# The Illusion of Domestic Demand in the U.S. EV and Critical Minerals Markets

written by Jack Lifton | November 25, 2024

“The American domestic market for EVs has not materialized, and the technology-critical minerals markets in the USA reflect the political pressure of confused government intervention, not any actual domestic demand. The dominant supply and demand markets in Asia set the prices for these minerals.” – Jack Lifton, Co-Chair, Critical Minerals Inc. (CMI)

The American domestic market for EVs has not materialized, and the technology-critical minerals markets in the USA reflect the political pressure of confused government intervention, not any actual domestic demand. The dominant supply and demand markets in Asia set the prices for these minerals. In most cases related to rare earth minerals and their processing, there is no actual domestic American demand, yet the investment community at all levels acts as if there were. The frenzy of the creation of junior mining companies with names that include the terms, rare earths, heavy rare earths, critical metals, lithium, battery, defense, and energy metals, and so on, although believed to be a paradigm of free market capitalism at its competitive finest, is, in fact, primarily just an attempt to get money, with no discernable purpose, through naked promotion.

It’s hard to get a clear view of the actual market, because the need to maintain competitive advantage is a universal prohibition on the open exchange of ideas.

It is clear, however, that the commercial production of higher atomic number, so-called “heavy” rare earths is currently

globally entirely under the ownership or control of Chinese companies, which have the full backing and support of the Chinese national government.

You cannot manufacture a rare earth permanent magnet motor for stable use in cyclic high-temperature environments, such as those found in motor vehicle power trains, without the magnets used in such motors being of the type that require the use of “heavy” rare earths in their composition.

Thus, today, all Electric Vehicles (EVs) that use rare earth permanent magnet motors (REPMMs) must source their traction motors from manufacturers that have access to the Chinese rare earth permanent magnet market.

The current attempt to create a commercial heavy rare earth (HREE) processing industry in North America is a paradigm example of market capitalism, and for investors, it is a matter of assessing the probability of success against the risk of failure. However, this probability of success assessment is a data-dependent specialist game.

The following discussion is based on the data as I know them.

**Definitions:** A commercial venture produces a market-sought item for less than the market selling price.

A high-coercivity rare earth permanent magnet retains its magnetic strength throughout repeated cycles of high temperature heating and cooling.

For any product of a domestic supply chain, when the taxpayer’s subsidies and the private industry’s premium prices stop, as they always must if politicians and CEOs are to retain their jobs based on no forward planning required and no consequences from failed policies or decisions along with guaranteed high

incomes, then what? The answer is, as always, ***only the lowest cost, most robust, and leanest competitors will survive.***

To my knowledge, four credible projects in North America are underway to build heavy rare earth separation and purification facilities with commercial capacity. They are 1.) a traditional solvent extraction system designed and to be built by the Saskatchewan Research Council as an addition to their existing light rare earth system; another, 2.) designed and to be built in-house by Energy Fuels Inc. (NYSE American: UUUU | TSX: EFR), also as an addition to its existing light rare earth facility; 3.), a plant to be designed in-house and built in Texas, by Australia's Lynas Rare Earths Ltd. (ASX: LYC), which currently operates the world's largest dedicated SX system for light rare earth separation in Malaysia; and 4.), a system, using an in-house developed variation of SX, claimed to be faster and more efficient, which has been both piloted and demonstrated, by Canada's Ucore Rare Metals Inc. (TSXV: UCU | OTCQX: UURAF), is scheduled to be built and operational in Louisiana by the end of 2025.

Another project, a fifth one, was announced just two days ago: The Canadian/Brazilian/Chilean company Aclara Resources Inc. (TSX: ARA) has just announced that it has the open support of the U.S. Department of Energy to build a rare earth separation plant in the US with HREE separation capability to process the HREE-rich ionic adsorption clays from the company's Brazilan and Chilean deposits into individual rare earth products suitable for rare earth metal and alloy making.

I note that all of the above separation plants would also be able to produce the light "magnet" rare earths, neodymium and praseodymium, the natural combination of which is called didymium and is written as NdPr, which, in the case of ionic adsorption clays, is many times more prevalent than the HREEs.

Thus, if they have appropriate feedstocks, all of the budding projects could produce the total suite of rare earths required for high-coercivity magnet making: Nd, Pr, Dy, and Tb.

If all of these plants were constructed, (North) America would have the largest capacity in the world for heavy rare earth separation next to China.

Here are two problems:

First, North America has no history of ever producing or processing the HREEs commercially. This rare earth permanent magnet supply chain subset was developed commercially only in China. It is true that Solvay's dedicated rare earth solvent extraction-based separation plant in France was the world's first total rare earths separation plant. Still, it is also true that this plant never produced HREEs commercially, for the same reason that no such plant was ever built in the United States (and no, the original Molycorp SX plant did not have any HREE separation capability or capacity. It was specifically designed to access the company's ore body's mid-level rare earth, europium). Second, and simply stated: ***North America has no credible heavy rare earth-bearing feedstock.***

So, what gives?

I think we lack the market intelligence that must inform capital outlays. I blame this on the endlessly repeated and uninformed tripe that passes today as market intelligence in the critical minerals demand space. I can't find another "analyst" who even mentions that there are NO North American deposits of rare earths that contain sufficient higher atomic number, "heavy," rare earths to be economically mineable.

So, where will the feedstocks come from to justify the above facility builds? And if we don't know that, doesn't that mean we

cannot predict the COGS of our necessary HREE products?

The information-challenged budget analysts in the “domestic” OEM American automotive industry give us one related answer: They will build battery factories with absolutely no guarantee of processed raw material-based component supply because they have been told that this is politically correct (at least it was until very recently) and even if they wipe out billions in capital, they firmly believe that the “government” will always bail them out. What’s the difference between these bureaucratic drones and their counterparts in China? The difference is that China’s bureaucrats and financial managers are much better at navigating mineral politics.

The same “budget analysts” have not even addressed the natural rare earth permanent magnet markets because they know nothing about rare earth supply and demand. Again, the common theme is that the papa government will not let them fail, so high salaries and benefits are assured.

Back to HREEs: Why are they necessary? ***Because today you cannot mass produce high coercivity rare earth permanent magnets for use in traction (drive) motors for EVs without them.***

So, what then is the domestic American demand for HREEs?

First, let’s limit ourselves to the domestic American manufactured EV market. A typical EV with one electric drive motor of the rare earth permanent magnet type will use 2.5 kg of higher atomic number rare earth-modified permanent magnet. So, a million such vehicles (6% of the US market) will require at least 2,500 tons of high coercivity rare earth permanent magnets. The rare earth content of such magnets is about 30% and 4% of that is typically, on average, HREE products, so manufacturing a million EVs will need 25 tons of Dy/Tb. Note that if all American car/truck production for the last year, 17

million units, were to be EVs, then the need for Dy/Tb for this market would be at least 425 tons per year.

The NdPr required for the total conversion of today's domestic market to EVs would be 10,725 tons per year.

Regardless of powertrain domestic American motor vehicles annual production requires also 5,000 tons per year of non high coercivity REPMMs in non-traction roles, such as window, seat, and power steering motors.

Thus, for a total conversion of the domestic American OEM automotive industry to EVs, there would be a need for 16,000 tons of NdPr and 425 tons of HREEs per year.

This translates to a total need for 40,000 tons per year of rare earth permanent magnets.

The above analysis is from openly available data.

Yet, almost 100% of the private sector's investment in domestic supply chains for technology critical materials has been for manufacturing lithium-ion batteries.

I believe this is because the REPMM market is so specialized and small, even though critical, that an understanding of its supply chain is not present either in America's governing or manufacturing classes.

As we approach 2025, after a decade of promoting the adoption of EVs to (somehow) stave off a "climate crisis," North America has just ONE credible high coercivity rare earth permanent magnet maker, a company brought here from Germany by a venture capital firm, not by a manufacturer or government agency. It is building a magnet manufacturing plant in South Carolina, funded by the U.S. Department of Defense for its, the DoD's, specialized needs. One OEM automotive company has "invested" in this

facility also to obtain for itself some additional manufacturing capacity at the plant not reserved for the DoD's classified and specialized needs.

The DoD has also been involved with the South Carolina's selection of the West's sole producer of rare earth metal and magnet alloy to design and engineer a metal and an alloy plant adjacent to the South Carolina facility.

The stated capacity of the South Carolina REPM plant is 3000 tons per year. Thus it will need 1000 tons per year of NdPr "metal" and 40 tons per year of HREEs.

The DoD has funded the Australian light rare earth producer, Lynas, to build a 5000 ton per year rare earth separation plant in Texas to supply the needs of the South Carolina facility. Lynas currently is the West's largest producer of NdPr "oxide," but it does not currently produce any HREEs. Lynas deposit of monazite rich minerals in Australia is the highest grade rare earth ore currently being commercially mined, but its HREE content is very small. Nonetheless, Lynas has built a test plant at its Malaysian primary separation operation for the engineering and design of additional SX circuits in Malaysia and Texas for the separation and purification of HREEs.

NOTE: I have not counted the Lynas' planned Texas facility as a potential HREE producer, because I have no knowledge of the Texas plant being under construction or of its design.

Let me conclude this essay with some conclusions about the future of a "domestic" American rare earth permanent magnet industry.

IF the domestic American OEM automobile assembly industry were to go totally EV, then its demand for REPMMs would require 16,000 tons per year of NdPr and 425 tons of HREEs.

No single domestic American mine or processing plant could possibly supply either quantity of rare earths in total.

And, keep in mind that there is additional demand in the North American market for REPMMs. This arises from household appliances, air conditioners, industrial motors and tools, aircraft and marine uses, etc.

The American marketing manager of the second largest REPM maker in the world recently told me that his (Chinese) company estimates the current domestic American market for REPMs at 20,000 to 40,000 tons per year.

Which means that the existing current market for REPMs today already requires 16,000 tons annually of NdPr, although only a small proportion of this additional demand would require HREEs, so let’s guess that, at most, the total electrification of the North American vehicle fleet, annually, would require at most, 500 tons per year of HREEs.

It is very unlikely that there can be a stand-alone HREE producer in America; the total demand for HREEs in the contemporary North American market is too small to support such a venture.

I think that the only way an HREE producer can be profitable is for it to simultaneously and ***primarily*** produce NdPr.

But unless a domestic REPMM industry is built up in North America and unless the demand for high-coercivity REPMMs reaches a threshold where such an industry can be profitable without subsidies, there is no need in the North American market for a large producer of rare earths and downstream metals and magnet alloys.

The only existing domestically unfulfilled American demand for

high-coercivity REPMs is from the U.S. Defense Department. Its choice of Lynas as a primary supplier of separated light rare earth with Ucore as a backup separation provider, and its choice of Vacuumschmelze as a magnet maker with its concomitant choice of Britain's Less Common Metals (LCM) Ltd as the metal and alloy maker for Vacuumschmelze almost closes its demand for a totally non-Chinese source of REPMs. The missing part of a total domestic American rare earth permanent magnet supply chain for the DoD is a source of HREES.

Of the five HREE capable suppliers named above, the only survivors will be those that have non-Chinese sources of HREEs and business models that allow for profitability at the demand levels for their share of the U.S. DoD requirements and the demand levels that will actually emerge from the OEM automotive market not the political, demand for EVs.

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The upcoming **CMI Summit IV**, themed *The War for Critical Minerals and Capital Resources*, is scheduled to take place in Toronto, Ontario, on May 13-14, 2025. The CMI Summit aims to foster strategic partnerships and develop actionable solutions that support the growing demand for critical minerals, crucial for the advancement of clean energy, technology, and national security.

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