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The Yin Deposit, a New REE Discovery in the Gifford Creek Carbonatite Complex, Gascoyne Province, Western Australia

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Dreadnought Resources' Yin deposit, part of the Gifford Creek Carbonatite Complex (GCCC) in the Gascoyne Province of Western Australia, is one of the most significant rare earth discoveries in Australia this millennium. Since identification of outcropping REE-bearing dikes (ironstones weathered from a ferrocarbonatite protolith) in May 2021, Yin has been drilled along an initial 3-km strike, yielding a 14.4 Mt @ 1.13% TREO initial resource, and was the subject of a university study where, through petrography, mineral, and geochemical analyses, REE mineralisation controls have been established.

Since the 1980s, the area has recognised REE mineralisation, but a significant portion of occurrences remained undiscovered until 2021/2022 due to accepted paradigms that all REE mineralisation was located north of the crustal-scale Lyons River Fault. Over the last 18 months, exploration focused entirely south of the Lyons River Fault; Dreadnought Resources have discovered multiple additional REE-bearing dike trends, and a series of carbonatite plutons central to, and related to, the metallogenesis of the region, redefining the mineralised potential of the GCCC and increasing the search space for mineralisation from a ~700-km^2 to a >1,200-km^2 area.

Strong industry-academia relationships have been critical to the advancement of the geological understanding of the GCCC. Studies have found the Yin deposit is defined by two main zones, geologically distinct in mineralogy and chemistry, with the zones interpreted to represent separate pulses during the emplacement history of the carbonatite dikes. The mineralogical complexity between these zones is compounded as subsequent supergene weathering affects the zones independently.

Successful exploration programs which identify potentially economic REE concentrations will be key to sustaining the metals required for a green energy transition. This talk will outline the exploration approach that led to these recent discoveries and discuss mineralisation controls at the deposit, where new geological understandings have significant implications for future exploration.