

## The US Department of Energy (DOE) Funds Next-Generation Rare Earths Processing Research Collaboration

### Highlights

- *Consortium will receive up to \$500K USD to fund R&D work*
- *Research could potentially reduce capex and opex costs while improving recovery efficiencies in rare earths processing*
- *Advantages: simple process; high throughput/rapid mass transfer rates; fast extraction kinetics*

American Rare Earths Limited (ASX:ARR, OTCQB:ARRNF) is proud to announce that its wholly owned US subsidiary, Western Rare Earths (WRE), has joined as the industrial partner in a research consortium that includes the technology company, Phinix, LLC and Virginia Tech University.

The team was awarded R&D funding by DOE's Office of Energy Efficiency and Renewable Energy (EERE) Advanced Manufacturing Office (AMO)<sup>1</sup> in an AMO program known as Critical Materials: Next-Generation Technologies and Field Validation. The consortium will receive up to \$500K USD to fund the work. WRE will provide rare earths bearing ores as feedstock for extraction and separation focused processing technology studies.

Mr Marty Weems, President of Western Rare Earths and President of North America for American Rare Earths Limited commented:

"We are honored to join this talented and prestigious consortium as part of our goal to help develop the next-generation of extraction, separation, and processing technologies"

"We value partnering with organizations at the forefront of developing cleaner, greener processing of rare earths for a more sustainable and secure North American supply chain. We could not be more excited about this latest collaboration. Dr. Das and Professor Zhang are highly accomplished innovators. We are deeply honoured by their invitation to join their team and support them on this important work. We see value in the simplicity of the process which is the key to high volume throughput and successful evolution to industrial scale operations."

## **Project Goal**

The project goal is to produce light, medium, and heavy rare earth oxide products of greater than 95% purity. Given the criticality of neodymium, a neodymium oxide product of greater than 95% purity will also be produced. An innovative extractor technology, based on gas-assisted micro-flow extraction (GAME) theory, will be employed with an efficient task-specific ionic liquid (TSIL) for rare earths extraction and separation. Success could reduce capex and opex expenditures for producing high value rare earths from lower grade sources while improving recovery efficiencies, thus reducing the loss of valuable rare earths to the tailings pile.

“Our proof of concept offers several advantages, such as simple process and high throughput,” says Subodh Das, Founder and CEO Phinix, LLC. “Moreover, due to rapid mass transfer rates and fast extraction of kinetics, our technology is credible for the recovery and separation of REEs from not only conventional rare earth ores, but also from resources with lower concentrations of rare earth content.”

## **Impact of DOE Funding**

“As a result of EERE funding, we expect to raise the Technology Readiness Level from its current classification of stage 2 to stage 3,” comments Wencai Zhang, Assistant Professor, Virginia Tech University. Prof. Zhang added, “This project represents a fantastic opportunity to showcase our new state of the art, Minerals and Materials Processing laboratory capabilities that we renovated and expanded over the past year. We now have one of the finest research facilities in the world that is focused on rare earths processing to facilitate the global transition to the reduced carbon, new energy future.”

## **About AMERICAN RARE EARTHS**

American Rare Earths Limited (ASX: ARR, OTCQB: ARRNF, FSE: 1BHA) is an Australian company listed on the ASX and the US OTC markets with assets in the growing rare earth metals sector of the United States of America, emerging as an alternative international supply chain to China's market dominance of a global rare earth market expected to expand to US\$20 billion by 2030. The Company's mission is to supply Critical Materials for Renewable Energy, Green Tech, Electric Vehicles, National Security, and a Carbon-Reduced Future.

Western Rare Earths (WRE) is the wholly owned US subsidiary of the Company. ARR owns 100% of the world-class La Paz rare-earth Project, located 170km northwest of Phoenix, Arizona. As a large tonnage, bulk deposit, La Paz is potentially the largest, rare-earth deposit in the USA and benefits from containing exceptionally low penalty elements such as radioactive thorium and uranium. ARR's other major project is Halleck Creek in Wyoming that recently completed exploration drilling with highly promising assay results. The results demonstrate the potential of Halleck Creek to become one of the major, large scale, rare-earth mines in North America.

## **About PHINIX LLC**

Phinix, LLC is a small-scale entrepreneurial company founded by Dr. Subodh Das in September 2008, after his diverse and successful academic and industrial careers in the metallurgy sector at the University of Kentucky, ARCO Aluminum Inc. and Alcoa. Phinix has been developing and commercializing extractive metallurgical processes, while Dr. Das has successfully managed numerous metallurgical research multi-disciplinary collaborations consortia involving industry, universities, and U.S. national laboratories. Dr. Subodh Das has been the Principal Investigator of many DOE (IOF-AMO-EERE and ARPA-E, REMADE) and DoD (DLA) projects since 2000. Phinix, LLC is currently focusing on the development and commercialization of processes for extraction of aluminum, magnesium, titanium, and rare earth elements (REEs) from domestic scrap/waste materials.

## **About VIRGINIA TECH UNIVERSITY**

The mineral processing and extractive metallurgy group of Dr. Wencai Zhang in the Department of Mining and Minerals Engineering at Virginia Tech is a university-based teaching and research group with extensive expertise in process technology and development. The Department was established in 1872 and is currently the only mining and minerals engineering program located within a nationally ranked college of engineering. The group has been focusing on the development of technologies for extracting precious metals and REEs from domestic scrap and waste materials, such as coal-based materials, bauxite residue, and electronic waste. The group was involved in the resource assessment, laboratory extraction study, and process flowsheet design for the recovery of REEs from coal refuse in 2015–2018. Several intellectual properties were generated, such as an innovative and low-cost process for the recovery and purification of REEs from acid coal mine leachate, as well as an efficient technology for improving the recovery of REEs from coal refuse. Based on the achievements, a pilot plant has been constructed in western Kentucky, which is the first domestic facility to enable the continuous production of mixed rare earth oxides of greater than 90% purity from coal refuse.

This market announcement has been approved for release to the market by the Board of American Rare Earths Limited.

Chris Gibbs

Managing Director

**Forward looking statements:**

This release contains forward-looking statements that involve subjective judgement and analysis and accordingly, are subject to significant uncertainties and risks, many of which are outside the control of, and are unknown to, American Rare Earths ( "ARR"). In such circumstances, the forward-looking statements can be identified by the use of forward-looking words such as "may", "will", "expect", "intend", "seek", "estimate", "believe", "continue" or other similar words.

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ARR wishes to caution readers that these forward-looking statements are based on economic predictions and assumptions on reserves, mining method, production rates, metal prices and costs (both capital and operating) developed by ARR management in conjunction with consultants.

This release and the forward-looking statements made in this release, speak only as of the date of the release.

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**References**

1. <https://www.energy.gov/eere/amo/advanced-manufacturing-office-family>