tecnalia

MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

Tecnalia – Waste Valorisation

Turning waste into value

EMIRI General Assembly & Side Events

- San Sebastián (Spain)
- November 2023

Waste Valorisation Platform

Waste

EoL (batteries, WEEE, permanent magnets...), urban waste, industrial residues, wastewater, etc

Development of innovative technologies and processes

Hydrometallurgical
Ionometallurgical
Pyrometallurgical
Electrometallurgical

Critical Metals
Energy

Resource

From Lab → To Pilot

Battery Recycling

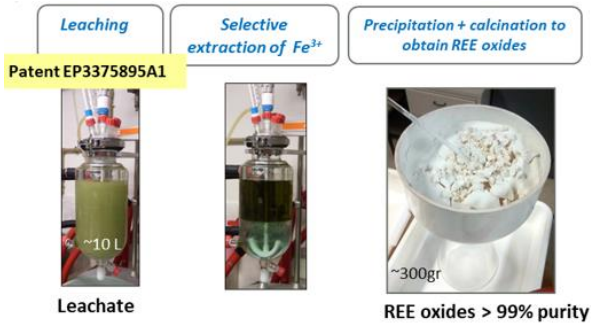
Tecnalia patent in process

CROCODILE
RHINOCEROS
LiCORNE
Horizon Europe
CoLaBATS

Critical Metals & Rare Earth Elements

peacoc
REE4EU
REEPRODUCE

Tecnalia patent in DES leaching for REE



Thermal Treatments

Pyrolysis and Gasification
Waste-to-Energy
→ *Syngas production*

Plasma Technology
→ *High Tº gasification*
→ *Metals recovery from WEEE*
→ *In-house Plasma reactor*

Wastewater & Sludge

Water treatment and remediation

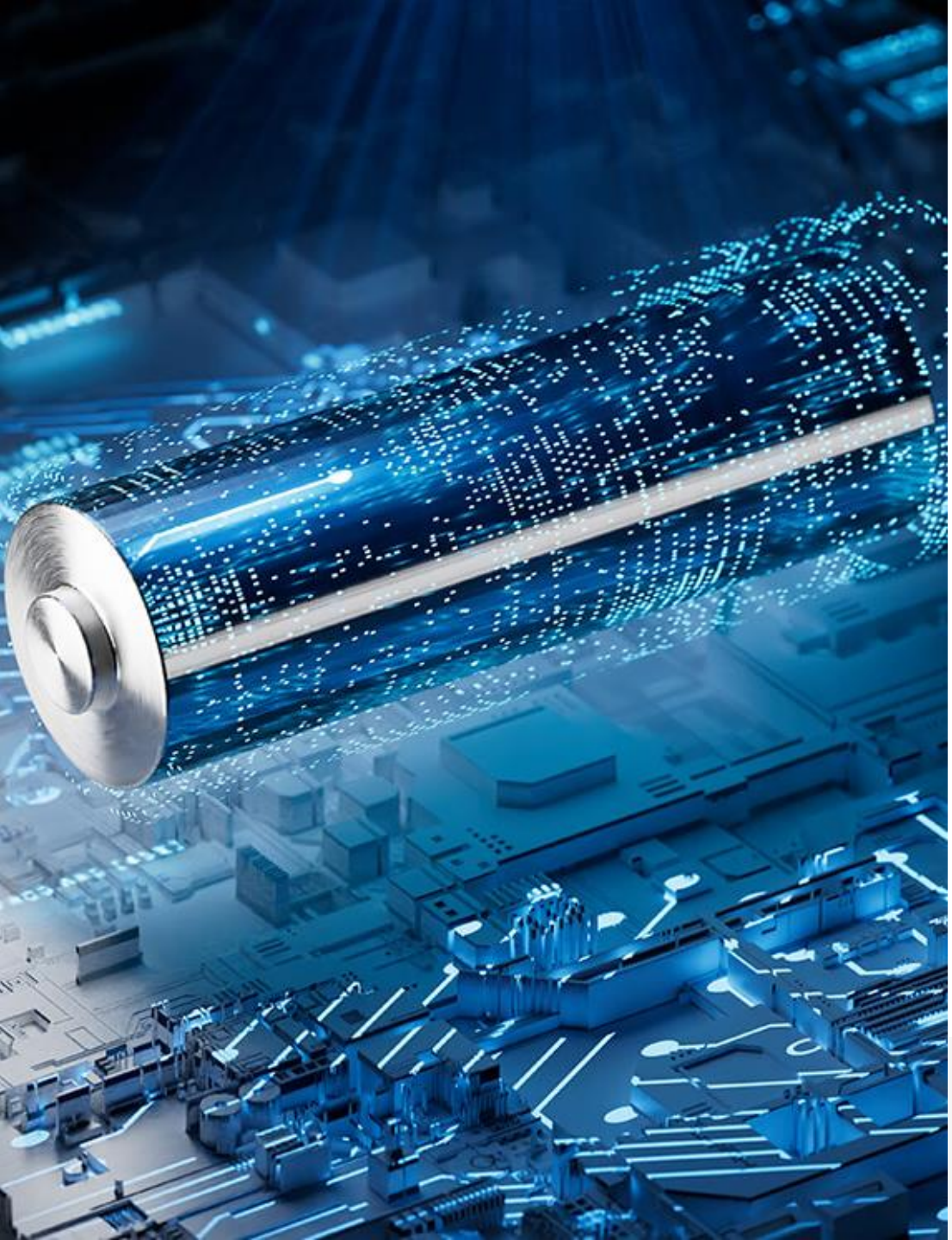
Electrochemistry for aqueous metals

Ionic Exchange Resins Technology

Membrane Technology (Osmosis, Micro/Ultra/Nano filtration)

Polymer & Composites

Fiber and polymer recovery



RHINOCEROS

Batteries reuse and direct production of high performances cathodic and anodic materials and other raw materials from batteries recycling using low cost and environmentally friendly technologies

Funded by the European Union under Grant Agreement No 101069685. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them.

Project overview

Grant agreement no:

101069685

Coordinator: Fundación Tecnalia R&I

Participants:

16 partners **9** countries:

Duration:

01/09/2022 to 30/08/2026

Project budget:

EUR 8.9 Million

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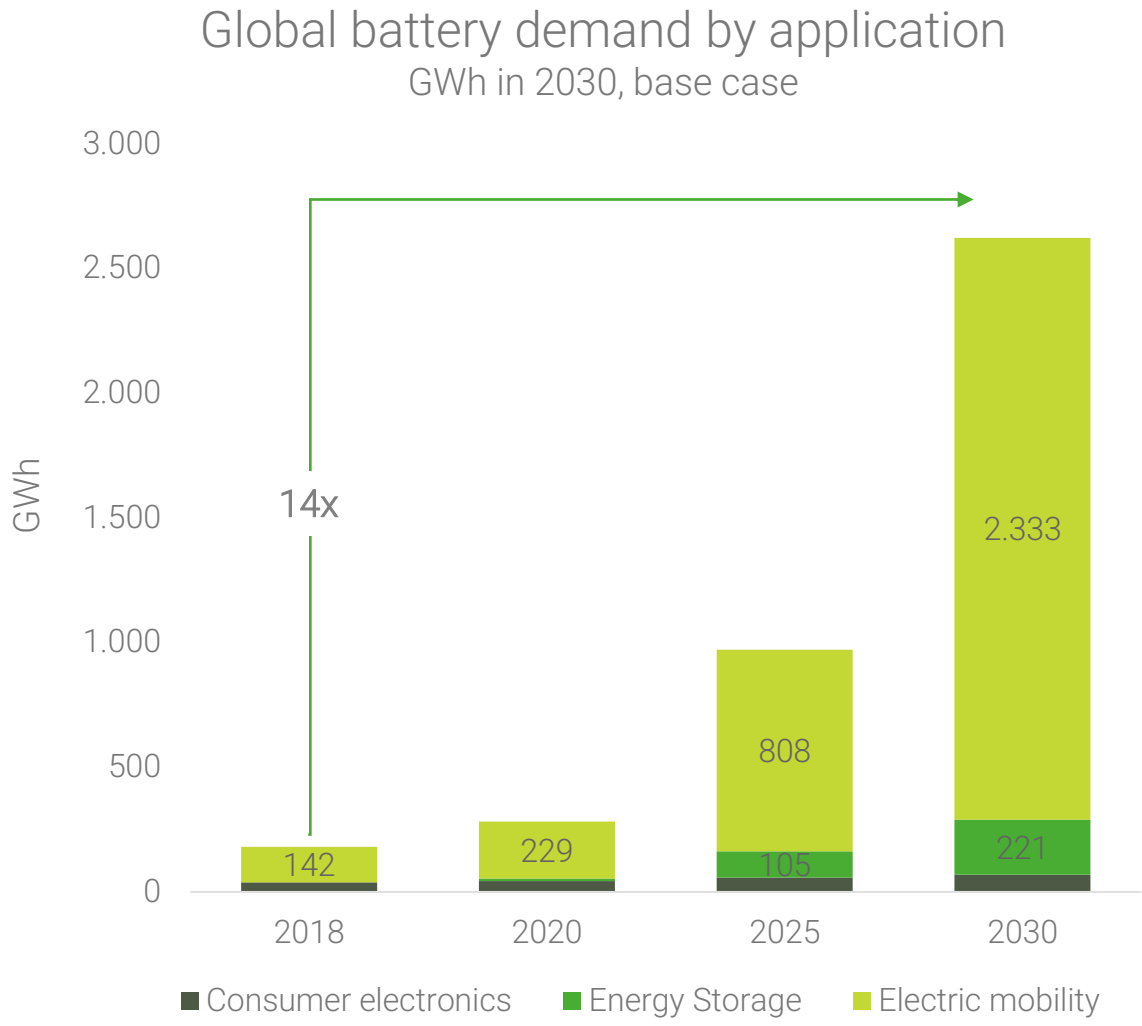
Motivation

- Battery market €250 billion a year by 2025
- Total of 25 new Li-ion factories in Europe
- Total cumulative capacity of 500 GWh by 2030
- From 2030, battery production expected to rise 300 GWH/year



Source: World Economic Forum & Global Battery Alliance (2019)

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RHINOCEROS Objectives

- To develop a smart system for **automated classification**, **dismantling** and **reassembling of LIBs**
- To propose and validate novel solutions for the **reuse and repurpose** of batteries for second life applications with 60% gain in disassembly/assembly time compared to SoA manual operations, and automating the current manual operations by up to 75%.
- To develop a set of cost efficient, flexible and environmentally friendly routes targeting the **recycling of all materials present in LIBs** – target >95% of active materials and base metals and >90% electrolyte, PE/PP and fluorinated compounds
- To identify and address **health risks**, **environmental impacts**, **safety hazards** and **new safety practices**
- **To validate the recovered materials** through the synthesis of new high-performance electrodes and elements for next generations batteries able to satisfy the targeted 2030 battery performances for EV batteries
- To validate the most promising process at **pilot level** (TRL upgrading to TRL6)- 10kg electrode materials/day, 1Kg/day electrolyte, fluorinated compounds and polymers

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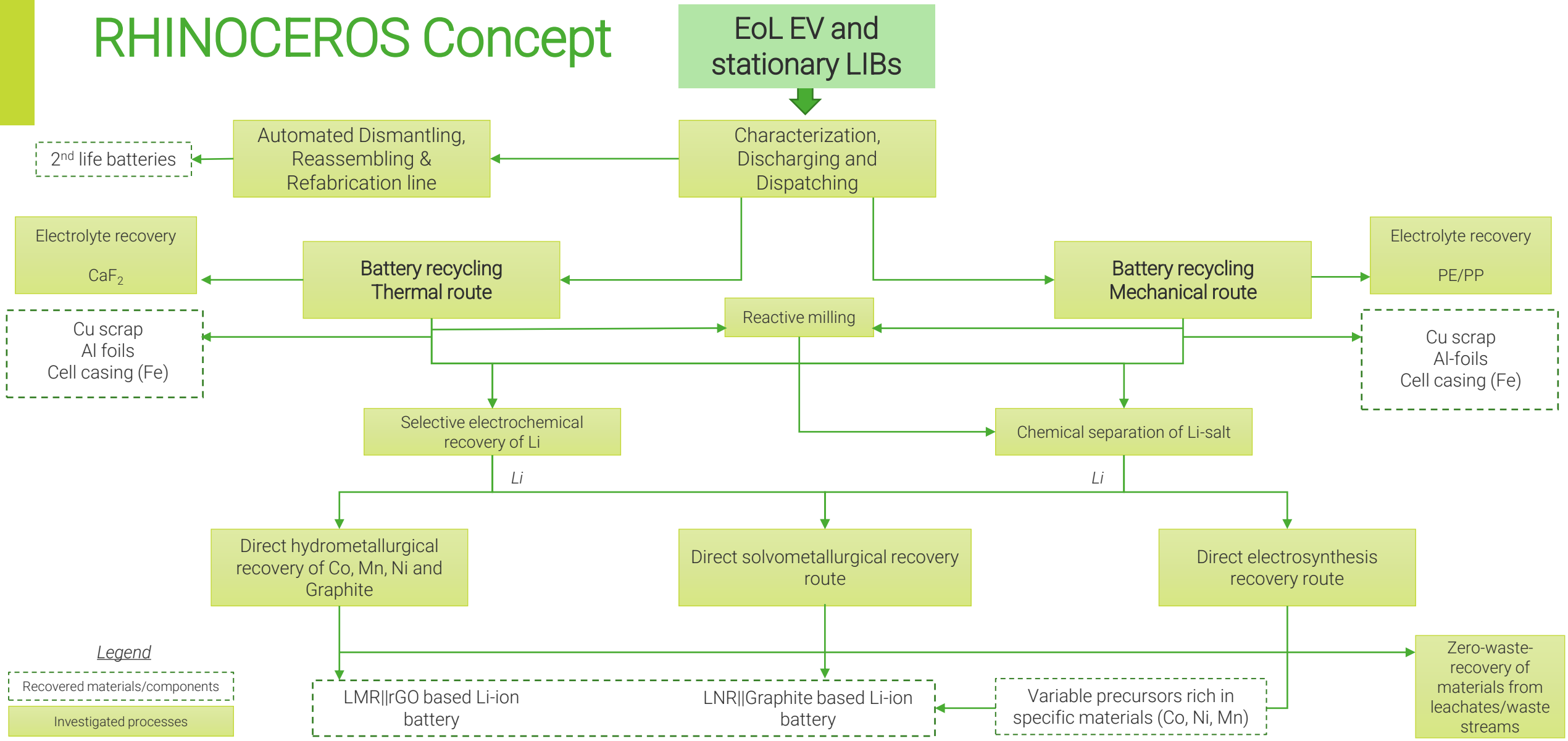
RHINOCEROS Concept



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Main Expected Impacts

- **Improve access to battery materials** and a **strengthened European raw material independency** by recovering all materials in EoL EV and stationary LIBs.

- **Successful repurposing of batteries** can have up to ~75% environmental impact reduction, and some of the recycling routes proposed could reduce CO_2 emission by ~80% compared to SoA pyrometallurgical processes for recycling of battery grade materials. **Zero-waste process**.

- Significant **reduction in cost** (~50%) to produce cathodes at same performances than their SoA counterparts

- High-performance materials, able to satisfy the **targeted 2030 battery performances for EV batteries**

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LiCORNE

Lithium recovery and battery-grade materials production from European resources

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Participants

Grant agreement no: 101069644

Coordinator: Fundación Tecnalia R&I

Participants:

16 partners from **10** countries:

Duration: 1/10/2022 to 30/09/2026

Project budget: EUR 6.8 Million

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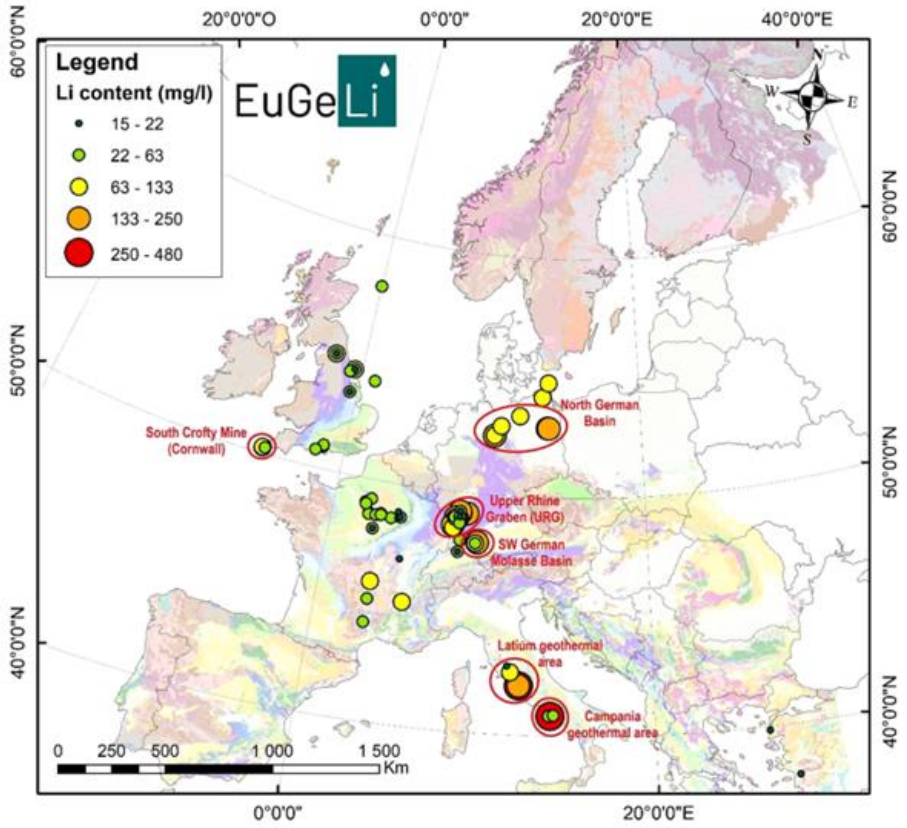
Opportunities on Li resources

Planned Li projects from pegmatites in Europe

Source: Infinity Lithium Corporation (2020). San Jose Valdeflorez lithium project, investor presentation.



Lithium-rich geothermal brines in Europe

Source: Lithium-rich geothermal brines in Europe: An up-date about geochemical characteristics and implications for potential Li resources (URL)

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LICORNE Objectives

- To **develop technologies at TRL 4**

1. **Beneficiation** technologies to increase Li concentration in pegmatites ore aiming to prevent 15% gangue entering downstream processes.
2. **Physico-chemical transformation** of Li-pegmatite concentrates with non-acidic and low temperature process (~200°C) to facilitate downstream processes
3. **Efficient extraction of Li** contained in pegmatites concentrate and Li, Co and Ni from cathode waste, targeting 90-95% Li extraction while eliminating high-energy process such as calcination and sulfuric acid use.
4. **Separation and purification** of Li from leachates and brines, targeting 94-99% Li selectivity depending on feedstock
5. **Recovery of Li** as battery-grade chemicals Li_2CO_3 or $LiOH{\cdot}H_2O$ targeting minimum 99% purity

- Benchmark the investigated technologies and **upscale the most promising one to TRL 5** - production of ~1 kg of battery-grade Li chemical (i.e., $LiOH{\cdot}H_2O$, Li_2CO_3 or Li-metal)

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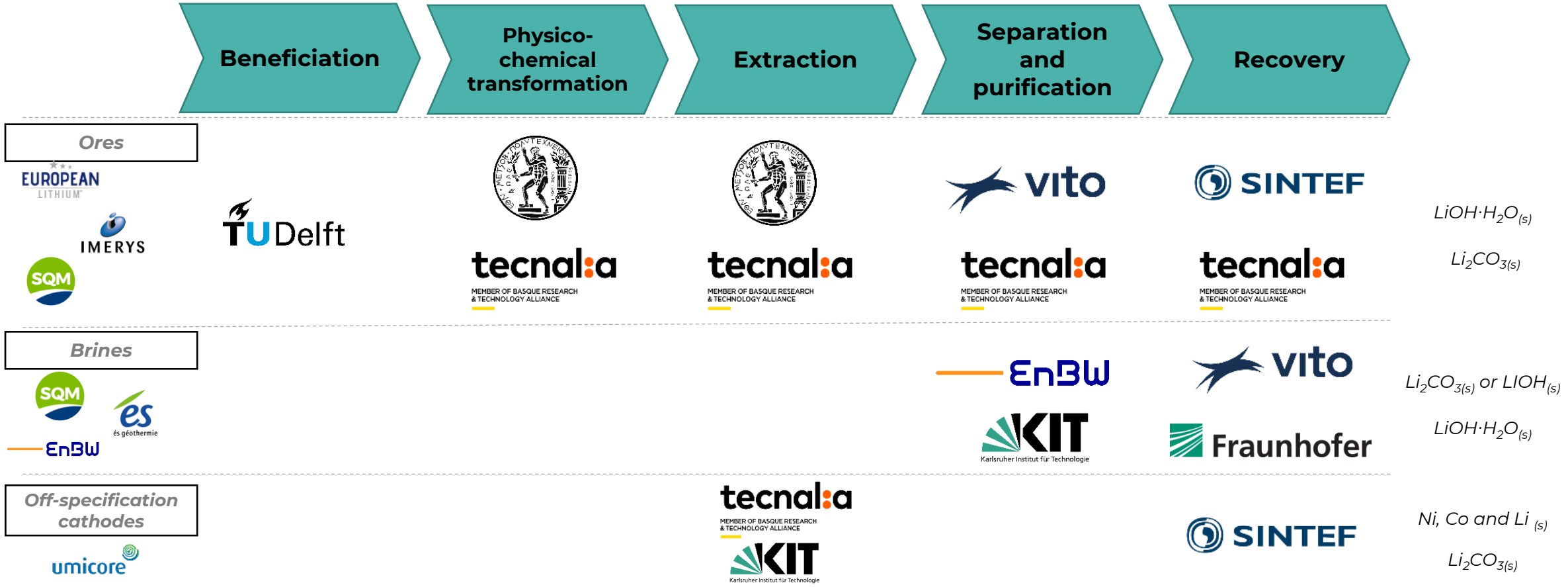
The concept

14 different ground-breaking technologies



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Expected impacts

Reduced carbon emissions, increased **energy efficiency**, and more efficient **resource use and yield**

Production of battery grade intermediates and precursor materials in a sustainable and socially acceptable way from European *low-grade deposits and secondary material sources*

Reduction of the European dependency on critical raw materials by increasing refining capacity to battery-grade material

New business opportunities and models for the European industry, creating additional jobs from increased processing and refining capacity

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LiCORNE EU project

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