



Bear Lodge Demonstration Plant Project

Project Description



May 10, 2021

Draft – For Discussion Purposes Only

EERE #2322-1516

**RARE EARTH ELEMENT (REE) SEPARATION AND PROCESSING
DEMONSTRATION PROJECT**

*Proposal Submitted Summer 2020 in Response to
Funding Opportunity Announcement (FOA) from the DOE*

Consortium of Companies

Rare Element Resources (RER)

General Atomics (GA)

Umwelt- und Ingenieurtechnik GmbH Dresden (UIT)

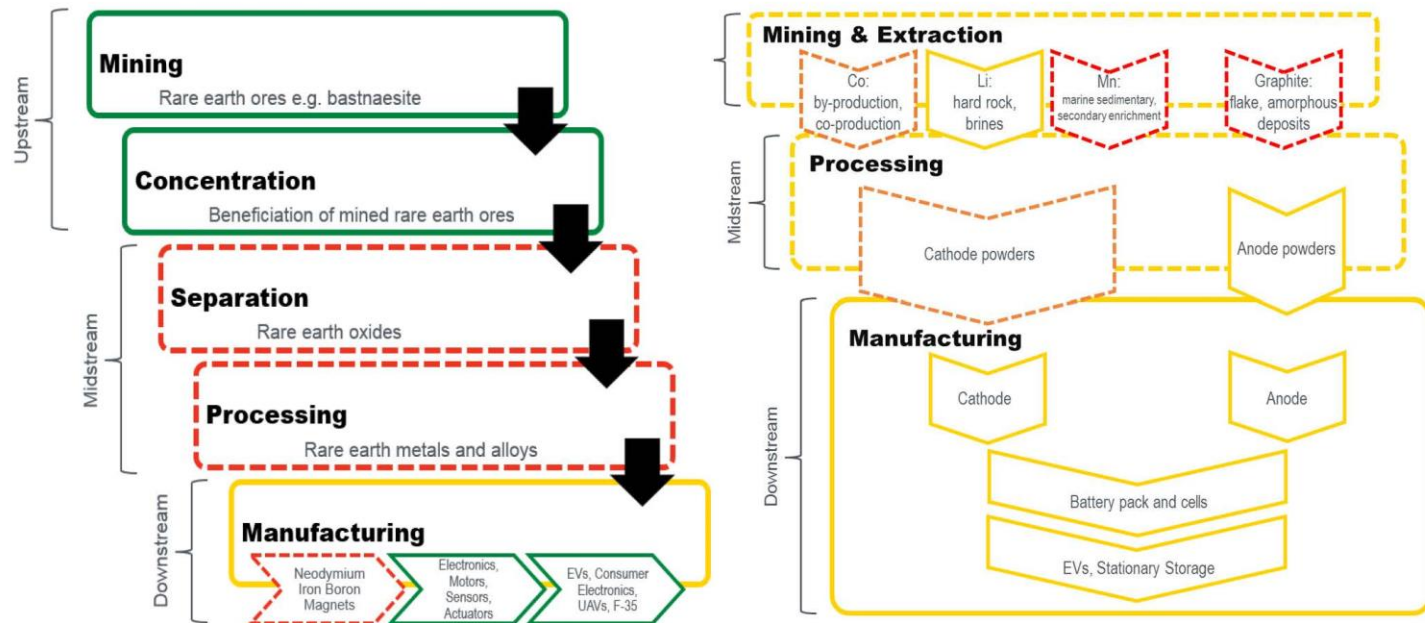
LNV, Inc. (LNV)- subcontractor

RER/GA's Project Selected January 21, 2021

Pre-Award negotiations expected complete by end of 2Q 2021

Technology Space and Strategic Goals

U.S. DEPARTMENT OF **ENERGY** | Energy Efficiency & Renewable Energy



RARE EARTH ELEMENT (REE) SEPARATION AND PROCESSING DEMONSTRATION PROJECT

Technology Summary:

Primary processing to produce highly pure TREO

- Physical beneficiation
- Efficient counter-current leaching
- Highly selective REE precipitation, filtration/wash, and calcination to produce pure TREO (>95% purity)

Complete removal of NORM:

- 100% removal of residual Th
- Non-radioactive REE raffinate for further processing

REE separation and refining:

- Innovative SX
- Applicable to produce pure NdPr (the primary project goal) and individual REE including La, Sm, Dy, Tb, and others

Maximized recycling of chemicals for economic processing:

- Complete extractant recycling
- Key reactants (dosed for maximized reactivity, but not completely consumed) are efficiently recycled for environmental compliance and minimized OPEX

Next-generation process control (focused on REE separation/refining)

- Real-time monitoring combined with model-based optimization

Project goals:

Demonstrate a wholly domestic REE facility that:

- Is located at a permitted and licensed domestic site
- Demonstrates the separation and refining of NdPr and other REE
- Provides a basis for scale-up to any future industrial-scale capacity the market requires
- Provides a basis for demonstration of separation economics
- Demonstrates a process that is capable of processing feed from any other mine source, either in the US or obtained as a result of initiatives to obtain TREO from allied countries

Impact:

Secure US supply of critical REE required for magnets (NdFeB, SmCo)

Consortium:

- Rare Element Resources, Inc. (RER) is incorporated in the state of Wyoming, USA.
- General Atomics (GA) is a privately held company, incorporated in 1986 in California, USA.
- Umwelt- und Ingenieurtechnik GmbH Dresden (UIT) is a division of General Atomics Europe GmbH (GAE), an affiliate of GA.
- LNV, an Adurra Group, Inc. engineering and construction subcontractor

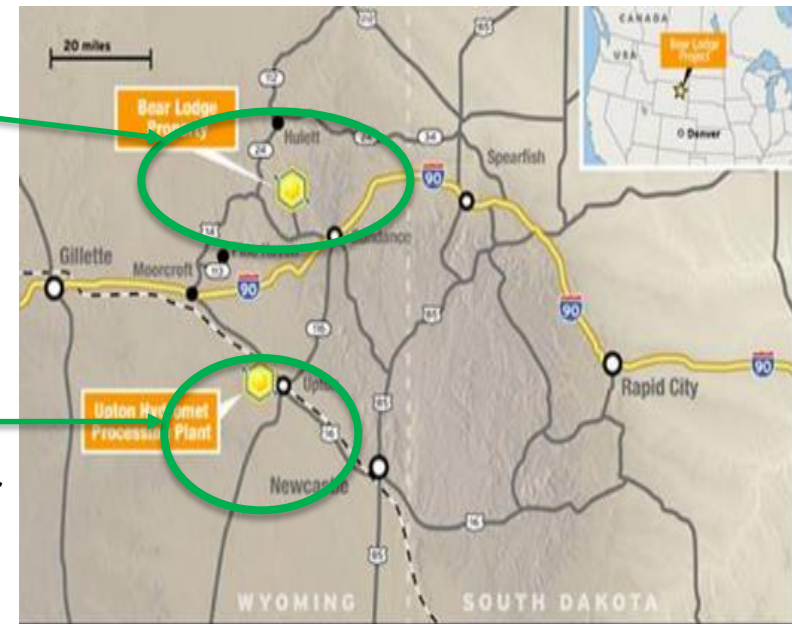
Bear Lodge Rare Earth Project located in an exceptional U.S. location

◆ Bear Lodge Rare Earth Project

- 63 miles east of Gillette, Wyoming (NE WY)
- Excellent infrastructure, including roads, water, power, etc.
- Ready access to supplies, materials and skilled labor

◆ Demonstration Plant

- Upton, WY demonstration hydrometallurgical plant near existing industrial park with water, power and rail



1000-ton Demo Plant Feed Sample Ready for Processing



1,000 ton bulk sample extracted for feed to demonstration plant (2014)

Material will be transported to Demonstration Plant site



Trench exposed near-surface main dyke and was bulk sampled along 300 foot length

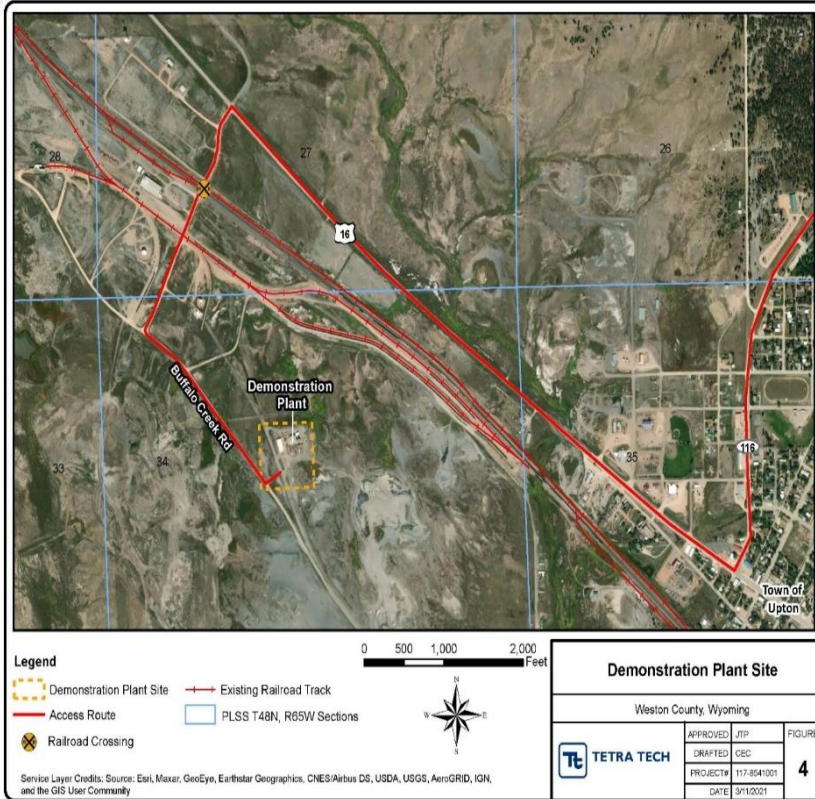
Trench fully reclaimed

No additional sampling required for Demonstration Plant



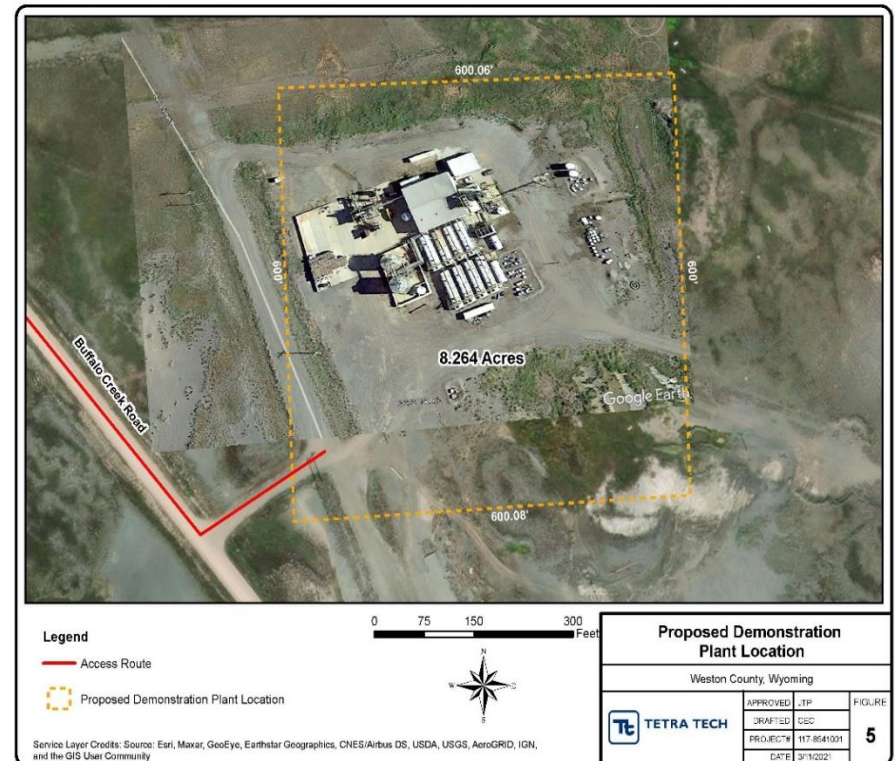
Bulk samples ranged from 3.65% to 14.65% TREO with an average grade of 10.1% TREO

Demonstration Plant Location- Upton, Wyoming

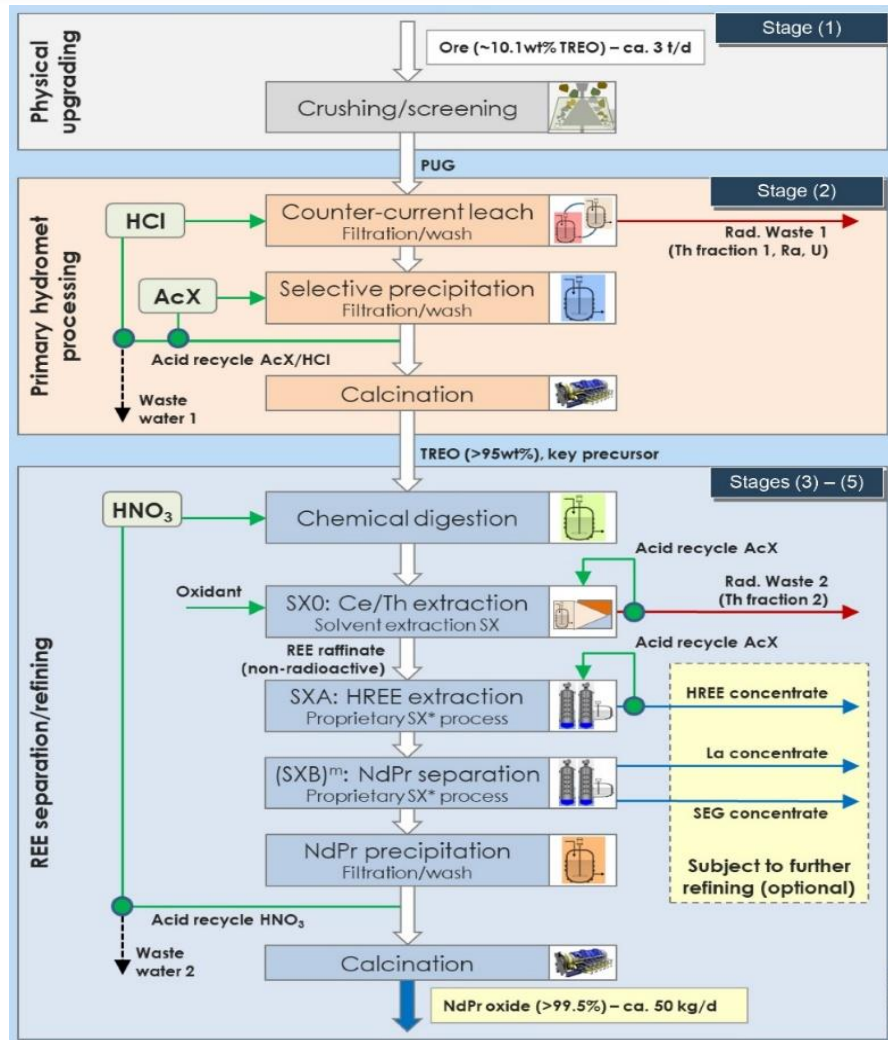


- Upton Logistics Industrial Center
- Lease agreement underway with owner Tiger Transfer LLC

- 8.2 Acre Brownfields Site
- Phase 1 Environmental Survey Completed on April 27- *Report pending*
- RER to add 18'x34'x32' building



Process Flowsheet



Permit/License Requirements for Demo Plant

- ◆ US Forest Service (USFS) – Road Use Permit to upgrade access road to transport sample to Demonstration Plant location
- ◆ Wyoming Department of Environmental Quality (WDEQ)
 - Air Quality Permit
 - Sample Loading, Crushing/Screening
 - Hydrometallurgical Process, Calcination
 - Separation Process
 - Asbestos Inspection
 - Water Quality Permit
 - Storm water SWPPP, WyPDES
 - Process Water Treatment
 - Sewer
- ◆ US Nuclear Regulatory Commission (USNRC)
 - Source Materials License
 - Performance Based License

Waste Categories

All solid waste generated by the process will be shipped off-site to a licensed storage facilities. The main waste categories include:

- ◆ Tailings – solid NORM waste to be conditioned (neutralized and immobilized) for off-site disposal. USNRC Source Material Possession License Required
- ◆ Th/Ce residues – solid NORM waste to be conditioned (de-watered) for off-site disposal.
- ◆ Filtrate from selective precipitation suspension (including wash water) in stage (2). Some of this will be recycled. Excess will be treated for disposal.
- ◆ Various filtrate categories from REO suspensions produced in stages (4) and (5). If possible this will be recycled.
- ◆ Non-hazardous Industrial Waste.
- ◆ Emissions generated from Process Equipment

Source Materials License Process

Guidance Document

- NUREG 1556 Volume 12
 - Applicable Sections of NUREG1556 are identified

Most Applicable Regulations

- 10 CFR 2-Domestic Licensing Proceedings and Issuance of Orders
- 10 CFR 19-Notices, Instruction and Reports to Workers: Inspections and Investigations
- 10 CFR 20-Standards for Protection Against Radiation
- 10 CFR 40-Domestic Licensing of Source Material
- 10 CFR 71Packaging and Transportation of Radioactive Material
- 10 CFR 171-Fees for Facilities, Materials, Import and Export Licenses and Other Regulatory Services Under the Atomic Energy Act, as Amended

NRC Form 313
(Section 8.1- 8.4, 8.12, 8.13)

Description of Radioactive Material
(Section 8.5)

Use and Purpose of Licensed Material
(Section 8.6)

Responsible Individuals and Their Training and Experience
(Section 8.7)

Training for Workers
(Section 8.8)

Facilities and Equipment
(Section 8.9)

Radiation Safety Program
(Section 8.10)

Waste Management
(Section 8.11)

Demo Project Schedule

To achieve the Demo project objectives, the program is divided into three distinct performance periods.

- ◆ (1) Design – up to 12 months
 - ◆ (2) Procurement and Construction + 12 months
 - ◆ (3) Operations + 12 months
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- ◆ Demo Plant Licensing and permitting will proceed in parallel with periods (1) and (2).
 - ◆ DOE contract expected to be completed in June 2021.
 - ◆ Demo Plant Permit and License Applications prepared and submitted to agencies in 3rd Q 2021.
 - ◆ NRC License expected in 3rd Q 2022.
 - ◆ Construction 2022.
 - ◆ Operation 2023.

Questions/Discussion