Critical Materials for the Two American Economies, The Military and the Consumer

written by Jack Lifton | June 15, 2021

Today's demand for critical technology enabling materials was originally brought about by (industrial) policy driven military procurement during, after, and since World War II. The continuing production of these relatively scarce materials is only made economically today possible by the additional and much larger demand of the consumer economy based not on an industrial policy but on the (regulated) free market model of capitalism. Pentagon procurement of its needs for critical materials through policy can bend the law of supply and demand, but it cannot break it. The demands of the free market economy (in the USA) drive the creation of it's critical material's supply. The present (2021) needs of the Department of Defense (DoD) for rare earths, mainly as permanent magnets, for example, are "classified," but are around 3,000 tons, measured as magnets per year. This is not enough demand for private capital to make an investment in a project that requires an entire supply chain to be (re) established.

The American consumer market from which 80+% of the domestic American rare earth demand arises has well established supply chains and has not experienced credible politically driven supply constraints. The largest single user of rare earth permanent magnets in the USA, the domestic OEM automotive industry, is faced with the need for a fundamental shift in its use of capital if it attempts to restore a total domestic rare earth permanent magnet supply chain for its demand. The best way for such restoration would be vertical integration, the

antithesis of today’s just in time system of sourcing components. For any individual automotive OEM the costs would be prohibitive and not only is the expertise not available in-house, but also the lack of suitable domestic personnel to carry out such a project, or to manage, or to engineer it is palpable.

The American administration’s latest announcement on how it will address the supply chain “crisis” is wrongheaded and misguided. The related bill in the U.S. Senate to promote “innovation” is another misguided use of taxpayer borrowing ability. This, “borrowing ability” is, in fact how the US government is financed; its debt so far exceeds its revenues that to speak of spending in Congress is to describe moneyholics, drunk on their power, and putting the future on a tab.

Washington’s aging and apparently permanent lawmakers, such as Senator (D-New York) spout drivel written by their jejune staffers about innovation as science, which, of course, means funding of University and internal government “grant mills.” The urgent need in America is for manufacturing “technology,” the engineering of science to, modernize, rebuild, and utilize specialized legacy technologies. We do not do endless laboratory work to invent new ways to do things that industries can already do as efficiently as possible while remaining competitive. This particularly applies to capital intensive industries such as mining, automotive, and electronics.

The lithium-ion battery manufacturing industry is a good example of something completely misunderstood by Washington’s insulated, isolated, and commercially illiterate mandarins. From Xanadu on the Potomac, the Biden administration decrees that it will bring lithium-ion battery production to the USA by aiming a money missile with a 19-billion-dollar warhead at the “problem.”

But investment money is not the problem in commercializing

science; it is the projection of positive returns on investment that drive new consumer industries, not innovation on its own. A good example is the American OEM automotive industry. That industry's dominance peaked in the 1950s when a completely vertically integrated General Motors was the number one industrial firm in the world. It was not "innovation" that drove GM to the top; it was superior management that knew how to manufacture, finance, and deliver the company's products to the consumer who either desired that product or could be manipulated into thinking they did. The position of Chief Engineer of a successful OEM automotive company, once held by Henry Ford in his own company, evolved into Vice President, Engineering, perhaps the second most important position in a manufacturing company's management, and the one individual in any company who must know the limitations of his company to develop and manufacture its products.

Today's, so-called, "tech" companies deliver specialized software (computer programs) as brainless toys to infantile adults using the throw-away model of consumer capitalism. Apple, for example, unconsciously mimicking the marketing ploy developed by GM to differentiate itself from Ford, has a new iPhone and Mac every year with "innovations" that only fit into their existing manufacturing supply chains. In order to maintain sales, existing customers must discard their existing products and buy the "new" ones. GM's marketers decided in the early 1920s that the next Chevrolet would be called the 1922 Chevrolet and that thereafter all GM cars would be named by the year they were produced. Other car makers continued to name models, such as Ford's Model T, but the success of the model-year naming ploy soon caught on. Car makers became fixated on the car's exterior appearance and its passenger compartment and experimented with drive and power trains mostly out-of-sight of the buying public, so that the enormous research, development, and manufacturing

engineering processes needing time for development in power trains could be done and tested before being offered for sale.

Safety regulations have contributed a great deal to the fall of the American OEM automotive industry to its present state, where all (both) of the domestic American OEMs have less market cap than just a couple of Wall Street's flavors-of-the-moment "tech" companies that make no profit and never will.

To sell a car or truck in the USA it must meet rigorous safety standards that have forced car makers to produce much more robust and therefore long-lived products. In 1970 GM predicted that the domestic car market in 2000 would be 26 million units per year and that it would need 28 domestic assembly plants to supply its share of that market. What has come to pass is a "mature" (aka, saturated) car market in which there is a vehicle on the road for every American citizen. The prediction of a 26 million unit year is long gone down the memory hole and the total number of assembly plants in North America does not equal what GM predicted for its own 2000 model year needs.

The Defense Department's investments were father and mother to the American technology boom that took place between 1941 and 1973 (The initial funding of the Manhattan "district" and the cancellation of the Space Shuttle). After that, innovation, slowed down considerably as private industry resumed its pre World War II internal funding of science and engineering that brought about the ascendancy of American consumer capitalism and global military dominance. Industries created before World War II, and without government support, included the telegraph, mass produced uniform quality steel and aluminum, the telephone, the light bulb, radio, the automobile, the airplane, television, the mechanical computer (OK, adding machine), miniaturized electronics, mechanical electric refrigeration, and many others in the life sciences, such as x-rays, insulin, and, originally,

penicillin. Although we pay lip service to the inventors of the above “technologies” as intentional promoters of higher living standards, in fact, their driving motive was almost always profit. The scientists whose discoveries led to the technologies listed above are long forgotten or known only to historians; they rarely sought fame or fortune.

It was Franklin D. Roosevelt who kicked off the great age of American innovation in 1941, not just by authorizing the Manhattan Project, but primarily by bringing in the CEOs of GM, Chrysler, Ford, GE, and Westinghouse to oversee the transformation of American free enterprise manufacturing and innovative product development into the industrial policy driven global powerhouse that crushed Nazi Germany, Fascist Italy, and Imperial Japan, all of which began a war to capture the raw materials and land their society’s desperately needed to manufacture the weapons of war and feed their armies.

After World War II a subset of American manufacturers soon known as the “military industrial complex created itself in order to produce products required by the industrial policy, and power to execute it, created by the War (now Defense) Department during the war. The civilian, soon to be known, as the consumer, economy decoupled itself and followed the free enterprise model of capitalism, but it was spillover from military spending that created the miniaturization of electronic switching into the integrated circuit, aka, the “chip,” which sparked a consumer product revolution the basis of which was further inspired by the rare earth permanent magnet the development of which was itself inspired by stylists in the OEM automotive industry who wanted slimmer doors on cars with power windows.

The Ford Scientific Laboratory was working on a sodium sulphur battery in 1964. I was a “helper” on that project. I didn’t work for Ford but I was being recruited by Ford Scientific for its

materials sciences group. I had been working with the electronic properties of Lithium and it’s salts since 1962 at Energy Conversion Devices, my first employer, where we made a molten salt version of what is now known as a lithium ion battery in 1963. These molten salt power train batteries proved extremely inappropriate for automotive use, but my point is that there isn’t much new under the sun other than different ways to do desired things such as energy storage more efficiently and safely. And these today are really engineering problems more so than scientific ones.

The US Defense Department on its own and without subsidies cannot catalyze the reshoring of a total domestic American, lithium, cobalt, or rare earth permanent magnet supply chain. It’s time for the White House to call in the managers of the manufacturing part of the domestic consumer products industry for a chat about the creation and implementation of a national industrial policy.