The Central Processing of Critical Metals, an Idea Whose Time Has Come

written by Jack Lifton | April 1, 2022

If individual nations and politically aligned regions are to achieve self-sufficiency and security of supply, as soon as possible, for the critical metals necessary for their defense and consumer economies, then the most efficient use of time and money in pursuit of these objectives is of paramount importance and duplications of effort are to be avoided at all costs.

This means that the central processing of the beneficiated ores and scraps containing recoverable quantities of the desired critical metals is the best solution to avoid the paramount deficiency in the downstream processing of critical materials into customer-specified end-use forms; the lack of educated, experienced, and demonstrably skilled chemical and metallurgical engineers specialized in hydro-, pyro-, metallurgical, and manufacturing engineering, whose training and opportunities for experience in the West have been scaled down dramatically since the politicians in the West failed to adopt an industrial policy to maintain not only secure supplies of critical materials, but also of critical skills.

Dr. Chris Haase, the former Director of the Critical Materials Institute of the U.S. Department of Energy recently spoke with me about this topic, and he said that "the resulting [political] weakness of the US natural resources industry has caused a significant decline in the number of newly trained mining, metallurgical, and extractive metallurgical engineers in the US." He added that "Recent data show that the United States graduates fewer than 207 hydrometallurgical engineers annually.

Hydrometallurgy is a combination of multiple functional specialties that target the recovery of metals from their ores and scraps using fluid-based processes, by applying multiple processing steps involving physical, chemical, and sometimes electrical processes that include beneficiation, dissolution, and concentration that allows the separation, purification, and refining of finished metal and alloys. Achieving economically and environmentally sustainable operations requires a confluence of skills and expertise to deliver value at scale."

"Unfortunately," he added, "the closure and/or sales of major US mining corporations in the 1970s and 80s resulted in the closures of nearly all corporate mining and extractive research and development labs. The closure of the US Bureau of Mines in 1996 and the transfer of its accountabilities to the US Geological Survey and the US Environmental Protection Agency further bifurcated and balkanized US hydrometallurgical research, development, and advisory capabilities. The remaining US know-how and technical capabilities reside primarily in [just] a handful of select mining universities (e.g., Colorado School of Mines, New Mexico Institute of Mining & Technology, South Dakota School of Mines, University of Idaho School of Mines), US National labs (e.g., Oak Ridge National Labs, Idaho National Labs, Ames Lab), and largely retired, nationally recognized experts with industrial experience.

Because hydrometallurgical processing and technology are essential for the production of critical materials necessary to deliver a future clean energy transition and to support strategic (i.e., military and high technology) supply chains as well as the vastly larger consumer industries it is of vital national importance to preserve, advance, and champion the hydrometallurgical discipline, capabilities, know-how, and technology research and development necessary to support US competitiveness." It is also extremely necessary to ***conserve***

these critical skills.

The best way to restore American self-sufficiency and security of supply of critical natural resources is to consolidate and thereby maximize the efficient use of America's legacy skills in mineral resource exploration, processing, and the mass production of useful forms of the natural resources by minimizing government involvement where it, government, has the least skills. These areas include finance and non-health and safety regulations.

Left on its own, the American minerals industry maximizes the efficient use of capital, because capitalism is unforgiving of its inefficient use.

Left on their own the best managers in the natural resource industries have come to the conclusion the dwindling skill reserves of the American natural resource industry mandate the creation of central processing facilities where the large variety of ores, scraps, and residues for various non-fuel minerals of critical metals can be preprocessed to prepare feedstocks for further processing into useful forms by the most efficient technologies the cost and capacity of which is not prohibited by insufficient feedstocks. This is exactly what China is now doing in the rare earths' space!

An American industrial policy would encourage the financing of centralized toll processing, minimize non health regulation and permitting, and otherwise get out of the way. Successful clean energy policies must be result-oriented, and reality-based, not just policy statements. The research and development of clean energy nonfuel minerals integrated processing technologies must be encouraged both at universities and at the industrial level. This is how the U.S. Defense Department procurement has always operated. The technological spinoffs of their work underpin

today’s global consumer as well as defense technologies.

Only an industrial policy, the success of which is judged by performance to objective, not the enrichment of governing cronies, can save the USA from second class status in a world where nations with such policies are already succeeding beyond the dreams of the senescent “progressive” capitalism being preached in the United States.

During World War II, capitalism with American characteristics gave the world the richest, most powerful, most opportunity-laden for all, nation in mankind’s history.

It’s time to revive that spirit.

China’s Rare Earth Industry’s Big Advantage is not Just in Mines

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China’s Real Rare Earth Infrastructure is based on a dedicated, and educated, specifically Experienced, and Skilled rare earth industrial and R&D workforce, financed, where needed, and supported by the State.

There is a debate among Western economists on the value and effect of industrial policies, set by governments, on the marketplace. It’s argued that when governments, instead of the markets, pick winners and losers in industries it never ends well.

China’s admittedly authoritarian central government does exactly that; it defines an industrial policy for the long term, and it picks winners and losers. But, unlike the American government, it does not careen from policy to policy based on the politics of the moment. China’s government’s long-term focus is on the growth of the overall economy, price stability, and domestic social harmony.

I think that it is the issue of price stability that has caused the Chinese central government to step into its domestic rare earth’s industry lately. Stable, or at least predictable, prices allow the long term planning characteristic of the Chinese industrial economy.

Just before Christmas China announced that it had formed a large and state-supported vertically integrated rare earth products’ company called, eponymously, China Rare Earths. This event, a merger of the rare earths operations managed by three mostly state owned and state controlled companies has been widely reported. What journalists seem to have missed is that this will be a well financed rare earth company from the start. The Peoples’ Bank of China (the PBOC) is the lender of last resort to any State Owned Enterprise (SOE) and if that enterprise is producing anything required by the current industrial policy then profit and loss take a back seat to security of supply. In rare earths, for example, mining and separation are today rarely, and then only barely, profitable especially in any country with strict worker health and safety and environmental management regulations. The profit is in downstream products, metals, alloys, and magnets, phosphors, and catalysts. This is why stand-alone rare earth ventures even with separation capability and capacity, such as Lynas Rare Earths Limited (ASX: LYC), make relatively little profit, while by contrast China’s vertically integrated, and so far, mostly private Shenghe Resources, which is vertically integrated from the mine to the

magnet does much better in sales volumes and profits than Lynas.

China’s rare earths industry has had a long learning curve, and this has generated the world’s largest rare earth R&D, rare earth mining, and rare earths production (processing and manufacturing) engineering reservoir of skilled and well-educated individuals dedicated to rare earths, in the world.

China Rare Earths inherits this human infrastructure, and, unlike, an American venture, such as MP Materials Corp. (NYSE: MP), does not go far to seek out specifically educated, experienced, and skilled engineers and workers from outside of the new company.

Each year China has a ruthlessly competitive national exam to determine admissions to its top universities. Last year some 15 million sat for the national exam. The top tier was selected for China’s most prestigious universities. Those chosen were mostly directed to what we call the STEM curricula, (the hard) sciences, technology, engineering and mathematics. This choice of direction is made in accordance with and support of China’s Industrial Policy, of being independent of the West in 10 technologies by 2025, and becoming a permanent center of technological innovation, superior to any other nation.

The United States, where social forces are denigrating college admissions’ qualification through the cancellation of blind testing, and where even mathematics may be branded as “racist” by half-witted college faculty and administrators, is surviving today as the top tier innovation nation through the work of legacy researchers, many of whom are foreign born, and most of whom are already in their peak productive years.

The American military pretends to be surprised by Chinese prowess in modern weaponry, and the American mainstream media simply does not report on China’s astounding space program. Both

are described as based on stolen intellectual property by a smug American media. Can they say the same about China’s dominance in rare earths and battery materials and the end-use consumer products mass produced in China based on those groups of metals?

The United States can and will supply its military needs for rare earth and battery metal enabled products from domestic sources or through domestic processing of imported ores, and, perhaps, restrictive tariffs to politically level the price competition.

But such self sufficiency will not be possible for the entire civilian economy. Compromise and rationing are the future of the domestic supplies of technology metals for green energy purposes. The best we can hope for is a hybrid energy supply, green where possible, but mostly from fossil fuels and nuclear, if the US intends to retain a domestic industrial economy.

More than ever now, the domestic production, processing, and fabrication of the critical metals and materials needed for a broadly prosperous technological society is itself critical. Depriving ourselves of STEM graduates to ensure those skills survive chosen is a step towards the national suicide of America’s standard of living.