



Company Announcement, October 26<sup>th</sup>, 2015

**Kvanefjeld Update:  
Refinery Piloting Successfully Completed**

- **Kvanefjeld refinery pilot plant activities successfully completed**
- **Conducted at Outotec Pori Research Laboratories, Finland, as part of the EURARE program**
- **Outcomes consistent with, and in areas exceeding, Feasibility design criteria**
- **Valuable operating data collected, further de-risking atmospheric leach circuit**
- **Confirms non-refractory nature of the Kvanefjeld ore minerals, with high extraction levels**
- **~25 kilograms of mixed rare earth carbonate produced, to be used by the EURARE program to produce advanced rare earth products**

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### **Kvanefjeld Refinery Pilot Plant Successful**

Greenland Minerals and Energy Ltd ('GMEL' or 'the Company') has successfully completed the refinery pilot plant operations in Finland for the Kvanefjeld Project. These pilot plant activities were performed as part of the EURARE program for which the Company is a work package leader.

The final phases of the pilot plant operations were completed at Outotec Pori Research Laboratories in October 2015. The Pori Research laboratories are part of Outotec, the provider of leading technologies and services for the sustainable use of Earth's natural resources.

The Company is extremely pleased with the refinery pilot plant outcomes. The operation was characterised by results that exceeded expectations with few surprises. GMEL would like to acknowledge the innovation and efforts of its technical team.

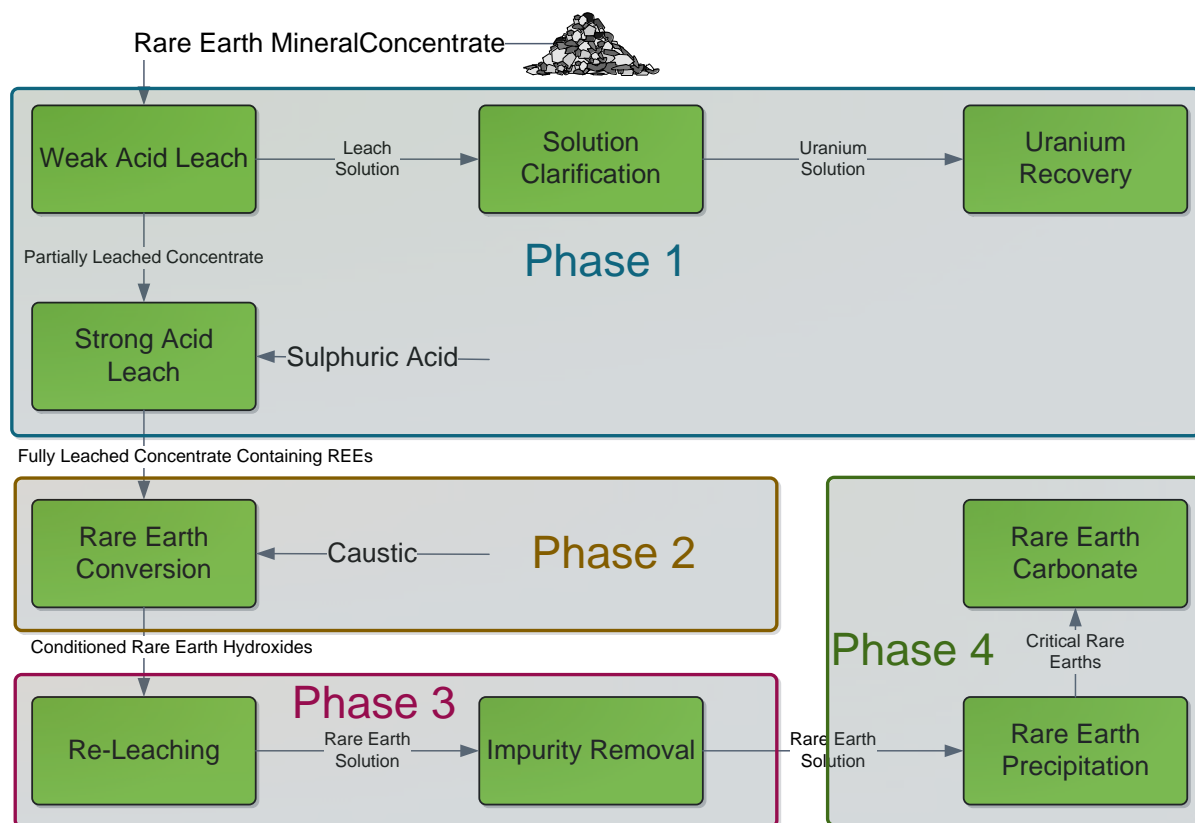


The success of the pilot plant operations was the culmination of years of metallurgical work which has taken the process from an initial concept to a rigorously-tested design.

The Company is also grateful to the efforts of the Outotec Pori's pilot plant technicians and metallurgists who made the pilot plant campaign successful.

## Pilot Plant Overview

The refinery process was piloted in four main phases to convert the mineral concentrate produced by the concentrator circuit, into a rare earth intermediate product.



**Figure 1:** Pilot plant phases for the Kvanefjeld refinery circuit. The mineral concentrates were generated in a pilot plant operation of the concentrator circuit conducted in Q2, 2015.

The first phase in the refinery process is atmospheric leaching with sulphuric acid. Here the uranium is extracted and separated away from the rare earths along with many of the impurities. This part of the process was piloted in September (ASX Announcement 24/9/15) at Outotec's Pori Research Laboratories.

The second phase consists of conditioning the filtered leach residues from the atmospheric sulphate leaching. The residues are conditioned with caustic to change the chemical form of the rare earths in the residue. This allows the rare earths to leach easily from the residue, in the next stage.

The third phase leaches the rare earths from the conditioned residues into a chloride solution. Impurities are removed from the rare earth chloride solution produced by precipitation. The leach conditions are atmospheric and mild.

The last and fourth phase produces a mixed rare earth carbonate product. This is achieved by dosing caustic soda into the purified rare earth chloride solution produced in the previous step. Rare earths precipitate as a mixed rare earth carbonate which is separated from the chloride solution by thickening and filtration.

The last three phases of the pilot plant campaign were performed between the 21<sup>st</sup> of September and 6<sup>th</sup> of October 2015 at Outotec's Pori Research Laboratories.

### **Valuable Operating Data**

Pilot plant scale operations of the refinery process have produced valuable information on the performance, that is not available at small or batch scale. In particular information on the performance of solid liquid separation units such as thickeners and filters are best determined during a pilot plant. Pilot plant samples were taken from the pilot plant and examined with Outotec's solid liquid separation equipment.

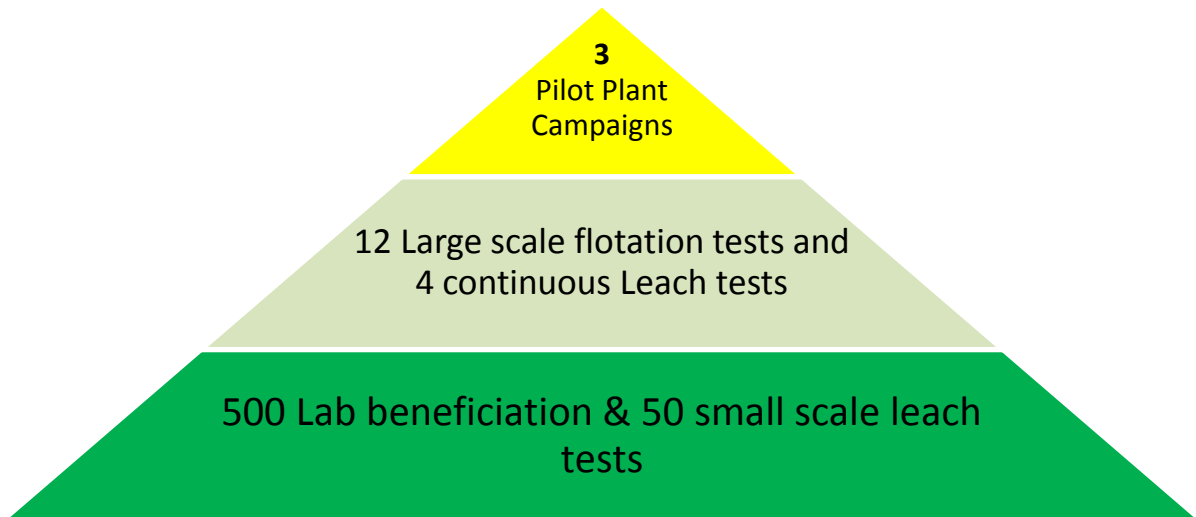
Due to the use of simple mechanical equipment the availability of the pilot plant was very high with no significant stoppages experienced. All materials of construction performed well with no corrosion observed due to process conditions.

The impurity removal circuit was operated with two different methods with the optimum method identified based on pilot plant performance. This will result in improved rare earth recoveries to those assumed for the Feasibility Study. Impurity removal was effective in removing uranium and thorium from the rare earths.

### **Rare Earth Carbonate**

Approximately 25 kilograms (dry and dehydrated basis) of rare earth carbonate were produced for further evaluation. This intermediate product contains a mixture of all 15 rare earths extracted by the process. The EURARE project will use the material to test further refining of the rare earths to produce final rare earth products.

The rare earth carbonate will be dispatched to MEAB Aachen, Germany for separation test work. The separation test work will involve the use of solvent extraction to produce individual rare earth oxides.

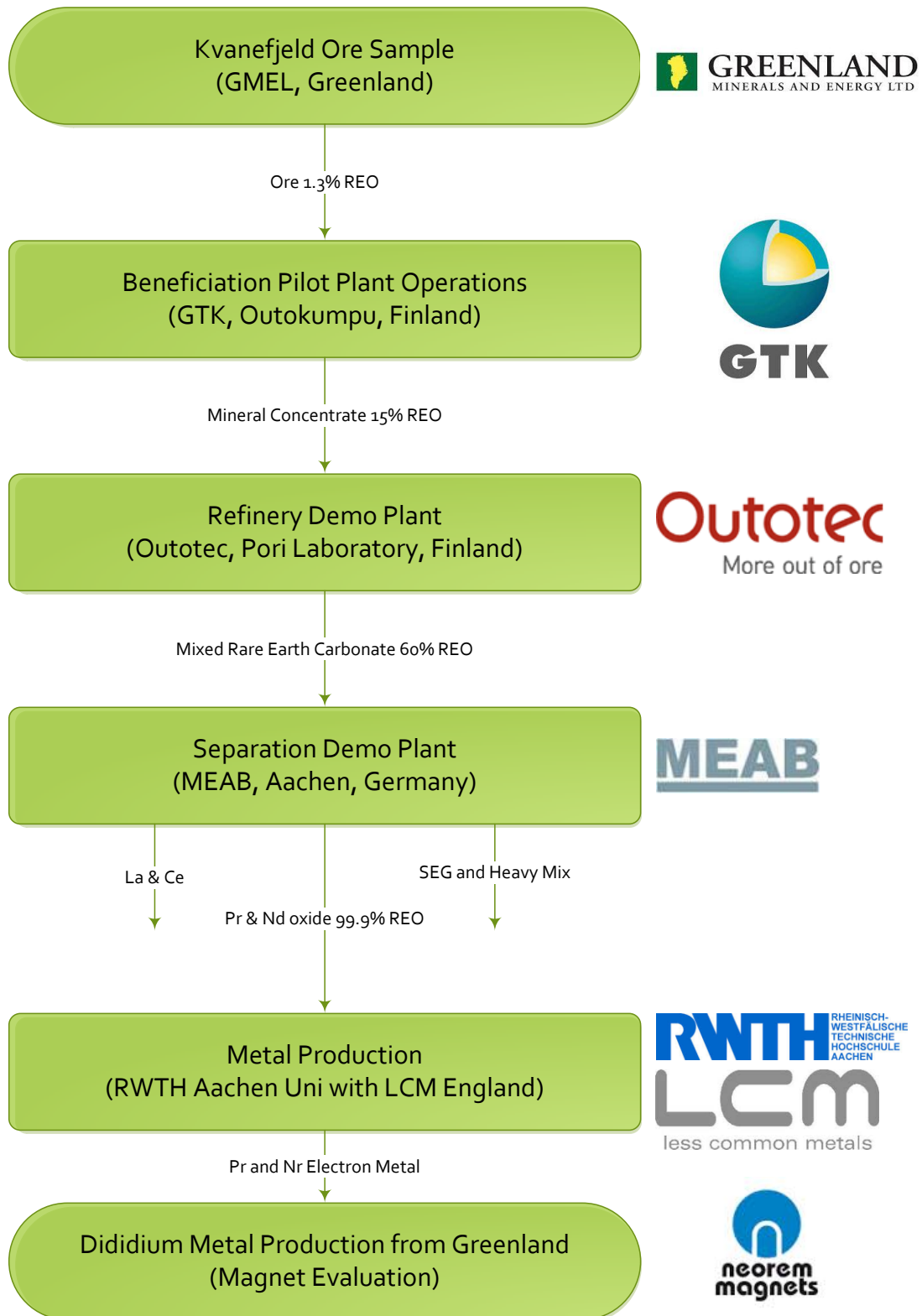


**Figure 2:** Summary of the metallurgical test work program that underlies the Kvanefjeld Project. Two of the three pilot plant campaigns have been on the concentrator circuit, the third (summarised herein) on the refinery circuit.



**“The EURARE project has received funding from the European Community’s Seventh Framework Programme ([FP7/2007-2013]) under grant agreement n°309373. This publication reflects only the author’s view, exempting the Community from any liability”. Project web site: [www.eurare.eu](http://www.eurare.eu)”**

**Material Flow During EURARE Demonstration Work Package for Kvanefjeld Ore**



**Figure 3:** Flow of Kvanefjeld raw materials through the EURARE Program

## ABOUT OUTOTEC

Outotec provides leading technologies and services for the Sustainable use of Earth's natural resources. As the global leader in minerals and metals processing technology, we have developed many breakthrough technologies over the decades for our customers in metals and mining industry. We also provide innovative solutions for industrial water treatment, the utilization of alternative energy sources and the chemical industry. Outotec shares are listed on NASDAQ OMX Helsinki. [www.outotec.com](http://www.outotec.com)

## ABOUT GREENLAND MINERALS AND ENERGY LTD.

Greenland Minerals and Energy Ltd (ASX: GGG) is an exploration and development company focused on developing high-quality mineral projects in Greenland. The Company's flagship project is the Kvanefjeld multi-element deposit (rare earth elements, uranium, zinc), that stands to be the world's premier specialty metals project. A pre-feasibility study was finalised in 2012, and a comprehensive feasibility study was completed in May, 2015. The studies demonstrate the potential for a large-scale, long-life, cost-competitive, multi-element mining operation. Through 2015, GMEL is focussed on completing a mining license application in order to commence project permitting, in parallel to advancing commercial discussions with development partners. For further information on Greenland Minerals and Energy visit <http://www.ggg.gl> or contact:

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Greenland Minerals and Energy Ltd will continue to advance the Kvanefjeld project in a manner that is in accord with both Greenlandic Government and local community expectations, and looks forward to being part of continued stakeholder discussions on the social and economic benefits associated with the development of the Kvanefjeld Project.

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### **Competent Person Statement – Mineral Resources and Ore Reserves**

*The information in this report that relates to Mineral Resources is based on information compiled by Mr Robin Simpson, a Competent Person who is a Member of the Australian Institute of Geoscientists. Mr Simpson is employed by SRK Consulting (UK) Ltd ("SRK"), and was engaged by Greenland Minerals and Energy Ltd on the basis of SRK's normal professional daily rates. SRK has no beneficial interest in the outcome of the technical assessment being capable of affecting its independence. Mr Simpson has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration and to the activity being undertaken to qualify as a Competent Person as defined in the 2012 Edition of the 'Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves'. Robin Simpson consents to the inclusion in the report of the matters based on his information in the form and context in which it appears.*

*The information in the statement that relates to the Ore Reserves Estimate is based on work completed or accepted by Mr Damien Krebs of Greenland Minerals and Energy Ltd and Mr Scott McEwing of SRK Consulting (Australasia) Pty Ltd.*

*Damien Krebs is a Member of The Australasian Institute of Mining and Metallurgy and has sufficient experience that is relevant to the type of metallurgy and scale of project under consideration, and to the activity he is undertaking, to qualify as Competent Persons in terms of The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code, 2012 edition). The Competent Persons consent to the inclusion of such information in this report in the form and context in which it appears.*

*Scott McEwing is a Fellow and Chartered Professional of The Australasian Institute of Mining and Metallurgy and has sufficient experience that is relevant to the style of mineralisation and type of deposit under consideration, and to the activity he is undertaking, to qualify as Competent Persons in terms of The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code, 2012 edition). The Competent Persons consent to the inclusion of such information in this report in the form and context in which it appears.*

The mineral resource estimate for the Kvanefjeld Project was updated and released in a Company Announcement on February 12<sup>th</sup>, 2015. The ore reserve estimate was released in a Company Announcement on June 3<sup>rd</sup>, 2015. There have been no material changes to the resource estimate, or ore reserve since the release of these announcements.