

**Owen Johnson**  
**Chemical Engineering**  
**Dr. Gokhan Egilmez and Dr. Amanda Simson**

### **The Sustainability of Rare Earth Elements**

Most people do not know that rare earth elements (REEs) are in their pockets nowadays, being used in cell phones and headphones, while also being used for green technologies, like wind turbines and electric cars. However, even though these REEs are vital to sustaining and advancing our society, the supply of them are running low, so we need to find a way sustain our supply.

I began by creating a concise set of tables displaying the amount of each REE in common products and green technologies. With these tables I was able to deduce which element was in the most critical state. Neodymium is used as the main component in permanent magnets that are found in cellphones, wind turbines, and much more. However, since the supply of this element is beginning to decline, I looked into the financial viability of extracting and recycling Neodymium from these permanent magnets.

The financial viability was calculated based on the approximation that only 5% of people would recycle their products with REEs, and that the products would have their magnets removed by hand. Based on these calculations, if a company were to start recycling Neodymium today, they would be losing \$15,000 per day. Though, if recycling numbers increases and break down is mechanized, it may become profitable in the following years as the cost of Neodymium increases.