

REE4EU



Integrated High Temperature Electrolysis and Ion Liquid Extraction for a Strong and Independent European Rare Earth Elements Supply Chain

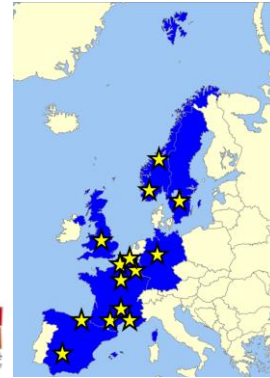
NAMEC Workshop, Brussels, June 29, 2018

Nader Akil – Operations Manager PNO Innovation, Brussels

REE4EU project

- ❑ H2020-SPIRE07-2015. Recovery Technologies of Minerals and Metals
- ❑ 1 October 2015 – 4 years
- ❑ 14 Partners:

RTOs:



SMEs



Industry:

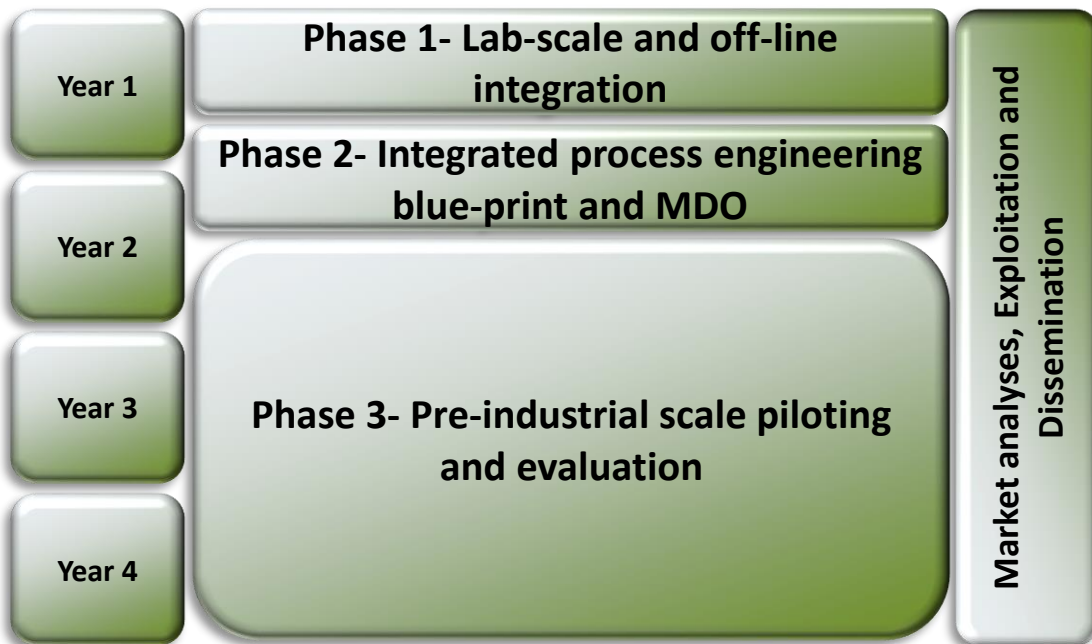
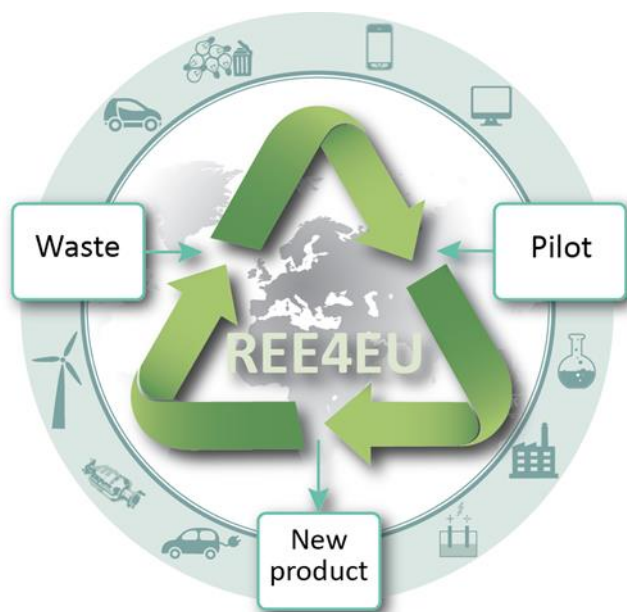


- ❑ Innovation Action
- ❑ Total Budget: EUR 9 063 772, (EU funding: EUR 7 522 491, Private investment: € 1 541 281)
- ❑ www.ree4eu.eu



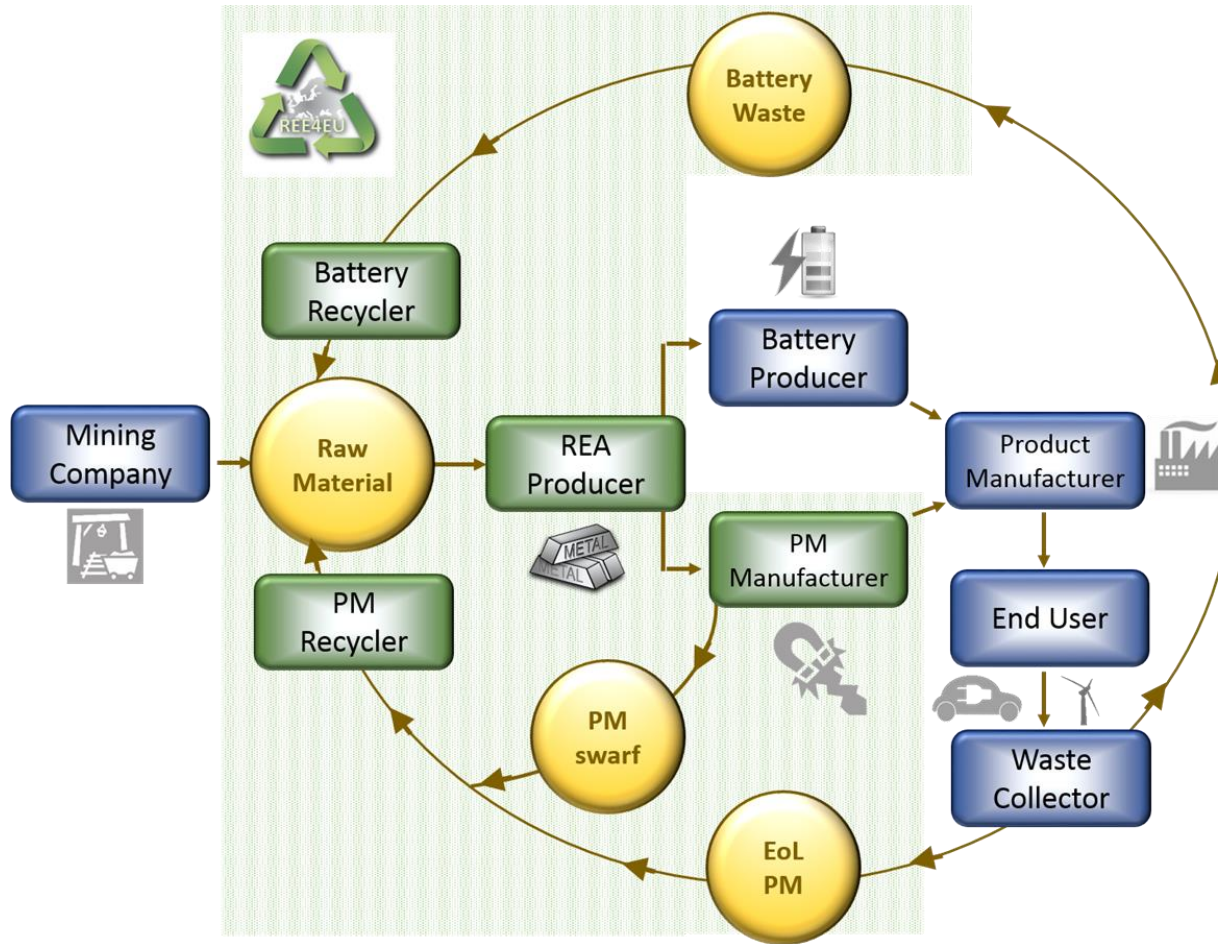
SPIRE-07-2015 REE4EU (IA)

Realize a breakthrough in securing REE availability in Europe, providing for the first time a cost effective and efficient REE extraction and **direct RE Alloys production route** from abundantly available in-process and end-of-life RE-containing waste streams



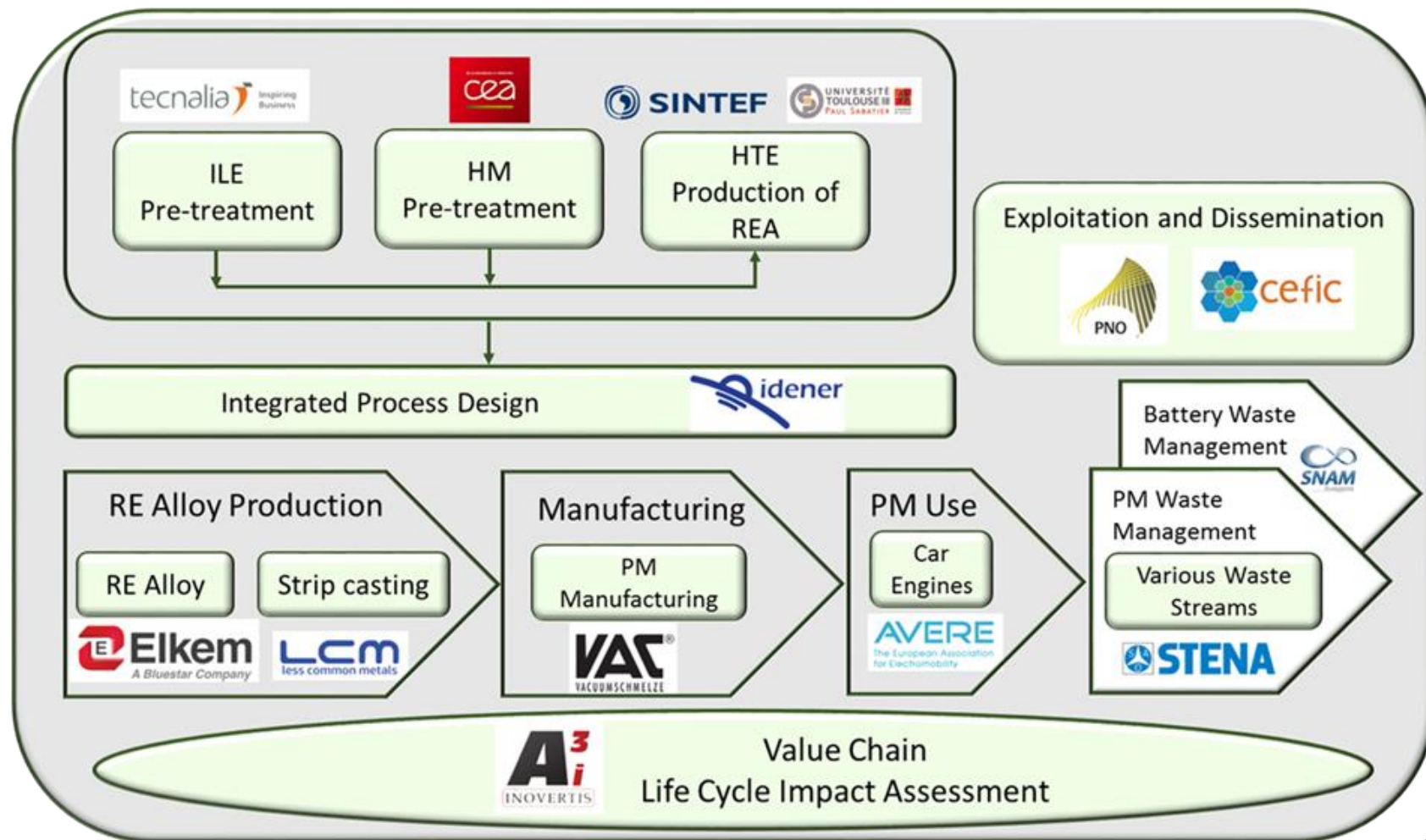
Waste resources covered in the project

Recovery of REA from spent NiMH battery black mass



Recovery of REA from Nd-based PM wastes: "in-process" waste from PM production and EoL

Consortium and Value Chain



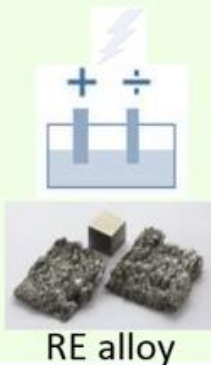
① Leaching and Selective IL Extraction



② Precipitation and Calcination



③ High Temperature Electrolysis Process



④ New Products



»»» Scientific/Technical Goals

- ❑ **Develop, validate and demonstrate in 2 industrially relevant Pilots** an innovative REO mixtures extraction and a novel direct REA production route for Permanent Magnets (PM) and Secondary Batteries.
- ❑ 90% recovery of **in-process wastes** from PM manufacturing.
- ❑ At least 20% recovery from **EoL** RE-containing **waste products**.

Expected Impacts (1)

The targeted integrated solution will demonstrate dramatic improvements in cost and environmental performance compared to state of the art technologies:

- This includes avoidance of processing steps
- 50% energy savings, 50% CO2 emission reduction
- Reduction of environmental unfriendly acids, waste water and toxic by-products, compared to state of the art technologies

Expected Impacts (2)

□ Technological:

- By developing REE4EU as **in-process recovery solution**, Europe is expected to deliver a resource efficient technology at an economically sustainable scale, while making EU based Nd-PM producers more cost effective.
- By developing REE4EU as **EoL recovery solution**, Europe can today build the basis for robustness against price fluctuation and Chinese trade quota, while significantly reducing the environmental impact and totally emancipating its production capacity from non-EU sources.

□ Economic/Social:

- 10% of the value of Europe's exports consist of products containing REs.
- 30 million jobs in Europe depend on the availability of raw materials.
- Total minimum recovery of 0.2 kton/year of REE-based waste (both in-process and EoL) → 5.4 MEUR/year.

»» Stakeholders and market studies available

D9.1 Value Chains Stakeholders Analysis Report



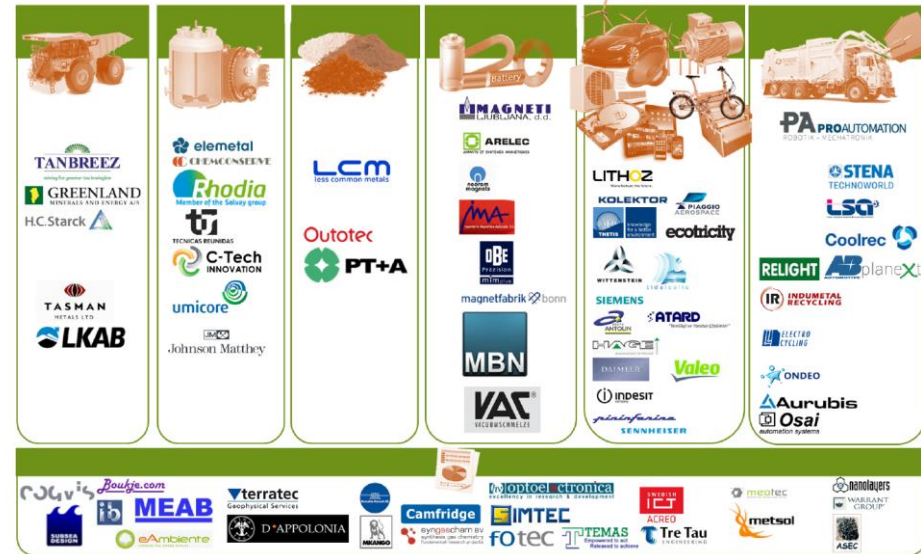
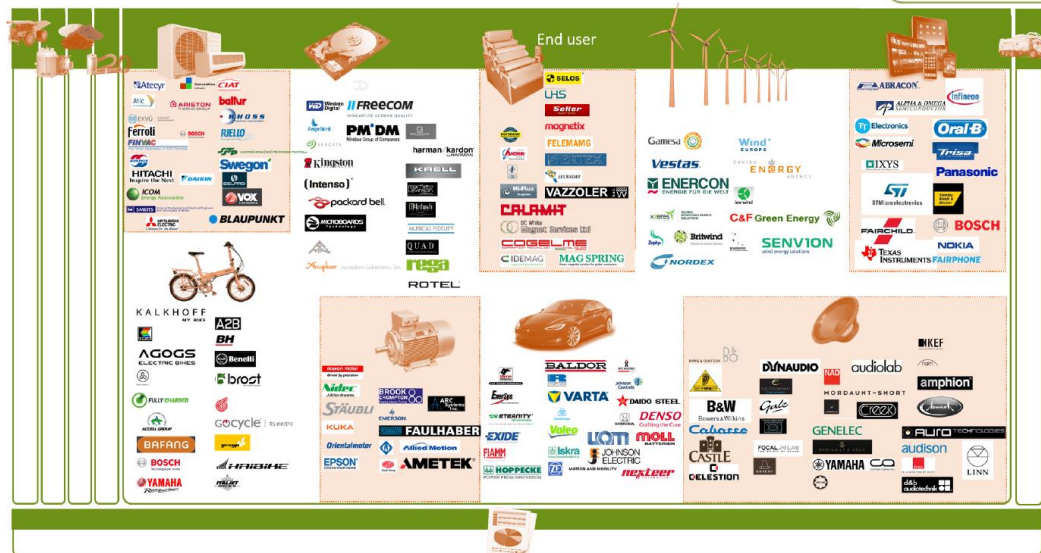
WP n° and title

WP9 - Market analyses, exploitation and dissemination

Documents can be downloaded from the REE4EU website:

www.REE4EU.EU

Potential end users



Stakeholders and market studies available

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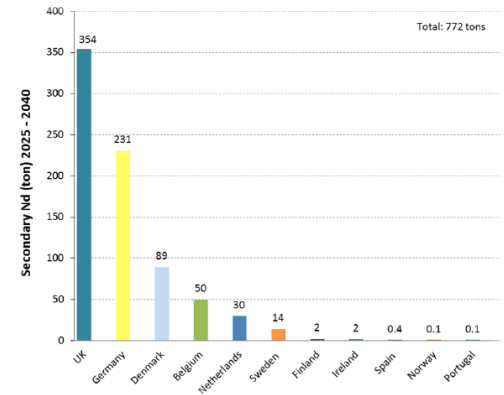
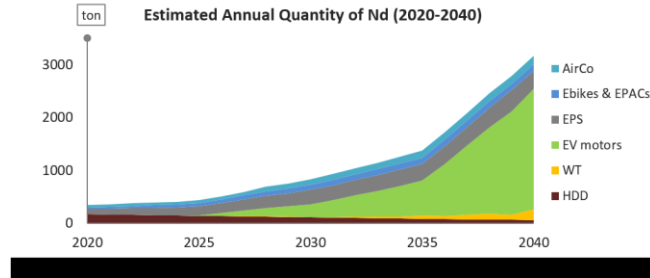


Figure 6. Cumulative quantity of secondary Nd contained in offshore wind turbine installations in the EU



»» Recommendations

The volatility of the REE price is a major barrier for potential investors. Even in the scenario of a profitable production of REE in Europe, investors can be very careful in investing into a technology where the price of the final product (REE) depends on geopolitical conditions. The recent future (a few years around 2011) showed a tremendous fluctuation of the REE price (e.g. up to 20 times). Measures to mitigate the risks for investors and to render the EU a land for a fertile investment should be thought and developed.

It could be that the cost of production of REE in Europe, even with very advanced and simplified processes such as the one developed in the REE4EU project, is not fully competitive compared to the production cost in china due to many factors (e.g. energy cost, transport costs, labor costs for collection and dismantling etc.). To supply the strategic EU sectors with affordable REE produced in Europe, some legislations or incentives need to be considered for instance to lower the cost of collection and dismantling e.g. through regional or national legislations or small taxes on products containing REE to contribute in their recycling in Europe.

»»» Contact Details

www.ree4eu.eu



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CONTACT

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If you would like more information about the project, please contact us:

Project Coordinator:

Dr. Ana Maria Martinez
Senior Research Scientist
SINTEF Materials and Chemistry
Trondheim (Norway)
AnaMaria.Martinez@sintef.no

Exploitation manager:

Dr. Nader Akil
Innovation and Grants Senior Consultant
PNO Innovation (part of PNO Innovation B.V.)
Brussels, Belgium
nader.akil@pnoconsultants.com



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