The Race to Electric Vehicles: Technology, US-China Rivalry, and Big Money

Ariel Sobelman and Doron Myersdorf | No. 1612 | June 20, 2022

As with other emerging technologies, batteries for electric cars and the efforts to achieve control of the developing technology are another example of the blurred border between civil technologies and those that affect national security. China has shown interest in Israeli developments in this field, and therefore the Israeli government must define a national policy on the subject in order to avoid finding itself in an unwanted and undesirable clash with the United States.

Joining many other markets, the smart electric vehicle market, including the future battery technologies, is marked by strategic rivalry between the United States and China. The fierce global competition for control of critical technologies has led many countries to introduce a policy of supervision of investments, business partnerships, technology exports and transfer, and intellectual property. An example from the vehicle industry is China’s decision of around ten years ago to define batteries as a key field for its national security. Today this is a national Chinese effort, and China’s manufacturers of batteries are supported by the government and the national banks, with the aim of realizing an enormous economic opportunity in view of the significant demand expected in the global battery market over the coming decades. This article deals with the market for batteries for electric vehicles, where in recent years Israel has become a significant player. As such the Israeli auto tech industry could be influenced both directly and indirectly by the competition and its ramifications.

Israeli experience in the vehicle industry – the Sussita Carmel Dukas – is not remembered fondly, but decades after that failed attempt, over a hundred startups in the field are active in Israel and have raised billions of dollars. Without producing a single automobile, Israel has recently become a leading player in the field of auto tech – vehicle technology – inter alia thanks to companies such as Mobileye, which was acquired by Intel. Today, most of the world’s vehicle manufacturers maintain R&D centers in Israel, dealing with a wide range of areas such as automatic driving, cyber
protection against attacks on cars, ride sharing, development of sensors to identify objects on the road, internal vehicle communication networks, and the batteries needed to run them. In fact, a considerable number of technologies for smart electric vehicles and autonomous driving are developed in Israel.

In order to encourage mass use of electric vehicles, batteries and charging systems must provide a driving and maintenance experience similar to that of gasoline vehicles, and at similar costs. The two main parameters for assessing whether electric vehicles are sufficiently mature for the consumer are the distance traveled between battery charges and the time needed for charging. Better Place, the Israeli electric vehicle company famously attempted to solve this problem with “gas stations” offering replacement of empty batteries with full ones, failed. Until recently, industry efforts focused on developing slow-charging quality batteries to be charged in the user’s home, with no need for specialized infrastructure such as fast charging stations or specific power outlets. However, the aim of the consumer, and consequently of the industry at large, is to reduce to a minimum the charging time needed, during which the vehicle cannot be used. While it takes three or four minutes to fill a tank with gasoline, an electric vehicle currently needs several hours for charging at home or in a public charging station. Alternatively, vehicles can use a specialized and expensive infrastructure for fast charging, which takes about an hour. However, the existing fast-charging technology significantly reduces the battery’s life. Therefore, there is a global race to develop the technology for fast and competitively priced battery charging for electric vehicles, and the results will play a large part in determining which country and car industry will lead the field.

Electric batteries are not a stand-alone component, but are dependent on an ecosystem that includes access by manufacturers to expensive geological deposits and rare earths, and an effective and stable supply chain for raw materials. Underlying the technology for lithium-ion batteries, which currently dominate the electric vehicle market, are anodes (the negative side of the battery) based on graphite, and cathodes (the positive side) of lithium metals. Lithium-ion batteries are divided into those based on an LFP cathode (Lithium iron phosphate) whose energy density is lower,
and more advanced batteries based on a nickel cathode. Over the years, the industry in China has strategically adopted LFP-based batteries, first and foremost to deal with the geo-political challenges around the supply chain and to build independence in the face of possible sanctions.

Israel is considered a world leader in advanced battery technology, based largely on replacing the graphite anode with nanometric silicon, to enable safe and rapid charging within a few minutes. Israeli developments of this kind are attractive to the Chinese industry, which also sees their potential for improving the performance of the LFP technology, with its limitations of energy density and charging times, as well as access to future technologies in the race with the West. While the market is still largely based on batteries using relatively old technology, the Chinese electric vehicle industry currently has a significant advantage over Western countries, and is working to increase its lead and dominate the industry. In other words, China is striving to secure its lead in the field of advanced batteries and electrical vehicles in general, and some of the relevant future technologies are currently being developed in Israel.

The Chinese industry has invested considerable efforts to ensure its access to electric vehicle technologies developed in Israel by means of investments in companies such as the public company SolarEdge, Addionics 3D batteries, and StoreDot. Last year, the Chinese battery manufacturer EVE began to invest in Israel by means of the Golden Energy investment fund. There have also been Chinese attempts to acquire companies, become involved in academic projects, and transfer knowledge and technology with a variety of methods.

It is not only the Chinese industry that is interested in Israeli developments. The United States has also identified batteries as a strategic area. As in other fields of technology, the Biden administration has recently allocated billions of dollars as part of the Bipartisan Infrastructure Law, in order to promote the local industry that is many years behind the industry in Asia, and particularly China. About a decade ago China lagged behind Japan in its ability to manufacture batteries, but today over 76 percent of global production originates in China, and thus far the West is unable to close the gap. In spite of emerging Western developments, there is no leading
Western technology for serial production, and the overwhelming majority of battery technologies and their intellectual property originate in Asia. Even the most popular Western car brands such as Tesla today manufacture most of their batteries in factories in China. While Tesla has set up some factories in the West (Nevada, Texas, and Berlin), they were unable to overcome the supply problems recently caused by the halt of production due to the latest wave of COVID and the lockdown in Shanghai.

The United States recently updated its list of critical and emerging technologies, and electric batteries and the materials needed to make them figure prominently on the list. The US is striving to build a specific supply chain for batteries – including lithium, nickel, graphite, and silicon, but it still has a long way to go for independence in obtaining these critical source materials. For many years, China has been the leader in government investment in the construction of large-scale means of production such as the impressive CATL battery factories, which were added to the factories of the giant ATL corporation. The Chinese regime does not allow the Japanese company TDK (the owner of ATL and developer of the original technology) to manufacture vehicle batteries in China, and these factories are therefore constructed under Chinese ownership, with royalty payments to ATL. There is also increased mining of lithium and materials for the LFP cathode, an area where China enjoys an inherent strategic advantage enabling battery cost reduction, while also focusing on substitutes for expensive cathode metals such as nickel, aluminum, manganese, and cobalt.

Restrictions on exports in the field of vehicle technologies are not new. For many years the United States has supervised the export of technologies affecting diesel engines, for example, and the same applies to the field of electric batteries. It appears that the US is trying to create significant differentiation vis-à-vis the future technology and has therefore stipulated a restriction on exporting or sharing the technology of batteries that enable energy density above 350 Wh/Kg. Such advanced technology will be achievable in the lithium-ion world only with the development of a new generation cathode that is not based on iron like LFP or on nickel like NMC.
Many countries in Europe have also understood that they trail behind, and factories are under construction in Norway, Germany, Poland, Italy, and Britain. However, the problem facing Europe, like the US, is the absence of significant technology in the world of batteries that does not originate in Asia. In some aspects, the world is currently experiencing a process similar to what happened in previous decades in the chip market, which eventually found itself dependent on Asian production. Western countries are determined to prevent a similar dependence in the electric vehicle market.

In spite of the efforts by the West in general, and the United States in particular, China remains the leading global player in the battery industry. Breakthrough technologies for rapid charging and improved energy density, such as are being developed in Israel, could contribute a great deal to the US and European vehicle industries – but that will only be in the long term, and it requires considerable increases in research efforts and investment in the means of production.

Israeli companies already find themselves facing a business and strategic dilemma: should they direct their developments at the Chinese market, for profits in the relatively short term, or at the US industry. At the business level, the dilemma concerns readily available capital, mass production, and access to these or other markets, as well as protection of intellectual capital and technological property. At a strategic level, as the US administration works to stop China obtaining technological advances, it is likely to exert increasing pressure on the Israeli government on this issue. It is doubtful whether Israeli ventures will navigate this techno-strategic environment and make decisions based on broader considerations of national security, and therefore the Israeli government must formulate national policy on the issue.

In conclusion, as with other emerging technologies, batteries for electric vehicles and the efforts to achieve control of the developing technology are another example of the blurred border between civil technologies and those that affect national security. In other areas of technology – cyber, artificial intelligence, and quantum computing, for example – the government has assessed the opportunities and the risks, and defined specific mechanisms for supervision. The field of auto tech is likewise
expected to be a significant component in the rivalry between the United States and China. Considering the scope of developments in Israel, it would be advisable to formulate national policy on the subject that will help guide the market on how to realize the enormous economic potential, with an understanding of the possible limitations and risks. Without such policy, and with huge amounts of money at stake, the private market will operate according to its understanding and needs. Critical technology still in the stages of development, such as the structure and materials of future lithium batteries, is already leaking from the West to China, the world’s leading battery manufacturer, while the United States is left behind. Without proper control and supervision, Israeli technologies and know-how could also leak, and Israel could find itself in an unintended and undesirable clash with the United States.

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Full disclosure: Dr. Doron Myersdorf is the CEO of StoreDot, which develops ultra-fast charging batteries for electric vehicles. He holds Bachelor’s, Master’s, and doctoral degrees in industrial management from the Technion.