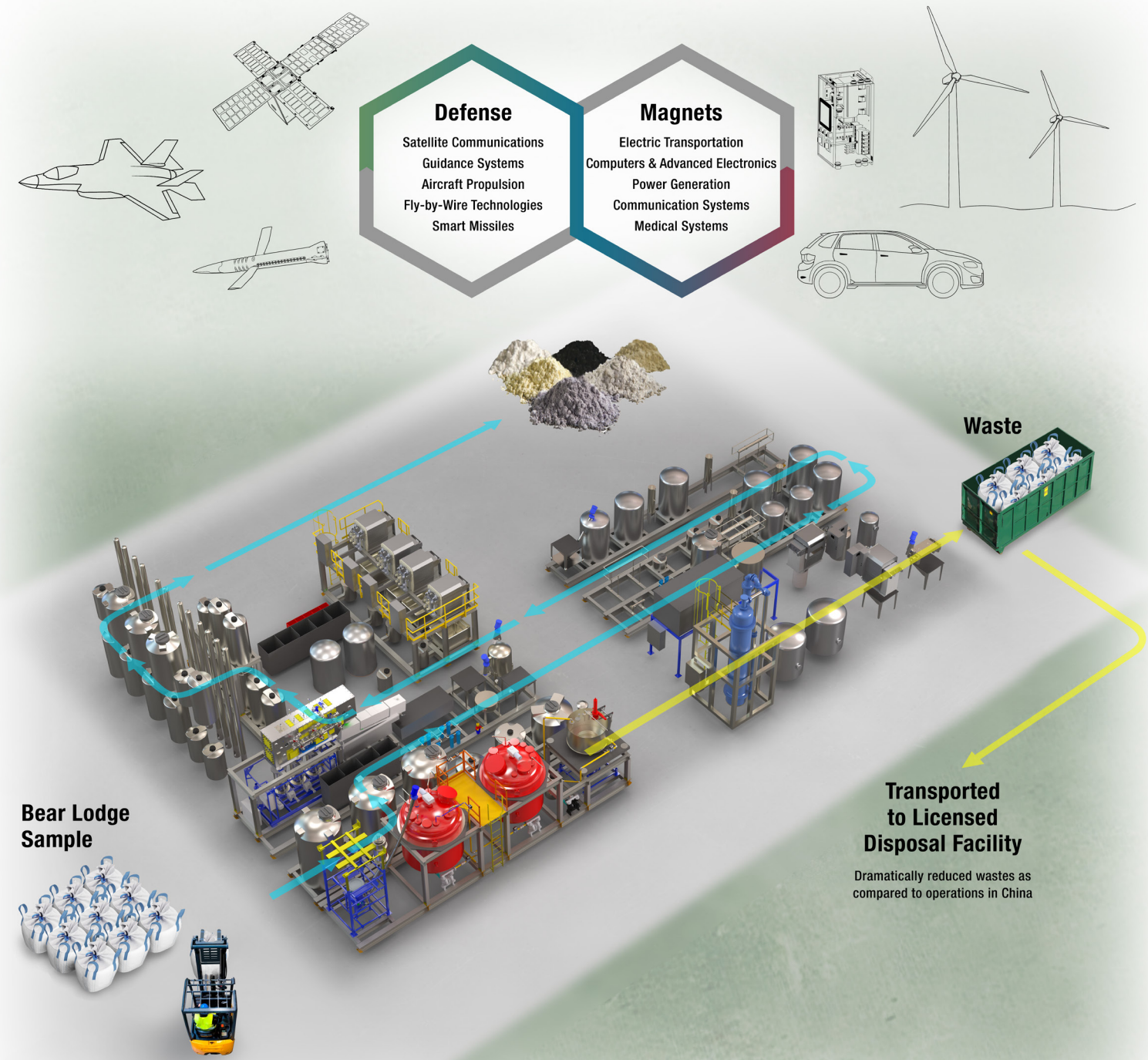


Rare Earth Elements (REEs)

REE Separation & Processing

Produces High-Purity, Magnet Material Rare Earth Minerals

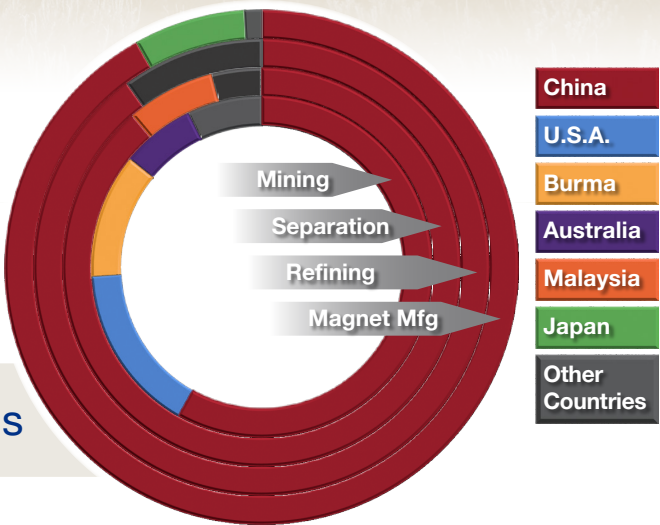


Establishing a Domestic Supply of REEs is Critical to U.S. Interests

China Currently Dominates All Aspects of REE & Magnet Production

Geographical concentration of supply chain stages for sintered NdFeB magnets

From center: REE mining, oxide separation, metal refining, & magnet manufacturing



REEs are Essential to Key U.S. Industries

Our Team's Response to Chinese REE Dominance



- Demonstrate unique, high-efficiency processes to provide a domestic capability to separate & refine individual REEs
- Develop the Bear Lodge Project for a domestic source of REE materials
- Build a foundation for a domestic magnet & electric motor manufacturing supply chain

Specific REEs (Nd, Pr, Dy, Tb) are vital input materials for a vast range of future-facing products

Separation & Processing Demonstration Plant Project

Bear Lodge is a World-Class Resource

- Located in NE Wyoming
- Rich supply of REEs
- Long mine life
- Demonstration program will use 1,000-ton sample previously extracted from Bear Lodge

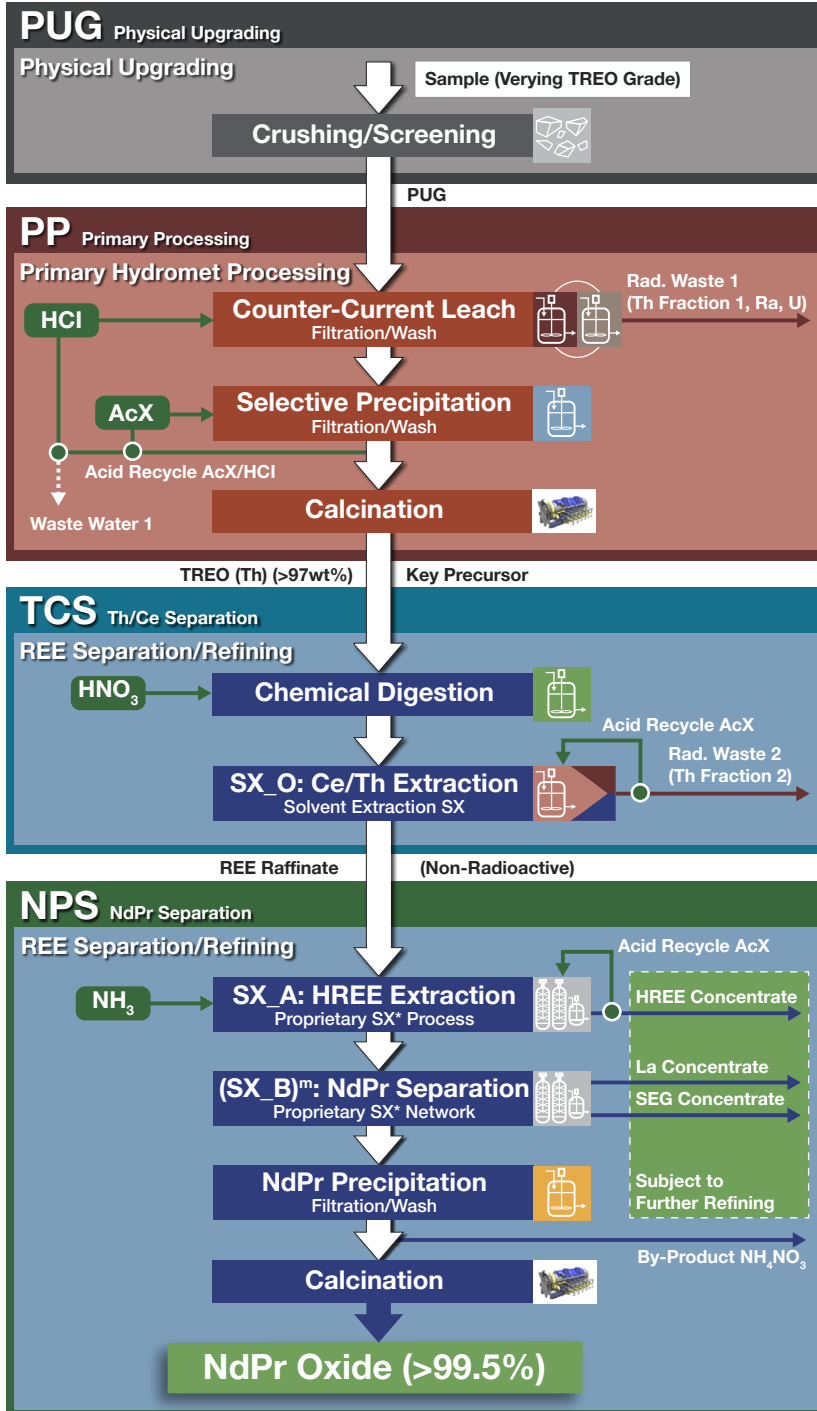
*U.S. DOE, Critical Materials Assessment 2023, July 2023.
Sm included because of its use in samarium/cobalt magnets.
**Other REEs include Holmium, Erbium, Thulium, Lutetium, Scandium and Ytterbium.

Rare Earth Elements	Distribution by Weight (%)
Neodymium (Nd)*	17.9
Praseodymium (Pr)*	4.9
Dysprosium (Dy)*	0.5
Terbium (Tb)*	0.1
Samarium (Sm)	3.0
Magnet Materials	26.4
Europium (Eu)	0.7
Yttrium (Y)	1.3
Cerium (Ce)	43.0
Lanthanum (La)	26.8
Gadolinium (Gd)	1.6
Other REEs**	0.2
Total Rare Earth Oxides	100.0

REE Separation Process

Process Advantages

- 92-97% recovery of REE concentrate from Bear Lodge mineral sample
- Novel, high-efficiency process producing >99.5% pure NdPr oxide & other rare earth oxides (REOs). The process recycles the majority of chemicals leading to reduced costs and process waste as compared to traditional practices.
- First-of-a-kind, real-time control software developed from first-principles for process design and optimization
- 100% separation of thorium, radium, & other radionuclides disposed at licensed facilities
- Process designed for zero emissions



PUG Physical Upgrading or comminution of the exploration sample; crushes sample to 1-3 mm size for further processing

PP Primary Processing of the sample to produce a high-purity concentrate, separating the bulk tailings and radioactive materials from REEs

TCS Thorium/Cerium Separation removes remaining radioactive materials as well as cerium

NPS Neodymium/Praseodymium Separation refines REEs into groups including: NdPr, LaCe, SEG, and HREE concentrates

Project Team

- U.S. Department of Energy (DOE)
- General Atomics Electromagnetic Systems (GA-EMS)
- Rare Element Resources (RER)
- Umwelt – und Ingenieurtechnik GmbH Dresden (UIT)
- LNV, a division of Ardurra

Project Objectives

- Demonstrate the separation of NdPr & other REEs at high purity
- Produce up to 15 tons of NdPr at >99.5% purity as well as La, SEG (combined Sm, Eu, & Gd) & heavy rare earth element (HREE) concentrates, which would be subject to further refining
- Provide clear pathways for the separation of other rare earths, including Sm, Dy, Tb, & other essential heavy REEs
- Provide a basis for scale-up to, and economic assessment of, a commercial capacity plant
- Demonstrate a process capable of treating REO concentrate from other sources, either in the US or obtained as a result of initiatives to obtain REO from allied countries

First-of-a-Kind REE Separation & Processing Demonstration Plant to be Located in Upton, WY

- Establishes a domestic facility for REE separation & processing
- Demonstrates key process steps for production of >99.5% pure REE oxides
- Provides basis for future commercial plant to be located in the vicinity of the Bear Lodge site



Use of pre-existing industrial site

State & Local Benefits

- Provides vital workforce training in key technical skills in the REE processing arena
 - Provides partnership opportunities in Rare Earth Sciences with the University of Wyoming, including the School of Energy Resources & other graduate programs
 - Ensures State of Wyoming has a competitive edge for domestic REE production and supply needs
 - Furthers the development of Wyoming as a REE industry hub
 - Lays the groundwork for future commercial-scale REE production facility
 - 240 jobs over two year construction period
 - 120 jobs for duration of operations (30+ years)
 - Supports local tax base
- 
- 



Project Timeline

[illegible]