

# Advanced Materials

Circularity for critical metals



Denis Goffaux

Advanced materials as a key enabling **technology in various sectors**



# Foundation of a *circular* materials technology company

With synergies in mobility businesses



E&ST	Cobalt & Specialty Materials	Plating, chemicals, automotive, construction		Residues from tooling and chemical industries	Chemicals used in cathode active materials and tires
	Metal Deposition Solutions	Consumer electronics, decorative applications, automotive		Connectors, Printed Circuit Boards	
	Electro-Optic Materials	Space, optics and electronics		Ge bearing residues	Pedestrian detection
Recycling	Precious Metals Refining	Metal recycling and refining industry		Recycling 17 metals	...used in various applications
	Precious Metals Management	Precious metal consumers (internal and external)		Traceability	Security of supply
	Jewelry & Industrial Metals	Jewelry, high-purity glass, chemicals		Recycling Gold, Silver, Platinum from jewellery and industrial applications	
Catalysis	Precious Metals Chemistry	Life science, fine chemicals		Closed-loop offering (with PMR)	Precursors for automotive and fuel cell catalysts

*Serving demanding high-tech applications*

*Synergies in R&D, metal management*

*Circularity = efficient and sustainable business model*

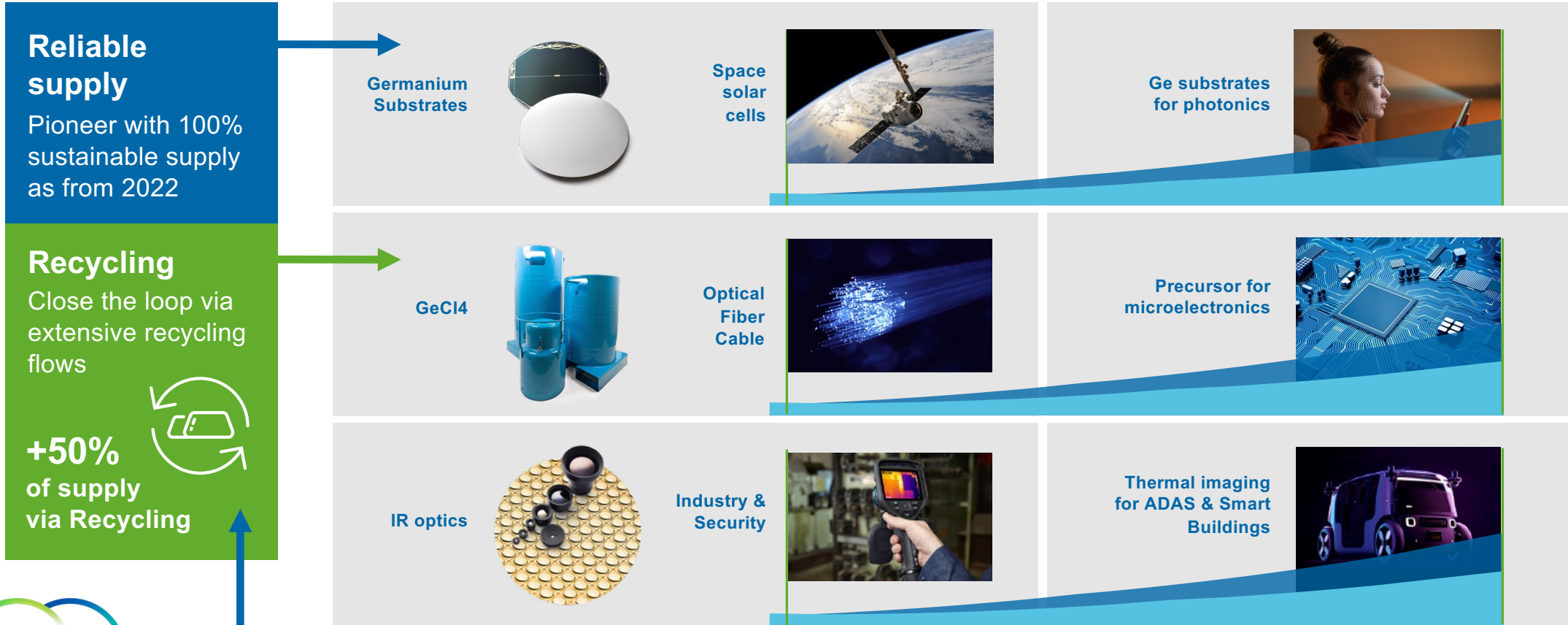
*Supporting mobility value proposition*

# Electro-Optic Materials

## State-of-the-art applications in a sustainable closed-loop model

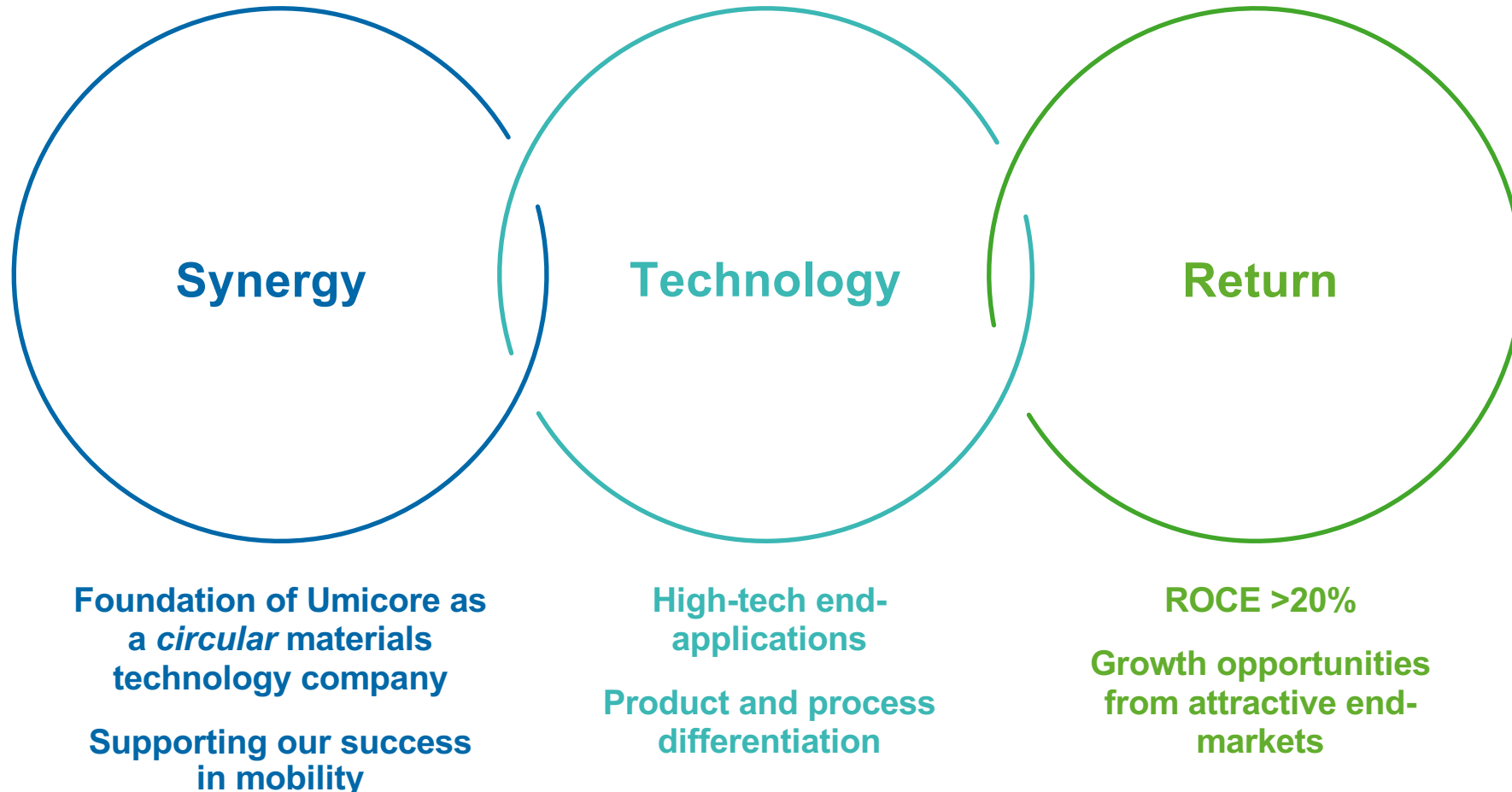
**Today**  
Mature leader

**Tomorrow**  
Use existing leadership to extend to new applications



# Key take-aways

## Supporting our success as a *circular* materials technology company



# Advanced Materials

Circularity for critical metals



SPEAKER

Denis Goffaux

## Precious Metals Refining

Leadership in sustainable and complex recycling



# Agenda

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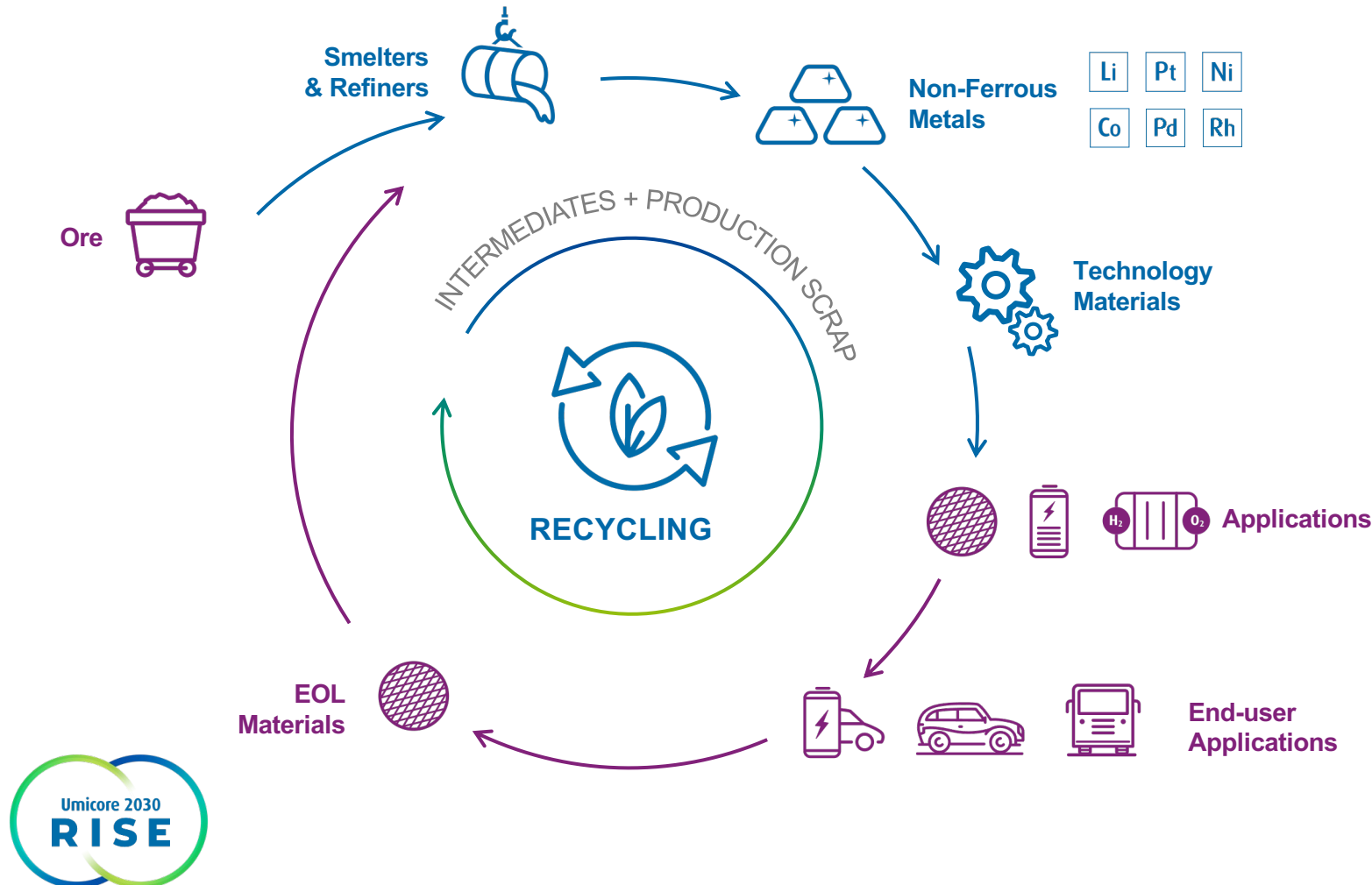
1.  
**World leader  
in sustainable,  
complex and low-  
carbon recycling**

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2.  
**RISE 2030**



# Key enabler of low carbon economy



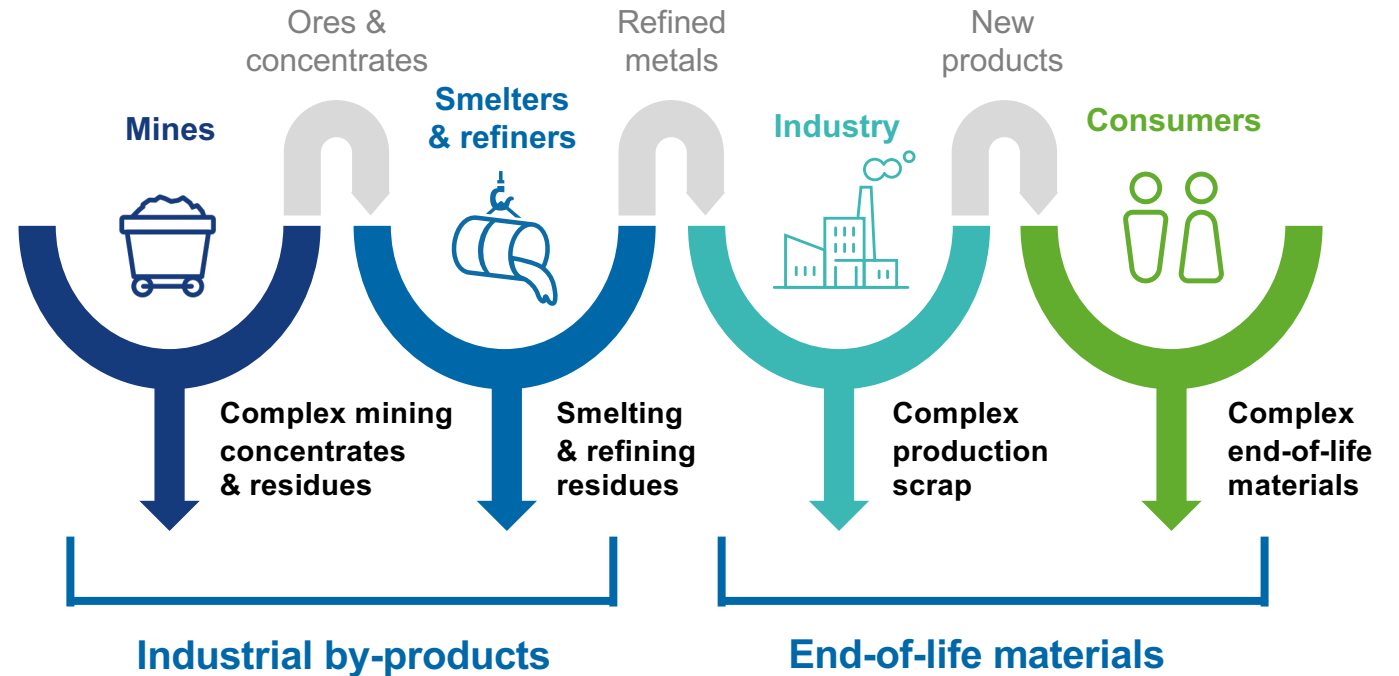
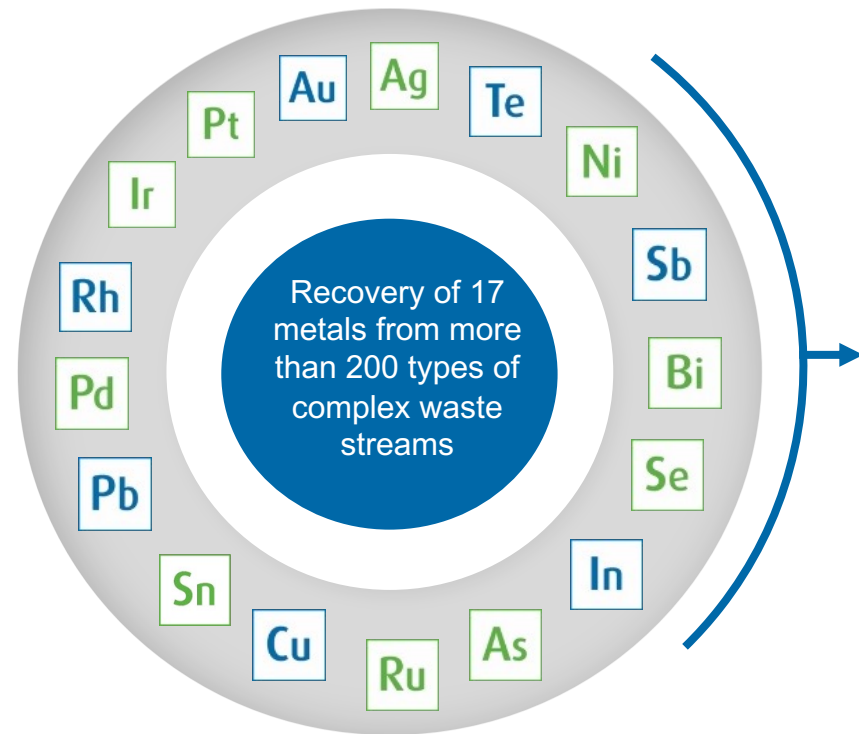
**At the heart of Umicore's closed-loop business model**

**Complementarity with other activities providing true competitive edge**

**Recycling reduces carbon footprint of metals in the value chain by ~50%**

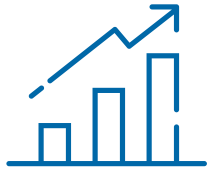


# Unique technology, touching the full value chain





# Profitable revenue model with significant metal price upside



## Precious Metals Refining revenue drivers

**Treatment  
& refining  
charges**

Determined  
by the complexity  
of the materials



**Fixed fee**

**Metal  
revenue**

Contractually agreed  
recovery rate and  
potential for extra  
'metal revenue'



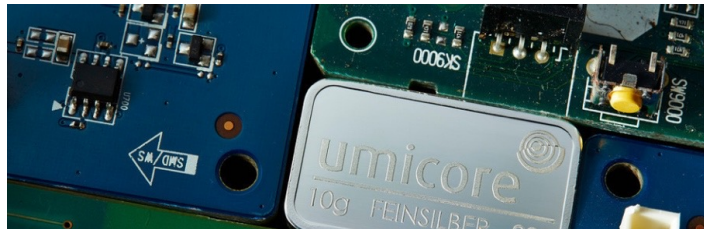
**Value of  
metal revenue**



# Very attractive market for Umicore

## Opportunities with increasing complexity of recycling feed

### Regulatory requirements

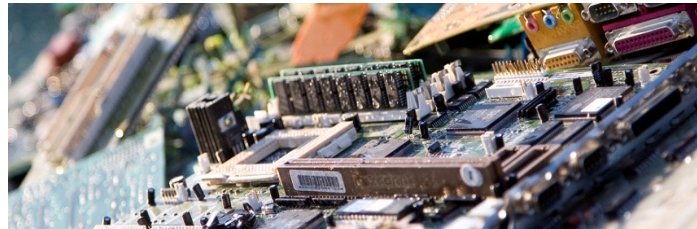


**Recycled content**

**Societal needs**

**More stringent legislation**

### Sustainability



**Increasing metals scarcity**

**Circular economy**

**~ 50% lower GHG footprint of recycled metals**

### Economic value



**Increasing complexity of feeds**

**Increasing demand for recycling, regardless of metal price evolution**



# Leadership in sustainable, complex and low carbon recycling

## Where to play

**Leverage leadership in sustainable, complex and low carbon recycling**

Focus on complex feed from a broad value chain, while maximizing closed-loop benefits

**Support adjacencies at Umicore level**

Battery Recycling Solutions to greatly benefit from world-class expertise of Precious Metals Refining

## How to win

**R**

**Reliable Transformation Partner**

**I**

**Innovation & Technology Leader**

**S**

**Sustainability Champion**

**E**

**Excellence in execution**



# Leadership in sustainable, complex and low carbon recycling



R

Reliable  
Transformation  
Partner

## SUSTAINABLE VALUE CREATION FOR CUSTOMERS

**Superior processing flexibility** to treat a broad range of input materials in line with changing market demand and customer needs

**Trusted partner** for more than 20 years, returning high metal value to customers through superior sampling and metal yield

**Reliability** in precious metals transactions and in value consignment

**Enabling customers** in their journey towards lower carbon footprint and higher recycled content



# Leadership in sustainable, complex and low carbon recycling

## INNOVATIVE METALLURGY AND CHEMISTRY

**Leverage our unrivalled pyro and hydro expertise** to further improve yields and expand input streams

**Leading CO<sub>2</sub> performance with our “NextGen” technology:** becoming the world-leading low carbon precious metals recycler



**Innovation**  
& Technology  
Leader

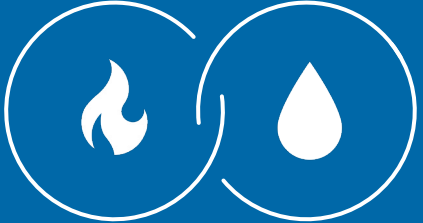




# Leverage our unrivalled pyro and hydro expertise




Recycling metals from complex waste streams cannot be done in one single process step

Best flowsheets are built from a combination of pyro- and hydrometallurgy steps



**Pyrometallurgy:**  
liberating valuable metals for further refining

**Hydrometallurgy:**  
refining to pure metals or compounds

			
<b>Process</b>			
Rate of chemical reactions	High	Low	Optimized
Metal selectivity	Moderate	High	High
Robustness to impurities	High	Low	High
<b>ESG</b>			
GHG biggest impact	Scope 1	Scope 3	Optimized
Physical footprint	Small	Large	Optimized





# “Next Gen” technology to reach our decarbonization goals

The right investments will be required



**1**

**AVOID**  
emissions

**2**

**REPLACE**  
emission sources

**3**

**CAPTURE**  
remaining emissions

Use synergies between feeds to improve overall efficiency

Substitute fossil fuels by electricity

Capture GHG

# Leadership in sustainable, complex and low carbon recycling



## KEY PARTNER FOR THE CIRCULAR ECONOMY

### Maximizing closed-loop benefits

- Majority of input mix from secondary sources
- Conflict-free and responsible sourcing certified operations

### Sustainable co-existence with the neighboring communities

- Committed to minimizing environmental impact of operations
- Building a green zone in Hoboken





# S

## Maximizing closed-loop benefits



**> 90% of Platinum Group Metals coming from secondary materials**

**Responsibly sourced materials at the heart of our operations**

- Certified conflict-free smelters
- LBMA Gold & Silver accredited
- LPPM Platinum & Palladium sponge certified
- Responsible Minerals Initiative (RMI) -conformant smelters and refiners

**1.8 million tons of GHG emissions avoided per year through material input mix & recycling**

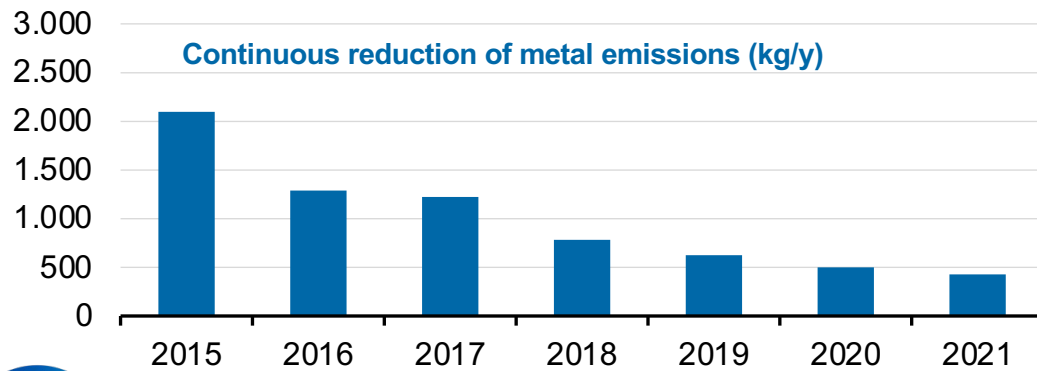


# Sustainable co-existence with our neighbors



## Minimizing impact

Using <b>best available technology</b>	<b>Full encapsulation of lead refinery and encapsulation of storage areas</b>
<b>Smart logistics</b> based on wind speed and direction	<b>Real-time measurement of dust emissions composition</b>



**5-hectare green zone** planned between the Hoboken plant and the residential area

**Onsite 1-hectare green zone**

# Leadership in sustainable, complex and low carbon recycling



E

Excellence  
in execution

## STRONG FOCUS ON OPERATIONAL EXCELLENCE

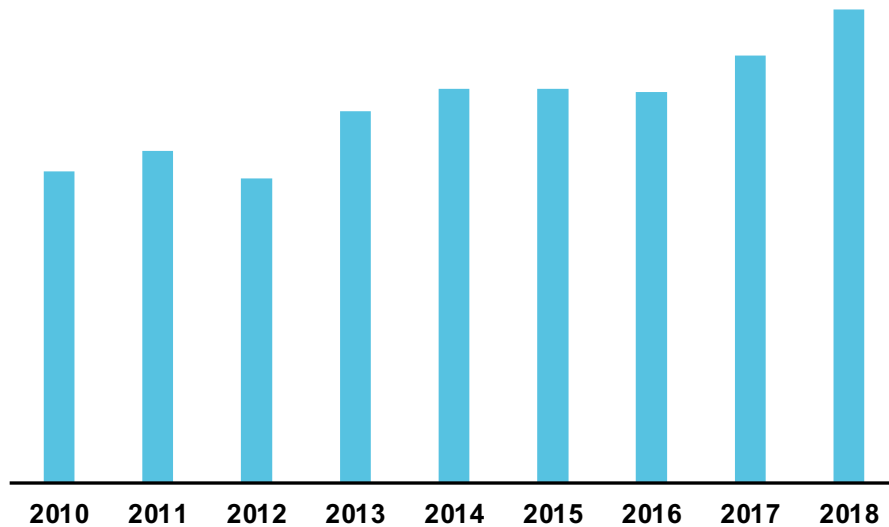
**Enhance operational excellence:** safety, process efficiency, sampling & assaying, high yields through digitalization and automation

**Continuous debottlenecking** to further reduce breakeven point in a context of high inflation and volatile metal prices

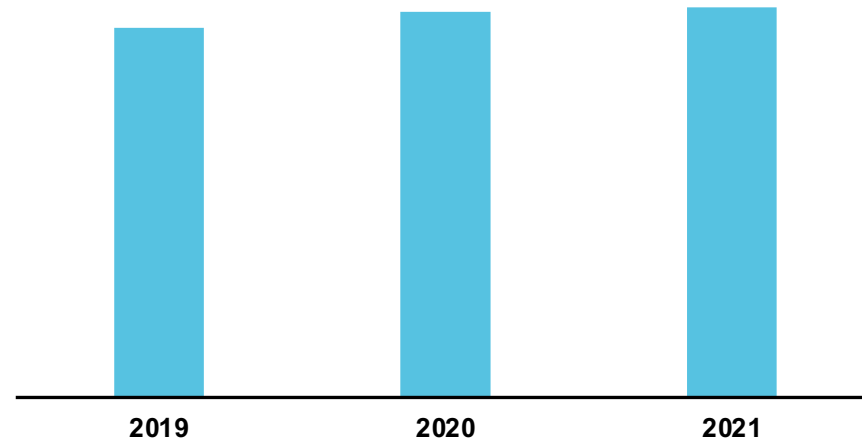


# Continuous debottlenecking and value creation

### Debottlenecking



### Conscious focus on value over volume



# Agenda

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**RISE 2030**



# Precious Metals Refining – RISE



Leadership in sustainable, complex and low carbon recycling



Strong competitive position allowing to keep EBITDA margins <40% and ROCE ~20% throughout the plan, at normalized PGM prices

umicore<sup>®</sup>

materials for a better life