

# **Before we can climb out from the Chinese control of rare earths and battery materials – we must understand our past.**

Technology is the engineering of science, and manufacturing engineering is the scaling up of engineering to enable the efficient and economical mass production of finished goods.

The scientific development of the rare earth permanent magnet and of the lithium-ion battery both occurred primarily in the United States in the greatest period of consumer technology development in American history; from 1945 until the end of the twentieth century.

Until the moon landing in 1969 the US Department of Defense (DoD), from the beginning of World War II, and NASA, from 1961-69, was the majority funding entities for both science and technology. Since then private corporations have provided the majority of funding for consumer product development.

The current awakening of government to a critical materials' supply crisis as a security issue has highlighted the failure of American manufacturing to pay any attention to the dangers of just-in-time supply chains, made fashionable beginning in the 1980s as a technique to free up the capital required by inventories of raw materials and semi-finished goods. For the capital-intensive OEM automotive, aerospace, and allied industries this was a "no brainer."

Overlooked completely at that time was the end of corporate subsidies for and thus the demise of stand-alone in-house education in specialty manufacturing engineering (now called

“automotive engineering in the OEM automotive industry). The General Motors Institute, GMI, in Flint, Michigan, for example, was a company-owned engineering college the students of which were typically GM employees in what is now called work-study programs. This ensured **continuity** as older engineers both taught and worked alongside the “students” in any one of the many parts plants and assembly plants in Flint and nearby Saginaw, Michigan, where foundries and the world’s largest steering gear manufacturing operations operated.

**One of GM’s parts operations in Indiana was called the Magnequench Division; it was the world’s largest manufacturer of rare earth permanent magnets.**

GM and Ford were heavily invested in science. The General Motors Technical Center and the Ford Scientific Laboratory were outstanding, but the managers of the corporations were losing focus on the long term and entering the long decline in their fortunes due to just-in-time outsourcing and the emphasis on share price, not corporate citizenship, aka, “financialization.”

Hugely expensive attempts at automation in the late 1970s and early 1980s had convinced American OEM automotive that it wasn’t going to work, so instead of profit growth through technological productivity increases the managers turned to cheap overseas labor. At first American engineers were sent to organize and manage operations in “developing” countries like China. It was assumed, as a matter of faith, that the Chinese in particular would never learn how to develop “native” industries to compete with American ones in producing goods for the American home market. Poorly made Japanese cars were just then the source of much derision in Detroit’s toniest suburbs. Korean cars were non-existent.

In the last 20 years of the twentieth century, the American Big Three car makers disassembled their vertically integrated operations, their in-house engineering continuity “colleges”,

and any long-term planning they might have looked at in favor of just-in-time outsourcing and management by the metric of share price only.

As I recall rare earth permanent magnets were first studied by the Russians in the late 1960s, by the 1970s both Japan's Sumitomo and General Motors had developed and begun manufacturing and using samarium cobalt types. In the late 1970s, cobalt pricing spiked (take note of this well those who look for big increases in rare earth, lithium, and cobalt prices as a supply or demand driver!) and this caused General Motors to switch over to neodymium iron boron magnets for its miniaturization of electric motors needs. The capacity for the production of the separated rare earths needed soon overwhelmed the then Molycorp's mine and separation capacity (7,000 tpa), and it (Molycorp) sought to outsource. The Chinese, eager for investment, and jobs, and having the large accessible deposits (as byproducts of mining the iron ore, magnetite) of light rare earths in the Bayan Obo region of Inner Mongolia, where health, safety, and the environment were of no interest soon became the biggest miners and separators of light rare earths using the chloride based solvent extraction technology proved out and gifted to them for that purpose by Molycorp.

Most commentators say that, after the above transfer of technology, the rest is history. But that means overlooking something. The Chinese did not just take over a technology and keep it static. They did at first, but soon, it was noticed by their leader, Deng Xiaoping, and soon thereafter the state underwrote a massive rare earth use and production research and development program while such programs in the west withered and died.

Rare earth mining and separating in North America ceased in 1998, the manufacture of rare earth metals, alloys, and magnets in North America ceased shortly thereafter, and the large-scale company set up originally by Sumitomo and GM for

that purpose, Magnequench, which had dominated the production of rare earth permanent magnets for many years, was, after many years during which it was unable to compete with Chinese rivals, ultimately sold to a Canadian concern that moved it to China in 2004.

It is not possible to ignore the fact that competence erosion in the extraction, separation, making of metals and alloys from, and making magnets based on rare earths did not occur as these technologies left North America. It is also foolish to not consider China's massive intellectual property developments in all of those rare earth sourcing, refining, and in the development of and manufacturing of rare earth enabled product technologies can be just ignored by those who think that throwing money and university research at a problem can miraculously overcome a generation of neglect and a criminal discontinuity of engineering skills.

Whether or not the US can re-create a total domestic rare earth enabled products supply chain will depend on whether or not the management of such attempts has enough perspective to find engineers, still alive who created the rare earth refining, metal and alloy making, and permanent magnet industry and entice them to train a new generation. I personally think we can still do this and be globally competitive, but I am skeptical of financiers who know nothing of how technologies are commercialized.

And until there is a focus for this work in the form of a commitment by, for example, the US DoD to take or pay for enough tonnage of rare earth permanent magnets and to pay for the tooling to produce the more than 500 different specifications of rare earth permanent magnets used in weapons systems, nothing will happen.

European manufacturers of products using rare earth permanent magnets still have a small domestic supply chain that has maintained continuity for 45 years. But Europe has no rare

earth mines. America has such a mine, and North America has many such deposits in development. America also has the only licensed and capable processor of purchased monazite in the Western World. That project is up and running. It will deliver the first multi-ton lot of radiation-free mixed rare earth carbonate to a European customer next month. That customer will separate the rare earths and deliver the magnet ones to a British company that will turn the delivered oxides into metals and alloys, which in turn will go to a German company to be made into magnets for a German OEM automotive company's EV powertrains.

The question now is will the US government wake up to the fact that it must use Title 7 of the Defense Production Act to assemble an industrial panel to address this issue.

The Chinese are watching intently.

---

## **Jack Lifton on how the lithium-ion battery material supply chain will determine if America can go EV**

In this episode of InvestorIntel's **Critical Materials Corner with Jack Lifton**, Jack talks about the lack of discussion about matching the supply and demand of lithium-ion battery materials in order to make an electric vehicle revolution possible.

In this InvestorIntel video, which may also be viewed on YouTube ([click here](#) to subscribe to the InvestorIntel

Channel), Jack went on to say that lithium is the most essential component of any lithium-ion battery. He pointed out that the current world production of lithium is not sufficient to electrify all the vehicles of just the United States. "100% electric car is not possible without a very large increase in the production of lithium worldwide," he added.

To watch the full video, [click here](#)

**Disclaimer:** This interview, which was produced by InvestorIntel Corp. (IIC) does not contain, nor does it purport to contain, a summary of all the material information concerning the "Company" being interviewed. IIC offers no representations or warranties that any of the information contained in this interview is accurate or complete.

This presentation may contain "forward-looking statements" within the meaning of applicable Canadian securities legislation. Forward-looking statements are based on the opinions and assumptions of management of the Company as of the date made. They are inherently susceptible to uncertainty and other factors that could cause actual events/results to differ materially from these forward-looking statements. Additional risks and uncertainties, including those that the Company does not know about now or that it currently deems immaterial, may also adversely affect the Company's business or any investment therein.

Any projections given are principally intended for use as objectives and are not intended, and should not be taken, as assurances that the projected results will be obtained by the Company. The assumptions used may not prove to be accurate and a potential decline in the Company's financial condition or results of operations may negatively impact the value of its securities. Prospective investors are urged to review the Company's profile on [www.Sedar.com](http://www.Sedar.com) and to carry out independent investigations in order to determine their interest in investing in the Company.

If you have any questions surrounding the content of this interview, please email [info@investorintel.com](mailto:info@investorintel.com).

---

## **Gold Newsletter's Brien Lundin on the recent rally in the price of gold**

In a recent InvestorIntel interview, Tracy Weslosky spoke with Brien Lundin, Publisher and Editor of Gold Newsletter about the recent rally in the price of gold and the subsequent rise in interest in silver and junior mining stocks.

In this InvestorIntel interview, which may also be viewed on YouTube ([click here to subscribe to the InvestorIntel Channel](#)), Mr. Lundin went on to say that with the market floated with central bank liquidity around the world and very little optimism in the market "the stage is set for a new gold rally and we may actually be seeing that at this moment." Sharing his gold stock recommendations he also explained how a bull market in the precious metals sector affects junior mining stocks in other sectors like rare earths, uranium and base metals.

To watch the full interview, [click here](#)

**Disclaimer:** This interview, which was produced by InvestorIntel Corp. (IIC) does not contain, nor does it purport to contain, a summary of all the material information concerning the "Company" being interviewed. IIC offers no representations or warranties that any of the information contained in this interview is accurate or complete.

This presentation may contain “forward-looking statements” within the meaning of applicable Canadian securities legislation. Forward-looking statements are based on the opinions and assumptions of management of the Company as of the date made. They are inherently susceptible to uncertainty and other factors that could cause actual events/results to differ materially from these forward-looking statements. Additional risks and uncertainties, including those that the Company does not know about now or that it currently deems immaterial, may also adversely affect the Company’s business or any investment therein.

Any projections given are principally intended for use as objectives and are not intended, and should not be taken, as assurances that the projected results will be obtained by the Company. The assumptions used may not prove to be accurate and a potential decline in the Company’s financial condition or results of operations may negatively impact the value of its securities. Prospective investors are urged to review the Company’s profile on [www.Sedar.com](http://www.Sedar.com) and to carry out independent investigations in order to determine their interest in investing in the Company.

If you have any questions surrounding the content of this interview, please email [info@investorintel.com](mailto:info@investorintel.com).

---

## **Jack Lifton on Apple Cars Rare Earths Supply Chain Rumors**

In this episode of InvestorIntel’s **Critical Materials Corner with Jack Lifton**, Jack talks about the rumored soon-to-

be signed contract between Apple and LG Electronics and Magna International joint venture, e-Powertrain, to produce electric Apple Cars.

In this InvestorIntel video, which may also be viewed on YouTube (click here to subscribe to the InvestorIntel Channel), Jack went on to say that the joint operation will need large quantities of lithium-ion batteries and rare earths. He further added that it is great news for the Canadian lithium, cobalt and rare earths miners as Magna International, being a Canadian company, "is going to focus on domestic sourcing." He continued, "We are going to see a regional development of the supply chain." Calling Magna "the Foxconn of the automobile industry", Jack explained why Apple's rumored decision to go with Magna makes very good sense and is just the "tip of an iceberg."

To watch the full video, click here

**Disclaimer:** This interview, which was produced by InvestorIntel Corp. (IIC) does not contain, nor does it purport to contain, a summary of all the material information concerning the "Company" being interviewed. IIC offers no representations or warranties that any of the information contained in this interview is accurate or complete.

This presentation may contain "forward-looking statements" within the meaning of applicable Canadian securities legislation. Forward-looking statements are based on the opinions and assumptions of management of the Company as of the date made. They are inherently susceptible to uncertainty and other factors that could cause actual events/results to differ materially from these forward-looking statements. Additional risks and uncertainties, including those that the Company does not know about now or that it currently deems immaterial, may also adversely affect the Company's business or any investment therein.

Any projections given are principally intended for use as objectives and are not intended, and should not be taken, as assurances that the projected results will be obtained by the Company. The assumptions used may not prove to be accurate and a potential decline in the Company's financial condition or results of operations may negatively impact the value of its securities. Prospective investors are urged to review the Company's profile on [www.Sedar.com](http://www.Sedar.com) and to carry out independent investigations in order to determine their interest in investing in the Company.

If you have any questions surrounding the content of this interview, please email [info@investorintel.com](mailto:info@investorintel.com).

---

## **Dr Francis Dube of ZEN Graphene Responds to Health Canada's Graphene Mask Recall**

In a recent InvestorIntel interview, Tracy Weslosky interviews Dr Francis Dube, Executive Chairman of ZEN Graphene Solutions Ltd. (TSXV: ZEN) about the Health Canada recall for graphene protective masks made late last week.

Responding to the recall statement made on Friday, April 2, 2021 "advising Canadians not to use face masks that contain graphene because there is a potential that they could inhale graphene particles, which may pose health risks", Dr Dube reinforces Health Canada's action but is careful to qualify that ZEN's Trebor product line was not the catalyst for this recall. Adding further understanding to the news release issued by ZEN Graphene earlier today to access the full interview, [click here](#)

## **About ZEN Graphene Solutions Ltd.**

ZEN is a next-gen nanomaterials technology company developing graphene-based technologies that help protect people and the environment. ZEN is currently focused on commercializing a patent pending graphene-based coating with 99% biocidal activity, including against COVID-19, and the potential to use similar graphene compounds as pharmaceutical products against infectious diseases. The company has a significant R&D pipeline with an interest in monomers, polymers, metal alloys, corrosion coatings, biosensors along with the production of graphene oxide and graphene quantum dots. Additionally, the company owns the unique Albany Graphite Project which provides the company with a potential competitive advantage in the graphene market. Labs in Japan, UK, Israel, USA, and Canada have independently demonstrated that ZEN's Albany Pure™ Graphite is an ideal precursor material that easily converts (exfoliates) to graphene, using a variety of mechanical, chemical, and electrochemical methods.

**Disclaimer:** About ZEN Graphene Solutions Ltd. is an advertorial member of InvestorIntel Corp.

This interview, which was produced by InvestorIntel Corp. (IIC) does not contain, nor does it purport to contain, a summary of all the material information concerning the "Company" being interviewed. IIC offers no representations or warranties that any of the information contained in this interview is accurate or complete.

This presentation may contain "forward-looking statements" within the meaning of applicable Canadian securities legislation. Forward-looking statements are based on the opinions and assumptions of management of the Company as of the date made. They are inherently susceptible to uncertainty and other factors that could cause actual events/results to differ materially from these forward-looking statements.

Additional risks and uncertainties, including those that the Company does not know about now or that it currently deems immaterial, may also adversely affect the Company's business or any investment therein.

Any projections given are principally intended for use as objectives and are not intended, and should not be taken, as assurances that the projected results will be obtained by the Company. The assumptions used may not prove to be accurate and a potential decline in the Company's financial condition or results of operations may negatively impact the value of its securities. Prospective investors are urged to review the Company's profile on [www.sedar.com](http://www.sedar.com) and to carry out independent investigations in order to determine their interest in investing in the Company.

If you have any questions surrounding the content of this interview, please email [info@investorintel.com](mailto:info@investorintel.com)

---

## **Jack Lifton on how President Biden's American Jobs Plan Impacts the EV Market**

In this episode of InvestorIntel's **Critical Materials Corner with Jack Lifton**, Jack talks about President Biden's American Jobs Plan which details how the United States government is going to spend nearly \$2 trillion on infrastructure, alternate energy, and creating millions of good-paying jobs.

In this InvestorIntel video, which may also be viewed on YouTube ([click here to subscribe to the InvestorIntel](#)

Channel), Jack went on to say that the Plan aims to have the entire United States adopt electric vehicles (EV) starting with an electrified Federal Government fleet, including the United States Postal Service. The Plan proposes a \$174 billion investment to win the EV market by enabling automakers to spur domestic supply chains from raw materials to parts, retool factories to compete globally, and support American workers to make batteries and EVs. He said that the Plan will also target climate change and out-competing China and has identified rare earths separation as a goal along with uranium mining.

To watch the full video, [click here](#)

**Disclaimer:** This interview, which was produced by InvestorIntel Corp. (IIC) does not contain, nor does it purport to contain, a summary of all the material information concerning the “Company” being interviewed. IIC offers no representations or warranties that any of the information contained in this interview is accurate or complete.

This presentation may contain “forward-looking statements” within the meaning of applicable Canadian securities legislation. Forward-looking statements are based on the opinions and assumptions of management of the Company as of the date made. They are inherently susceptible to uncertainty and other factors that could cause actual events/results to differ materially from these forward-looking statements. Additional risks and uncertainties, including those that the Company does not know about now or that it currently deems immaterial, may also adversely affect the Company’s business or any investment therein.

Any projections given are principally intended for use as objectives and are not intended, and should not be taken, as assurances that the projected results will be obtained by the Company. The assumptions used may not prove to be accurate and a potential decline in the Company’s financial condition or results of operations may negatively impact the value of

its securities. Prospective investors are urged to review the Company's profile on [www.sedar.com](http://www.sedar.com) and to carry out independent investigations in order to determine their interest in investing in the Company.

If you have any questions surrounding the content of this interview, please email [info@investorintel.com](mailto:info@investorintel.com).

---

## **Chinese Dominance of Rare Earths Sets off Alarm Bells in Washington**

In this episode of InvestorIntel's **Critical Materials Corner with Jack Lifton**, Jack talks about geopolitical issues with China and how regionalism is going to affect not just the interest and demand for rare earths, but for all critical materials.

In this InvestorIntel video, which may also be viewed on YouTube ([click here to subscribe to the InvestorIntel Channel](#)), Jack went on to say that the Chinese dominance of the rare earths space has set off alarm bells not just in the US but also in EU and Canada. "I see the security of the supply of critical materials becoming a regional issue in this world," he added. Jack highlighted that Canada is going ahead faster than the US in the critical materials space by developing several rare earths deposits for production and building the first full-scale rare earths separation plant in Saskatchewan.

To watch the full video, [click here](#)