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## **MKANGO AND HYPROMAG TO COLLABORATE IN MAJOR NEW GRANT-FUNDED PROJECT TO RECYCLE RARE EARTH MAGNETS FROM ELECTRONIC WASTE, ELECTRIC MOTORS AND WIND TURBINES FOR THE UK SUPPLY CHAIN**

### **Highlights**

- **Mkango Rare Earths UK Ltd (“Mkango UK”) is pleased to announce it will collaborate with HyProMag, Bowers & Wilkins (“B&W Group”), European Metal Recycling (“EMR”), GKN Automotive Innovation Centre (“GKN Automotive”), Jaguar Land Rover and University of Birmingham (“UoB”) in the Driving the Electric Revolution challenge at UK Research and Innovation grant funded project, “Secure Critical Rare Earth Magnets for UK” (“SCREAM” or the “Project”)**
- **SCREAM will establish a recycled source of rare earth magnets in the UK to provide greater security of supply to UK industry, whilst aiming to achieve a 10% reduction in cost and a significant reduction in environmental impact, with an estimated 88% less energy for short loop (i.e. magnet to magnet) recycled magnets versus primary mining to separation to metal alloy to magnet production**
- **The Project includes pilot plants for short loop recycling, encompassing scrap pre-processing, HPMS (Hydrogen Processing of Magnet Scrap) and production of recycled sintered magnets, as well as for complementary recycling routes, namely remelting and strip casting to produce neodymium, iron, and boron (“NdFeB”) alloys as well as chemical processing**
- **Mkango UK’s role in the Project is to establish a pilot plant in the UK to chemically process recycled HPMS NdFeB powder and magnet swarf (i.e. the powder produced from grinding and finishing magnets) from a range of scrap sources including electronic waste, electric motors and wind turbines, complementing the short loop magnet recycling routes being developed in parallel**
- **HyProMag will work with UoB to develop a new semi continuous version of the HPMS process and to produce short loop recycled sintered magnets at multiple grades to match the requirements for a range of applications**

**London / Vancouver: March 14, 2022** – Mkango Resources Ltd. (AIM/TSX-V: MKA) (the “Company” or “Mkango”) is pleased to announce that its 100% owned subsidiary, Mkango UK, is collaborating with B&W Group, EMR, GKN Automotive, HyProMag, Jaguar Land Rover and UoB in a £3.4 million magnet recycling project, SCREAM, of which £2.4 million or 71% will be funded by Driving the Electric Revolution, an Industrial Strategy Challenge Fund challenge delivered by UK Research and Innovation (UKRI).

The budget for Mkango UK’s chemical processing pilot plant programme, to be developed as part of the Project, is £1.1 million, of which £0.8 million or 70% will be funded by UKRI. Mkango UK was established by Mkango to evaluate and develop complementary opportunities in rare earth recycling and green technology in the UK.

Mkango also holds a 42% interest in SCREAM project partner, HyProMag, together with certain offtake and supply rights. HyProMag is pioneering commercialisation of short loop rare earth magnet recycling in the UK and Germany using HPMS technology.

**William Dawes, Chief Executive of Mkango stated:** *“We are very excited about this innovative project and the opportunity to develop chemical processing of NdFeB magnet scrap in the UK alongside supporting the scale up of the HPMS technology via our strategic interest in HyProMag. We envisage that the recycling of rare earth magnets will play a key role in the development of robust supply chains to catalyse and support growth in the electric vehicle sector and in other clean technologies.*

*“This Project further cements Mkango’s and HyProMag’s early mover advantage in the rare earth magnet recycling sector, highlighting its competitive position and strong network of industry and academic partners.”*

**Nick Mann, Operations General Manager of HyProMag stated:** *“As HyProMag moves forward in the manufacturing of recycled magnets, the ability to demonstrate our products in a range of applications with different demands is crucial.*

*“We are delighted to be working with such a talented consortium, to deliver premium products engineered to the highest standards and in doing so forge future relationships. This Project will push our magnet making to new levels and prove our ability to offer an alternative to current supply routes.”*

Rare earth magnets play a key role in clean energy technologies including electric vehicles and wind turbine generators, and they are also a key component in electronic devices including mobile phones, hard disk drives and loudspeakers. The UK has no domestic source of primary rare earths. The development of domestic sources of recycled rare earths via HPMS, a homegrown technology, is a significant opportunity for the UK to fast-track the development of sustainable and competitive rare earth magnet production.

### **HyProMag and the HPMS technology**

The patented HPMS process for extracting and demagnetising NdFeB alloy powders from magnets embedded in scrap and redundant equipment was originally developed within the Magnetic Materials Group at the UoB and subsequently licenced to HyProMag. The development of chemical processing of both recycled HPMS NdFeB powder and magnet swarf by Mkango UK complements the short loop HPMS process being scaled up by HyProMag, broadening the range of material that can be processed, including scrap that is not suitable for short loop magnet recycling.

### **The SCREAM Project**

The objective of the SCREAM project is to establish a recycled source of permanent magnets in the UK that will provide greater security in the supply of these materials to the UK, whilst aiming to achieve a 10% reduction in cost and a significant reduction in the environmental impact of these materials. Short loop magnet recycling is expected to have a significant environmental benefit, requiring an estimated 88% less energy versus primary mining to separation to metal alloy to magnet production.

NdFeB magnets will be recovered from end of life automotive, robotic, separator and loudspeaker scrap streams using an automated sorting line and HPMS. The extracted HPMS powders will be processed directly from the alloys into sintered magnets on a newly installed production line at the Tyseley Energy Park in Birmingham or converted into strip cast alloys for blending or chemical processing by Mkango UK.

HyProMag will scale up this process to develop magnets that are different grades for a range of applications.

The recycled magnets will be independently qualified for magnetic, corrosion and mechanical performance and then tested in a variety of applications including loudspeakers, retaining clips, a magnetic separator and an automotive drive motor.

### **About HyProMag**

The Magnetic Materials Group (“MMG”) within the School of Metallurgy and Materials at the UoB has been active in the field of rare earth alloys and processing of permanent magnets using hydrogen for over 40 years. Originated by Professor Rex Harris, the hydrogen decrepitation method, which is used to reduce NdFeB alloys to a powder, is now ubiquitously employed in worldwide magnet processing.

In a further development, the MMG patented a process for extracting and demagnetising NdFeB powders from magnets embedded in redundant equipment using hydrogen in a process called HPMS. This patent and related intellectual property is at the core of HyProMag’s business. The MMG continues to develop new research and development opportunities, cooperates widely in Europe, including a major EU project, SusMagPro, which is also focused on recycling of magnets. The directors of HyProMag all provide their expertise to the MMG and there is potential for HyProMag to gain possible future access to new intellectual property.

HyProMag, European Metal Recycling Limited and UoB recently completed the REAP project (Rare-Earth Extraction from Audio Products). EMR is a global leader in metal recycling, operating at 150 locations around the world, and the largest automotive recycler in the UK. EMR pre-processed automotive and flat screen TV loudspeaker scrap to provide a feed of scrap components containing NdFeB magnets to HyProMag. HyProMag used the HPMS process in conjunction with the UoB to extract the magnets as a demagnetised alloy powder, which was then successfully used in the remanufacture of magnets.

HyProMag also leads the Innovate UK grant funded project, “Rare-Earth Recycling for E-Machines” (“RaRE”) with partners UoB Advanced Electric Machines Research Limited, Bentley Motors Limited, Intelligent Lifecycle Solutions Limited and Unipart Powertrain Applications Limited.

HyProMag’s strategy is to establish recycling facilities for NdFeB magnets at Tyseley in Birmingham and other locations to provide a sustainable solution for the supply of NdFeB magnets and alloy powders for a wide range of markets including, for example, automotive and electronics. A number of product options are being evaluated including hydrogen decrepitated (HD) demagnetised powders suitable for magnet producers, alloy ingot remelted from HD powders suitable for alloy feed or magnet production, anisotropic alloy powders (HDDR) for bonded magnets and sintered NdFeB magnets as required by the RaRE project for automotive applications.

The founding directors of HyProMag, comprising Professor Emeritus Rex Harris, former Head of the MMG, Professor Allan Walton, current Head of the MMG, and two Honorary Fellows, Dr John Speight and Mr David Kennedy, are leading world experts in the field of rare earth magnetic materials, alloys and hydrogen technology, and have significant industry experience. Following the investment by Maginito, HyProMag appointed William Dawes, a Director of Maginito and Chief Executive Officer of Mkango, to the Board of HyProMag.

In November 2021, HyProMag established a subsidiary in Germany, HyProMag GmbH, to rollout commercialisation of HPMS technology into Germany and Europe, and to further support Government initiatives to strengthen European rare earth supply chains and accelerate the green transition. HyProMag GmbH, is 80% owned by HyProMag Limited and 20% owned by Professor Carlo Burkhardt of Pforzheim University in Germany, co-ordinator of the abovementioned SusMagPro project.

For more information, please visit <https://hypromag.com/>

### **Market Abuse Regulation (MAR) Disclosure**

The information contained within this announcement is deemed by the Company to constitute inside information as stipulated under the Market Abuse Regulations (EU) No. 596/2014 ('MAR') which has been incorporated into UK law by the European Union (Withdrawal) Act 2018. Upon the publication of this announcement via Regulatory Information Service, this inside information is now considered to be in the public domain.

### **About Mkango Resources Limited**

Mkango's corporate strategy is to develop new sustainable primary and secondary sources of neodymium, praseodymium, dysprosium and terbium to supply accelerating demand from electric vehicles, wind turbines

and other clean technologies. This integrated Mine, Refine, Recycle strategy differentiates Mkango from its peers, uniquely positioning the Company in the rare earths sector.

Mkango is developing Songwe Hill in Malawi with a Feasibility Study nearing completion. Malawi is known as "The Warm Heart of Africa", a stable democracy with existing road, rail and power infrastructure, and new infrastructure developments underway.

In parallel, Mkango and Grupa Azoty PULAWY, Poland's leading chemical company and the second largest manufacturer of nitrogen and compound fertilizers in the European Union, have agreed to work together towards development of a rare earth Separation Plant at Pulawy in Poland. The Separation Plant will process the purified mixed rare earth carbonate produced at Songwe.

Through its ownership of Maginito ([www.maginito.com](http://www.maginito.com)), Mkango is also developing green technology opportunities in the rare earths supply chain, encompassing neodymium (NdFeB) magnet recycling as well as innovative rare earth alloy, magnet, and separation technologies. Maginito holds a 42% interest in UK rare earth (NdFeB) magnet recycler, HyProMag ([www.hypromag.com](http://www.hypromag.com)) with an option to increase its interest to 49%.

Mkango also has an extensive exploration portfolio in Malawi, including the Mchinji rutile exploration project, the Thambani uranium-tantalum-niobium-zircon project and Chimimbe nickel-cobalt project.

For more information, please visit [www.mkango.ca](http://www.mkango.ca)

### **Cautionary Note Regarding Forward-Looking Statements**

This news release contains forward-looking statements (within the meaning of that term under applicable securities laws) with respect to Mkango, its business, HyProMag, the Separation Plant and Songwe. Generally, forward looking statements can be identified by the use of words such as "plans", "expects" or "is expected to", "scheduled", "estimates" "intends", "anticipates", "believes", or variations of such words and phrases, or statements that certain actions, events or results "can", "may", "could", "would", "should", "might" or "will", occur or be achieved, or the negative connotations thereof. Readers are cautioned not to place undue reliance on forward-looking statements, as there can be no assurance that the plans, intentions or expectations upon which they are based will occur. By their nature, forward-looking statements involve numerous assumptions, known and unknown risks and uncertainties, both general and specific, that contribute to the possibility that the predictions, forecasts, projections and other forward-looking statements will not occur, which may cause actual performance and results in future periods to differ materially from any estimates or projections of future performance or results expressed or implied by such forward-looking statements. Such factors and risks include, without limiting the foregoing, governmental action relating to COVID-19, COVID-19 and other market effects on global demand and pricing for the metals and associated downstream products for which Mkango is exploring, researching and developing, factors relating the development of the Separation Plant, including the outcome and timing of the completion of the feasibility studies, cost overruns, complexities in building and operating the Separation Plant, changes in economics and government regulation, the positive results of a feasibility study on Songwe Hill and delays in obtaining financing or governmental approvals for, and the impact of environmental and other regulations relating to, Songwe Hill and the Separation Plant. The forward-looking statements contained in this news release are made as of the date of this news release. Except as required by law, the Company disclaims any intention and assumes no obligation to update or revise any forward-looking statements, whether as a result of new information, future events or otherwise, except as required by applicable law. Additionally, the Company undertakes no obligation to comment on the expectations of, or statements made by, third parties in respect of the matters discussed above.

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