

PS1: CRITICAL MATERIALS

- Overall improvement of our Criticality Assessment (12 elements of the Mendeleev table get better scores and only 4 worse - and none of the 4 becomes red)
- Focus should remain on the elements that remain Red though with some improvement: Cobalt, Tungsten and 3 Rare Earth (Neodymium, Praseodymium and Dysprosium)

A. NEW CAPACITIES ARE CRUCIALLY NEEDED WITH ECOLOGICAL DESIGN AND BASED IN COUNTRIES WITH LOW GEOPOLITICAL RISK (AUSTRALIA OR NORTH AMERICA)

1. Sunrise project in Australia (expected starting date in 2021 + new volumes nickel: 20kt (/120kt world consumption for battery usage in 2018) + 5kt cobalt (/120kt world consumption in 2018)
2. Mountain Pass project in California (expected starting date: 2020 + new volumes 5.400t NdPr(/50kt world consumption in 2018)

B. COOPERATION BETWEEN ALL ACTORS ALONG THE SUPPLY CHAIN IS A MUST TO AVOID SHORT TERM REACTIONS ADVERSARY TO LONG TERM TRENDS

1. Direct investment in mines that are no open pits but close to direct customers such as Apollo in the Pyreneans (expected delay: 5 years from public authorization + new volumes 1Kt tungsten vs 80kt world consumption and 3,5kt French consumption in 2018)
2. Also long term supply contracts between miners and car makers are on the agenda

C. SUBSTITUTION IS PROGRESSING

1. BMW announced new electrical engines that require no Rare Earth
2. The BASF - DOE project to develop cathodes with lower cobalt and higher energy density with same stability properties

D. END OF LIFE RECYCLING OF EE EQUIPMENT IS STILL IN EARLY STAGE BUT THE POTENTIAL IS IMPORTANT

1. BMW, Northvolt and Umicore project to recycle EV batteries and recover cobalt and rare earth
2. JX NMM LIB Recycle Testing Plan in Japan with recovery of cobalt and nickel

E. INTERNATIONAL COOPERATION IS REQUIRED AT EVERY LEVEL TO LIMIT IMPACT OF POLITICAL TENSIONS

1. Personal involvement of each key industrial actor
2. Use of existing international organizations to anticipate and smooth down possible conflicts (ICC, World Bank, European Development Bank)

SPEAKERS

Robert Friedland - Chairman Ivanhoe (Canada/Singapore) - Co-chair
James Litinsky - Co Chairman MP Materials (USA) - Co-chair
Andreas Wendt - Chief Purchasing Officer BMW (Germany)
Pierre Toulhoat - CEO BRGM (France)
David Trafford - CEO CRU (UK)
Frank Bekaert - Senior Partner McKinsey (Belgium)

Moderator: Prof. Victoire de MARGERIE, Vice-Chairman World Materials Forum