

Global market change to drive demand for heavy rare earth elements

Demand Among the Big Top for Heavy Rare Earth Elements (HREE), Now and Coming Soon Means HREE Demand is Going to Rise

✘ The big headline on the WSJ's marketing section last Thursday, January 29, 2015, was that Apple just reported that it had the most profitable quarter in "human history" as the paper's headline writer told us. But the most important part of the story for natural resource investors is that for the first time Apple iPhone sales in China have been greater than its total sales in the developed world. This is very good for Apple but it should sound a warning bell for the rest of us. Ask not for whom that bell tolls it tolls for the developed world's middle classes-you and me among them. For investors in technology-metals-production it is a clarion call. Go, the bell says, and invest in the domestic discovery, development, and production of technology metals and materials. *There is no other way we can maintain the broadest coverage of our quality of life economically.*

America's overall economic growth (recovery[?]) since the big recession that began in 2007-8 has been almost entirely confined to the "Big Top," those who a recent Federal Reserve paper defined as the "top" wage earners (top 5%). Among the middle class, incomes have declined overall in the same time period. In the "developed" world this is not just an American experience but a general one.

At **InvestorIntel** readers are interested in the shares of junior companies, mostly mining exploration companies that have located sources of rare technology metals. So how does the first paragraph above impact how they should value such

ventures?

The answer is that for the developed world the prices of high end gadgets have a lot of “elasticity.” The prices can go up without much affecting the demand. This has always been the case for luxury goods or positional goods (the things that rich people and not-so-rich people buy so they can physically demonstrate that they have more money than someone else-A billionaire’s Rolls Royce or the BMW the guy next door just bought).

✘ Demand in the developed world for the miniaturized consumer gadgets made possible, beginning after World War II and continuing to this day, by the use of the electronic properties of the rare technology metals and materials goes through a cycle: First the new gadget is introduced at very high prices to reflect and recover its cost of development and its content of exotic materials and new methods of manufacturing engineering. Manufacturers go to the market place as soon as they can to try and recover product start-up costs as fast as possible. Then, as revenues pick up from sales and manufacturing expenditures are paid off and the product is proven to have a sustainable demand, other manufacturers will enter the market at lower prices causing an upsurge in demand. Finally when everyone who wants one has one then the manufacturers will turn to incremental changes in the gadget to differentiate themselves from the other guy. This is the operation of the (relatively) free market at its textbook best.

This was and is the story of the telephone, the electric light, the automobile, and the home “labor saving” appliance.

✘ There are, however, two new things to consider under the sun of capitalism and the consumer economy, about the post World War II miniaturized consumer electronic gadgets boom that differentiate it from the first gadget boom in the First Age of Technology, 1847-1914, which I date from the invention

of the electric telegraph to that of stainless steel. The first new thing is the post WWII boom in first American, then European, Japanese and Chinese, and soon Indian GDP with the concomitant rise of the largest number of "middle class" earners in human history. Middle class can be defined as those who have significant disposable (so called discretionary) income after paying for food, shelter, and health care, the basics.

The second factor is that rare, scarcely produced materials, were available in previously unheard of quantities just after WWII and their newly discovered electronic properties allowed their use in device components as signal detectors, signal modulators, and ultimately even as voltage controlled current switches. This allowed the inventions of the transistor, the integrated circuit, the electronic "switch" (replacing mechanical relays) and the color display. If you really think about it the telephone, the electric powered adding machine, and the cathode-ray tube were invented and in use for up to 3 generations (the telephone!) before their marginal development cascaded into the rapid expansion of their use and availability after WWII. This was due mainly to advances in the utilization of the electronic properties of the technology metals and materials produced in large quantities, **regardless of the cost**, as part of that war's "effort."

☒ The Technology Metals were in sufficient supply beginning after WWII so that the consumer gadget market could be born and then grow even as the "Defense" budget shored up research not only into the utilization of these materials but also into their production. This type of support was reinforced during the "Star Wars" era, but with the end of the cold war it has waned dramatically. Consumer technology development is back to marginal improvements in capabilities passed off to investors as "innovations" or in the latest Madison Avenue hype as "disruptive technologies."

Today the technology metals supply chains built since WWII are

in full use and for some materials even in overcapacity. In the developed world gadget consumption has reached saturation for cell phones and TV's, most obviously, and those technologies have reverted to the marginal improvement theme for marketing and market share maintenance. The personal computer "revolution" is over, and names such as ultrabook, tablet. Phablet, and so forth cannot disguise the fact that all of these are based on marginal improvements in photolithography and known manufacturing technology.

✘ So when everyone who can afford one or borrow enough to obtain one has one where is demand to come from? Trivially one answer is from the replacement of worn out or irreparably damaged devices, but this is a predictable number and modern "cheap" electronic gadgets have pretty good working lives; they have to in order to compete. At the high end of cost Apple devices are remarkably sturdy and long lived.

Even so I think that the gadget cycle, the manufacturing for which drives the demand for technology metals and materials will continue just as before with one big difference: Initial demand for the "latest" technology although still coming from the 'Big Top' of American society will now begin to shift its geographical center to Asia as the growth of the Chinese and shortly the Indian economies continue to be the global drivers for wealth creation.

All of us are aware of the story that the motion of the air caused by the flapping of a butterfly's wings on one side of the world can lead to monumental effects on the weather on the other side of the world. This is supposed to be an example of "chaos theory" and in the Hollywood version of this urban legend a time traveler disturbs a Paleozoic butterfly and the result is that in our time there are no human beings. This is great science fiction, but, in fact, in the real world it turns out not so much that little changes cause big ones but that big changes cause big changes (This is an example of the common sense principle of Le Chatelier, which the nineteenth

century Frenchman whose name it bears first brought to the attention of the scientific world-look it up you might learn something).

The price fluctuations of the rare earths are a small set of the consequences of the (big) attempt by the Chinese central government to rein in commodity production and refining overcapacity in those sectors of the Chinese economy where such actions can directly affect the pricing of the commodity. The government's intent is to manage the Chinese economy with a goal of steady growth sufficient to add at least 10,000,000 good jobs per year in particular for those rural Chinese who are flooding into the cities looking for the "good life." China with its 10 trillion dollar a year GDP is the second largest national economy on the earth (In fact by a measure that the Chinese refer to in a mildly derogatory way as "academic and journalistic" the Chinese economy is bigger than that of the USA [the academic measure in question is called PPP, purchasing power parity-look that up and learn something). The biggest commodities among those the production of which is being addressed in this current Chinese program are COAL and IRON , after that comes STEEL , and much farther down the list, Rare Earth mining/Refining/Metals fabrication/Magnet making.

✘ The running commentary, mainly from the worlds of academia, journalism, and finance, about how "important" rare earths are to the Chinese economy and the U.S. Military is really just promoters' excretions to pump share prices in junior mining stocks. **More money will have been spent on beer, snacks in general and chicken wings in particular, and chips by Americans watching sporting events such as the SuperBowl in 2015 on television that the total revenues of the global (including the Chinese) rare earth supply chain through and including metals and alloys making.**

BUT; The facts are that China's middle class is growing; and that the Chinese economy has already created a very large

number of upper class gadget and positional good consumers; and that India is now accelerating its economy towards the same goals of rapid GDP growth fueled first by infrastructure growth and then by consumerism. This indicates that it is WITH China's economic growth model in mind, not that of the contemporary USA, that India will proceed. This means that with the plateauing of HREE production in SE Asia that the world's second and soon-to-be third largest economies governing the lives of 1/3 of the earth's peoples that HREEs are to be sought after avidly now and for perhaps the next two decades. HREE production/separation/purification/metals and alloys fabrication is thus a solid long term investment.

☒ Yes, there are ionic adsorption clays outside of southern China, and yes, I believe that the production of HREES will INCREASE in Malaysia as its ionic adsorption clays are worked and as xenotime from tin refining continues to be produced there. BUT the best, largest, and longest mining life HARD ROCK deposits of the HREEs are to be found today in North America, Europe, and Australia.

The APPLICATION of existing separation technologies used for decades in the processing of other metals is now being directed to the separation of mixed HREEs from each other. In addition the traditional method of separating the individual rare earths from each other, solvent extraction, is being rapidly improved with regard to soak time and costs. One or more of these technological advances-all developed by small size private chemical engineering companies-will succeed in being pilot plant proven by mid 2016 at the latest.

This will mean that any and all HREE deposits outside of China can be economically integrated downstream to the production of individual high purity rare earths as end products for sale into the market.

The traditional methods of rare earth metals and alloys production, metallothermic reduction and the electrolysis of

molten salt rare earth eutectics with alkaline or alkali earth salts, are being modernized and new technologies, including biochemical ones, are moving to pilot plant stage.

If the new high growth markets in Asia are to be satisfied then investments will have to be made in HREE production from hard rock sources right now. This is why Chinese, Japanese, and Korean groups have invested in Greenland and Southern Africa and Australia.

The basic commodity minerals markets have stalled due to China's infrastructure growth entering a necessary cooling off period while India is just beginning. It is a hiatus. But in any case the production of critical rare technology metals and materials for consumer electronics has plateaued not due to overcapacity but due to a match between current capacity and current demand.

To expand the markets for consumer electronics from today's size to that of tomorrow's it is critical that HREEs be brought into production outside of China. Otherwise the age of consumer electronics technology will be more and more restricted to the Big Top.

In either case though the production of HREEs are a great investment.