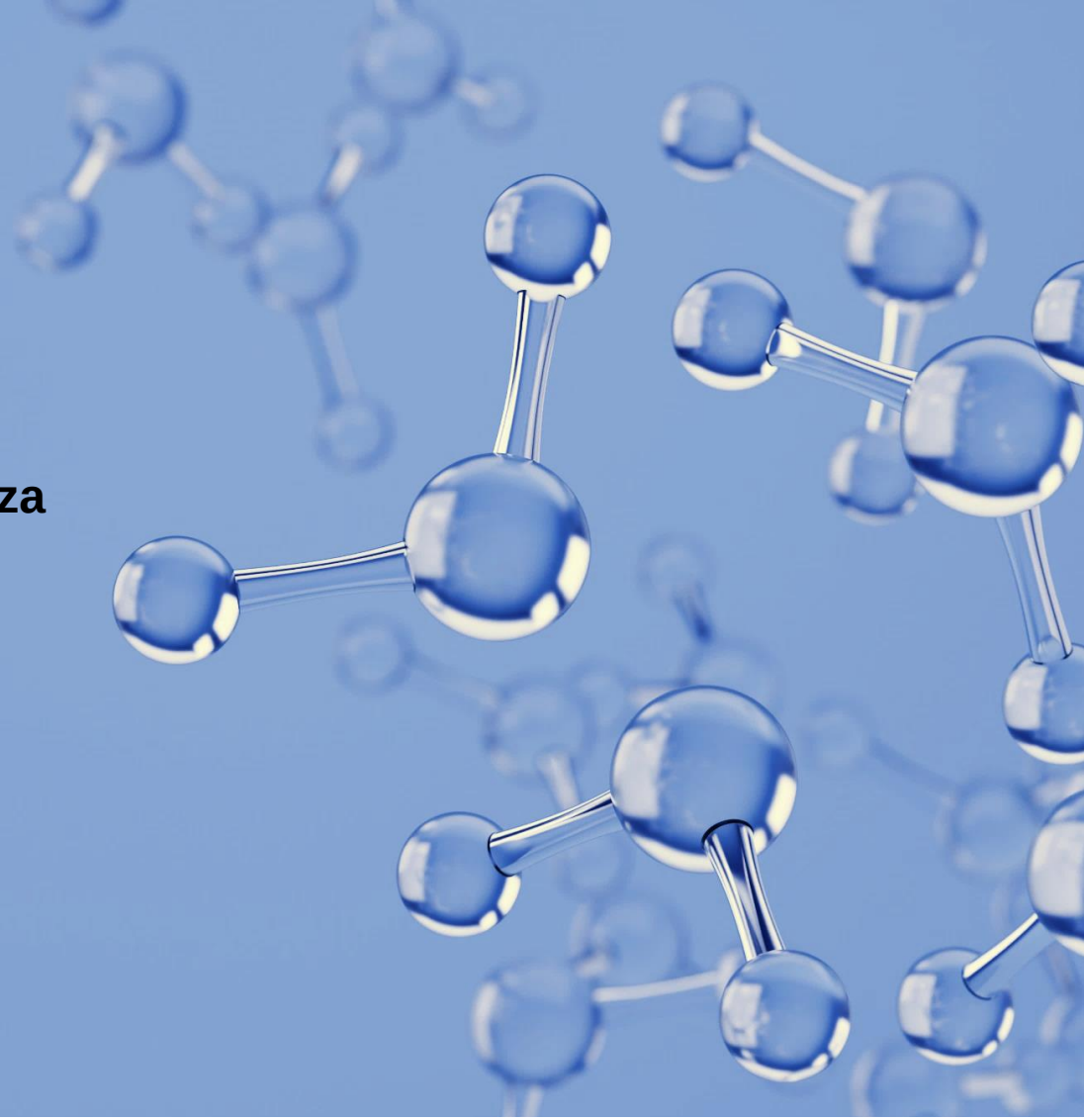
Materie prime critiche e strategiche: fonti secondarie per l'approvigionamento: VI Conferenza annual ICESP

Una catena del valore circolare ed ecosistemica: la sfida di Italmatch chemicals nel settore della e-mobility

Maria Cristina Pasi, 5 Dicembre 2023



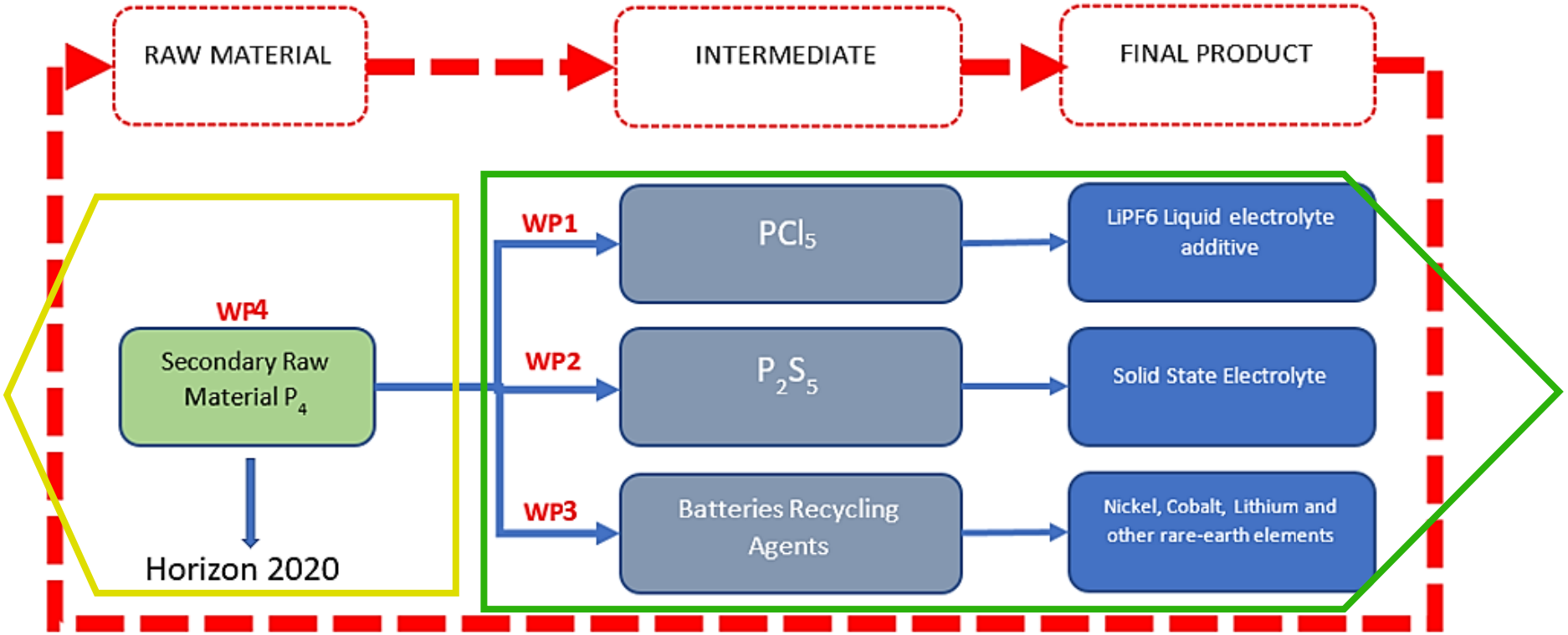
FLASH PHOS
The complete thermochemical recycling of sewage sludge

IPCEI BATTERIES
EuBatIn

Italmatch Chemicals

Italmatch strategy: from recycling to sustainability

The challenge of secondary resources in the eco-systemic value chains: from integrated to ecosystemic and servitized circular value chains



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IPCEI 2 EuBatIn in a glance

IPCEI European Battery Innovation (EuBatIn) Partners

RAW AND ADVANCED MATERIALS	BATTERY CELLS	BATTERY SYSTEMS	RECYCLING AND SUSTAINABILITY
ALKEEMIA SPA	ALUMINA SYSTEMS	ALUMINA SYSTEMS	BOREALIS
ARKEMA	BMW	AVL	ENEL X
BOREALIS	CELLFORCE GROUP	BMW	ENGITEC
FERROGLOBE	ELRINGKLINGER	ENDURANCE	FORTUM
GREEN ENERGY STORAGE	GREEN ENERGY STORAGE	ENEL X	HYDROMETAL
HYDROMETAL	INOBAT ENERGY	ENERGO-AQUA	ITALMATCH CHEMICALS
ITALMATCH CHEMICALS	MANZ	FPT INDUSTRIAL	KELIBER
KELIBER	MIDAC	INOBAT ENERGY	LIOFIT
SGL CARBON	NORTHVOLT	MANZ	LITTLE ELECTRIC CAR
SOLVAY	SGL CARBON	MIBA	MIDAC
TOKAI COBEX	SKELETON TECHNOLOGIES	MIBA BATTERY SYSTEMS	SGL CARBON
VARTA MICRO INNOVATION	SUNLIGHT GROUP ENERGY STORAGE SYSTEMS	MIDAC	VALMET AUTOMOTIVE
	VARTA MICRO INNOVATION	RIMAC AUTOMOBILI	ZTS
		ROSENDAHL NEXTROM	
		SKELETON TECHNOLOGIES	
		SUNLIGHT GROUP ENERGY STORAGE SYSTEMS	
		VALMET AUTOMOTIVE	

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WP1: Innovative PCl_5 supply chain towards a feasible LiPF6 EU production chain

WP2: All-Solid-State-Lithium-Batteries (ASSLBs) and All-Solid-State-Lithium-Sulphur-Batteries (ASSLSBs) Material Development Contribution

WP3: Nickel, Cobalt, Lithium and other rare-earth elements recovery from exhausted batteries – Development of new chemistry/co-formulations for reducing CAPEX-OPEX in hydrometallurgy recycling processes

1 **Objective #3**: **Significantly improve the CO2 footprint of battery cell production with regard to the international benchmark and ensure consequent battery recycling and/or re-use in 2nd Life Application, thus, maintaining a circular material flow with high environmental and social standards.**

2 **Objective #4**: **Create a cost optimised battery value chain in Europe** through standardization as well as process innovation and optimization, leveraging on factory digitization, thus supporting the market penetration of e-mobility within Europe.

Objective #4: Create a cost optimised battery value chain in Europe

3 Achieve the goals of the SET plan by **providing highest quality battery cells from Europe** and – due to the specific R&D efforts in the field of energy storage systems (ESS) – novel cell technologies that will be developed focussing on redox-flow batteries or LFP/LTO batteries

Providing highest quality battery cells from Europe

4 *EuBatIn* will very concretely contribute to the execution of the Green Deal in several number of fields, also through the **recycling of battery cells and the development of recycling processes (WS4**)

Battery label and the development of recycling processes (WS4)

5 Critical resources such as cobalt, natural graphite, lithium and nickel is reduced by making more effective use of each battery cell during and after its lifetime, specifically through hybridisation with other energy storage technologies like supercapacitors. Moreover, **development of alternative cathode materials (including Na-ion) using less than 10% cobalt** ultimately leads to the usage of cathode materials with no critical resources like cobalt

Critical resources such as cobalt, natural graphite, lithium and nickel is reduced
-Development of alternative cathode materials (including Na-ion) using less than 10% cobalt

6 The sustainability of the extraction and exploitation of […] resources is fundamental and **recycling of materials will increasingly become important** for diversifying the EU's supply and should be encouraged in the context of the transition to a circular economy

Recycling of materials will increasingly become important

7 Thus, sustainable sourcing as well as recycling are highlighted to be key measures in order to redeem the goal of sustainable battery production following a circular economy logic.

Sustainable sourcing as well as recycling are highlighted to be key measures

8 Recycling processes will be piloted which will make it possible to close the material loop and **re-use the critical raw materials within the EU**

Re-use the critical raw materials within the EU

PARSES CRM 2023: setting 2030 benchmarks & options for strategic raw materials

EU EXTRACTION

At least **10%** of the EU's annual consumption for extraction

EU PROCESSING

At least **40%** of the EU's annual consumption for processing

EU RECYCLING

At least **15%** of the EU's annual consumption for recycling

EXTERNAL SOURCES

Not more than **65%** of the EU's annual consumption of **each strategic raw material at any relevant stage of processing** from a single third country

Requiring Member States to step up **efforts to recover critical raw materials from waste** products and mining waste

Increasing the share of recycled critical raw materials in manufacturing

Recognising certification schemes to increase the sustainability of the critical raw materials placed on the EU market

Creating a **Critical Raw Materials Club with interested countries** globally to strengthen supply chains and foster sustainable investment and trade

Identifying **Strategic Projects** in the Union and third countries that intend to become active in the extraction, processing or recycling of strategic raw materials. They would benefit from streamlined and predictable permitting procedures in the Union and coordination of support to improve access to finance

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CRM 2023 strategic & critical raw materials: hence…

Critical Raw Materials are both of high economic importance for the EU and have a high risk of supply disruption

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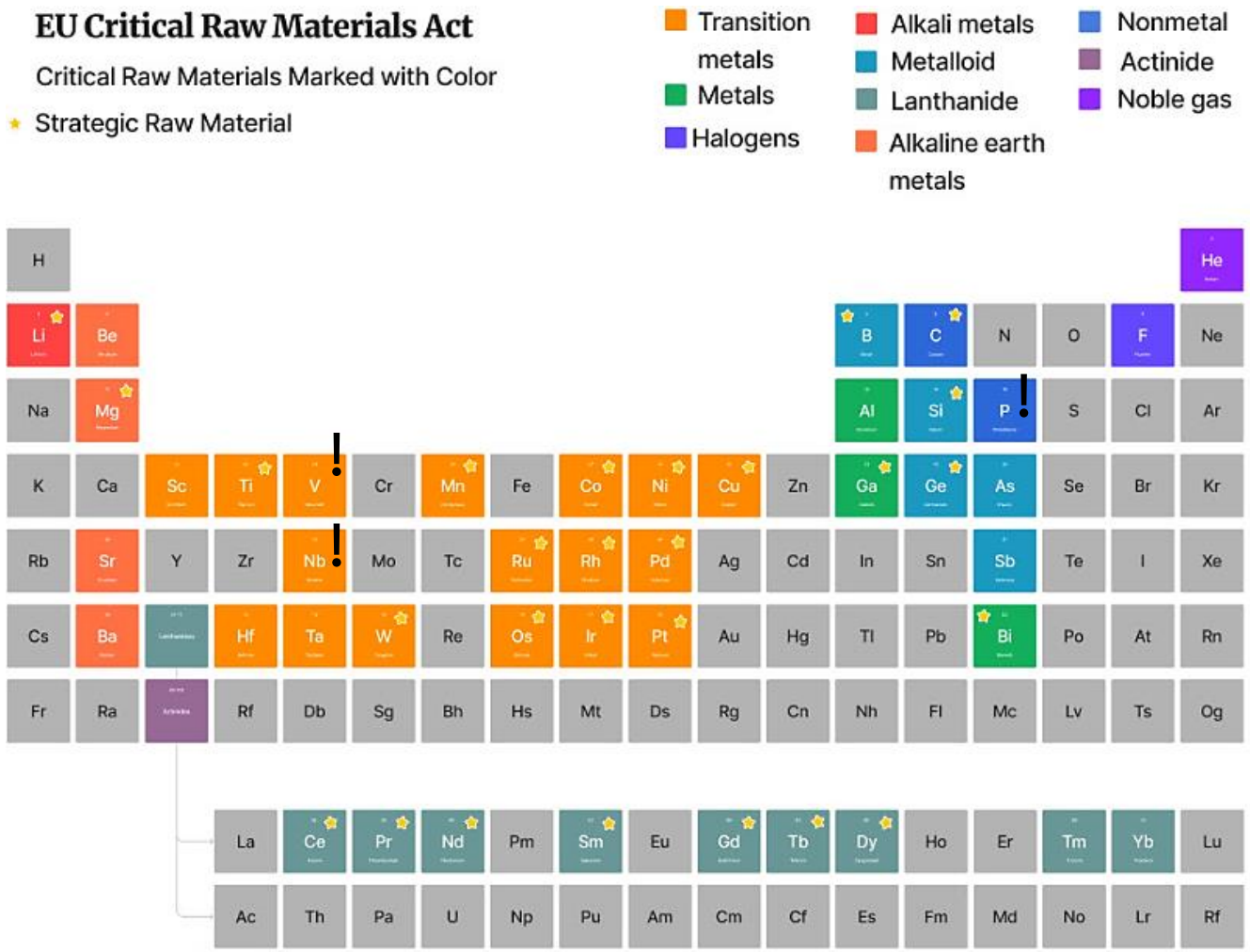
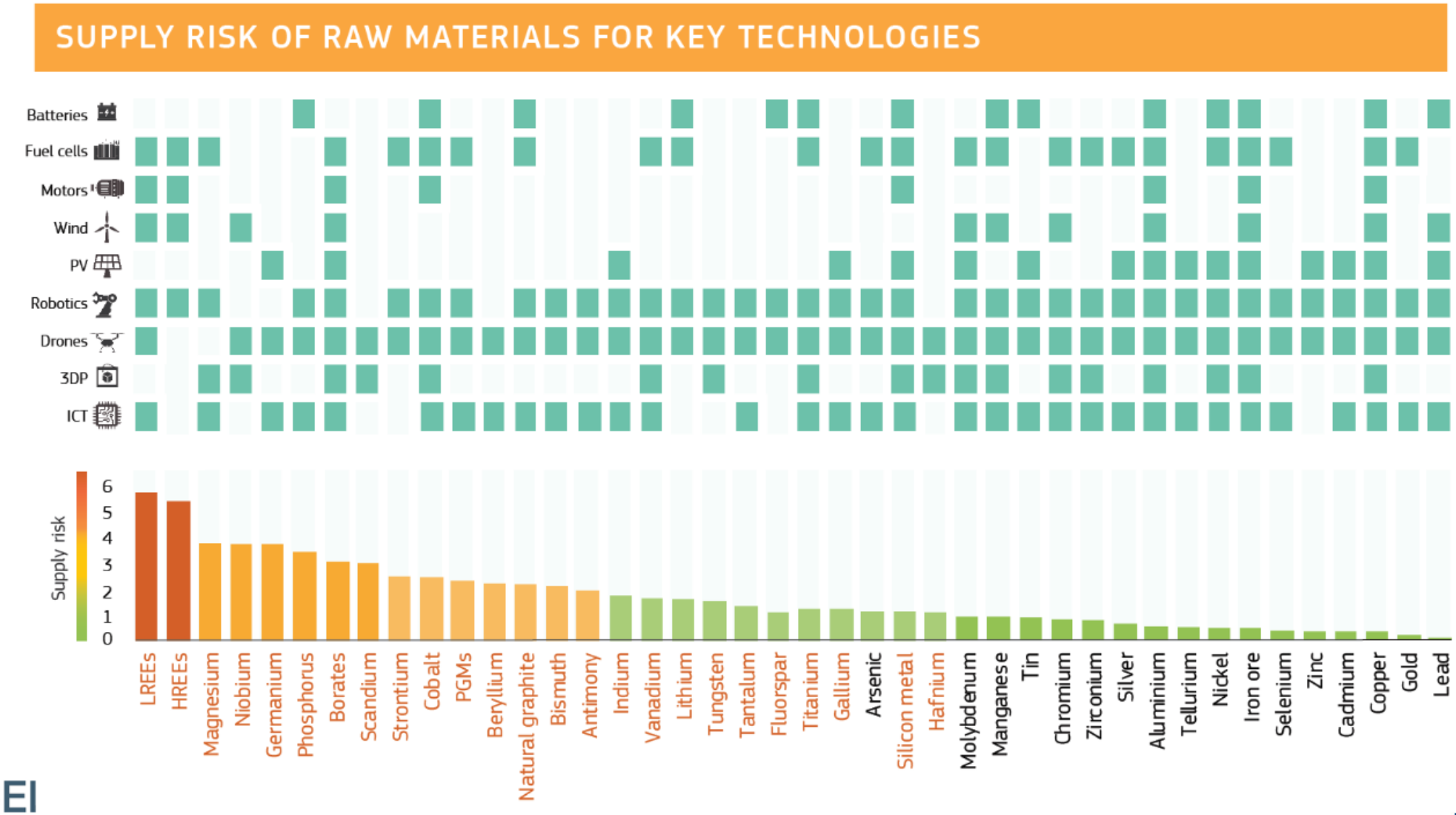
Strategic raw materials are additionally characterised by their importance **for strategic areas** such as renewable energy, digital, aerospace and defence technologies, their projected demand growth relative to current supply, and the difficulties of scaling up production



PARSES CRM 2023: recycling against supply risk for key technologies



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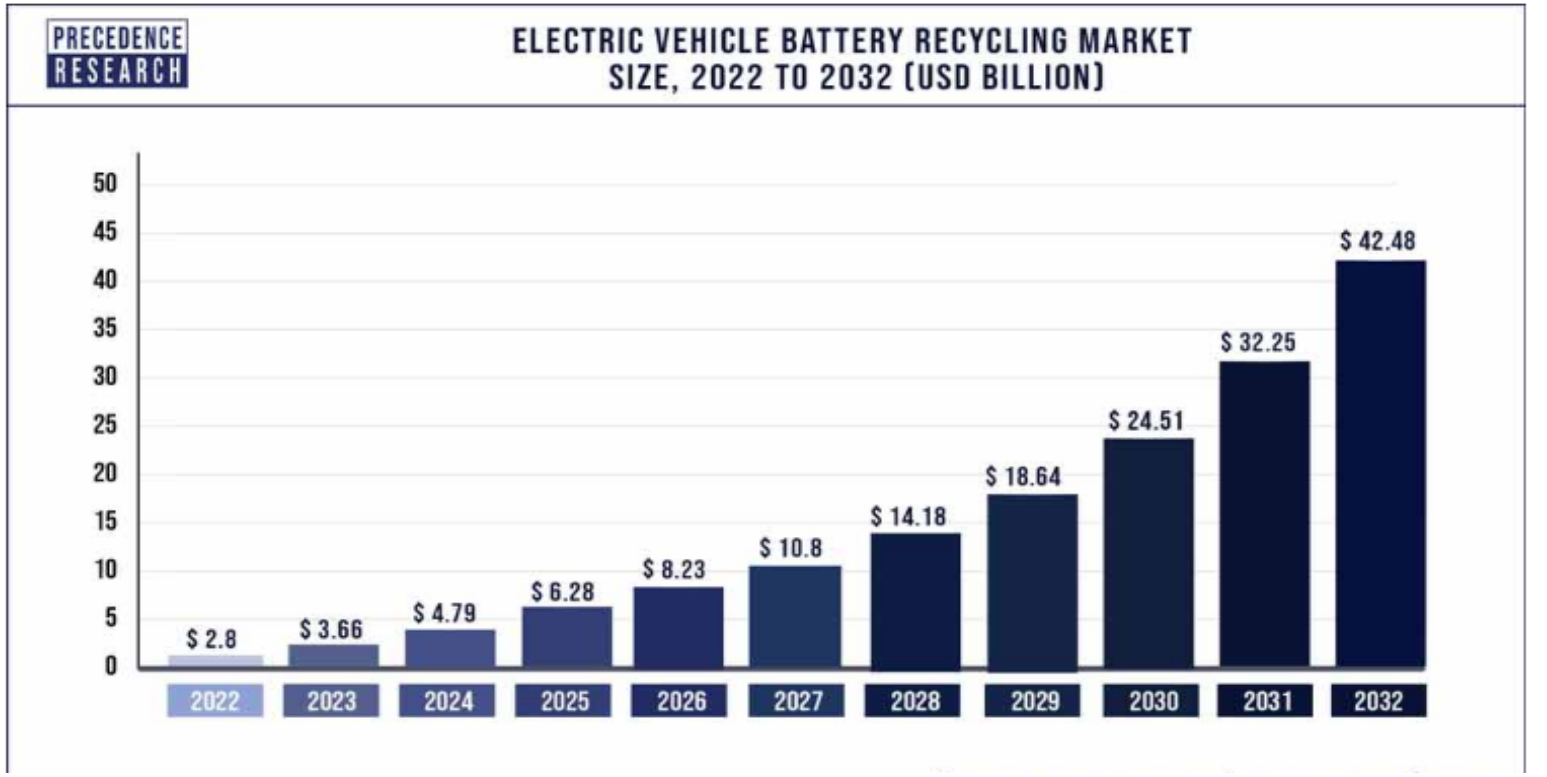

Electric Vehicle Battery Recycling Market Share, By Region, 2022 (%)

Regions	Revenue Share in 2022 (%)
North America	25%
Asia Pacific	51%
Europe	18%
Latin America	4%
MEA	2%

CRM 2023 e criticità: il parere dell'Industria

1. Gli obiettivi attualmente definiti potrebbero non essere sufficienti per stabilire una catena di approvvigionamento sicura. Il 10% di estrazione primaria e il 40% di trasformazione sembrano piuttosto deboli per avere un impatto significativo
2. Attualmente, gli obiettivi non sono giuridicamente applicabili per gli Stati membri a causa degli ostacoli normativi nazionali e dell'UE che impediscono una rapida adozione da parte del mercato.
3. Saranno necessari grandi investimenti per migliorare la tecnologia del riciclo in Europa: mancano incentivi finanziari flessibili per attrarre nuovi progetti e sostenere gli obiettivi dei progetti di transizione ecologica per bilanciare i fattori penalizzanti esterni
4. Sviluppo di standard internazionali per il riciclo: i regolamenti sul riuso e sul riciclo nei vari settori industriali non includono alcun riferimento a metodologie e limiti armonici, condivisi per un riciclo standardizzato spendibile globalmente
5. Caso batterie esauste: sono esse stesse materili critici_strategici data la bassa disponibilità territoriale in Europa

FLASHPHOS

The complete thermochemical recycling of sewage sludge

The complete thermochemical recycling of sewage sludge

Recycling P_4: a servitization case for the e-battery value chain

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958267.

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PROJECT FACTSHEET

FLASHPHOS

FlashPhos will demonstrate at a large scale a thermochemical process to convert sewage sludge into

- high-quality white phosphorus (P_4),
- climate-friendly alternative cement raw material,
- iron alloy,
- heavy metal concentrate,

University of Stuttgart
Germany

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herp

A TEC GROUP
A Member of LOESCHE Family

aufbereitung / recycling / prüftechnik
ARP

InsPyro

Dyckerhoff

SMS Inside Excellence

TU Graz

unitherm CEMCON

vdz

GORIUP FEUERFEST GmbH

Steinbeis Europa Zentrum

böhler

MITechnology of Austria
Edlinger

RESOURCEFULL

INERCO

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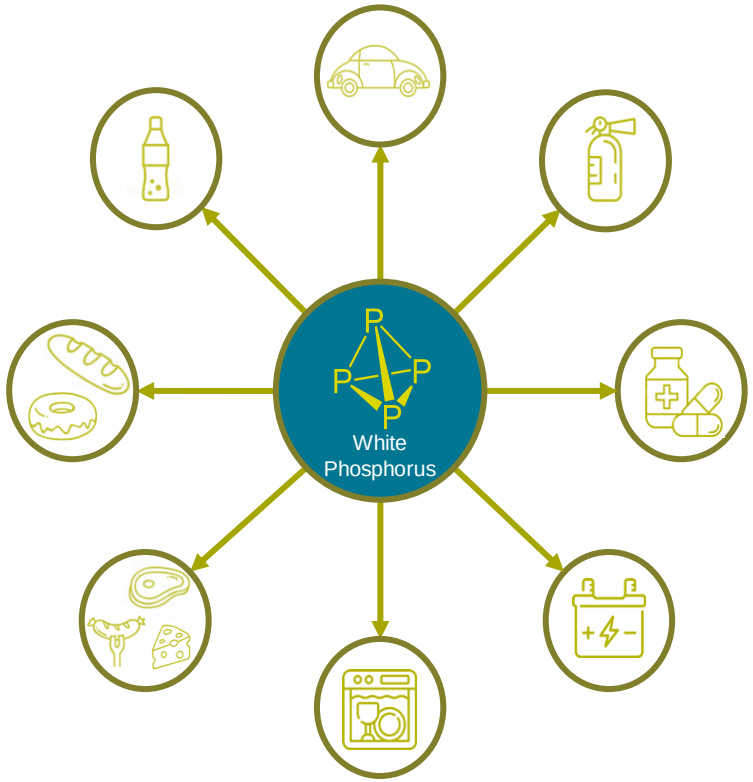
WHY WHITE PHOSPHORUS?

- The natural resource of white phosphorus (P_4) is the **finite fossil resource** phosphate rock
- The European Union is **dependent** on white phosphorus imports from **few little reliable countries**.
- P_4 can be converted into **thermal phosphoric acid** (H_3PO_4), **phosphorus chlorides, sulphides** and other P-derivatives
- White phosphorus is thus a **critical raw material** e.g. for chemical, food and pharmaceutical industries



- Biggest sludge producers in Europe:
  DE, ES, FR, UK, IT, PL
- Predominant sludge disposal in Europe:
  soil application (> 2/3)
- **Contamination of soil** with polymer flocculants, industrial chemicals, microplastics, pathogens
- EU aims to **stop soil application**
- **No sustainable concepts** in the other
  “Big 5” and most smaller countries for
  sludge disposal and P-recovery

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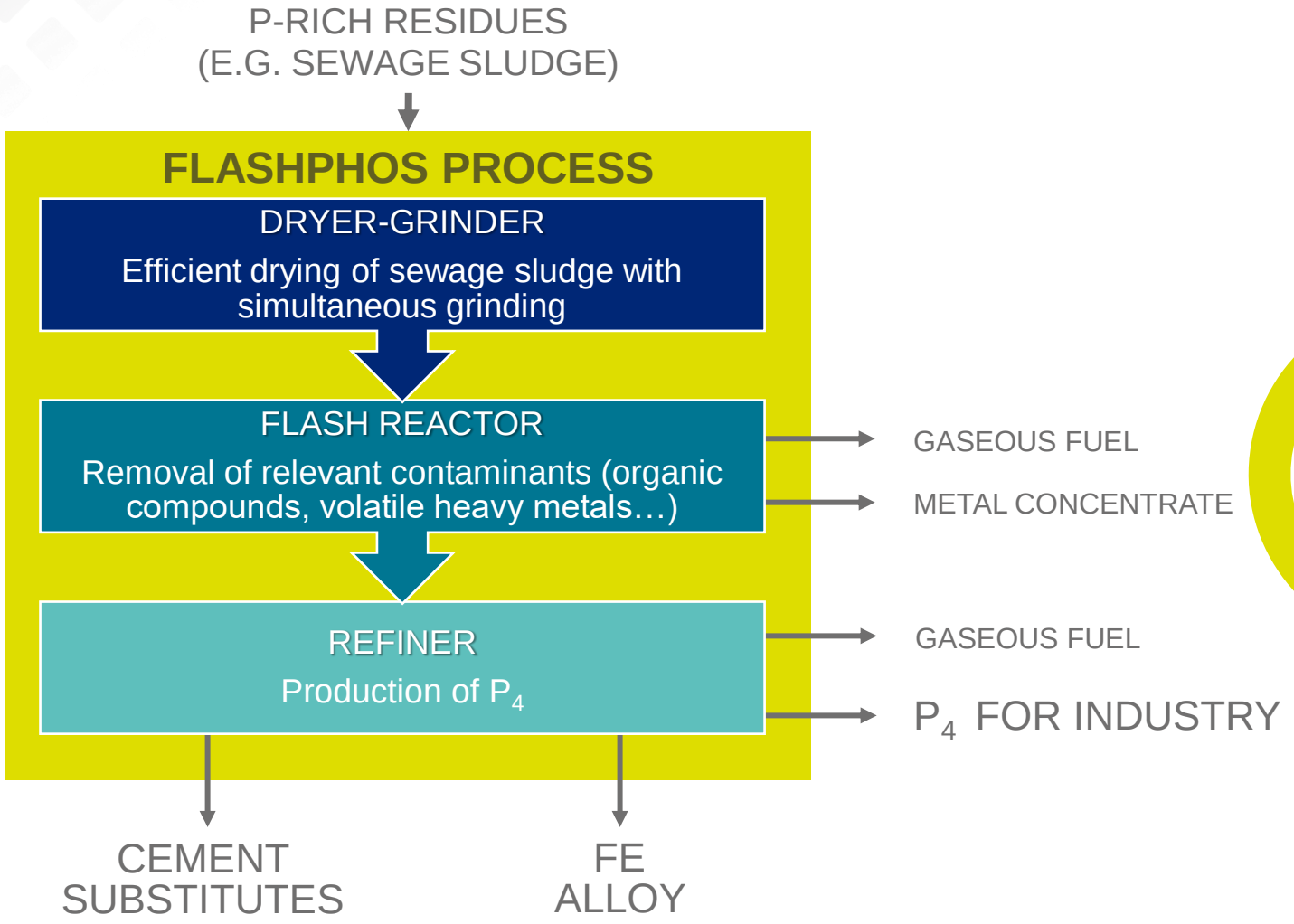
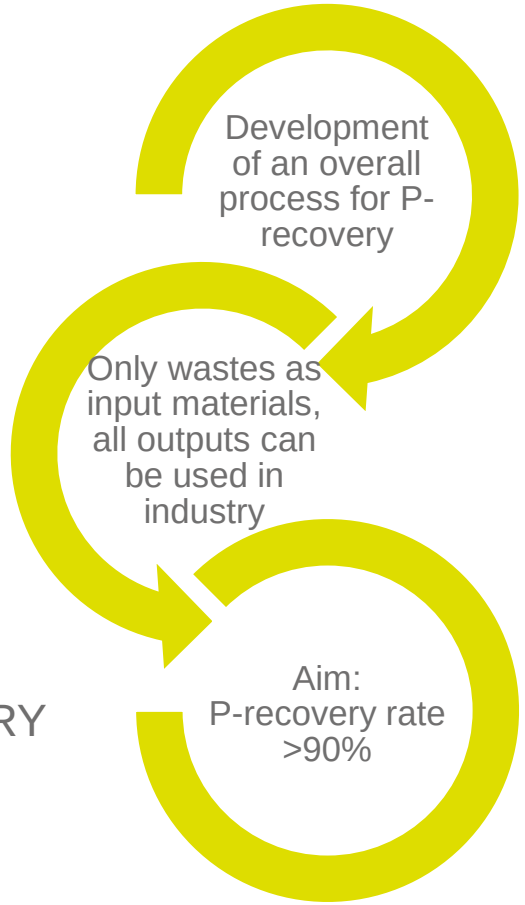
TECHNOLOGIES





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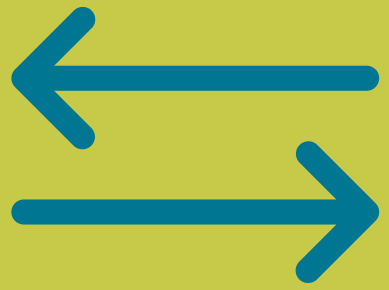
IMPACT UNTIL 2040

15 FlashPhos plants in operation

Recycling of 15% of the EU's sewage sludge



Substitution of 50% of P_4 needed in Europe

Creation of new P-containing products in a fully circular approach

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Thank you

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