



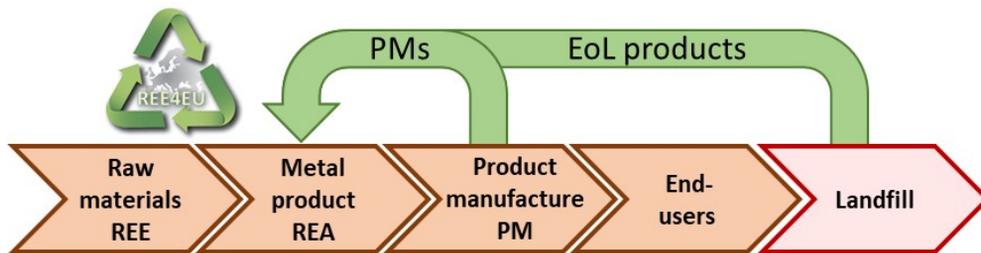
## Europe's Closed-Loop Permanent Magnet Recycling Process at Pilot Scale

### Exploitation workshop

24 April 2019, Avenue de la joyeuse Entrée 1, 1040 Brussels

## REE4EU: Integrated High-Temperature Electrolysis (HTE) and Ion Liquid Extraction (ILE) for a strong and independent European Rare Earth Elements Supply Chain

The REE4EU project demonstrates a fully closed-loop recycling process, from REE-containing waste material to REE-containing product, by recovering REE from Permanent Magnets swarfs (PMs) and End of Life products (e.g. PM and batteries). Differently to State-of-Art methods, this novel approach will avoid energy intensive and costly separation processes of the individual REO from REO mixtures, and presents a novel direct route to produce REAs.



The project is developing, validating and demonstrating this concept in two industrially relevant Pilots. The targeted integrated solution is based on two developed lab-proven technologies: (1) High-Temperature Electrolysis (HTE) for direct REA production, and (2) Ionic Liquid Extraction (ILE) for REE recovery.

REE4EU involves in its consortium the full REE value chain to prove technical and economic viability, and to develop required market data and a business case for a new European secondary REA production sector. The achieved results within this project will contribute to decrease Europe's dependence on imported REE, creating new jobs and providing valuable raw materials for fast growing European green-technology industries such as Electrical/Hybrid vehicles and Wind Turbines.

### Objectives of the workshop

- Present the REE4EU recovery technology and latest results, including the technological aspects, the environmental foot-print and preliminary economic assessment.
- Discussion on the possibilities of bringing the REE4EU technology to the market.

Watch the REE4EU video describing the project in the REE4EU web page [www.ree4eu.eu](http://www.ree4eu.eu) or in the following link:

[https://www.youtube.com/watch?time\\_continue=1&v=6b0CS65a1Ro](https://www.youtube.com/watch?time_continue=1&v=6b0CS65a1Ro)





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### REE4EU Exploitation Workshop Agenda

Time	Agenda	Presenter
10:00-10:30	Registration and Networking	PNO Innovation
10:30- 10:45	Welcome and introduction	Ana Maria Martinez (SINTEF) & Nader Akil (PNO )
10:45-11:00	EC vision on supporting critical raw materials related activities in the EU	Bjorn Debecker (EASME) & Mihai Barcanescu (A.SPIRE)
11:00- 11:45	REE need/barriers/opportunities from the perspective of the RE-permanent magnet European Industry	Rolf Blank (Vacuumschmelze) & Kagya Nyanin (Less Common Metals)
11:45-12:30	Current status of rare earth production in China and recycling in Japan	Invited speaker Professor Toru Okabe, University of Tokyo (Japan)
12:30-13:30	Lunch break	
13:30-13:50	The REE4EU technology	Ana Maria Martinez (SINTEF)
14:00-14:10	Secondary REE Market	Nader Akil (PNO)
14:10-15:00	REE4EU technology: Economic and Environmental Assessment	Marine Gaillard & Colin Jury (Inovertis)
15:00-16:00	<b>Panel discussion</b> - Establishing the REE4EU value chain in Europe - Threats and Opportunities Moderator: Nader Akil (PNO) Panellists: <ul style="list-style-type: none"><li>- Mr. David O’Brock (REEtec – Norway)</li><li>- Dr. Gro Eide (Elkem ASA Technology - Norway)</li><li>- Mr. Scott Dunn (Urban Mining Company – EE.UU)</li><li>- Mr. Daniel Cios (EU Commission, DG GROW – Belgium)</li><li>- Prof. Toru Okabe (University of Tokyo – Japan)</li></ul>	





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### List of speakers



**Dr. Ana Maria Martinez**  
Senior Scientist  
SINTEF (Norway)

Research Scientist at SINTEF, which is the largest contract-based, private, non-profit research foundation in Scandinavia.

Her main research interest and expertise (more than 25 years) is electrochemical processes in high temperature molten salts and ionic liquids, including electrowinning, electrorefining and electrodeposition. In the last years her research has focused on the recovery of critical raw materials from secondary resources, and she is currently involved in several EU-funded projects in that subject.

She is the author of almost 50 publications in scientific journals, inventor of two patent applications, and co-supervisor of several PhD candidates at the Norwegian University of Science and Technology. Moreover, she has a wide experience in applied research, working with industries all over the world dealing with metal production from primary (mining) and secondary (wastes) resources.

Martinez is the founder behind the REE4EU technology and the scientific and administrative coordinator of the project.



**Dr. Nader Akil**  
Operations Manager  
PNO Innovation - Brussels (Belgium)

Highly experienced Senior Innovation and EU Grants consultant at PNO Innovation (Brussels) with a demonstrated history in the conceptualisation and building of strategic collaborative projects in several fields, as well as innovation ecosystems and large networks in raw materials, chemical and environmental technologies. Nader has 20 years of experience in research and innovation, competitive intelligence and project management. Worked at large industry, research centres and universities in the Netherlands, USA, France, and Belgium. He has a PhD in opto-electronics, more than 50 scientific publications, 13 patents, and has raised several dozen million euros for his clients to develop technologies in the past years. He is currently involved in several EU projects as an exploitation manager, or as a partner delivering innovation services such as market and business analysis, exploitation workshops etc. Nader is currently the Operations Manager of the PNO Innovation office in Brussels.



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**Mr. Mihai Barcanescu**  
Programme Manager  
A.SPIRE (Belgium)

Mihai Barcanescu is the Programme Manager in A.SPIRE, working on both project and policy-related aspects. His main work experience is in R&I projects and policies at the EU level (FP7 and H2020), gained in Brussels-based organizations. He has worked extensively on transport, energy efficiency and renewable energies, and various industry topics. With professional fluency in English and a good command of the French and Italian languages, he is able to easily liaise with different stakeholders and support the communications activities. He has a BA in Political Science (Bucharest University) and a MA in European Studies (Free University of Brussels).



**Dr. Bjorn Debecker**  
Senior Project Adviser  
European Commission EASME (Belgium)

Bjorn Debecker obtained his MSc and PhD in Mining Engineering at the Catholic University of Leuven (B). After being active in the field of GIS and microelectronics he joined the European Commission in 2013, where he was first working for the EU Research Fund for Coal and Steel. Since 2018 he is a Senior Project Advisor on H2020 funding in Raw Materials in the Executive Agency for Small and Medium Enterprises (EASME), where he is dealing with projects on mining and processing.



**Dr. Rolf Blank**  
Senior Physicist  
Vacuumschmelze GmbH & Co (Germany)

Dr. Rolf Blank has worked as senior physicist since more than 30 years for Vacuumschmelze GmbH & Co KG in Hanau, Germany. Actually he is the head of the R&D for Rare Earth Permanent Magnets.



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**Mr. Kagya Nyanin**  
Technical Manager  
Less Common Metals (United Kingdom)

Technical Manager at LCM, responsible for management of the European project portfolio as well as process improvement and new product development. Prior to joining LCM, Kagya worked in technical and quality management roles at Tata Steel UK for 9 years. Kagya holds BSc (Hons) in Metallurgical Engineering and MRes in Materials in Engineering.



**Professor Toru Okabe**  
Institute of Industrial Sciences  
University of Tokyo (Japan)

Professor at the Institute of Industrial Science, the University of Tokyo, and Vice President of the same institution. Dr. Okabe is specialised in materials science, environmental science, resource circulation engineering and rare metal process engineering. For more than 30 years, he has consistently pursued research on refining/recycling "rare metals" or "specialty metals" or "less-common metals". He has also been developing a new processing technology for future-materials such as titanium, with the ultimate goal of realising processing technology that changes rare metal to common metals. Recently, in addition to the research on the innovative production technology, he has been working on new recycling and environmental technology of rare metals, such as niobium, tantalum, scandium, tungsten, rhenium, and precious metals.

Professor Okabe possesses a long list of awards, not only "best paper" awards in specialised scientific conferences, but also several technological development prizes and academic prizes.

He has been a technological advisor for the Japanese Institute of Industry in the strategies towards the security of supply of critical rare elements important for the development of high-tech industries in Japan.



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**Dr. Marine Gaillard**  
Project Manager  
INOVERTIS (France)

Holder of a PhD degree in Chemistry and Catalysis and of an Engineering degree in Chemistry and Sustainable Processes for the Industry, Marine developed an expertise in waste valorization (biomass transformation, bio-sourced chemistry, bio-based energies). At INOVERTIS she works on techno-economic and engineering studies in the frame of R&D collaborative projects or industrial consulting, especially for the development of innovative technologies of waste recycling: delignification, gasification, pyrolysis or hydrothermal liquefaction.



**Mr. Colin Jury**  
LCA and Ecodesign Expert  
INOVERTIS (France)

Colin Jury is in charge of the environmental evaluation and eco-design activities at the INOVERTIS group. He applied and shared his competencies as an R&D Engineer, performing LCA studies in the frame of research projects as well as industrial consulting. In particular, he has been in charge of economic and environmental studies of biomass/waste-to-energy technologies, recycling processes and also worked on the eco-design of innovative agrofuels, agromaterials or electric and electronic equipments.



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**Dr. Gro Eide**  
Director R&D  
Elkem ASA Technology (Norway)

Gro Eide is the Director of R&D Technical Centre at Elkem Technology, Kristiansand, Norway. Gro Eide holds an PhD in Material Physics on thin casting of Aluminium from University of Oslo in 1997, a Siv.Ing degree in Physics from University of Trondheim 1992 and a degree in Master of Management from Norwegian Business School 2009. She started her work in Elkem in 1997 as a researcher followed by different R&D-related management positions in Elkem. Her research expertise is focused on product and process development of Silicon based materials, and recycling of materials in the metallurgical industry.



**Mr. Scott Dunn**  
President and CEO  
Urban Mining Company (EE.UU)

Mr. Dunn is a business specialist, with interests in the commercialization and management of growth companies with a focus on resource efficiency and circular economies. He is a co-founder and currently serving as President & CEO of Urban Mining Company, where his main responsibilities include business development, financial planning and managing financial risks including the development of all real and personal property assets of the company, and corporate direction and strategy. Scott has an educational background in environmental science, with specializations in geopolitics and natural resources, economy, and finance (BSc. University of Southern California).



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**Mr. Daniel Cios**  
Policy Assistant  
European Commission, DG GROW (Belgium)

Joined the Commission in 2018 as policy assistant in the Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs. Has been following closely EU raw materials policies since 2008, conducted academic research and gained professional experience in this field. Before joining the Commission he worked as a consultant for mining and oil companies on issues related to supplies of raw materials and performed economic and technological analysis of various innovative projects. He also worked in the Polish Ministry for Foreign Affairs, during the period of the Polish Presidency of the Council of the European Union, where he was responsible for organizing meetings on ministers level.



**Mr. David O'Brock**  
Commercial Director  
REEtec (Norway)

David is responsible for the commercial activities in regards to raw material feedstocks and finished products at REEtec. He has extensive experience in the REE industry and has been involved with the Lanthanides' markets and processing since 1999. David served on the management board of the Estonian rare earth processing factory, Silmet (NPM Silmet), for more than a decade. He has extensive knowledge of the applications, processing of, and markets for rare earth elements.



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