ASX Announouncement : 1 June 2012

Open Briefing PFS Outcomes and Outlook

Open Briefing interview with CEO Rod McIllree

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Greenland Minerals and Energy Limited (GMEL; ASX: GGG) is a rare earth element (REE) exploration and development company focused on the Kvanefjeld multi-element deposit (GGG 61%, with agreement in place to move to 100% in 2012) in southern Greenland.

Market capitalisation: $160 million

In this Open Briefing®, Rod McIllree discusses

- **Pre-feasibility study outcomes**
- **Beneficiation advantages**
- **Resource upgrade**

Record of interview:

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Greenland Minerals and Energy Limited (GMEL; ASX: GGG) recently released a pre-feasibility study (PFS) for the Kvanefjeld rare earth element (REE) project that estimates an ungeared, pre-tax IRR for the project of 32% and a pay-back of less than four years from the start of production. The valuation is based on a discount rate of 10%, which seems relatively low for a project around which there are still a number of uncertainties. Can you comment?

CEO Rod McIllree
We're quite comfortable with the discount rate used for valuations in the PFS, and believe it appropriately reflects the ongoing de-risking of Kvanefjeld across all fronts, be they technical, political or corporate. Discount rates partially reflect sovereign risk issues and what is generally unappreciated is that Greenland is a politically stable jurisdiction that runs on the Scandinavian legal system. The government in Greenland has a clear political and economic mandate to work with foreign companies to get quality mining operations up and running. As a point of reference, raising the discount rate to 15% gives the project an NPV of US$2.5 billion, which is still very robust.

In the five years we've been operating in Greenland, we've seen a political evolution toward establishing a strong minerals sector. Nowhere is this more obvious than in the licensing developments we experienced as we moved through the feasibility program. More broadly, Greenland's growing profile as a raw material supplier is reflected in the increasing frequency of high level political visits from countries interested in supply from Greenland.

On a technical front, since 2009 we've placed a huge amount of emphasis on understanding the mineral mix of our resource base. Working with mineralogists at the University of British Columbia in Canada, who are the best in the business, we were able to establish a technically robust means of extracting heavy REEs and uranium, the key value drivers of the project. Focusing on the mineralogy before launching into pilot or demonstration plants meant we were

able to get it right the first time and this is demonstrated in the PFS outcomes. Importantly, by industry standards we've established a simple process route with low technical risk.

Many other REE deposits feature minerals that are highly refractory and require complex, high-temperature mineral cracking processes for economic elements to be liberated. The economic minerals at Kvanefjeld can be isolated from the waste minerals using flotation, after which, leaching with sulphuric acid under atmospheric conditions generates particularly high extraction yields for heavy REEs and uranium. It's a massive advantage compared with projects requiring processes like conventional acid baking or caustic cracking.

In an embryonic sector like REEs (ex-China), there is always some market uncertainty. We're looking to produce three main product streams, with uranium and heavy REEs being the most important of these. We believe the biggest market risk is associated with light REEs,, particularly lanthanum and cerium. In the PFS we've heavily discounted lanthanum and cerium to the cost of production, or around US$5 to US$10 per kg, in our economic modelling and we feel that's a realistic price assumption for these light REEs which our research indicates will be in oversupply in the near future.

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Your valuation of the Kvanefjeld project is most sensitive to your REE price assumptions. What is the basis of the price assumptions you've employed in the PFS?

CEO Rod McIllree
We reviewed price forecasts from a number of independent industry analysts. The general theme of the analysis was that light REEs, particularly lanthanum and cerium, may be in oversupply by 2016, whereas heavy REEs will almost certainly remain in short supply. This scenario would see lanthanum and cerium prices retreat toward the cost of production, while heavy REEs, and also neodymium, are likely to retain much of their current value. Neodymium is a light REE but its outlook remains strong as it's a key REE for the growing magnet sector.

We then looked at the conservative end of the independent pricing forecasts, which represent a significant reduction from current REE prices (FOB China). We believe our pricing assumptions are both conservative and realistic, taking into consideration the market risk of light REE oversupply.

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According to the PFS, Kvanefjeld will be a multi-commodity project with annual production of 2.6 million lbs U_30_8, 4,200 tonnes of heavy rare earth hydroxide, 10,400 tonnes of mixed rare earth carbonate and 26,200 tonnes of light rare earth carbonate. Where will production at this level place Kvanefjeld in terms of global supply and how will production costs compare with other large scale REE projects?

CEO Rod McIllree
Based on uranium mine production figures for 2011, at 2.6 million lbs per annum, Kvanefjeld would have been the fourteenth largest producer in the world.

At approximately 40,000 tonnes per annum of rare earths across a series of high purity concentrates, Kvanefjeld will rank with Molycorp's Mountain Pass operation as the largest rare earth producer outside China. Lynas' LAMP plant in Malaysia, once expanded, will have the capacity to produce approximately 22,000 tonnes per annum.

However, an important distinction needs to be drawn between Kvanefjeld and both Molycorp's Mountain Pass and Lynas' LAMP facility. Both of these operations produce almost exclusively light REEs whereas a significant proportion of Kvanefjeld's production will be heavy REEs, as well as uranium and zinc. Kvanefjeld will be the largest long-term producer of heavy REEs outside China. The significant production of both heavy REEs and U_30_8 de-risk Kvanefjeld in relation to potential volatility in light REE pricing.

Looking to cost of production, we announced in our PFS that the cost of producing uranium will be US$30.80 per lb, with a cost of US$28.36 per kg for a high value heavy REE product, US$4.18 per kg for a light REE product and US$8.58 per kg for a mixed REE product. That averages out at US$7.79 per kg for the REEs, but it's important to appreciate the product spread. Each product stream will be very cost competitive in its own right and one product stream won't have to be subsidised by the other; this is the true power of a polymetallic project like Kvanefjeld.

Based on uranium costs published by Morgan Stanley in November 2011, US$30.80 per lb is at about the fiftieth percentile of 2011's cost curve of producers, and would be the lowest cost production on the forward looking cost curve estimated for uranium mining operations to come into production before 2020.

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Your preliminary design for the flowsheet at Kvanefjeld includes an initial flotation circuit before processing via a normal atmospheric leach process. How will this affect overall production costs and what are the benefits?

CEO Rod McIllree
One of the key advantages to Kvanefjeld is that its REE and uranium minerals are highly amenable to a simple process route which makes for a cost competitive operation. The floatation process concentrates the minerals containing REEs and uranium, into roughly 10% of the original mass effectively multiplying the grade by a factor of 10. This process yields a concentrate that's approximately 12% rare earth oxide. That's a very favourable upgrade ratio by industry standards, achieved through a simple flotation circuit. It will allow us to efficiently convert a bulk, lower grade ore into a high grade, low mass mineral concentrate. We can then leach this concentrate under atmospheric conditions to extract over 90% of the uranium and heavy REEs; another very favourable outcome. The efficiency of these two steps will lead to cost-effective production of both uranium and REEs. The process flow sheet will also lend itself to modular plant construction that will further aid in reducing project development costs.

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The PFS estimates the capital cost of the project at US$1.53 billion and development is forecast to begin in 2014 with production targeted for 2016. Prior to that. you'll need to complete a bankable feasibility study (BFS) and secure funding. What interest have you had in terms of equity investment, project joint venture partnerships or off-take agreements and what is your preferred funding option?

CEO Rod McIllree
We're in the process of working through the financing scenarios to take the project through the next key milestones and there are a number of options. We have a constructive dialogue with numerous 'strategic' parties interested in participating in the project's development and that includes investment at the project level as well as off-takes and assistance with financing. Those discussions will evolve as we continue to advance the project.

There's scope for strategic investment to facilitate the BFS but it's important for us to understand the big picture before we consider such a step. With the PFS behind us, we are focused on positioning the business in preparation for an investment at the corporate and the project level. Independence can be important through the feasibility process, because ultimately the further a project is de-risked, the greater the attributable value. For this reason we may raise further working capital through share placements. However, the feedback from interested strategic parties is strong, with numerous groups indicating a very positive view of the developments presented in the Kvanefjeld PFS. So we're confident there will be scope to structure the main project development costs through strategic investment and associated financing.

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Can Kvanefjeld be developed in stages or do you need to find funding for a full capacity

operation before the project can be started?

CEO Rod McIlree
The process flow sheet we've established certainly lends itself to a modular construction scenario and in theory we could start at a lower throughput with a reduced cost. However, we feel we're not far off the optimal starting point at 7.2 million tpa, but we could stage the process.

Looking forward, we have a massive resource base, with a lot of tonnage in the better grade profiles. This gives the project the advantage of having scope for significant growth as markets develop. We could mine the collective resources at a large scale for decades; well over 50 years.

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What steps now have to be completed before GMEL can be granted an exploitation license for Kvanefjeld? How are you positioned with regard to obtaining a uranium production license and to what extent do project economics depend on your ability to exploit the uranium resource?

CEO Rod McIlree
We've been working on the environmental and social impact assessments (EIA and SIA) for Kvanefjeld since early last year. The terms of reference for these studies, which were approved by the Greenland government in mid 2011, set out the assessment of a uranium-producing, multi-element operation. The EIA and SIA represent core components of a mining license application, along with the necessary technical and economic documentation. We're aiming to conclude these studies late this year.

We're fully licensed for all our work programs on Kvanefjeld and now our licensing conditions are inclusive of uranium, we have the right to apply to exploit it along with all the other economic components. We have engaged and will continue to engage Greenland's Bureau of Minerals and Petroleum through the completion of the studies to ensure the project is in line with local expectations and that all systems are ready to proceed once an exploitation license is lodged.

We have advanced the project to what is now an economically robust proposition that will benchmark very strongly against industry peers. On the basis of ongoing discussions with strategic groups and a strong level of interest we don't see economics as an impeding factor in exploiting the resource.

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In late March, GMEL announced its first mineral resource estimate from Zone 2 within the Kvanefjeld project area, with inferred resources of 242 million tonnes at 304 ppm U_3O_8, 1% TREO and 0.26% zinc, which boosts the overall project inventory and opens the resource up for further exploration. What does the resource increase mean for the overall Kvanefjeld project and why do you need to expand the resource at this early stage?

CEO Rod McIlree
The rationale for delineating initial resources at Zones 2 and 3 has been twofold. Firstly, from a strategic perspective it provides an indication of the scale of the system we're dealing with: one of the world's great uranium and REE resources that could continue to grow for many years. When looking to gain the attention of large investors in and users of these minerals, it helps to have an outstanding resource.

Secondly, it gives us an understanding of the different grade tonnage profiles across the most accessible deposits. There's a lot of scope to continue to optimise the project: improving the grades in the mine schedule can reduce operating costs significantly. For example, we have over 100 million tonnes in the upper portion of Zone 2 at over 400 ppm U_3O_8, 1.3% total rare earth oxide that could be incorporated into the mine schedule in future to enhance both the grades scheduled and life of mine.

Delineating and understanding the resource base have represented a value addition to the project but we've now largely achieved what we aimed to do in this area: we've built a vast resource base thoroughly and cost effectively.

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Thank you Rod.

For more information on Greenland Minerals and Energy, visit www.ggg.gl or call Rod McIllree on +61 8 9382 2322.

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