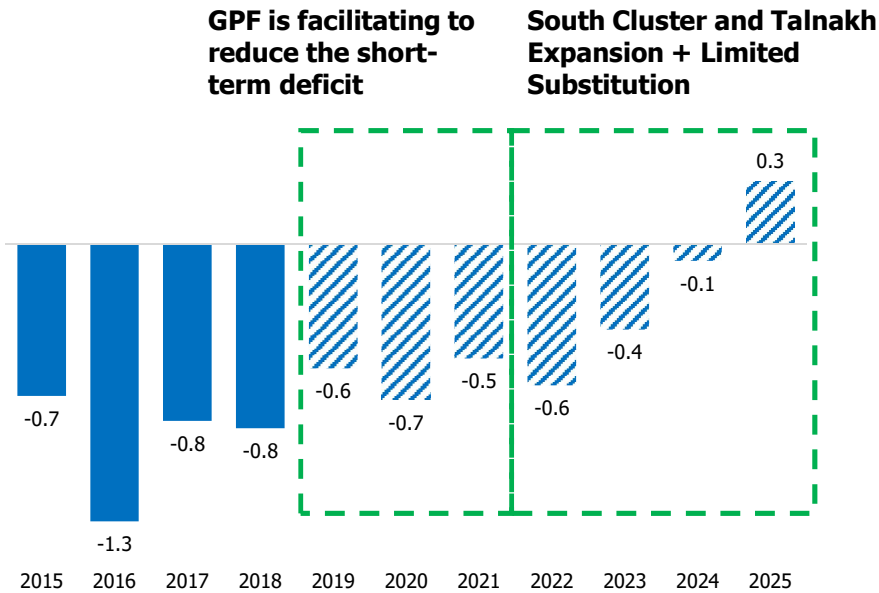
Average PGM loadings per vehicle, change in 2019, (%)



# PGM Market in the New Status Quo

Palladium Deficit is Driven by the New Status Quo in Autocatalyst Business. Nornickel is Providing Solutions for Sustainable Supply

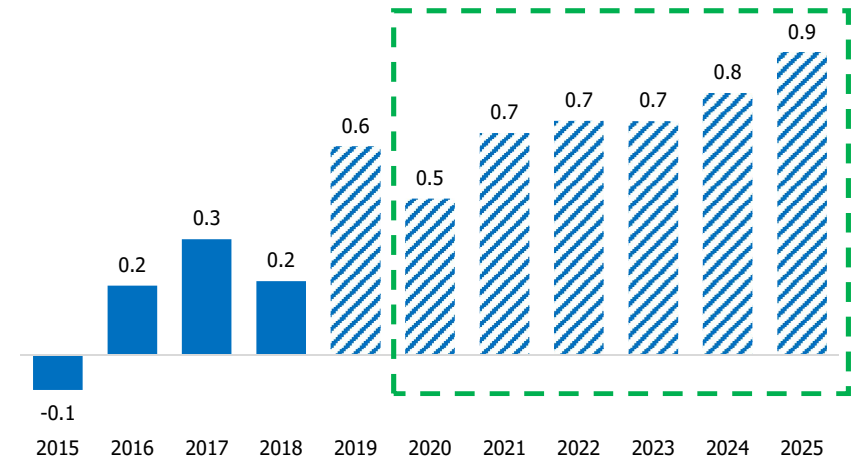
Palladium production/consumption balance, MOz



Platinum Market: Strong Intrinsic Growth Opportunities

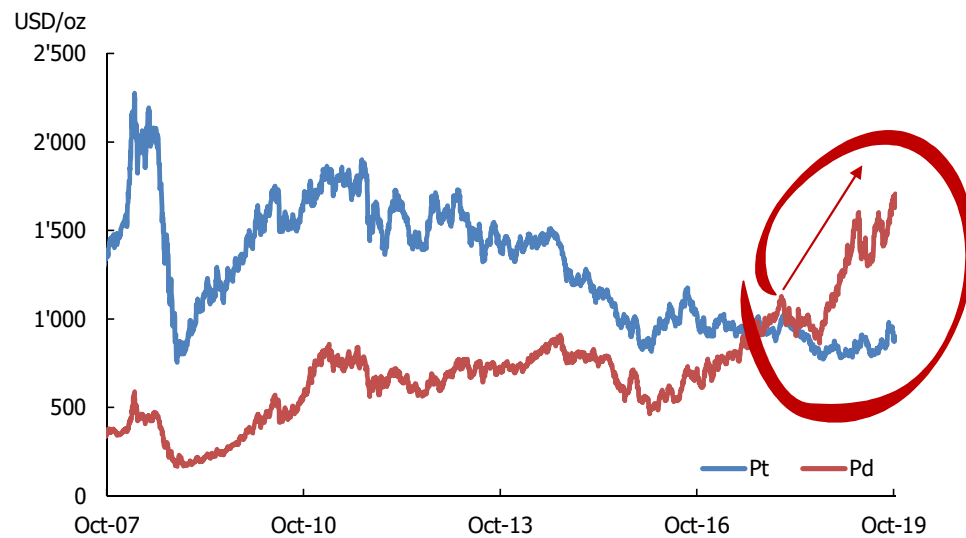
Platinum production/consumption balance, MOz

**Accelerating industrial and HDD demand, possible jewellery market Renaissance and growing investment offtake may absorb a significant part of the surplus**



## Premium of Palladium to Platinum is Sustainable in the Mid-Term

Palladium Established a Sustainable Premium to Platinum on Stronger Fundamentals...



... as Pd Loadings in Gasoline Vehicles are Supported by Higher Fair Value-in-Use

	Palladium	Platinum
Thermal durability	Higher	Lower
HC and CO oxidation at low temperatures	Higher	Lower
NOx reduction	Higher	Lower

- Palladium performs better than platinum in gasoline vehicles
- Introduction of Real Driving Emission tests incentivizes «over engineering» and higher palladium loadings
- Long-term stability/reliability of supply is supportive of palladium demand
- Progress in the development of prospective mining projects should mitigate structural deficit in the medium-term

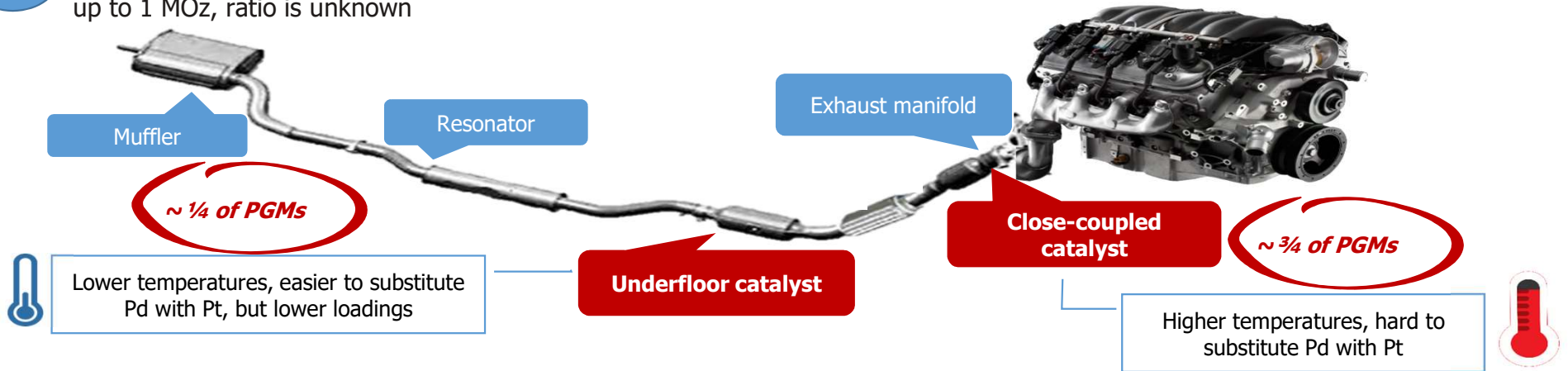
# Palladium Substitution: Three Possibilities and Challenges

## I Pd-rich Diesel Catalysts used in North America

up to 0.5 MOz with 1:1 ratio

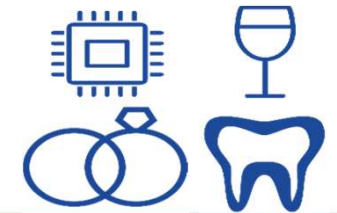
## II Gasoline Vehicles: obstacles in substitution in close-coupled converter

up to 1 MOz, ratio is unknown



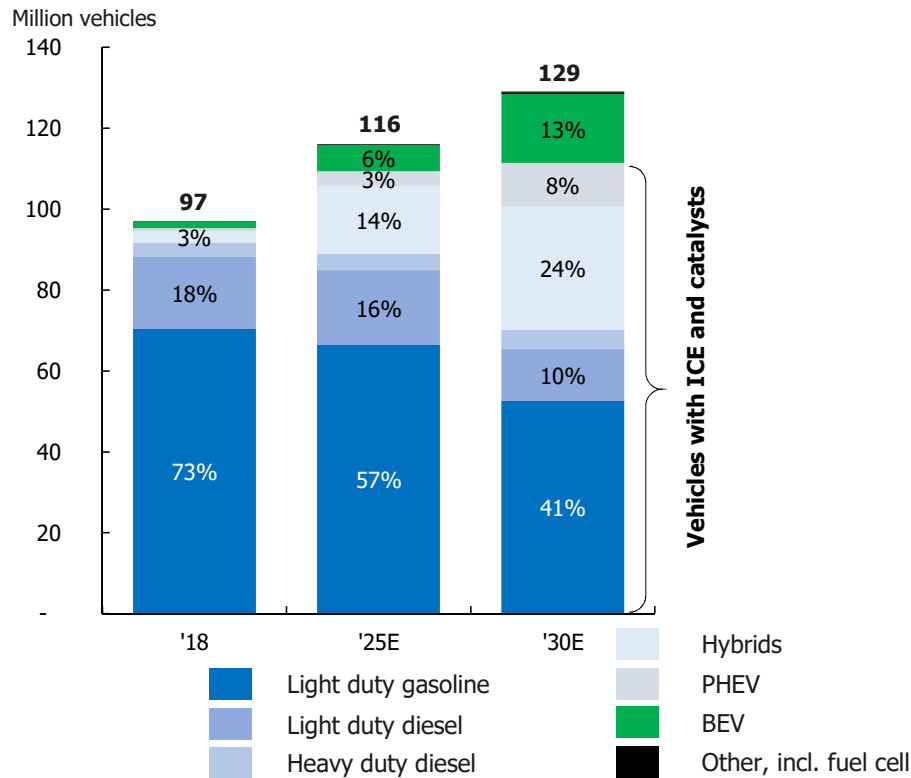
## III Substitution in other industrial applications

Only a lack of the metal available for spot purchase can push consumers to start a full-scale replacement



# Powertrain Structure & Battery Materials Bottlenecks

## Automotive Market Is Going To Be ICE-dominated



## Battery Market Limitations and Supply Chain Bottlenecks

China: financial incentives for domestically built electric vehicles were cut by some 75% in 2019

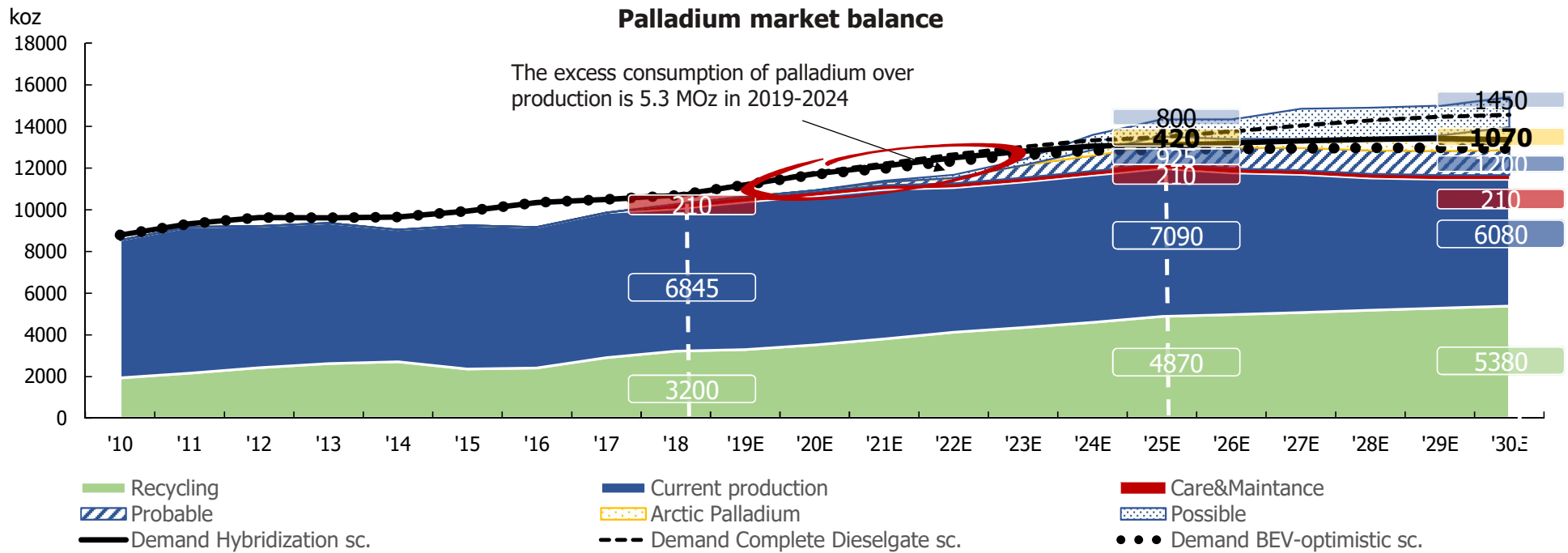
NEV sales in July 2019 in China fell by -5% YoY for the first time in 5 years

12 million EVs and PHEVs in 2025 will require incremental supply of over 700kt of nickel (30% of global nickel demand in 2019) and 80kt cobalt (50% of 2019 demand)

**Nickel market is in deficit and recently announced Indonesia ban will make it wider**



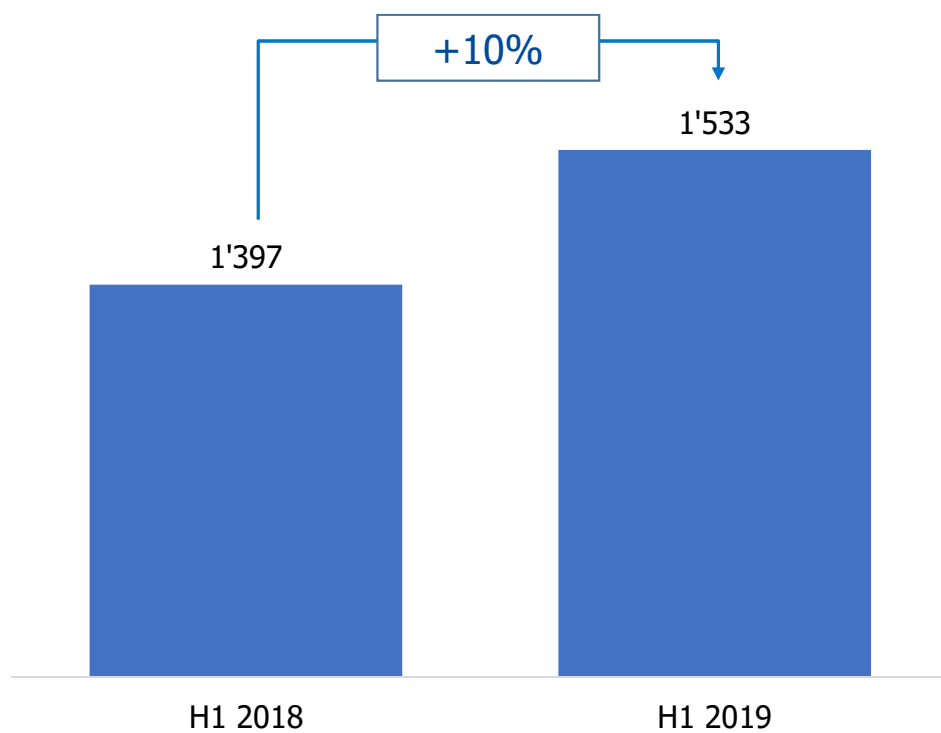
# Palladium & 3E PGM Supply/Demand Balance: Long-Term Forecast



## Nornickel: Short-Term Measures to Provide Liquidity to the Market

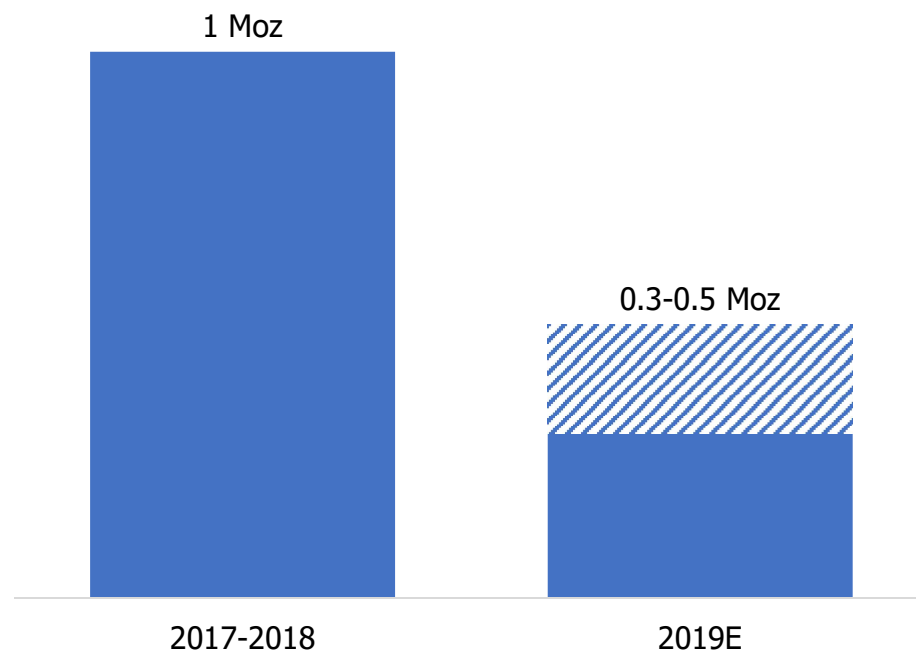
Current Production Ramp-Up: Additional Metal Came from WIP Material

Nornickel palladium production, koz

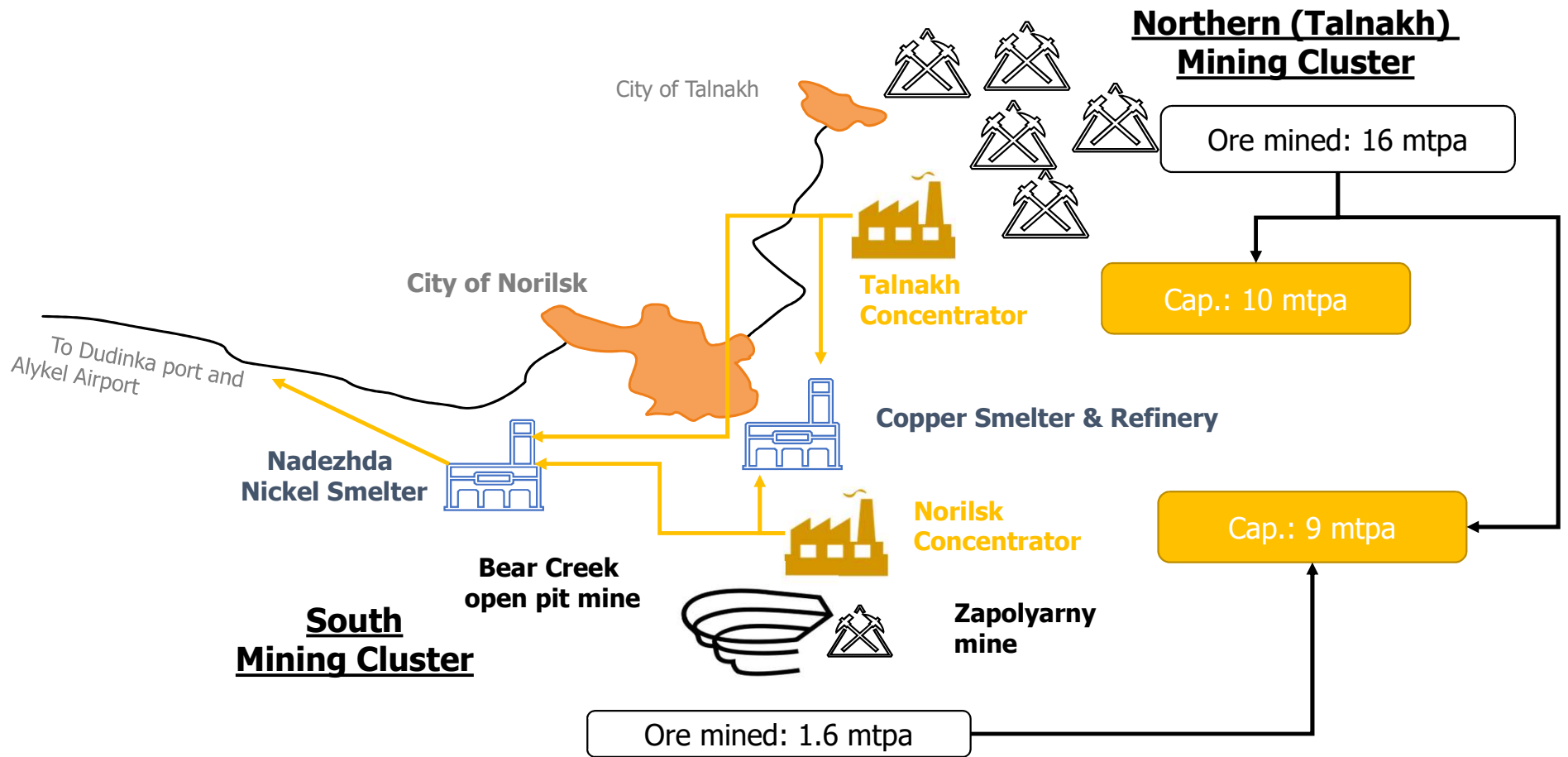


Global Palladium Fund has been Continuing to supply the Market from Previously Unavailable Stocks

GPF shipments



# Norilsk Nickel: Current Production Flow in Norilsk



# Norilsk Nickel: Talnakh and South Cluster Expansion

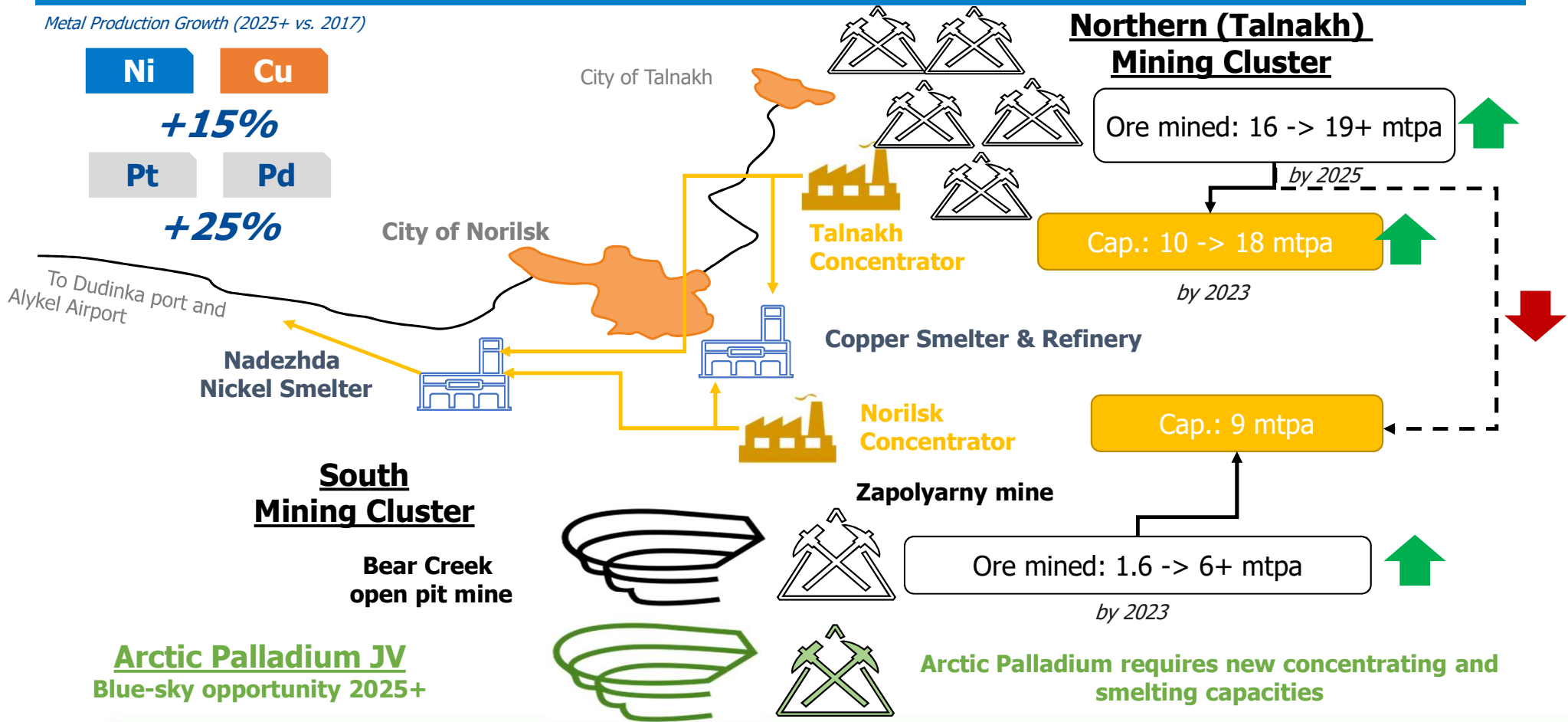
Metal Production Growth (2025+ vs. 2017)

**Ni** **Cu**

**+15%**

**Pt** **Pd**

**+25%**



## PGM and Nickel Market Reports by Nornickel

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Available at:  
<https://www.nornickel.com/investors/commodity-research/>