

The text 'ASX ANNOUNCEMENT' in a large, bold, sans-serif font. A vertical orange bar is positioned to the left of the text.

10 October 2019

Strategic metal potential identified at Cyclone


- **Hunan Rare Earth Industry Group (HRE) identifies a potential additional product, strategic rare metal hafnium (HfO₂), within the zircon component of the Cyclone Zircon Project's heavy mineral concentrate**
- **Offtake discussions further progressing, with HRE continuing to examine direct project investment and China-based processing involvement**
- **Other potential project participants' interests currently being formalised amid strong demand and continued constrained supply for zircon.**

Mineral and silica sands developer Diatreme Resources Limited (ASX:DRX) announced today a boost for its Cyclone Zircon Project, with potential offtake partner, Hunan Rare Earth Industry Group, identifying the valuable strategic metal hafnium within the zircon component of Cyclone's heavy mineral concentrate (HMC).

Global demand for hafnium is on the rise due to its specialty usage in aerospace and industrial alloys, including for nuclear control rods, semiconductors and submarines. Yet with supply constrained following Japan's post-Fukushima nuclear plant shutdowns, prices have risen from around US\$500 in 2014 to more than US\$1,500 per kilogram, with further demand growth expected.

The identification of this potential opportunity occurred during detailed project offtake discussions by both HRE and DRX of the independent metallurgy reports and bulk sampling undertaken during the original prefeasibility study (PFS) and subsequent definitive feasibility study (DFS). These followed the signing of an MOU with HRE for the potential life of mine offtake of HMC from Cyclone and its potential investment into the project (**refer ASX announcement 5 August 2019**).

Diatreme's CEO Neil McIntyre said: "The discovery of potential strategic metals within Cyclone's HMC provides a further boost to this increasingly valuable zircon-rich project. Diatreme looks forward to unlocking its value further, working with HRE and our other potential development partners."



HRE has highly specialised expertise within the rare earths sector in addition to mineral sands such as zircon. Diatreme's technical and project advisers together with HRE's in-house technical assessments have concurred that the Cyclone zircon component of the HMC product could contain potentially a range of 1.3% to 1.4% hafnium by volume, adding significantly to its overall value.

Diatreme is working closely with HRE to examine the establishment of specialist processing facilities to be operated by HRE in China, enabling the full exploitation of all valuable components of Cyclone's HMC.

The work with HRE follows the signing of an EOI with MCC International Corporation, part of the leading China Minmetals Group, for the provision of engineering, procurement and construction services to Cyclone, (**refer ASX announcement 5 August 2019**) in addition to assisting in sourcing suitable project finance to facilitate the project's development.

Located in the Eucla Basin of Western Australia, the Cyclone project is one of a handful of major zircon-rich discoveries identified during the past decade, amid projections of a looming supply deficit for high-grade mineral sands.

Excerpt from PFS - Project Metallurgy Report - prepared by Mineral Technologies

XRF ZrO₂ assay data may be used to calculate the zircon content and recovery. It is emphasised that this method is indicative only. For calculation purposes it has been assumed that all ZrO₂ is present as liberated zircon grains containing 67% ZrO₂. The ZrO₂ assay values used throughout the report include hafnium dioxide (HfO₂) by convention. The typical proportion of Zr:Hf is 50:1. For example, a reported ZrO₂ assay of 67% would contain 65.6-65.7% ZrO₂ plus 1.3-1.4% HfO₂.

Expected Cyclone HMC Volumes

The Cyclone DFS (**refer ASX release dated 15 November 2018**) highlighted potential expected total life of mine (LOM) zircon production (DFS study expected life of mine estimate of 13.2 years) comprising 1.94 million tonnes (Mt) of heavy mineral concentrate (HMC), containing 936 kilotonne (kt) of zircon, producing 772kt of zircon final product from the actual mining and minerals processing activity.

Cautionary Note: Full definitive feasibility study on the Cyclone Zircon Project was released to ASX on the 15th November 2018, and the above numbers are an extraction from that report prepared by China ENFI Engineering Corporation (ENFI).

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Based on the production estimates for zircon as a component of the HMC and applying the expected Hafnium content range this would indicate the potential for approximately 10kt (10 million kg) of contained hafnium from LOM production.

Cautionary Note: *This potential identified Hafnium mineral will need to be further extracted from the zircon component of the heavy mineral concentrate (HMC) and final recovery rates and the economics of extraction are yet to be determined.*

Hafnium Value

A lustrous, silvery grey metal, hafnium chemically resembles zirconium and is sourced principally from zircon. Most natural zircon has a zirconium to hafnium ratio of 33.6:1 (source: U.S. Geological Survey). The principal uses of hafnium are in high-temperature ceramics, nickel-base superalloys, nozzles for plasma arc metal cutting and nuclear control rods.

However, the difficulty of separating hafnium from zirconium has made it a scarce commodity. When zirconium demand dropped sharply following Japan’s Fukushima disaster of 2011, hafnium prices increased sharply, rising from around US\$500/kg to \$600/kg to current levels exceeding US\$1,500 per kg.

Analysts Mordor Intelligence have forecast a compound annual growth rate for hafnium demand of 7.08% from 2019-2024, driven by increasing demand from the aerospace, semiconductor and submarine industries. The United States accounts for the largest market share, consuming around 27% of the global market in 2018, largely from nuclear reactors (source: <https://www.mordorintelligence.com/industry-reports/hafnium-market>).

Hafnium Price Chart



Source: Kitco.com



Cyclone Zircon Project – Next Steps

Diatreme continues to engage in detailed discussions with a range of potential Cyclone project participants, supported by specialist corporate advisers Blackbird Partners.

With talks advancing, the Company aims to secure binding agreements with both HRE and MCC, providing suitable final terms are agreed, while also progressing discussions with other interested parties.

Ultimately, the Company seeks to assemble an optimum mix of commercial parties into binding agreements that will facilitate the project's development and unlock value for shareholders and anticipates significant progress on these arrangements during the 4th quarter.

Mr McIntyre added: "Diatreme is focused on assembling the right mix of development partners for Cyclone and together with our rapidly emerging Galalar Silica Project in Queensland, the Company now has two potentially highly valuable projects in mineral and silica sands that are well positioned for development amid rising Asian demand and limited supply."

Neil McIntyre

Chief Executive Officer

Greg Starr

Chairman

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About Hunan Rare Earth Industry Group Ltd (HRE)

HRE's parent company is Hunan Gold Corporation Limited, formerly Chenzhou Mining Group Co., Ltd, a Shenzhen listed company with a market capitalisation of RMB 12 Billion (A\$2.5 billion) principally engaged in the exploration, mining, smelting and processing of nonferrous metal. The company's main products include gold, pure antimony, antimony oxide, ethylene glycol, antimony, zircon, rare earths and tungsten products, which are distributed in domestic and overseas markets.

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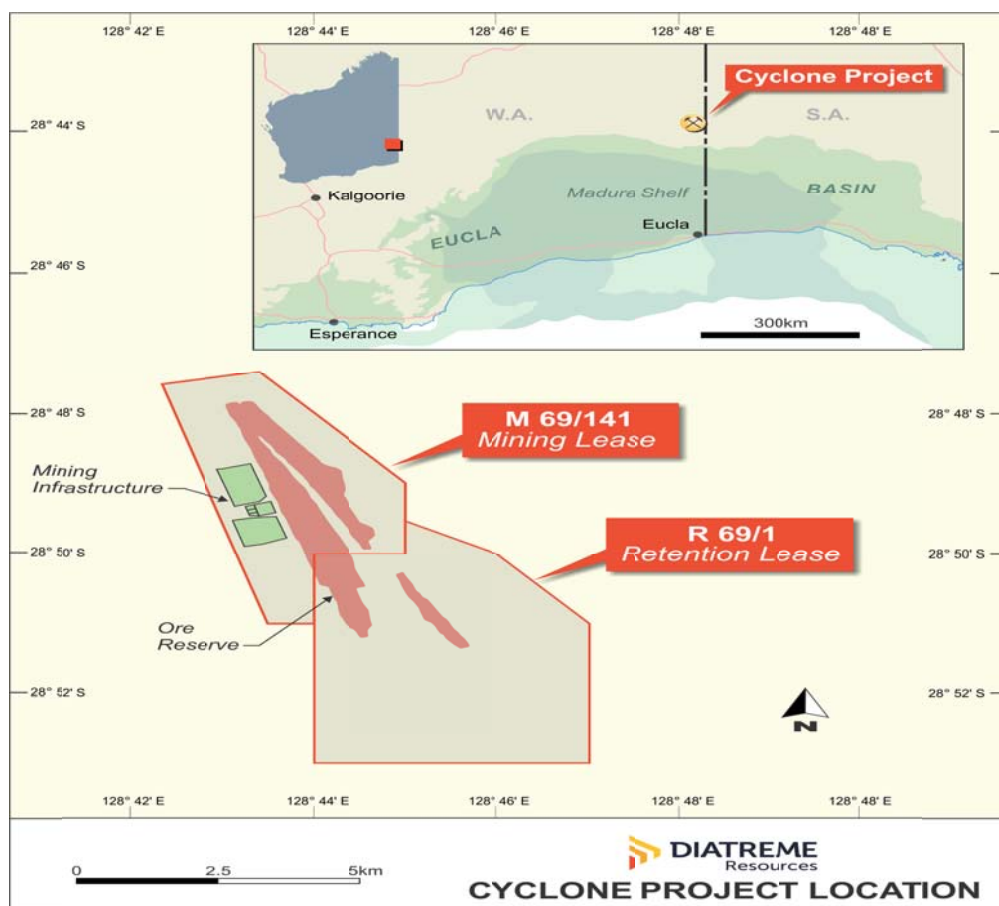
About Cyclone Zircon Project

Discovered in 2007, the Cyclone Zircon deposit is located along the Barton shoreline within the Wanna Lakes area of the northern Eucla Basin, 25 kilometres from Western Australia's state border with South Australia and 220 kilometres north of the transcontinental railway.

In November 2014, Western Australia's Department of Mines and Petroleum granted a Mining Lease (M69/141) for the project, which followed the signing of a Project Agreement with the traditional owners, the Spinifex People. In January 2017, the project received final ministerial consent allowing for the development of a mineral sands mine and associated infrastructure.

A Definitive Feasibility Study was completed in November 2018 by China ENFI Engineering Corp., part of the leading China Minmetals group, reaffirming Cyclone's potential as the largest undeveloped zircon dominant heavy minerals project in the world-class Eucla Basin (refer map below).

Figure 1: Cyclone Project Location



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