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The Geological Setting of Vanadium Mineralisation in the Neuquén Basin of Central Argentina: An Opportunity for the Clean Energy and Energy Storage Sectors in South America

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NewEra Metal Resources Ltd. is Argentina's leading vanadium exploration company, with a strategic project portfolio including former mine sites in a large unexplored vanadium district. Situated in the Neuquén Basin of central Argentina, this vanadium district contains >100 bitumen vein-hosted vanadium occurrences in a region exceeding 500 km in length and 100 km in width, parallel to the Andean trend.

The solid bitumen veins are located within the Malargüe fold-and-thrust belt (FTB) on the eastern side of the Andes in the Neuquén Basin. Dark, organic marine shales of the Late Jurassic- to Early Cretaceous-age Vaca Muerta Formation are the most important hydrocarbon source rocks in the Neuquén Basin. Bitumen is genetically related to oil, and the vanadium-rich veins are hosted by these shales.

In "heavy oils," such as those of South America, asphaltenes contain approximately 40-90% of total vanadium and 25-75% of total nickel. The summed concentration of vanadium and nickel in heavy oil asphaltenes can reach 1 wt.%. The relationship of bitumen to oil explains the high concentration of vanadium in bitumen of the Neuquén Basin.

Research and theoretical modelling of bitumen chemical and physical data show the rock to be very amenable to gasification. A processing flowsheet has been identified whereby synthesis gas ("syngas") and a metal-rich ash is produced. Vanadium (and nickel) is recovered from the ash. Clean, low-carbon hydrogen can be separated from the syngas and is then available for hydrogen fuel cells to produce electricity or to be used as hydrogen in different applications, including the energy, transport, and chemical industries.

While the traditional use of vanadium to strengthen steel continues to lead market demand, it is the metal's use in battery manufacture, namely vanadium redox flow batteries (VRFBs) for energy storage, that is expected to have the biggest impact on future demand.