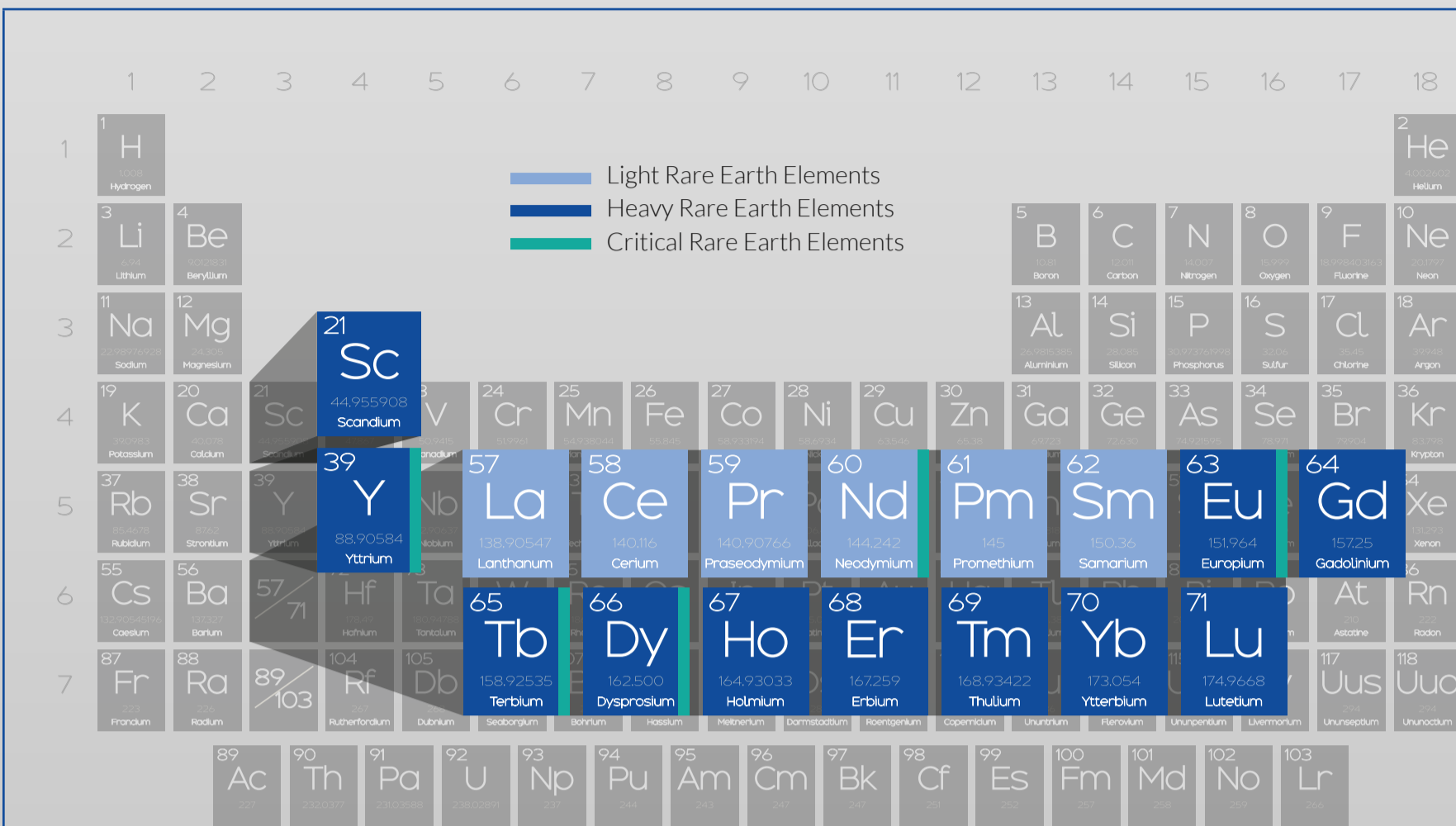


RARE EARTH

The building blocks of our nation's technology future.



Rare Earth Element Uses [1]



DEFENSE
Satellite Communications
Guidance Systems
Aircraft Structures
Fly-by-Wire
Smart Missiles

Nd, Eu, Tb, Dy, Y, Lu, Sm, Pr, La



CERAMICS
Capacitors
Sensors
Colorants
Scintillators
Refractories

Nd, Y, Eu, Dy, Lu, Gd, La, Ce, Pr



PHOSPHORS
Display phosphors-CRT,LPD,LCD
Fluorescents
Medical Imaging
Lasers
Fiber Optics

Nd, Eu, Tb, Y, Er, Gd, Ce, Pr



GLASS & POLISHING
Polishing Compounds
Pigments & Coatings
UV Resistant Glass
Photo-Optical Glass
X-Ray Imaging

Nd, Gd, Er, Ho, La, Ce, Pr



METAL ALLOYS
NiMH Batteries
Fuel Cells
Steel
Super Alloys
Aluminum/Magnesium

Nd, Y, La, Ce, Pr



CATALYSTS
Petroleum Refining
Catalytic Converter
Fuel Additives
Chemical Processing
Air Pollution Controls

Nd, La, Ce, Pr

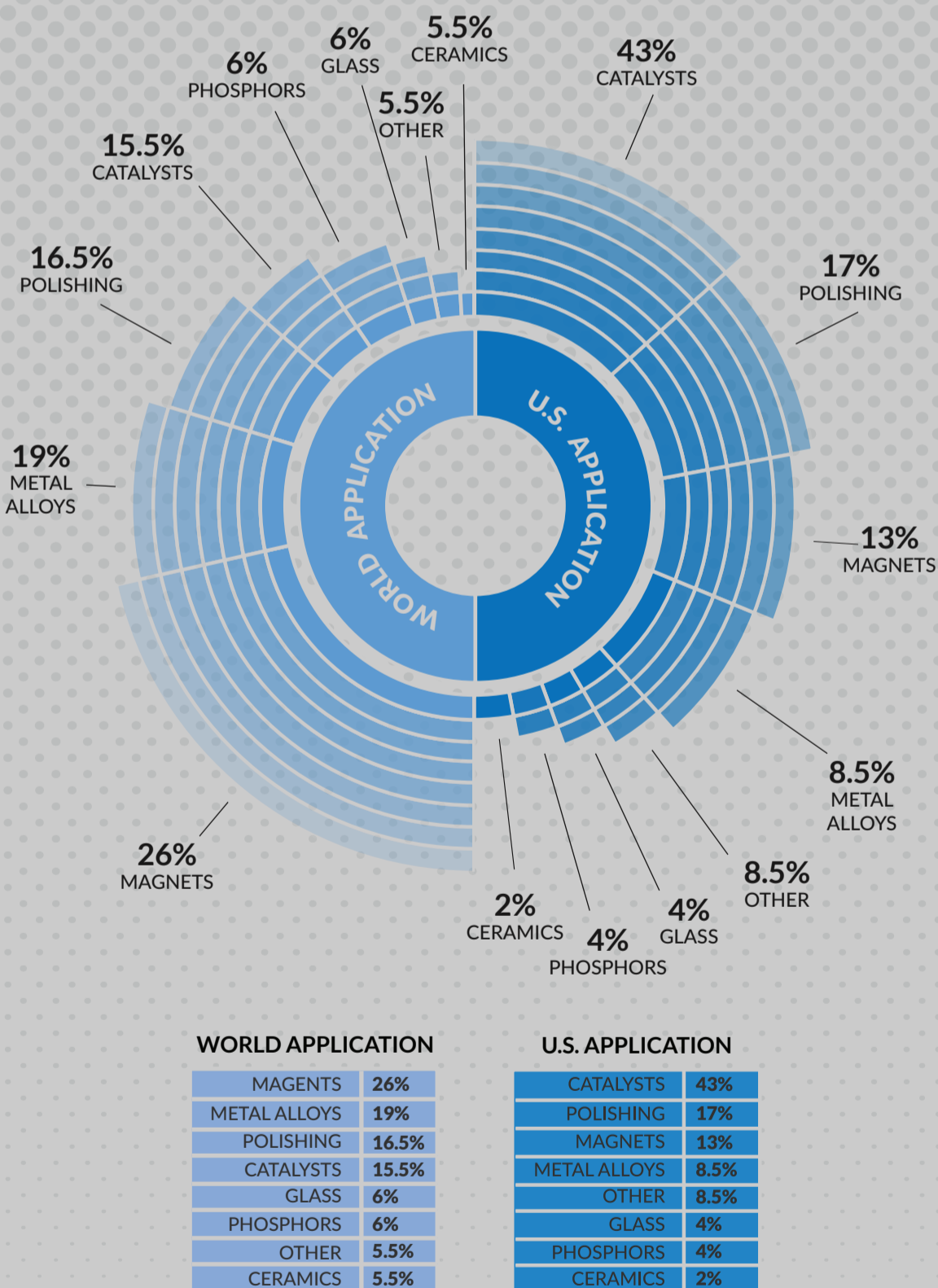


MAGNETICS
Computer Hard Drives
Disk Drive Motors
Anti-Lock Brakes
Automotive Parts
Frictionless Bearings
Magnetic Refrigeration
Microwave Power Tubes
Power Generation
Microphones & Speakers
Communication Systems
MRI

Nd, Tb, Dy, Pr

RARE EARTH ELEMENTS are essential building blocks for components of today's emerging energy and lifestyle technologies: Satellite communications, sensors, fiber optics, lasers, wind turbines, energy efficient light bulbs, LCD screens, medical devices and potential technologies of the future all rely on the supply of REE materials.

Percentage of REE Applications [2]



U.S. Economic Activity Supported By Rare Earth Chemistry [3]

Intermediate products delivered \$39.2 billion in revenue, creating 101,800 jobs & generating \$6.1 billion in payroll (magnets, catalysts, metallurgical additives, polishing powders, glass additives, ceramics, and batteries)

End-market products and technologies delivered \$259.6 billion in revenue, creating 433,500 jobs & generating \$27.3 billion in payroll (health care, hybrid electric vehicles, lighting, communication systems, audio equipment, defense technologies, optics, oil refining, and wind power)

References:

- [1] <http://www.frontierrareearths.com/rare-earth-uses/>
- [2] Percentage of REE Applications projected for 2015
<https://fas.org/sgp/crs/natsec/R41347.pdf>
- [3] U.S. Economic Activity Supported By Rare Earth Chemistry in 2013
<http://www.rareearthtechalliance.com/Resources/The-Economic-Benefits-of-the-North-American-Rare-Earths-Industry.pdf>