

GEOGRAPHY REPORT - Les Knight – June 2023

Lithium: What's it all about. Talk by Dr. Rick Smith to the Teesdale U3A Geography Group

Lithium is a low-density alkaline metal which historically had relatively few uses. This changed in the early 1990s with the invention of lithium-ion batteries. The signalled change to a low carbon economy has led to an unprecedented rise in demand for lithium for car and large-scale energy storage batteries. The current price is \$75,000 per tonne. To achieve current targets for battery production lithium mining will have to increase 20-fold by 2050 and we will need 59 new mines in the next twelve years !

Rick explained that lithium occurs in a number of geological situations but in none of these is the element very concentrated. Currently the largest production is from giant open pit mines working pegmatite (a coarse-grained granite), for example in Australia, or by dissolving salts formed by evaporation of 'salar' intermontane lakes in the Andes of Chile, Bolivia, and Argentina. While these latter deposits in the, so-called 'lithium triangle', are cheap to extract there is increasing hostility to mining on environmental grounds.

Rick described a number of other geological situations that potentially could be sources of lithium, but the commercial viability of these have yet to be demonstrated. Lithium can be concentrated in some ancient lake clays. A huge example of such a deposit was found in Serbia. However, environmental opposition led to mining this, the largest deposit in Europe, being cancelled.

Some granites, including those in Cornwall, contain dispersed fine-grained lithium-bearing minerals. Recovery of the lithium involves large-scale open pit mining, crushing the granite to a fine dust, separating the lithium-bearing mineral, and then chemically recovering the lithium. In principle this is possible but the economic and practical aspects have yet to be demonstrated.

Lastly, lithium can occur dissolved in some hot brines as for example in the Weardale granite. Here wells will be drilled into the granite, from which hot brines are extracted. Heat and the lithium are then extracted at the surface before the cold brine is reinjected into the granite. The difficulty here is that 'direct extraction' of lithium in commercial quantities from brine of low concentrations has not been proven on a commercial scale.

It is clear that upscaling lithium production to meet decarbonisation targets over such short timescales using as yet unproven technologies will prove extraordinarily challenging. However, as Rick pointed out during questions, the shortage of lithium is just one issue. It has been calculated that to decarbonise the world's economy by 2050 will require the mining of more minerals than man has mined over the last 4000 years !

Next meeting: Thursday 17th August. Field visits. Details to follow.