
CATL

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CATL: China's Battery King

I. The Ningde Era

The view from Mr. Zeng Yuqun's (曾毓群) office is an impressive one. The landscape itself is striking—blue tidal waters flow around the green hills of Fujian Province, lapping against the waterfront that rings the corporate office park. But the more impressive part of the view is that Mr. Zeng and his business partners are largely responsible for building it. Ningde, Mr. Zeng's hometown and now home to the battery-shaped headquarters of his Contemporary Amperex Technology Limited, was a fairly undeveloped coastal town in 1998.[1] Now, a little more than twenty years later, it is a rapidly growing city with more than 3 million inhabitants. A great deal of that growth stems from the business activities of Zeng's tremendously successful business ventures. Zeng, too, has reaped the benefits of this success—as of May 6, 2021, his fortune of $34.5 billion USD toppled Li Ka-shing as Hong Kong's richest man. He is now the 41st richest person in the world.[2]

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CATL: China's Battery King

Contemporary Amperex Technology Limited, abbreviated CATL, shares its founders deep roots here. Its name in Mandarin, 宁德时代, means "Ningde era," a clear tribute to Zeng's beloved hometown. And just as Ningde has changed a great deal over the years, so too has Mr. Zeng's career. Before becoming an entrepreneur, Zeng worked for a state-run company making $30 USD a month.[3] His educational background focused on scientific pursuits, leading him to earn a doctorate in condensed matter physics from the Chinese Academy of Sciences in Beijing.[4] Over the course of Zeng's professional career, he has focused almost exclusively on the battery industry—designing, building, and distributing new and improved means of energy storage.[5]

The story of CATL begins with the founding of a similarly named company years earlier. In 1999, at the age of 31, Zeng founded Amperex Technology Limited (ATL), a company that manufactured lithium-polymer batteries based on designs acquired through technology licensing agreements with U.S. companies; at the time, U.S. private industry was considered the key driver of advancements in the industry.[6] These lithium-polymer batteries form a subset of lithium-ion batteries (explained in section III), and generally find use in laptops, MP3 players, and other portable electronic devices. Over the next few years, ATL would continue in this line of business in a fairly successful manner, producing batteries for over 1 million devices by 2001.[7] A significant portion of ATL's success during this time period also resulted from the company's ability to capitalize effectively on an important new technological innovation. According to industry experts Jeff Zhu and Michael Shen, other companies producing lithium-ion batteries at the time, such as Sony, had encountered a recurring problem—their batteries swelled and sometimes burst after a few charging cycles, severely limiting their longevity. Under Zeng's leadership, ATL successfully directed their research and development efforts to solve this issue and began producing batteries that did not suffer from the same swelling symptoms.[8]

ATL's reputation as a valuable company continued to grow throughout the early 2000s. In 2005, the Japanese multinational electronics company TDK acquired ATL and sought to streamline its manufacturing process using the former company's economies of scale and existing resources.[9] Most importantly, the leadership of TDK oriented ATL's production of batteries towards a burgeoning new market: smartphones. Using TDK's existing corporate connections and strong international reputation, ATL would go on to become a battery supplier for smartphone giants Apple and Samsung. They have continued to produce batteries for consumer electronics, such as smartphones and tablets, ever since.[10]

Mr. Zeng and his second-in-command, Vice Chairman Huang Shilin, continued to manage ATL's operations following the acquisition by TDK. According to Huang, he and Zeng learned important lessons in discipline, efficiency, and multinational business operations from their cooperation with the larger Japanese firm, lessons which they combined with their existing experience in the Chinese entrepreneurial environment to capitalize on new opportunities that were arising during the mid 2000s.[11] In 2006, they began receiving inquiries from other corporations about the possibility of developing and building batteries for electric vehicles (EVs), with the first such request coming from the Reva Electric Car Company in India.[12] Sensing a new opportunity, Huang and Zeng set aside some of ATL's budget to fund a new research and development initiative—a specialized team of physics experts and engineers that would try to design new and better batteries for EVs.[13] That same year, they began work on this project and acquiring technology licenses from the United States to accelerate their progress.[14] At the time, only one other company in China—the Shenzhen-based BYD Co. Ltd.—was buying up U.S. licenses or funneling millions of dollars into EV battery R&D initiatives.

Just two years after the Reva inquiry, the 2008 Beijing Olympics gave ATL the opportunity it needed to demonstrate the success of its R&D project. The Chinese government, in a move designed to demonstrate the country's technological advancement and commitment to electrification of public transit, commissioned a demonstration fleet of electric buses to ferry passengers around the city for the duration of the Olympic Games.[15] ATL was selected as one of the main suppliers of the batteries for these electric buses, gaining them both a lucrative new contract and, perhaps even more importantly, a highly-visible publicity campaign for their batteries. Shortly thereafter, in the years from 2009-2013, the Chinese government began implementing new subsidies to promote EVs, identifying EV manufacturing and lithium-ion battery production as two strategically crucial sectors of the economy.[16] In 2009, for instance, the "Ten Cities, Thousand Vehicles" program was launched with the goal of deploying at least a thousand EVs in each of ten Chinese cities.[17] The government's policies helped establish a business environment in China that was even more auspicious for ATL's new R&D project. In 2012, in order to more effectively capitalize on these new subsidies and the opportunities they would provide, Zeng and Huang spun off ATL's EV battery operations into a new company: CATL.[18] ATL initially held a fifteen percent stake in CATL, but liquidated that holding in 2015. CATL is also functionally separate from TDK, although the Japanese company continues to collect royalties on some of the former's intellectual property. CATL and ATL continue to collaborate and share information, but the former operates more independently under the leadership of Mr. Zeng.[19]

In setting up CATL, Zeng drew inspiration from Chinese telecom giant Huawei—which he greatly admired along with its founder, Ren Zhengfei. Zeng consciously strove to make his company operate like Huawei. He poached foreign talent like Bob Galyen, an American battery

expert and longtime GM executive as his Chief Technology Officer after hearing him speak once at a conference. Inviting Mr. Galyen to dinner in Ningde, Zeng showed up at the restaurant with his entire senior management and engineering staff—around 60 people.[20] Beyond copying Huawei's hiring practices and departmental structures, Zeng tried to recreate Huawei's culture of demanding but interdisciplinary workloads, giving employees multiple roles and asking them to work long hours as the company grew. As one employee put it, "I was hired as a supply-chain manager, but then they also made me program manager, and then also design-quality manager."[21] Zeng also mimicked Huawei's practice of prioritizing R&D to deliver frequent technology improvements; the firm spent approximately 11% of revenue and has almost 5,400 staff on R&D as of 2017. BYD, on the other hand, spends just 6%.[22] In fact, in 2019, CATL's R&D spending increased by around 50% to 3 billion yuan, or over $460 million USD.[23]

Over the next decade, the Chinese government employed a carrot-and-stick approach to push for the wider adoption of EVs within China—cheap land for factories, tax breaks, and subsidies for up to ⅓ of the cost of an EV for car purchasers. There was only one condition—carmakers had to use batteries from a list of approved battery suppliers. The list included dozens of Chinese firms including CATL, but completely excluded foreign ones. Most foreign automakers then, like BMW, really only had two reputable options available to them for their domestic battery supplier—BYD and CATL. The senior leadership of BYD, ironically also founded by a battery engineer, was not interested in supplying batteries to other companies because they were hyper-focused on growing its own car manufacturing setup. As a result, CATL snatched up contract after contract, marketing themselves as the cooperative company. Over the course of a decade, CATL worked hand-in-hand with each carmaker to customize their battery uniquely to their vehicles.[24] Vivas Kumar—Tesla's former lead battery supply chain

manager—said in our interview that this was key to CATL success over their chief rival BYD: "BYD and CATL were going after fundamentally different things. BYD was focused on interior China. CATL was aggressive about getting new partnerships."[25] Zeng emphasized in working with German carmakers early on, his workforce added into a mixture of approaches—Chinese entrepreneurship and state support, Japanese discipline, and now German engineering.[26]

II. Can a pig really fly?

But despite CATL's staggering success, Zeng would soon face what many Chinese entrepreneurs in any industry would consider a "death sentence": the inevitable end of the Chinese government's subsidy-rich, sugar-high period of protectionist growth for the EV industry. This came across 2018 and 2019 when Beijing scrapped its restrictions on foreign EV batteries, re-opened its market to the big Korean and Japanese battery-makers, and announced a complete phaseout of subsidies through 2020.[27] These moments are typically the most critical inflection points for any Chinese company, where companies can die or thrive from one day to the next based simply on the actions of the state. In 2017, a year before CATL's public offering, Zeng had sent a company-wide internal email with the subject line: "what happens after the typhoon phases? Can a pig really fly?"[28] He was referring to a well-known Chinese allegory made famous among Chinese businessmen by Xiaomi CEO Lei Jun (在风口上，猪也能飞起来?).[29] The pig represents the company, while the typhoon represents government support, monetary and non-monetary. The perpetual fear in the back of every Chinese entrepreneur's mind is that as soon as the government adopts more free-market, competitive policies—the pig (the company) which was previously under the illusion it was flying on its own, would no longer be able to fly without the government's help.

But Zeng from the very beginning was painstakingly preparing for this moment by diversifying sales in the EU and U.S. which he expected to go up when China's sales would slow. Zeng, even when CATL was still a small company, insisted on establishing divisions in France, Germany, Canada, Japan, and the U.S. when it did not make sense to do so. When CATL broke ground on Germany's first auto battery factory in 2018 beating the famous German auto industry to the punch, the world was shocked yet again by what appeared to be perhaps an overly ambitious CEO expanding too quickly abroad.[30] But Zeng's risky bets paid off and not only has the company's orientation outside China financially buttressed their growth when other domestic Chinese companies exclusively depended on the booming Chinese market, through its international experience, CATL has formed its crucial relationships with the very same foreign companies that are now pushing CATL to innovate in ways uncharacteristic of most Chinese technology companies. The withdrawal of protectionist support for the industry ironically brought together CATL and Tesla—now their most important innovation partner and customer. Tesla's Shanghai Gigafactory officially became the first foreign car maker to set up a wholly-owned factory without a Chinese partner. Jeff Zhu said that such a policy reversal by the Chinese government had "long been planned" and it was "only a matter of time" before they scrapped the highly detested "Joint Venture Law."[31] Zeng had successfully steered the company through its major stress test, but CATL's bigger challenges still lie ahead.

III. Batteries 101

In order to understand CATL's role in the battery industry, it is worth understanding the technical background. At the turn of the millenium, over a decade before CATL was established, Nickel Metal Hydride (Ni-MH) batteries were considered the most advanced technology available for electric vehicle (EV) use. With their high energy density, power, and durability,

Ni-MH fulfilled many of the requirements necessary for the automotive industry. They were easy to develop, safe, and functional over a wide range of temperatures. However, Ni-MH batteries were heavy, which hindered EV development, and the technology quickly became outdated.[32]

However, the most popular type of batteries for EVs today are Lithium Ion (Li-Ion) batteries, well known for their charge-to-weight ratios. Unlike AA or AAA batteries, which are all similar regardless of the manufacturer, electric-car batteries need to be custom-made to suit different car models. There are two popular types of batteries, distinguished by the materials used in their cathodes — Lithium Nickel Manganese Cobalt Oxide (NMC) and Lithium Iron Phosphate (LFP) batteries.[33]

When it comes to EV batteries, there are three variables of importance: dollar per kilowatt hour ($/kWh, which measures price), energy density, and cycle life. There is no perfect battery that optimizes all three of these variables; NMC and LFP batteries both have their strengths and weaknesses. NMC batteries are known for having the highest energy density, which is defined as the amount of energy stored in a given system.[34] Thus, NMC batteries are generally space-efficient with high power output, which means that high amounts of energy are released in a given time period. However, they have a low cycle life, meaning the battery degrades faster, and are more expensive per unit than LFP batteries.[35] Comparatively, LFP batteries have lower power output, lower energy density, but are cheaper to produce and more resilient to degradation.[36] Here is a side by side comparison of the features of NMC versus LFP batteries (**Exhibit 3**).

Both NMC and LFP batteries consist of a cathode, an anode, a separator in the middle, and electrolyte to enable the flow of lithium ions back and forth. The difference in capacity and price between the two batteries are primarily due to the makeup of the cathodes of the different

batteries. Significantly, the cathode, or the oxidizing electrode in charge of acquiring electrons from the circuit, is the most expensive part of the battery, as it is made from a combination of different minerals.[38] NMC batteries use cobalt, the most expensive element used in batteries, as well as nickel, an element that runs the risk of a long-run shortage.[39] Yet, both of these elements are what gives NMC batteries such a high energy density. In comparison, LFP batteries use neither of these elements, opting instead for iron and phosphorus—cheaper, yet less energy-dense elements (**Exhibit 4**).[40]

Though the two batteries both have benefits and drawbacks, advancements in LFP batteries are a relatively recent phenomenon. Traditional EVs, such as the Nissan Leaf, Chevy Volt, or the BMW i3 all tend to use NMC batteries for their higher power output. However, Elon Musk announced in mid-2020 that the entry-level Tesla Model 3 Standard Range Plus would begin using LFP batteries produced by CATL.[42]

As Kumar noted in our interview, "What CATL has done really well is they've cornered the market for LFP batteries and are seen as the leaders of LFP technology." Compared to competitors, CATL offers cobalt-free LFP batteries that fall below $80/kWh, with the cost of battery cells dropping below $60/kWh, numbers that are far below $100/kWh, the cost that is widely regarded as the "magic price point" for automakers to produce and sell mass market EVs.[43] [44] In China, the price of CATL's LFP cathode material is 43% less expensive per kWh than their NMC811 material, which is the most energy-dense cathode offered to EV manufacturers. In comparison, General Motors and LG Chem, which are developing their own batteries, are not expected to reach similar cost levels until 2025. Yet, the energy density of CATL's batteries remains comparatively low, being only 65%-70% of CATL's MNC811, which

means that the LFP batteries need to be roughly one third larger in size to accommodate for the energy density differential.[45] [46]

To combat this, CATL has developed a cell-to-pack (CTP) approach that has improved the energy density of their LFP batteries. Generally, EV batteries are made up of a cluster of modules, which is made up of a cluster of cells, and then installed as packs. With CATL's CTP technology, they skipped over the process of making up modules and have integrated cells directly into packs, increasing energy density from 180 Wh/kg to more than 200 Wh/kg, which is one of the highest energy densities of LFP batteries that exist on the market. This has also reduced the space necessary for batteries within the EV system, reducing connections and circuits by a factor of 200. By 2024 or 2025, CATL is aiming to increase energy density of their CTP LFP batteries to 350 Wh/kg, which is extremely high for even NMC batteries.[47] [48]

Factoring in future innovations, Tesla's switch to LFP batteries may also be motivated by potential for lower cost. Making the switch to LFP batteries would decrease the cost of the Model 3 in China, where Tesla sold over 11,000 vehicles (most of which were the Model 3). Additionally, subsidies for EVs in China only apply to cars with price tags under 300,000 yuan, so the move to LFP could be price-motivated on Tesla's part, especially since their Long-Run Model 3 is just above the 300,000 yuan price threshold.[49] [50]

Looking forward, limitations rooted in battery chemistry pose many challenges for CATL. For one, the speed of innovation of batteries is inherently limited. While other technological advancements, such as innovations in semiconductor technology, follow a consistent upward trajectory (a model known as Moore's law), batteries are constrained by physical size and requirements. Electrons in computer chips and other technology are small and do not take up physical space, whereas ions, which transfer charge in batteries, are comparatively

large and require space allocation—and so do cathodes, anodes, and processors.[51] Additionally, battery development is constrained by the physical requirements of the minerals involved in battery production; nickel, cobalt, iron, manganese, etc. all require significant investment into both the quality and quantity of raw materials. Consequently, scientists expect battery development to be incremental at best, a limitation that CATL will inherently have to reckon with.

IV. Challenges in the Supply Chain

While the laws of physics pose a non-negotiable challenge CATL must contend with in the long-term, short-term raw material shortages in the supply chain are posing a more urgent threat to CATL's business. Highly purified amounts of nickel, manganese, cobalt, and lithium are required to make batteries and thus CATL has been left with two options: vertically integrate their supply chain through direct equity investments in raw materials, or innovate in battery chemistry. For the former, Kumar noted that compared to other battery-makers, "CATL has done a really good job of making direct investments at the mining and chemicals level along the supply chain to secure their supply of materials. CATL does this better than anyone else in terms of making the investments, but we have yet to see how these investments pay off."[52] Indeed, CATL has quickly expanded their global footprint inking deals on nearly every continent. CATL delegations have agreed to build a $5b lithium battery plant in Indonesia starting production in 2024 with processing of its nickel laterite ore, expand the Pilgangoora Lithium-Tantalum Project (Western Australia) and processing facility to produce lithium hydroxide in South Korea, and purchase stakes in mining projects in Argentina's Lithium Triangle and the cobalt mines of the Democratic Republic of the Congo (DRC).[53] [54] [55] [56] But CATL is not the only battery-maker "taking their destiny into their own hands" as Kumar put it.[57] Tesla, whom CATL supplies, is

pursuing the same vertical integration strategy either through direct equity investments to build up mining assets under their direct control or pursuing radically innovative unproven methods of mineral sourcing like extracting lithium from clay deposits in Nevada.[58] [59]

At the same time though, Zeng knows this strategy won't last. If CATL is to remain a battery powerhouse in the context of surging demand (**Exhibit 5**), they *must* master the second option of innovation. Luckily, CATL has an invaluable partner in the difficult task of battery chemistry innovation—their largest and most high-profile customer—Tesla itself. In June of 2020, Zeng shook the battery world when he announced that CATL was ready to produce its new "million-mile battery" jointly developed with Tesla for any interested parties.[60] Reuters characterized the collaboration as a joint development between Tesla and CATL that "deploys technology developed by Tesla in collaboration with a team of academic battery experts recruited by Elon Musk"—likely the team led by Jeff Dahn at Dalhousie University in Canada.[61] Dr. Dahn responded to our group's email by simply saying: "I am a battery chemistry guy and really know no details of the CATL Tesla partnership. The interview would taje [sic] 20 seconds. Sent from my iPhone." His two lead researchers, Chongyin Yang and Michael Metzger, did not respond for comment.

What is notable about the Tesla-CATL collaboration is it epitomizes CATL's unique approach to innovation in battery manufacturing. The company's willingness to "take direction on battery design from others" in the mold of a contract manufacturer is in "direct contrast to LG Chem or SK Innovation who like to do their own in-house design."[62] Even if Zeng has an all-star team of battery chemists hand-selected by Musk helping him, Zeng knows that even close collaboration with Tesla itself isn't enough to continue innovating to sustain battery supremacy: in addition to experimenting with structural advancements in vehicle-battery integration, CATL

is rumored to be developing a brand new type battery, one that operates without nickel or cobalt and thus is a radical departure from their existing LFP or NMC batteries.[63] [64] It is not known whether Tesla's own engineers are involved and details about makeup, cost, and energy density are scant—but the complete elimination of bottleneck metals would be a true game-changer for the entire industry.

V. The Future: Big Storage

Unlike 5G or semiconductors, battery technology has typically not received the same amount of global attention and focus—CATL is far less of a household name in comparison to Huawei or TSMC. But the climate crisis is rightly changing this by putting batteries at the forefront of sought-after climate technology.

Batteries (and this case study for that matter) are usually discussed in the context of the EV automotive market simply because it is the most lucrative application. But the bigger application of batteries is utility-scale storage, sometimes referred to as "big storage." As Kumar counseled: "if you stop looking at battery cells as the powertrain of a vehicle, and start looking at battery cells as an energy storage unit that can be deployed in many applications, you open up a wide variety of uses."[65]

The average EV has ~7,000 batteries packed together, but electrifying EVs is one part of a much larger equation to combat climate change. These "megabatteries" contain millions of cells arranged in shipping container-sized modules, which plug directly into a wind or solar farm to store energy when the wind is not blowing or the sun is not shining.[66] The true test will be whether battery-makers like CATL can produce enough batteries to supply not only the booming EV industry, but the much larger utility-scale energy storage industry as well. Wind and solar energy technologies have been around for decades, but it is really only in the past couple of years

that technologically efficient and cost-effective batteries have emerged through a combination of Western-led innovation in battery chemistry/form-factor design combined with Chinese innovation in more efficient manufacturing techniques, rendering big storage possible. Thus, the larger opportunities in the future for CATL lie in producing batteries for these big storage projects—as battery density is not an issue. Kumar explained that in comparison to cars which require highly efficient cells given the limitations posed by a small surface area to work with and extreme sensitivity to weight (which affects mileage), utility-scale energy storage systems are built on extremely large, barren plots of land without regard for the confining metrics of battery performance.[67] Given its dominance in LFP battery technology—the less efficient, but cheaper chemistry—CATL is well positioned to become the main provider for large battery projects around the world beyond EVs.[68] Under Huang Shilin's leadership, CATL has begun experimenting and will soon begin to produce grid storage systems (**Exhibit 6**).[69]

VI. US-China Geopolitical Situation

As if material shortages amid surging battery demand were not enough to worry about, tensions between the U.S. and China have grown in recent years, reaching a new low point under the Trump administration. And although President Biden has not held office for very long, it seems unlikely that we will see a meaningful reversal in this trend in the next three years. In fact, "President Biden has stated Trump was ineffective in containing China's influence and curtailing China's lack of transparency, rule of law, and human rights because the Trump administration failed in bringing together allies against China."[70]

Since 1979, the goal of the U.S. has been to integrate China into the established global system. In 2018, the Trump administration set tariffs and trade barriers on China, sparking the current US-China trade war. The basis of this trade offensive stems from a combination of

long-term forces and circumstances unique to the Trump Administration. Trump has accused China of unfair trading practices and intellectual property theft, but the move also has to do with the U.S. gaining access to the Chinese market and reducing the United States' trade deficit.[71] China perceives this and other moves as the U.S. attempting to hamper China's rise as a global power. On April 9, 2021, President Biden's Office of the Director of National Intelligence (ODNI) released the 2021 *Annual Threat Assessment (ATA) of the US Intelligence Community*, which states that "Beijing sees increasingly competitive US-China relations as part of an epochal geopolitical shift and views Washington's economic measures against Beijing since 2018 as part of a broader U.S. effort to contain China's rise."[72] The report further states "China increasingly is a near-peer competitor, challenging the United States in multiple arenas — especially economically, militarily, and technologically — and is pushing to change global norms."[73]

Outside of the technology sector, the U.S. and China oppose one another with regard to flashpoint issues including Taiwan, Hong Kong, the Uighurs in Xinjiang, and the South China Sea. But in the realm of technology-based competition and distrust, the ATA 2021 report states "China will remain the top threat to U.S. technological competitiveness as the CCP [Chinese Communist Party] targets key technology sectors and proprietary commercial and military technology from U.S. and allied companies and research institutions associated with defense, energy, finance, and other sectors. Beijing uses a variety of tools, from public investment to espionage and theft, to advance its technological capabilities."[74] For the foreseeable future, the U.S. and China will continue to compete across all fronts. And in the technology sector, China will threaten to overtake the U.S. as the global leader.[75]

In the U.S., there are many that believe China's growth is not based on "fair competition or transparency" and that the CCP is to blame, so the U.S. must prioritize protecting American

businesses.[76] On the other side, there are those that believe in prioritizing "investing in U.S. competitiveness and innovation" and that the U.S. should focus on building a coalition with other nations such as with the Quadrilateral Security Dialogue (Quad) between Australia, India, Japan, and the U.S., to counterbalance China.[77] "Neither camp trusts China to be the global leader in technology because its authoritarian political system may abuse technologies to surveil its citizens, silence political dissidents, and oppress ethnic minorities."[78] In addition, critics warn that the CCP is further cementing its power using technology. Building public trust must be a priority for U.S. and Chinese technology companies.

The U.S. and China should be determined to mutually develop their relationship and build trust so that neither side loses out on technological contributions and investments—however, this will be a difficult goal to accomplish while maintaining economic and national security.[79] A second Cold War would not be beneficial for either side.The U.S. and China are inextricably linked economically, and a decoupling of that linkage would have huge negative ramifications for the people, businesses, and societies involved. And for CATL, such a decoupling would be disastrous, jeopardizing their valuable partnerships with multinational and U.S.-based corporations.

VII. Geopolitical Implications

Chinese technology companies have been a growing U.S. national security concern for many years. This concern arises in part because the relationship between Chinese tech companies and the Chinese government has historically been unclear, with suspicions that the Chinese Civil-Military Fusion policies render compartmentalization of intellectual property between the private and public sector effectively impossible.[80] The first generation of Chinese technology companies to go global—Huawei, ZTE, and Lenovo—did so while trying to maintain a low

profile. However, despite their efforts, distrust towards Chinese companies has grown considerably among the American public:

> "Some companies are clear threats to national security, while others find themselves the victim of their own poorly informed international nonmarket strategy. Media, government, and public perceptions of Chinese technology companies are often undermined by the corporate leadership's own inability to explain early on who they are, what their technologies do, and how they work. There is little public trust in such companies because there is often a pronounced lack of clear corporate information and transparency. Such distrust in Chinese technology companies is further compounded by a general lack of understanding business-government relations in China as well as the role of the technology sector in society."[81]

Recently, the Federal Communications Commission (FCC) designated five Chinese companies as a threat to U.S. national security and placed them on an economic blacklist. While the U.S. government has restricted business with specific Chinese tech companies, CATL's electric batteries are not yet perceived as equally threatening. But because China is poised to dominate the U.S. in electric car and electric battery manufacturing, it is quite possible that a large Chinese tech company leading this industry could quickly find itself on the receiving end of a blacklist or other damaging policy treatment.

The geopolitical implications of CATL's meteoric rise over a decade are significant in and of themselves. Firstly, CATL is already the global leader in electric battery manufacturing and will only continue to grow, both domestically in China and worldwide. They have emerged as leaders of the industry and are determined to shape the future in battery technology. Secondly, CATL has uniquely positioned themselves in working with U.S. companies, including their

current partnerships with Tesla and General Motors. These partnerships in addition to Elon Musk's popularity in China, if they continue to be successful, can change U.S. public opinion on working with Chinese companies and can be a model for future cooperation between U.S. and China. It certainly benefits CATL that their chairman, Zeng Yuqun, has a personal relationship with Elon Musk, even texting one another about innovations in technology and reducing the cost to manufacture batteries and vehicles. In an interview with Bloomberg, Zeng stated, "Elon talks about cost all day long, and I told him to be assured that I would have solutions. We get along well. He's a fun guy."[82] [83] This personal relationship could lend itself to a continued increase of Tesla's presence in China and an opportunity for CATL to penetrate into the U.S. market.

Lastly, there is climate change. The automotive energy has ushered in the new energy trend of batteries due to the rising global demand resulting from efforts to combat climate change and push for energy conservation, emission reduction, and development of renewable energy. Battery powered automobiles have reshaped the entire industry's supply chain and CATL has emerged as a new industry leader.[84] Additionally, CATL Chairman, Zeng Yuqun, serves on the Chinese People's Political Consultative Conference, an advisory body to CCP leadership. There, Zeng is in a position to push forward proposals focusing on renewable energy and try to steer CCP leadership and China into becoming more conscientious about climate change and to prioritize it.[85] CATL's emergence as the global leader in electric battery manufacturing and partnerships with car manufacturers around the world represents a future whereupon there is a decrease of dependence on fossil fuels globally.

VIII. Conclusion

At the end of a wildly successful first decade, CATL and Zeng Yuqun are now facing a crucial juncture in the road forward. Though the company's early relentless focus on expansion

and partnership beyond China has helped secure its position as the world's leading battery manufacturer, diminishing state support and future supply chain shortages pose two major challenges for the company in the years ahead. If these changes to the business environment detract from CATL's competitive advantages against other major players, competitors could eat into the market share of Zeng's company and topple the current market leader from its first-place position. In such a rapidly evolving and multifaceted industry, tectonic shifts in the business landscape may occur at a much faster pace than in more traditionally established sectors of the economy—Zeng and his colleagues, therefore, cannot afford to make mistakes.

CATL now faces the challenge of independently innovating in ways that typically have not aligned with Chinese companies' strengths. As Kumar remarked, "In general, Western companies are better at innovating to find new battery chemistries and form factors, and in general, Chinese companies are better at scaling up quickly. CATL can get 3x the capacity faster than any other company. That's just a different form of innovation—it's innovation in operational manufacturing efficiency rather than at the chemistry level."[86] Consequently, Kumar believes that "you need both the Western and Chinese philosophies of innovation—for both kinds of thinking to exist in tandem." Indeed, it has long been conventional wisdom that American companies innovate, and Chinese companies scale. But Zeng Yuqun's new bets for his firebrand company lie beyond this comfort zone. By pushing the company to remove particular metals, experiment with new designs, and jointly develop the million-mile battery with Tesla, the physicist-turned-businessman from Ningde is now pushing not only his company but the Chinese battery industry itself into uncharted territory. By challenging old assumptions about if and how Chinese companies innovate, Zeng needs to be confident that his company can create its own

distinctive brand of Chinese innovation atop his existing combination of Chinese entrepreneurship, Japanese discipline, German engineering, and American inventiveness.

Compounding this challenge in innovation, geopolitical tensions between the U.S. and China are also jeopardizing its valuable partnerships with companies in the West. In particular, threats to its partnership with Tesla are forcing CATL to move faster than it ordinarily would. Is the urgency of the climate crisis enough to compel both Beijing and Washington to continue to allow the Tesla-CATL/Musk-Zeng relationship to prosper? Increased skepticism of Chinese companies from policymakers in Washington and the U.S. public alike have sewn doubt in this regard. Though Zeng had assiduously prepared to handle the consequences of dramatic policy changes from the Chinese government at home, he never anticipated having to do damage-control to assuage the concerns of the American government too.

The second major challenge CATL faces is a physical one. As demand for batteries continues to skyrocket, supply will need to keep up. But the world is expected to face major shortages in nickel, manganese, cobalt, and lithium—and for the battery industry, this will be a difficult challenge to overcome. CATL has attempted to mitigate the expected shortage through aggressive vertical integration, but both battery chemistry and physical availability of minerals pose obstacles for CATL as it attempts to secure its position as the global leader in the battery industry.

At the end of the day, it is clear that CATL is focused on innovating its batteries, both for the future of EVs and for the future of global efforts to counteract climate change. Zeng remains steadfast in his belief that corporations can work hand-in-hand with governments to provide solutions to this global crisis—Bloomberg News reported that he now serves on the Chinese People's Political Consultative Conference, a high-level advisory body to CCP leadership, where

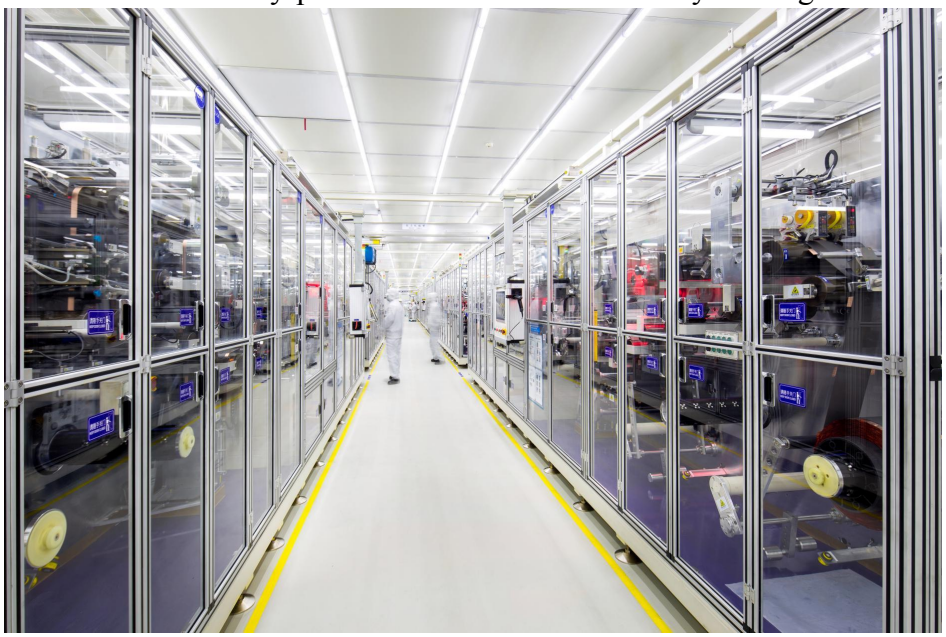
he regularly advances initiatives to prioritize clean energy. The potential of batteries and electric vehicles in the future remains huge, but given the challenges ahead, how CATL chooses to pave the path forward has immense implications for their business and for the industry as a whole. And despite the challenges he faces, Zeng remains optimistic about the future of his company and its unwavering underlying goal—according to him, he does not consider himself to be in competition with other battery-makers, urging others to always remember "we are all competing with gasoline cars."[87]

Exhibits

Exhibit 1 Founder & Chairman Zeng Yuqun in his office at CATL Headquarters in Ningde

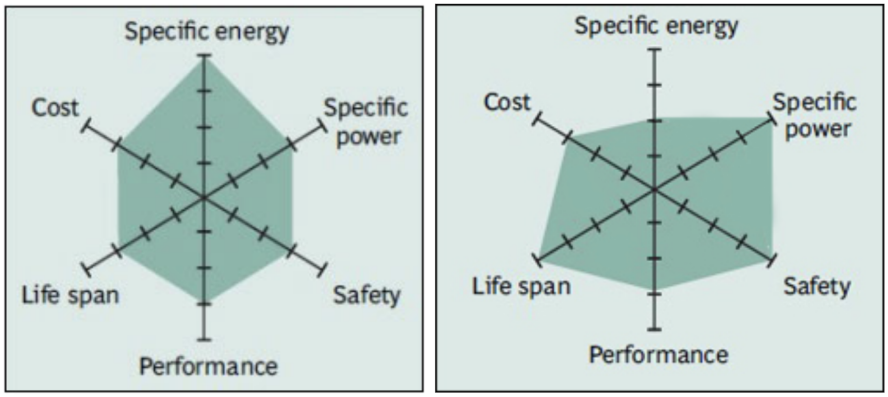
Source: Qilai Shen/Bloomberg

Exhibit 2 Battery-production line at CATL factory in Ningde



Source: Quartz

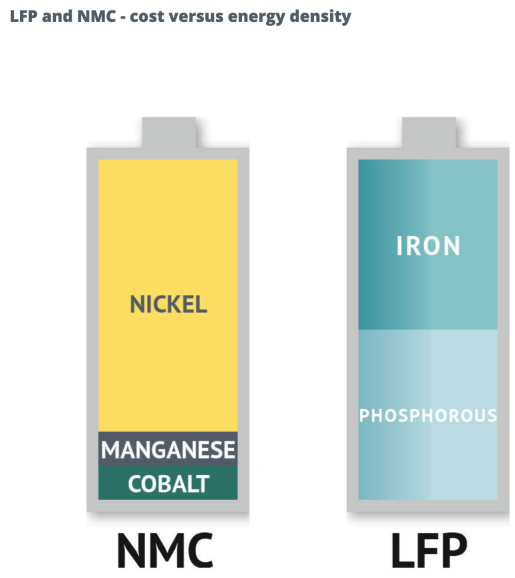
Exhibit 3 NMC v. LFP Snapshots



Snapshot of NMC *Snapshot of Li-phosphate*

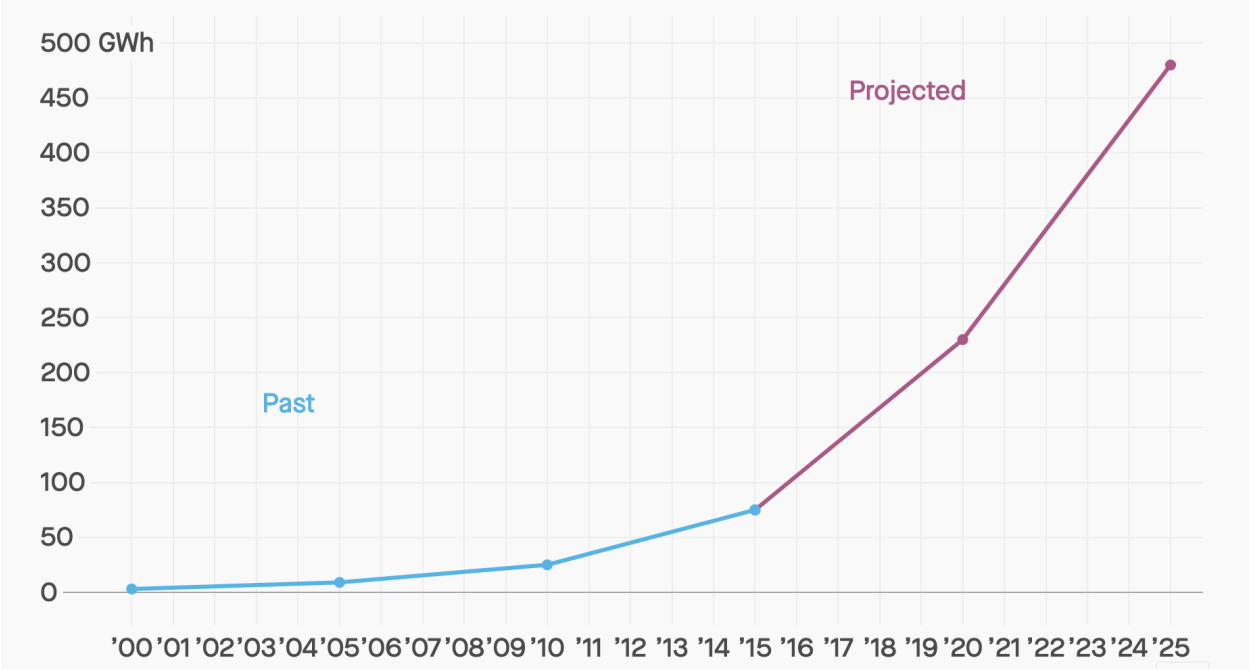
Source: Boston Consulting Group & Cadex Electronics[37]

Exhibit 4 LFP v. NMC



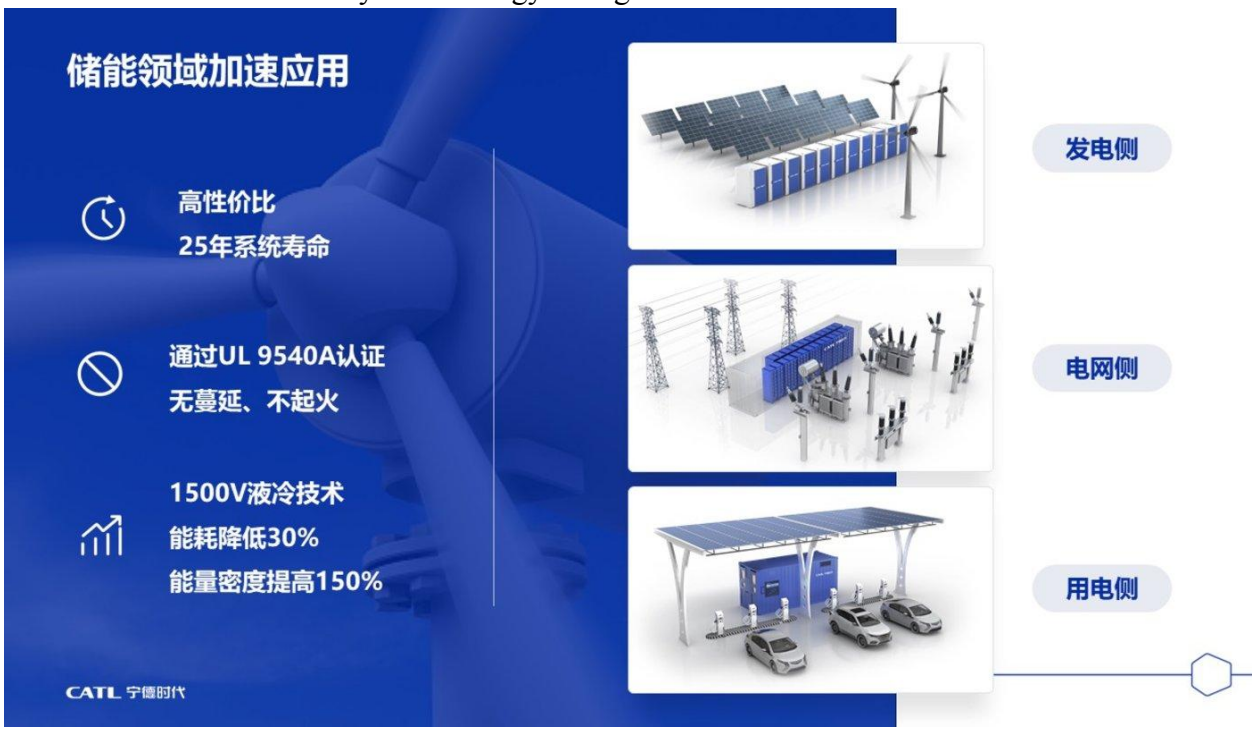
Source: The Nickel Institute[41]

Exhibit 5 The global production capacity of lithium-ion batteries



Source: Quartz | Avicenne

Exhibit 6 CATL's utility-scale energy storage solutions



Source: CATL

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Alvarez, Simon. "Tesla's Shift to LFP Cells for Megapack Batteries Heralds an Energy Storage Revolution," May 4, 2021. https://www.teslarati.com/tesla-lfp-megapack-batteries-disruption/. Tesla recently shifted to cobalt-free lithium iron phosphate (LFP) batteries for its flagship energy storage product, the Megapack, heralding what some industry insiders describe as an "energy storage revolution." Given LFP batteries tend to be less energy-dense than their NMC counterparts found in Tesla's flagship EVs, the switch is aimed at affordability and could "effectively accelerate the inevitable obsolescence of dirty peaker plants."

"Annual Threat Assessment of the U.S. Intelligence Community." Office of the Director of National Intelligence, April 9, 2021. https://www.dni.gov/files/ODNI/documents/assessments/ATA-2021-Unclassified-Report.pdf. Annual report generated by the Director of National Intelligence, Avril Haines, in coordination with the U.S. Intelligence Community. The report focuses on worldwide threats to U.S. national security, both in the near-term and long-term. There is a chapter titled "China's Push for Global Power" that was helpful for this case study that focused on the Chinese Communist Party's continued sustainment of power, China's regional and global activities, military capabilities, weapons of mass destruction, space, cyber, intelligence, and elections influence and interference.

Bryan, Irene Preisinger, Victoria. "China's CATL to Build Its First European EV Battery Factory in Germany." *Reuters*, July 9, 2018. https://www.reuters.com/article/us-bmw-catl-batteries-idUSKBN1JZ11Y. Chinese battery maker CATL will build its first overseas production site in Germany, supplying BMW with lithium-ion batteries. The contract was signed by Chinese Premier Li Keqiang during a visit to Germany. Chairman Zeng articulated a vision to eventually "supply all the OEMs in Europe" already looking beyond this site in Thuringia. German Chancellor Angela Merkel was receptive toward the new investment, but made it clear she wanted Germany to eventually compete with Chinese battery-makers to over-reliance due to Europe's lack of its own production capabilities.

Celik, Gozde, and Luke Sheehan. "CATL Dominates the Battery Industry." EqualOcean (亿欧), March 11, 2020. https://equalocean.com/analysis/2020031113769. Analysts at EqualOcean, a research firm headquartered in Beijing, provide key growth metrics derived from the company's financial indicators.

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ml.
CATL announces further investment in the 3Q Lithium Project (maintained by Canada's Neo Lithium Corp.) located in Catamarca, Argentina—the largest lithium producing area in Argentina (and the world)—known as the "lithium triangle."

Daly, Tom. "CATL Takes Stake in China Moly Cobalt Mine for $137.5 Million." *Reuters*, April 11, 2021. https://www.reuters.com/article/us-cmoc-catl-mine-idUSKBN2BY0BZ.
CATL will take a stake in a Chinese copper-cobalt mine located in the DRC managed by another Chinese company—China Molybdenum. The DRC is the world's largest supplier of cobalt, but its acquisition is the most troublesome for battery-makers given the inhumane working conditions associated with its mines. Interestingly, this is not the first partnership between CATL and China Moly—the two companies already have a broad strategic partnership overlapping in projects, global acquisitions, lithium investments and distinct cooperation in Indonesia.

Ferguson, John, Sherry Liu, and Kristopher Valdez. Zoom interview with Vivas Kumar, Principal Consultant with Benchmark Mineral Intelligence and Former Tesla Battery Manager, April 6, 2021.
Vivas Kumar formerly led Tesla's battery supply chain division as the "global lead negotiator on multiple long-term battery materials contracts and commercial partnerships efforts." He was also the "co-lead on representing Tesla in senior-level government conversations in 6 continents about policy actions to spur further battery value chain development and investment." Speaking on-the-record for approximately 30min, Kumar had previously worked extensively with CATL.

Ferguson, John, Davis Tyler-Dudley, and Sherry Liu. Zoom Interview with Jeff Zhu (President Asia Pacific, Cabot Corporation) and Michael Shen of (Commercial Manager of Energy Materials, Cabot Corporation), April 29, 2021.
Jeff Zhu and Michael Shen, both of the Cabot Corporation, specialize in energy materials. Specifically, the two are both extremely familiar with Chinese government policies toward businesses that have nurtured CATL's rise.

Hanley, Steve. "CATL Says It Has A Million-Mile Battery. Is There A Connection To Tesla?" CleanTechnica, June 9, 2020. https://cleantechnica.com/2020/06/09/catl-says-it-has-a-million-mile-battery-is-there-a-connection-to-tesla/.
There is still active debate over the extent of cooperation between CATL and Tesla in the creation of CATL's "million-mile battery." Some question why Tesla would ever agree to allow CATL to produce the industry's best-performing battery for other EV competitors (sharing the efforts of Tesla's own battery research).

"CATL Working On Batteries With No Nickel & No Cobalt." CleanTechnica, August 17, 2020. https://cleantechnica.com/2020/08/17/catl-working-on-batteries-with-no-nickel-no-cobalt/.
Nickel and cobalt are two of the most expensive ingredients in lithium-ion batteries and a CATL senior executive confirmed the company was working on a new type of battery without these two metals. The article points out that due to CATL's close relationship with Tesla, whatever CATL happens to experiment on has a good chance of ending up in Tesla's products even if Tesla's engineers are not tasked with the research themselves.

Hawkins, Andrew J. "Tesla's Battery Day Ended with No Battery and a Lot of Unanswered Questions." The Verge, October 1, 2020. https://www.theverge.com/2020/10/1/21452436/tesla-battery-day-reaction-elon-musk-questions-li

thium-mining.
Tesla's Battery Day event was a widely anticipated presentation by Elon Musk and Drew Baglino, head of energy engineering, with many industry insiders believing the event would see Musk unveil the million-mile battery. But this article explains in detail why people's expectations were not met by the event and instead, many were left confused by Tesla's strategy for the battery market. Experts came away with the impression that "Tesla was headed into uncharted waters without a clear sense of direction" due to their announcements they would manufacture their own "tabless" 4680-form-factor battery, attempt to mine their own lithium from clay deposits in Nevada, and even process their own raw materials. Put simply, the vision Musk laid out on Battery Day was less about reimagining batteries themselves, and more about reimagining manufacturing. One expert said "it was as much a manufacturing day as it was a battery day." Regardless, the vision that Musk clearly articulated was in-line with where other battery-makers were heading—vertical integration.

He, Katherine(Qianran). "The Rise of CATL." Medium, August 15, 2020. https://medium.com/batterybits/the-rise-of-catl-29452bea854a.
Katherine He is a senior battery engineer and founding managing editor of BatteryBits, a blog that is on a mission to "create a hub of insights and ideas produced by and for battery experts in industry, academia, policy, and finance." She agrees with other assessments that CATL's success is in large part due to a) aggressively pursuing foreign partnerships early on to develop world-class engineering and manufacturing capabilities, and b) preparing early for the inevitable disappearance of policy subsidies via these strategic alliances. She also describes in detail CATL's plans to prepare against future threats from new disruptive technologies (i.e. solid-state) by investing in mining industries to further drive down the cost of its batteries.

Henze, Veronika. "Battery Pack Prices Cited Below $100/KWh for the First Time in 2020, While Market Average Sits at $137/KWh." *BloombergNEF* (blog), December 16, 2020. https://about.bnef.com/blog/battery-pack-prices-cited-below-100-kwh-for-the-first-time-in-2020-while-market-average-sits-at-137-kwh/.
BloombergNEF is a research provider covering global markets and technology, specializing in the transition to low-carbon emissions. "Our expert coverage assesses pathways for the power, transport, industry, buildings and agriculture sectors to adapt to the energy transition. We help commodity trading, corporate strategy, finance and policy professionals navigate change and generate opportunities." This article reported that for the first time ever, lithium-ion battery pack prices dropped to less than $100/kWh. This is a significant step towards electric vehicles reaching similar price points of internal combustion vehicles.

Huang, Echo. "China's Breaking up the EV Battery Monopoly It Carefully Created." Quartz, June 25, 2019. https://qz.com/1651944/china-ends-policy-steering-ev-makers-to-local-battery-firms/.
This article explains in detail, the policy changes enacted by the Chinese government across 2018 and 2019 that remove extensive state support for the EV industry in China—changes that significantly affect companies like CATL which have come to rely on rich subsidies and protectionist support from foreign competition. Such changes were announced by China's powerful Ministry of Industry and Information Technology (MIIT). The policies were objectively extraordinarily successful even if unpopular around the world—propelling China to the top of the world in terms of battery makers. The top 10 battery makers powering its domestic EV market were all Chinese, but along the way, such policies also nurtured its global champions including CATL, now the world's *largest* EV battery maker.

Iclodean, C, B Varga, N Burnete, D Cimerdean, and B Jurchiş. "Comparison of Different Battery Types

for Electric Vehicles." *IOP Conference Series: Materials Science and Engineering* 252 (October 2017): 012058. https://doi.org/10.1088/1757-899X/252/1/012058.

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Khan, Qasim, and Peng Zhenghao. "EO Intelligence: CATL Research Report 2020." EqualOcean Intelligence (亿欧智库), August 3, 2020. https://equalocean.com/research/2020080314406. EqualOcean (EO) is a technology innovation and investment research platform, founded and headquartered in Beijing. EqualOcean Intelligence is the research and consulting division of EO. This think tank provides detailed market and investment analysis as comprehensive reports that are made available for purchase to the public. The CATL Research Report 2020 provided market analysis since CATL's founding and included battery market prospects, CATL's history, operations and business analysis, and future challenges and opportunities.

Lam, Nadia. "Founder of Tesla Supplier CATL Topples Li Ka-Shing as Hong Kong's Richest Man." South China Morning Post, May 5, 2021. https://www.scmp.com/business/article/3132291/founder-tesla-supplier-catl-topples-li-ka-shing-hong-kongs-richest-man.
South China Morning Post report detailing the net worth of CATL surpassing Li Ka-shing as Hong Kong's richest man due to a significant rise in recent demand for EVs.

Lambert, Fred. "Electric Vehicle Battery Cost Officially Dips under Critical $100/KWh Price Point but There's a Catch." *Electrek* (blog), December 16, 2020. https://electrek.co/2020/12/16/electric-vehicle-battery-dips-critical-100-kwh-price-point/.

Lienert, Norihiko Shirouzu, Paul. "Exclusive: Tesla's Secret Batteries Aim to Rework the Math for Electric Cars and the Grid." *Reuters*, May 14, 2020. https://www.reuters.com/article/us-autos-tesla-batteries-exclusive-idUSKBN22Q1WC.
In an exclusive report by Reuters, the first to publish such information, Zeng announced a new "million mile" battery jointly developed with CATL at the center of their strategy. The report says the new battery deploys technology developed by Tesla in collaboration with a team of academic battery experts recruited by Musk. Tesla plans to launch the battery first in China.

Liu, John, and Chunying Zhang. "Zeng Yuqun, Friend to Tesla's (TSLA) Elon Musk in China," December 3, 2020. https://www.bloomberg.com/news/articles/2020-12-03/zeng-yuqun-friend-to-tesla-s-tsla-elon-musk-in-china-bloomberg-50-2020.
Musk and Zeng share a personal relationship and "text about technology, COVID-19, and cheaper batteries and cars." Both companies are opening plants in Germany, though neither side is ruling out the possibility of working together.

Ma, Jie, David Stringer, Yan Zhang, and Sohee Kim. "The Breakneck Rise of China's Colossus of Electric-Car Batteries." Bloomberg, February 1, 2018. https://www.bloomberg.com/news/features/2018-02-01/the-breakneck-rise-of-china-s-colossus-of-electric-car-batteries.
This article recounts how Chinese government support has helped set China on a path to dominate global electric vehicle and battery production.

Moore, Dasia. "How Batteries Will Power the Future." Quartz, January 24, 2020. https://qz.com/1790116/how-batteries-will-power-the-future/.
Overview of the industry's four giants—Panasonic, CATL, BYD, and LG Chem—all based in East Asia, and explains why batteries are critical to a greener future and walks through the challenges that stand in the way of mass manufacturing. The article makes the case that "Big Battery" will replace "Big Oil." Panasonic represents the old guard—as a 101-year-old tech giant while CATL is the young upstart by focusing exclusively on EV batteries. At the same time though, Big Oil is unlikely to lose out entirely in the transition away from fossil fuels given hydrocarbon giants including Royal Dutch Shell, BP, and Total have all invested massive amounts into renewable energy startups.

Moss, Trefor. "The Key to Electric Cars Is Batteries. One Chinese Firm Dominates the Industry." Wall Street Journal, November 3, 2019. https://www.wsj.com/articles/how-china-positioned-itself-to-dominate-the-future-of-electric-cars-11572804489.
This article examines the early days of Mr. Zeng and CATL including his efforts at replicating Huawei's management practices and culture. Former employees recount stories of taking on multiple roles, working long hours, and showing up for dinner invitations meant to woo senior foreign auto executives whom Mr. Zeng wanted to poach. The article also examines how the Chinese government's support nurtured CATL's rise. In the words of a former CATL project manager: "without its restrictions, I don't think CATL would ever have been successful."

Price, Rob. "Xiaomi CEO Lei Jun Discusses Secret Behind Xiaomi's Success," June 8, 2015. https://www.businessinsider.com/xiaomi-ceo-lei-jun-discusses-secret-behind-success-pig-flying-whirlwind-2015-6.
Xiaomi CEO Lei Jun is a household Chinese name, far more so than Zeng Yuqun. This article describes the well-known Chinese allegory describing how companies are like pigs, who can "fly" at the center of a whirlwind if it "seizes the right opportunity." Mr. Zeng has taken a slightly alternative interpretation to the saying using it as a metaphor for the deceptive support the Chinese government provides to early entrepreneurs.

Rathi, Akshat. "How We Get to the next Big Battery Breakthrough." Quartz. Accessed May 5, 2021. https://qz.com/1588236/how-we-get-to-the-next-big-battery-breakthrough/.
Akshat, a Quartz reporter who has heavily covered the rise of CATL explains how lithium-ion battery chemistries will remain the dominant chemistry for at least another decade or more. He summarizes several potential approaches companies are taking to make batteries more powerful or more "energy dense." One idea is to replace layered electrodes with something structurally stronger like an experimental "spinel" structure. A bigger breakthrough would be to develop a commercially viable anode made completely from silicon. What makes this exceedingly difficult is that silicon swells to four times its original volume during the absorption of lithium ions.

"The Inside Story of How CATL Became the World's Largest Electric-Vehicle Battery Company." Quartz, April 3, 2019. https://qz.com/1585662/how-catl-became-the-worlds-biggest-electric-car-battery-company/.
This article is the most comprehensive in-depth history of CATL thus far. It carefully recounts the founder's early days, founding, and subsequent rise through the 2010s to present day.

Ren, Daniel. "China's Largest Battery Maker CATL Plans to Build a US$5 Billion Indonesia Plant as Widodo Extends Overture to Elon Musk." South China Morning Post, December 16, 2020. https://www.scmp.com/business/companies/article/3114189/chinas-largest-battery-maker-catl-pla

ns-build-us5-billion.
Indonesia is the largest nickel producer in the world. CATL signs an agreement with Indonesian state miner PT Aneka Tambang to establish their second offshore production line following their $2b plant in Germany that will supply BMW at the start of their production in 2021.

Rudisuela, Ken. "Battle of the Batteries - Cost versus Performance." Nickel Institute, June 10, 2020. https://nickelinstitute.org/blog/2020/june/battle-of-the-batteries-cost-versus-performance/.

Schlachter, Fred. "No Moore's Law for Batteries." *Proceedings of the National Academy of Sciences* 110, no. 14 (April 2, 2013): 5273–5273. https://doi.org/10.1073/pnas.1302988110.

Simon, Johnny, and Akshat Rathi. "Inside CATL's Massive Factory and the City That Supports It." Quartz, April 4, 2019. https://qz.com/1586552/inside-catls-massive-factory-and-ningde-the-city-it-supports/.
This article documents through satellite imagery and on-the-ground photography how CATL has aided in the transformation and build-up of the city of Ningde, Fujian Province.

Staff, Reuters. "China's CATL Aims to Make EVs Drive Further with New Tech." *Reuters*, August 12, 2020. https://www.reuters.com/article/us-catl-batteries-idUSKCN2580Q6.
CATL is reported to be working on a new technology that will allow battery cells to be integrated directly with an EV's chassis, shedding traditional casings that have always made battery systems bulkier than they need to be. This will allow an EV to load more cells and therefore extend its range—the primary concern for customers. Chairman Zeng Yuqun said the company aims to launch the technology before 2030, but did not say whether CATL was already working with any automaker to implement this new design. This technology would theoretically allow EV battery makers like CATL to participate in vehicle design from an even earlier stage.

"China's CATL Buys into Beaten down Australian Lithium Miner Pilbara." *Reuters*, September 4, 2019. https://www.reuters.com/article/us-pilbara-minerals-raising-idUSKCN1VP0GT.

Stringer, David, and Yvonne Yue Li. "Tesla Is Trying to Mine Its Own Lithium." Fortune, September 28, 2020. https://fortune.com/2020/09/28/tesla-mine-lithium-batteries-cheaper-cars/.
Tesla—at its highly anticipated Battery Day event—declared it would make its own battery cells and to enter production of battery cathodes and associated raw materials. The most challenging aspect seems to be the focus of this article—mining their own lithium from clay deposits in Nevada—in a largely unproven process. Obtaining lithium from clay has typically been considered too difficult and expensive due to low recovery rates. Some projections predict about 5% of global supply of mined lithium may come from unconventional sources, mostly clay, by 2030. Musk says Tesla is focusing on the development of a process to extract the metal using sodium chloride (table salt) instead of more expensive chemical reagents, a process that no other mine uses to date.

Battery University Group (BUG). "Types of Lithium-Ion Batteries – Battery University," February 11, 2021. https://batteryuniversity.com/index.php/learn/article/types_of_lithium_ion.

Yan. "China's CATL Unveils Cell-to-Pack Battery Platform." Xinhua Net, September 13, 2019. http://www.xinhuanet.com/english/2019-09/13/c_138389934.htm.

Yu, Wenchi. "Risk Mitigation and Creating Social Impact: Chinese Technology Companies in the United States." Harvard Kennedy School Ash Center for Democratic Governance and Innovation Policy

Briefs Series, April 2021.
https://ash.harvard.edu/files/ash/files/wenchi_yu_policy_brief.pdf?m=1618407028.
This report focused on U.S. policy in regards to trade and technology towards China under the Trump administration. It details the current state of US-China relations, Chinese technology companies in the U.S., focusing on Huawei, Grindr, Kunlun, TikTok, and Bytedance and provides U.S. policy recommendations. "This paper reviews key US policy developments under the Trump administration, both broadly toward China and more narrowly relating to trade and technology, and examines the business strategy of four Chinese technology companies operating in the United States. It outlines the benefits of a corporate risk mitigation approach that incorporates social impact creation as an integral part of business and nonmarket strategy for Chinese technology companies, in the United States, and elsewhere. However, this paper also argues that corporate actions can only go so far. Because technology necessarily involves concerns of national security, the role of government—and government cooperation—is essential. It is only through a combination of more locally engaged corporate actions and internationally agreed upon sectoral rules and standard settings that we will be better able to improve transparency and trust-building across borders."

Zhang, Chunying, David Stringer, and John Liu. "The Battery Billionaire Who's Key to Tesla's Future in China." *Bloomberg.Com*, July 12, 2020.
https://www.bloomberg.com/news/articles/2020-07-12/elon-musk-and-tesla-a-plan-to-succeed-in-china.
This Bloomberg article, dated July 12, 2020, focuses on the growing partnership between CATL Chairman Zeng Yuqun and Tesla's Elon Musk and how both companies will benefit one another. Tesla is hoping to penetrate the Chinese market while CATL is hoping to spread more globally. "The pair trade text messages to discuss prospective innovations in technology, their responses to the challenges wrought by the coronavirus and the Tesla chief's primary obsession: cheaper batteries and vehicles." CATL is able to provide the cheaper batteries to Tesla.