SecREEts Citizen Lab



SecREEts

Secure European Critical Rare Earth Elements

This project has received funding from the European Union's horizon 2020 Research and Innovation Programme under Grant Agreement No 776559



Porsgrunn, 28 September 2022.

Led by Prospex Institute With REEtec, SINTEF, Yara.

About SecREEts

SecREEts is a project receiving funding from the European Commission Horizon 2020 programme for research & innovation. It aims to establish a secure and stable supply of Rare Earth Elements (REEs) in Europe, using sustainable extraction methods from European apatite sources used in the production of NPK fertilisers. SecREEts partners are developing pilot processes for a sustainable extraction, separation and manufacturing of REEs to create permanent magnets for application to areas such as electric vehicles, industrial motors, wind turbines, with replication potential in consumer products or medical equipment. The main objective of SecREEts is to set up a new integrated European value chain for extraction, refining and production of REEs.

SecREEts partners are: SINTEF AS – Norway – Coordinator Yara International ASA – Norway – Industrial pilot REEtec AS – Norway – Industrial Pilot Less Common Metals Ltd – UK – Industrial Pilot Vacuumschmelze GMBH & Co kg – Germany Quantis – Switzerland Institut National de l'Environnement et des Risques INERIS – France Prospex Institute asbl – Belgium

Please find all relevant information and latest updates on the project website: <u>www.secreets.eu</u>

Citizen Engagement in SecREEts

As part of the SecREEts Public Engagement strategy, Prospex Institute organises yearly Citizen Labs, to consult local communities in areas where industrial partners are established. Through identifying civil society organisations, media groups, political parties and public authorities, Prospex Institute facilitates discussions between local communities and industrial partners to highlight challenges and opportunities related to SecREEts throughout the whole duration of the project. The outputs of these consultations will allow SecREEts to co-create a level of social awareness around the project and incorporate local stakeholders' feedback into future developments.

The final Citizen lab in Porsgrunn (Norway) took place on 28th September 2022, at the DuVerden Sjøfartsmuseum and Vitensenter, following the second Norwegian Citizen Lab in September 2020.

Together with REEtec, Yara and SINTEF, Prospex Institute presented the outcomes of SecREEts in the Telemark region. The team delivered brief presentations and conducted with an exercise to evaluate stakeholder engagement activities throughout the project. The workshop was organised around group discussions, interviews to explore what will happen next after the ending of the SecREEts project in November 2022.

For this event, Prospex Institute worked with REEtec, Vekst i Grenland and Yara to map the relevant stakeholders. Overall, 47 stakeholders were mapped based on categories and quotas previously defined.

Following an invitation process in several rounds, Prospex Institute received registrations from 16 stakeholders. As illustrated in the table below.

Industry	
Trade Unions	1
Business organisations	3
Research, Academia Innovation	4
Civil Society	
Youth Education	1
REE end-users	0
Local media	0
Political life	
Local governance	5
Political Parties	2
GENDER	
Male	10
Female	5
Not specified	0
AGE GROUP	
16-29	0
30-49	7
Over 49	7
Not specified	0

In accordance with the European General Data Protection Regulation, participants were requested to fill in a registration form online ahead of the event, with personal information and consent for the sharing of their personal data among SecREEts partners and permission for us to take pictures and us them as part of SecREEts communication activities. To ensure transparency, participants were explained at the start of the Citizen Lab that the meeting is public, and information presented by the SecREEts team during the event can be shared externally.

List of Abbreviations

EU: European Union EVs: Electric Vehicles LCA: Life Cycle Assessment LCM: Less Common Metals PI: Prospex Institute RE: Rare Earths REE: Rare Earth Elements UK: United Kingdom VAC: Vacuumschmelze

Agenda and discussions

1 – Welcome & Introduction

Miro Prek from Prospex Institute (PI) and lead moderator of the Citizen Lab opened the session by thanking all participants for their time. After having introduced the other colleague from PI, he introduced Arne Petter Ratvik, senior research at SINTEF and SecREEts project coordinator, as well as Fredrik Rodahl from Yara and Toril Roberg from REEtec.

Miro Prek then introduced the Citizen Lab, stating that this workshop would focus on giving insights on what has been achieved in the SecREEts Project, with a focus on Yara and REEtec, as well as on collecting feedback on the engagement activities carried out by Prospex Institute throughout the project.

He then provided an overview of the house rules, explaining that the session was a public meeting and that all participants are free to communicate about the meeting for this interactive session. He then gave the agenda of the day.

2 – Outcomes of the SecREEts project – with Arne Petter Ratvik, SINTEF

After a first introduction, Miro Prek introduced the first session in which participants heard about what has happened over the past four years in SecREEts.

Arne Petter Ratvik, Senior Scientist at SINTEF and SecREEts Project Leader, took the floor. After having highlighted the importance of REEs and Europe's current dependency on China as producer, he presented project results, giving an overview of the SecREEts achievements. The slides from his presentation are available below:



Hvorfor er det viktig å sikre Europa kritiske materialer som sjeldne jordarter?





8

SecREEts – Hva er vår målsetning



- Verifisering av pilotprosesser for etablering av produksjon av sjeldne jordarter i Europa
- Utvinning fra fosfatstein i gjødselproduksjon etterfulgt av separasjon og framstilling av metall
- Hovedfokus på Pr (praseodym), Nd (neodym) and Dy (dysprosium), de viktigste metallene for å produsere supersterke magneter
- Andre elementer vil bli tilgjengelig for anvendelser innenfor bl.a. medisinsk diagnostikk (Ga), katalysatorer (La, Ce) og forbrukerelektronikk (lyspærer, LED-skjermer, etc.)

Status:

- SecREEts har verifisert nyskapende industrielle piloter for integrert verdikjede i Europa:
 - Framstilling av konsentrat Yara
 - Separasjon fra konsentrat REEtec
 - Elektrokjemisk metallproduksjon LCM

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 776559

SINTEF

SecREEts Piloter – Utviklet for industriell oppskallering



- Yara pilot Ekstraksjon av konsentrat (NO)
 - Pilot installert i gjødselfabrikken
 - RE produksjonspotensial: 3 000 tonne (inkludert Ce)
- REEtec pilot Separasjon av REE (NO)
 - Helt nyutviklet separasjonsteknologi
 - Hovedfokus på NdPr og Dy oksider for magnetproduksjon
 - Modulært
- LCM pilot Saltsmelteelektrolyse for metalframstilling (UK)
 - Miljøvennlig elektrolyseprosess
 - Tynnstøping og hydrogendekrepitering (nedbryting av flak til mindre biter) for framstilling av magneter





Miljøanalyser hos LCM, UK

Yara Pilot

This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 776559

() SINTEF

SecREEts

Bærekraft, risikoanalyse og samfunnsformidling



Forventninger etter endt prosjektet

SecREEts

- Etablere stabil og sikker tilgang på kritiske sjeldne jordarter i Europa
- Industriell produksjon 1-3 år etter endt prosjekt
- Potensiell produksjon basert på integrert verdikjede:
 420 tonn NdPr (1 200 tonn NdFeB magnet) and 18 tonn Dy
- Teknologien er overførbar til andre lokaliteter
- Separasjonsprosessen er modulær og fleksibel i forhold til andre kilder for sjeldne jordarter
- Separasjon av andre sjeldne jordarter medisinsk diagnostikk, katalytiske prosesser og forbrukerelektronikk
- Elektrolytisk framstilling av metallegeringer er modulær og uavhengig av oksidkildene
- Nedstrøms europeisk tilgang til sjeldne jordarter



This project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 776559

() SINTEF

3 – YARA and REEtec's achievements in SecREEts – with Fredrik Rodahl (Yara) and Toril Roberg (REEtec)

After hearing what has happened in the previous years, participants had a closer look at REEtec and YARA's achievements in SecREEts thanks to an interview with project partners Fredrik Rodahl (Yara) and Toril Roberg (REEtec).

The overarching objective of the interview, moderated by Clara Boissenin (PI) was to learn more about the main achievements of the two Telemark-based companies, as well as the main challenges faced in the past four years of SecREEts. The questions and answers are summarised below.

Question for Fredrik Rodahl: How did you set up the process at Yara? Tell us a bit about the journey...

- *A*: Rare earth elements are a component of some phosphate rocks, but it is a quite much lower amount than in traditional mining operation, so for us to extract these minerals we need to find a process that is either smarter than others or cheap enough to be a side process in the fertilization production.

Yara had a factory that produced REEs but this became unprofitable as the price pressure from China was too hard, and it was considered a project that was at a loss. So consulted and tried to find a new process that was simpler, the previous one was very complicated, and to design an extraction method that we could create from a lab and convert to pilot scale. We made a concept that we wanted to expand on, but for now Yara does not want to invest in further production, because raw material in the phosphate is very critical, it is not easy to find material that you can obtain REEs from. We went quite far in the development, but are lacking the small steps to build further on that.

Question for Toril Roberg: And what about the process at REEtec?

- *A:* The composition and content of rare earth elements in the concentrate from Yara varied and made the processing more challenging than anticipated. Of the 300 kg of RE-metals that was received, approximately 100 kg were neodymium-praseodymium (NdPr). In lab scale the extraction of the NdPr was done with low loss, but in full scale the process was more challenging. The process needs more work before industrialization.

- *Toril (REEtec):* We concluded that we were able to produce what we were supposed to, a NdPr oxide with < 99.85 % purity.

Question for both: What's been the most challenging part of the SecREEts project for your respective pilots?

- Toril's answer: The technology gap between the Yara and the REEtec process.

- *Fredrik's answer:* When we had built the pilot in our factory, it was approximately fall 2020, and there was a full lock-down. So, the amount of effort we had to out in to operate during Covid-19 without violating procedures, it was important to keep production in the fertilizer going on

Question for both: What has been the most rewarding part?

- *Toril's answer*: Despite the challenges we had, we were able to produce high purity oxides that LCM made metal of, which now are part of magnets. We learned a lot in when processing the material from Yara. We have now much better knowledge in understanding the chemistry, which has led us to come closer to do this in a full-scale project.

- *Fredrik's answer*: The collaboration project with REEtec was good, but technically rewarding and useful for us as well, to look at chemistry from a different angle in the fertilization, it was very rewarding and useful for Yara as a Company.

Question for both: We will talk about what happens after SecREEts in a moment, but maybe you can already give us some elements of context. What is the picture looking like for REE manufacturing in Norway at the moment?

-Toril's answer - We have plans to build a factory. I will talk more about that later. We have an agreement for a raw-material delivery from a mine in Canada run by Vital Metals. They will produce a carbonate raw-material, this is the same type of raw-material we have tested in our pilot, in addition to the Yara material.

- *Fredrik's answer:* With the process that we developed, when there is a possibility of more reliable access to phosphate that is good for Yara when it comes to fertilization process, then we can produce concentrate that is completely free of any waste. But we are lacking some basic material right now.

4 – Environmental Impact Assessment in SecREEts – with Pauline

Chrobot (Quantis)

Clara Boissenin introduced the next session, explaining that participates will have a closer look at the Environmental Impact Assessment in SecREEts, showing a short video interview with Pauline Chrobot (Quantis) in charge of the project Work Package on Sustainability and Risk Assessment.

In the video, Pauline explained that Quantis had the role of calculating environmental impact of the supply chain in SecREEts and compare with the conventional supply chain, that in SecREEts case would be based in China, were most permanent magnets are produced currently.

After having explain the LCA process and its constraints, Pauline explained that the analysis has shown that the production of a permanent magnet through SecREEts supply chain has a lower environmental impact across all the indicators Quantis has looked at, compared to the production of a permanent magnet in China, where for the 1st step there is a strong impact associated with the mining and separation activities.



video interview with Pauline Chrobot

5 – Recap of local community engagement – with Clara Boissenin PI

Clara Boissenin (PI) took then the floor and presented the achievements in terms of community engagement in the past years within the SecREEts project.

She then introduced Thomas Hansen from DuVerden Sjøfartsmuseum and Vitensenter , who briefly recounted the school activities that took place with DuVerden in 2022 ad that engaged students in science and chemistry tracks.

A part of the evaluation exercise, participants gather in small groups and were asked to reflect on the engagement activities and to fill-in an evaluation form answering the following questions:

- In what you heard just now or in activities you attended, what do you think has been the most valuable for the local community
- What would have been your suggestions to improve the process of engaging the local community? Or what would you have done differently/in addition?



Small group discussions on evaluating the engagement activities

After having let all groups discuss, Clara Boissenin brought then everyone back in plenary and asked each group to share their thoughts. Participants were also encouraged to react to each other's points

The main aspects that came out of the discussion can be summarised as follows:

- **Community engagement is key**. It is fundamental to increase knowledge and **create an understanding around the importance of REE**.
- Importance of keep involving the youth: universities, youth councils, more exhibitions. Collaboration such as the one with Duverden Science Museum are very beneficials and more schools should be included.
- Engagement activities should be carried out on a bigger scale
- Educating the public is important as there is a huge knowledge gap between the research community and the general public.

At the end of the sessions all evaluations forms were collected by Francesca Ferrara from PI. (Feedback from the evaluations forms can be found in the annex)

6 – **REEtec after SecREEts** – *Toril Roberg (REEtec)*

In this last session moderated Miro Prek (PI) participants heard about what will happen at REETec after the ending of SecREEts in November 2022.

The main points of the conversation can be summarized as follows:

- REEtec has made an agreement with Vital Metals, who started a mine in Canada and for which REEtec will separate.
- REEtec had made an agreement with Schaeffler, who use magnets in EVs, small engines and are big part in the shift to EVs.
- REEtecs process is competitive and more flexible compared to tradition separation.
- REEtec assumes that the new factory will start up in 2024

7 – Conclusions & Wrap up

Miro Prek and Clara Boissenin (PI) wrapped up the Citizen Lab by thanking all participants for attending. On behalf of SecREEts, Arne Petter Ratvik thanked everyone, followed by Toril Roberg and Fredrik Rodahl who thanked everyone on behalf of REEtec and Yara. Project partners also acknowledge that SecREEts project would have not happened without EU funds.

Questions & Answers

Q: What is the reason you mix dysprosium with iron?

- A: A magnet neodymium-praseodymium often is a neodymium magnet, but is approximately 30% neodymium-praseodymium (NdPr) and the rest is iron, and that is making it stronger.
- A: Many magnets lose their magnetism when it is hot, so with these you keep the qualities of magnets even with high temperatures.

Q: How is the producing recycling process? How much can you extract? What percentage of extraction?

- A: it is Going back to fertilization production, but based on Yara almost 100% throughout the process – in the downstream process it is 100%

Q: How big was the stream of materials form YARA?

- A The Pilot had stream in cubic, we had 250 kg, it is small scale pilot, it's a partial stream, is not the processing of the whole factory.

Q: Can I ask the type of concentrate? What are you separating?

- A: That depends on the concentrate you want; it varies greatly from batch to batch.
- A: There is no good answer, we were developing and testing.

Q: Many of you have mentioned that your general impression that there is not much knowledge on REEs. I was wondering what you believe is important for people to know, what knowledge they need to get when it comes to REEs?

- A: REE are used in many of parts our life, thing we use maybe not directly, but that produce the thing we use daily, are based on a chemistry of REEs. All knowledge should be built on this. If everyone is thought of this everyone, the understanding of what is needed would be improved.

- A: EVs, everyone wants them, wind turbines... The best permanent magnets we need, we cannot create these without REEs

Evaluations

At the end of the meeting, participants were handed evaluation forms. These forms are designed to help the SecREEts team get feedback on their public engagement strategy and the Citizen Labs more specifically.

The participants were asked the following questions:

Please mark:	Very good	Good	ОК	Bad	Very bad	No opinion
Number of answers	5	2	0	0	0	0

1. How do you rate the Citizen Lab in general?

Comments:

- the sound was unpleasant; mosquitoes were very fast ©

2. Did this lab help you understand challenges related to Rare Earth Elements?

Please mark:	Very much	Much	Somewhat	Little	Very little	No opinion
Number of answers	2	4	1	0	0	0

Comments:

- No comment

3. Did this lab help you understand what the SecREEts project has done in Porsgrunn and what will happen next?

Please mark:	Very much	Much	Somewhat	Little	Very little	No opinion
Number of answers	3	4	0	0	0	0

Comments:

- a lot of professional stuff beyond my level of competence

4. How much were you enabled to contribute to the discussion?

Please mark:	Very much	Much	Somewhat	Little	Very little	No opinion
Number of answers	4	1	2	0	0	0

Comments:

- No comment

Do you have any other comments or remarks?

- I hope to be able to participate in other occasions
- upscale event to large audience