



There may be one billion tonnes of rare minerals here

Mapping and test drilling in the bedrock in Dalane show large amounts of easily accessible minerals.



Gheorge Maruita (front) and Marco Caeiro screw on the drill pipes to extract fresh drill core samples. *Photo: Alf Bergin*

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To reach the last exploration location, we have to take off from the E39 at Helleland, near Egersund in Sør-Rogaland. After passing a couple of small farms, we glimpse some smaller drilling rigs in the terrain.

- We have drilled in the ground in Dalane for about 1.5 years now, but are still only in the concept phase, says Monika Øksnes, Norway Minerals's operations director for the search for phosphate, titanium and vanadium.

The findings from the concept phase are so promising that the investigations continue with undiminished vigor. In an announcement sent out in February, Norway Minerals estimated the mineral resources in the Storeknuten exploration area to be 910 million tonnes of potentially drivable mass. Last year, Norway Minerals estimated in a similar announcement that there is 1.55 billion tonnes of potentially drivable mass at Øygrei.



- Mining has not been decided yet, but the minerals are up to date, so it is not necessary to dig far down, says operations director Monika Øksnes. *Photo: Alf Bergin*

This is considerably more than NGU's far more conservative estimate of 282 million tonnes of ore for the three zones that make up the so-called «Bjerkreim-Sokndal intrusion» where the mineral deposits are.

- Our figures are based on superficial surveys. We have not drilled. Much is the result of previous basic research from students and professors at the universities of Bergen, Aarhus and Liège, says Gurli Meyer, researcher at NGU.

Meyer believes the occurrence in Dalane is rich and highly ranked worldwide.

- It is a predictable, fine occurrence in an area that is used to mineral exploration from before, including Titania in Sokndal, she says.

Her NGU colleague, researcher Håvard Gautneb, adds that discoveries and production of such minerals are welcome in Europe, since today's mineral production is dominated by countries such as China and Russia. Geopolitical conditions, such as corona and war, can disrupt access to these raw materials, which are necessary, among other things, for the green shift.

- It is not the access to the minerals and the deposit itself that is the problem. There are geopolitical conditions that can make trade in minerals difficult or impossible, says Gautneb.

Three minerals

At the end of the working day, the work team takes the day's catch of drill cores, which they have picked up from the bedrock, back to the headquarters - which is a little further south in the heath. There, the geologists in the core log shed (Core Shed) go through each drilling sample and take preliminary analyzes to check, among other things, breaking strength, magnetism and element content.

The drilling samples are then cut lengthwise, where one part is sent to a laboratory abroad for more thorough analysis.

- So far we have drilled 127 boreholes. They are drilled at an angle of 80-45 degrees and are usually between 300 and 500 meters long, says

Øksnes.



Erlend Risnes uses a hand-held X-ray gun (pxrf) to measure the element content in the drill cores. - The ions that are ejected from the pxrf emit electrons from the elements. This is sent back as energy with specific wavelengths so that the pxrf can measure which elements the sample contains, he says. *Photo: Alf Bergin*

A hollow diamond drill is used to take the drill core samples. The rock in which it is drilled is called norite. It is a magmatic rock of the gabbro type. In the Bjerkreim-Sokndal intrusion, the norite contains the minerals apatite (with phosphate), ilmenite (with titanium) and magnetite (with vanadium).

All three raw materials are considered critical by the EU.

Phosphate is an important ingredient in fertilizers. Titanium is used as a dye in paints, as well as in alloys. Vanadium is used in the steel industry, but is also becoming important for the green shift.

"Vanadium is important for large stationary rechargeable batteries, which are used in solar parks, among other places," says Gautneb.

No operation yet

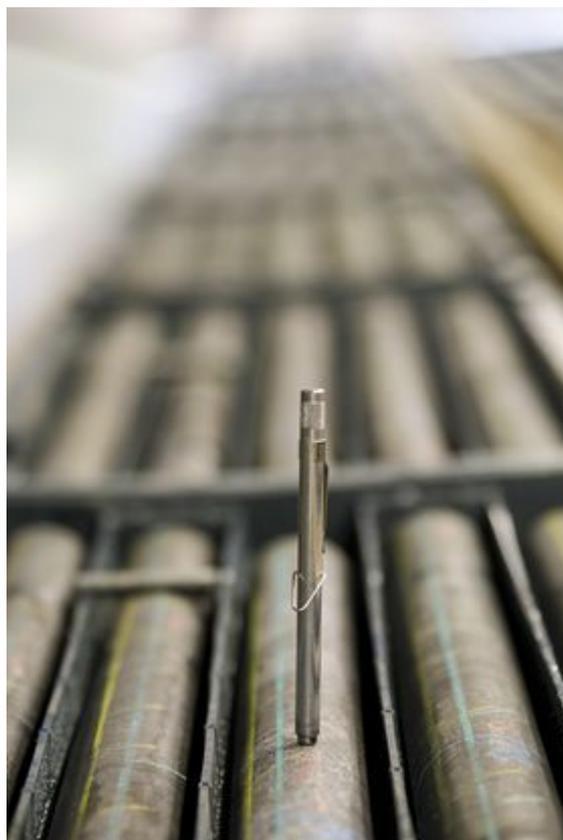
The initial exploration drilling in Dalane will continue until the summer. Then the concept phase turns into an opportunity phase. More drilling may still be needed to increase knowledge of geology. But the road to possible mining is still several years ahead.

- It normally takes 10-15 years from the start of exploration until the actual mining operations can start, says Øksnes.

As a geologist, she and her colleagues in the core log shed are happy to be able to work in the field - and physically with stones in their hands.

- It's nice to have a job that is so relevant to the subject area. Here we strike a blow for the mineral industry in Norway, she says with a smile.

Part of her job will be to facilitate environmentally friendly mining. A mine, whether it is an open pit or in the form of underground tunnels, does not beautify the landscape. This can mean major interventions, which can lead to inconveniences such as noise and dust. Although there may be many local jobs, hardly everyone will welcome mining in their immediate area. But vanadium for rechargeable batteries, and phosphate for fertilizers, must be obtained from one place.



Party tricks! The magnetic pen is used for a quick check of the magnetism in each drill core. Then a more accurate measurement is made with a MagSus. *Photo: Alf Bergin*

- Europe has the technology to conduct environmentally friendly mining, but at the same time it is here that there is the greatest resistance to destroying nature, Meyer from NGU points out.

Focuses on electrically powered machinery

According to Monika Øksnes, measures will be taken to counteract noise and dust, and electrically powered machinery will reduce pollution.

She is cautious about suggesting a number of future jobs, but believes a comparison with existing mining operations - such as at Titania nearby or at Rana Gruber in Nordland - is relevant.

- It can be about a couple of hundred jobs in the operational phase. And then there are the indirect jobs in addition, says Øksnes.

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