

REE exploration prospects and secondary resources in Sweden

Mintell4EU UNFC Case Study

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Erika Ingvald



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- EC sees UNFC a valuable tool for harmonization of resources within EU
- UNFC WP of Mintell4EU, a GeoEra project
- REEs are the most critical raw materials on the EU critical list
- Sweden is one of few EU countries with known REE resources and hence took responsibility for REEs in Mintell4EU
- We chose to study three projects of different character and maturity
 - Olserum, Norra Kärr and LKAB ReeMAP
- How to do UNFC classification based on available public data only?
- Applied Nordic Guidance Document, and used the Orama cook book for how to bridge between CRIRSCO and UNFC

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ReeMAP – operating mine, waste recovery project, challenges with future permits

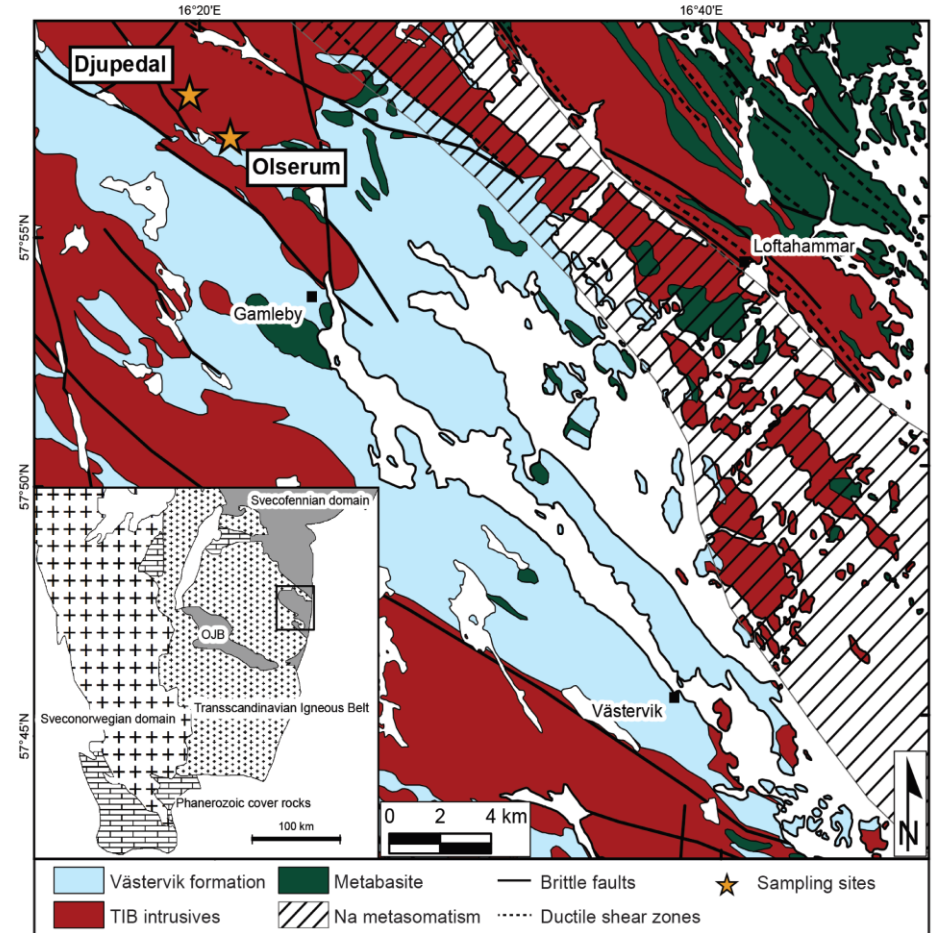
Norra Kärr – mature exploration project with a complicated permitting history, grants and appeals

Öserum – exploration project, explored for a range of commodities since the 50's, unique permitting situation

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- Olserum E2, F1-F2, G1-G2
- Today two companies hold more or less identical exploration permits
- HREE project. The REEs are mainly found within the minerals monazite and xenotime. Straight forward, known processing methods.
- Mineralization is well known due to exploration of different commodities since the 1950s.
- Change of ownership since technical report in 2013, NI43-101, also NI43 was improved afterwards



REE exploration prospects and secondary resources in Sweden



■ Norra Kärr E2 F2.1 G1-2

- HREE project. Low in U and Th.
- A mining concession was granted at one stage, but due to several appeals in different courts, the company still awaits its final permits, to take the next step towards environmental permitting, project moves up and down the E-axis. The project highlights the challenges concerning the permitting processes in Sweden and with different interests concerning land use. N2K nearby and water reservoir and regulations are involved.
- The REEs are concentrated to the silicate eudialyte. The process of extracting the REE from eudialyte has been tested on laboratory scale but no full-scale test have been carried out as far as we know of.
- Well known deposit. NI43-101 in 2014, working on an update

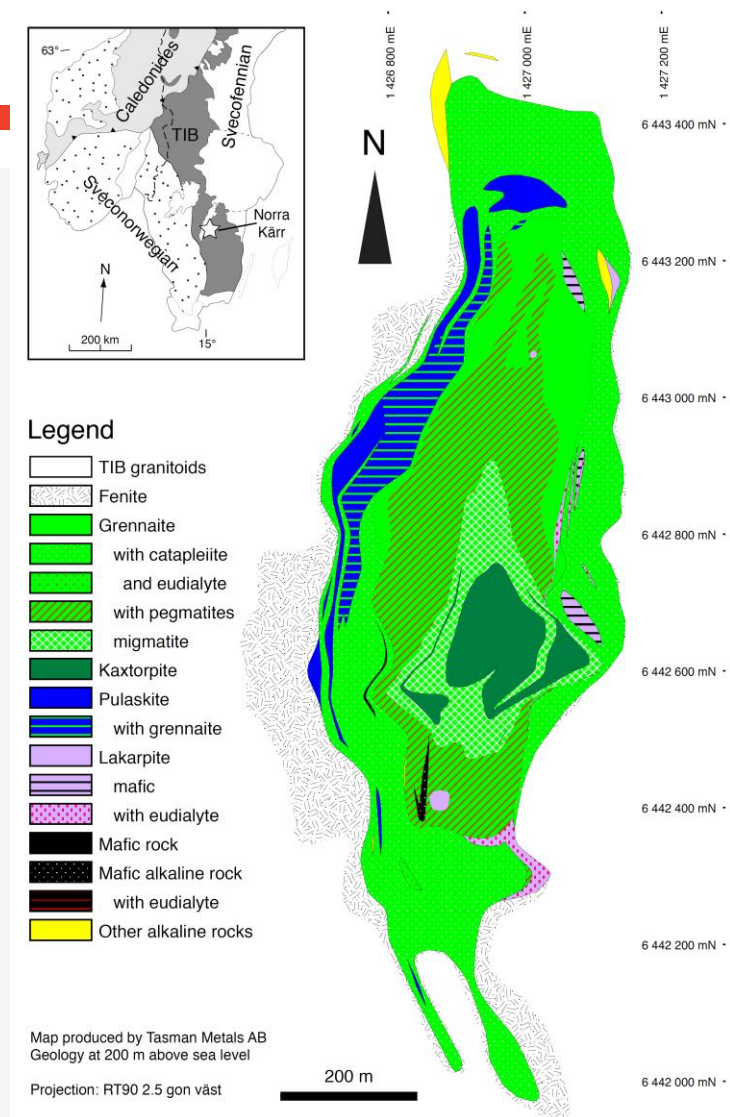
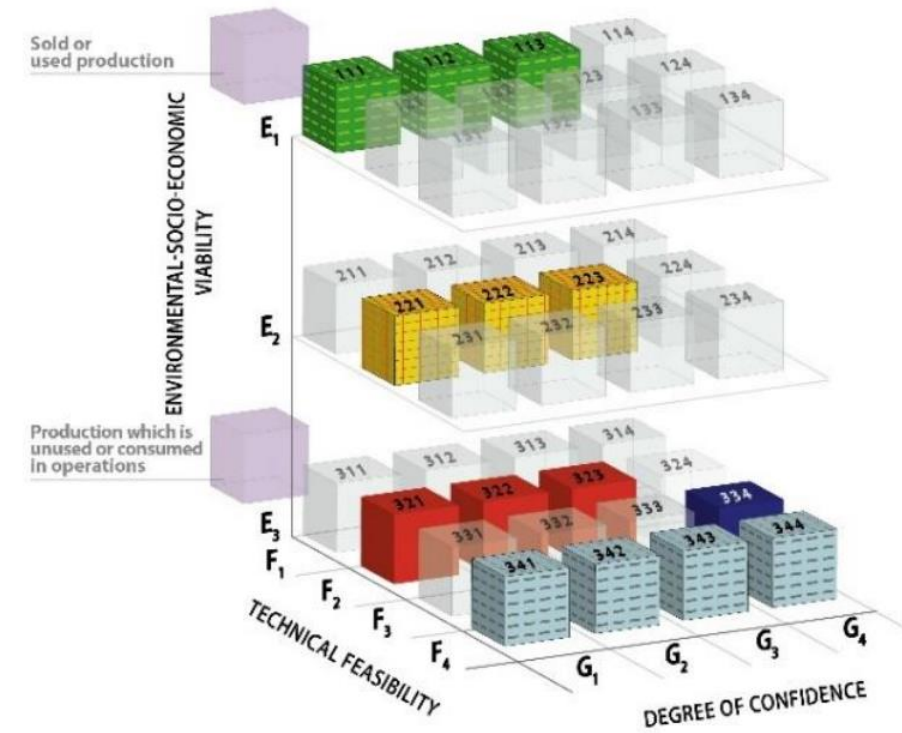


Table 3. Timeline showing the prolonged procedure of receiving valid permits for the Norra Kärr project (Source; Leading Edge Materials).

2009	Exploration permit Norra Kärr No.1
2012	Prolonged exploration permits until 2015
2015	Prolonged exploration permits until 2017
2016	The Administrative Court repeals the decision of the Mining Inspectorate of Sweden
2017	The Court of Appeals repeals the judgement of the Administrative Court
2017	Prolonged exploration permits until 2019
2019	Prolonged exploration permits until 2024
2021	Prolonged exploration permits until 2025
2013	Mining concession
2014	The government dismisses the appeal and decides not to repeal the Mining lease.
2016	The Supreme Administrative Court repeals the decision of the government
2016	The government returns the application of Mining lease to the Mining Inspectorate for a retrial.
2021	The project bounced back to the company by the Swedish Mining Inspectorate, awaiting Natura 2000 assessment

UNFC Categories and Example Classes



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- LKAB ReeMAP E2 F2 G1-2
- HREE project
- State owned mining company, ongoing mining of iron ore since more than 100 years, secured ore base for another 40+. Will cover 30% of Europe's REE need, part of a total industrial makeover
- Permitting challenges for the apatite works planned on two minesites where the environmental permits are under revision
- Planning extraction of REE and phosphorus to also produce gypsum and mineral fertilizer from falling mining waste and involves processes never used in an integrated full-scale project. Investment plan in place.
- PERC report in progress, most of the info from company's web page, additional info from scientific papers

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■ Challenges and conclusions

- Bridging between CRIRSCO and UNFC is fairly straight forward, the Orama cookbook is very useful.
- We know the three projects and their history very well, and it became obvious to us that we, in early drafts, omitted information that for us is “common knowledge” but to a third party is unknown and might be valuable or even crucial (thankyou GTK for invaluable comments). An external review improves the classification immensely.
- After doing the work, we contacted the respective companies to get their feedback, to secure the quality of our work (and market UNFC). Our assessment of the respective projects correlated with that of the companies.
- One outstanding question concerns how a classification stands if a project is transferred to a new owner, and new CRIRSCO technical reports haven't yet been published by this owner. Our take is that the old one stands until there is a new one, as long as this is transparently communicated. Also it is important to be transparent on dates of publications referred to since CRIRSCO codes also can be updated.
- It is perfectly possible to classify according to UNFC based on publicly available information, also if it is not CRIRSCO reports, as long as you are transparent on the details. Starting point that can be inherited and improved by companies for example.

Thank you!

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