Case 18 Tesla: Disrupting the Auto Industry

Tesla Motors' strategy was no secret: in 2006 the chairman and CEO, Elon Musk, announced:

So, in short, the master plan is:

- Build a sports car.
- Use that money to build an affordable car.
- Use that money to build an even more affordable car.
- While doing above, also provide zero emission electric power generation options.
- Don't tell anyone.[1]

The remarkable thing was that by 2015, Tesla had kept to that strategy and executed it almost flawlessly. Phase 1 ("Build a sports car") was realized with the launch of its Roadster in 2007. Phase 2 ("Use that money to build an affordable car") began in 2013 with the launch of the Model S.

The acclaim that greeted both cars had propelled Tesla's reputation and its share price. Since its initial public offering in June 2010, Tesla's share price had followed an upward trajectory. On June 12, 2015, Tesla's stock market value was $31.7 billion. By comparison, Fiat Chrysler was valued at $20.5 billion despite that fact that Fiat Chrysler would sell about 2.5 million cars in 2015 against Tesla's 55,000. The optimism that supported Tesla's valuation reflected the company's remarkable achievements during its short history and investors' faith in the ability of Elon Musk to realize his vision "to accelerate the advent of sustainable transport by bringing compelling mass market electric cars to market as soon as possible."[2]

Indeed, Musk's vision for Tesla extended beyond revolutionizing the automobile industry: Tesla's battery technology would also provide an energy storage system that would change "the fundamental energy infrastructure of the world."

A central issue in the debate over the appropriate market valuation of Tesla was whether Tesla should be valued as an automobile company or as a technology company. In practice, these two issues could not be separated: Tesla's principal source of revenue would be its cars, but realizing the expectations of earnings growth that were implicit in Tesla's share price required Tesla to maintain technological leadership in electric vehicles. Given that Tesla's rivals were some of the world's largest industrial companies—Toyota, General Motors, Ford, Volkswagen, and Renault–Nissan, to name a few—this was a daunting prospect.

The 21st century saw the Second Coming of electric cars. Electric cars and buses were popular during the 1890s and 1900s, but by the 1920s they had been largely displaced by the internal combustion engine.

Most of the world's leading automobile companies had been undertaking research into electric cars since the 1960s, including developing electric "concept cars." In the early 1990s, several automakers introduced electric vehicles to California in response to pressure from the California Air Resources Board. However, the first commercially successful electric cars were hybrid electric vehicles (HEVs). Sales of HEVs in the US grew from 9,350 in 2000 to 352,862 in 2007. By far the most successful HEV, both in the US and globally, was the Toyota Prius, which by early 2010 had sold 1.6 million units worldwide.

Mass production, plug-in electric vehicles (PEVs) were first launched in 2008. There were two types of PEV: all-electric cars—of which the pioneers were the Tesla Roadster (2008), the Mitsubishi i-MiEV (2009), the Nissan Leaf (2010), and the BYD e6 (launched in China in 2010)—and plug-in hybrid electric vehicles (PHEVs) which were fitted with an internal combustion engine in order to extend their range. General Motors' Chevrolet Volt, introduced in 2009, was a PHEV.

However, there were also a number of other types of battery electric vehicles (BEVs). Some of these were highway-capable, low-speed, all-electric cars such as the Renault Twizy and the city cars produced by the Reva Electric Car of Bangalore, India. There were also various types of neighborhood electric vehicles (NEVs) intended for off-road use—these included golf carts and vehicles for university campuses, military bases, industrial plants, and other facilities. Global Electric Motorcars, a subsidiary of Polaris, was the US market leader in NEVs. Most NEVs used heavier, but cheaper, lead–acid batteries.

Electric motors had very different properties from internal combustion engines—in particular they delivered strong torque over a wide range of engine speeds, thereby dispensing with the need for a gearbox. This range of torque also gave them rapid acceleration. Although electric motors were much lighter than internal combustion engines, the weight advantages were offset by the need for heavy batteries—which were also the most expensive part of an electric car, costing from $10,000 to $25,000.

Electric cars were either redesigns of existing gasoline-powered models (e.g., the Ford Focus Electric and Volkswagen's e-Golf) or newly designed electric cars (e.g., the Tesla Roadster and Nissan's Leaf). Complete redesign had major technical advantages: the battery pack formed part of the floor of the passenger cabin, which saved on space and improved stability and handling due to a lower center of gravity.

Predictions that electric cars would rapidly displace conventionally powered cars had proved false. In 2009, Frost & Sullivan had predicted that the market for electric vehicles (including hybrid electric vehicles) would grow to 0.6 million units worldwide in 2015—about 14% of new vehicles sold.[3] In 2014, global registrations of electric cars totaled 340,000. Although this was a 70% increase on 2013, it was a tiny fraction of the total automobile market. The US was market leader in terms of

578 CASES TO ACCOMPANY CONTEMPORARY STRATEGY ANALYSIS

TABLE 1 Sales of leading models of plug-in electric cars in the US during January to May (units)

	2015	2014
Tesla S (estimated)	9,200	9,000
Nissan Leaf	7,742	8,301
Chevrolet Volt	4,400	5,290
BMW i3	3,900	336
Ford Fusion PHEV	3,563	3,553
Ford C-max Energi PHEV	2,900	2,415
Toyota Prius PHEV	2,426	5,988
Chevy Spark	1,559	454

Source: evobsession.

numbers sold, yet electric cars accounted for a mere 0.74% of total car sales. During 2015, the market for electric cars, especially in the US, was adversely affected by lower oil prices: total sales for the first five months of 2015 were little changed from the year-ago period (Table 1). However, electric car sales in China grew rapidly, overtaking the US as the largest market for electric cars.

While oil prices were an important factor influencing consumer choice between gasoline and electric cars, government incentives were even more important. Norway had the highest penetration of electric cars (14% of the market in 2014). This reflected incentives that included exemption from purchase taxes on cars (including VAT), road tax, and fees in public car parks; electric cars were also allowed to use bus lanes.

"Range anxiety"—the threat of running out of battery charge and the limited availability of charging stations were seen as the primary obstacles to the market penetration of all-electric PEVs. However, both issues were being resolved. Between 2015 and 2018, the range of EVs was expected to double—most EVs would then have a range of close to 200 miles (though still far from the 265-mile range of the Tesla S (with an 85 kWh battery pack). Charging stations were widely available in most urban areas, but they were sparse in many rural areas.

While most experts expected the plug-in electric car to be the primary threat to conventional cars, it was not the only zero-emission technology available to automakers. Fuel cells offered an alternative to plug-in electrical power. Fuel cells are powered by hydrogen which reacts with oxygen from the air to create electricity that then drives an electric motor. Fuel cell technology was developed during the space program and became applied to experimental land vehicles during the 1960s. Although a number of automakers had developed prototypes of fuel cell cars, only Toyota, Hyundai, and Honda had marketed cars powered by fuel cells. Since fuel cells consume hydrogen, a key factor limiting the adoption of fuel cells was the absence of a network of hydrogen fueling stations.

Tesla Motors: Product Launches

Elon Musk was a South African-born, serial entrepreneur with interests in e-commerce, renewable energy, and space travel. He had co-founded Zip2, which provided web-based software to publishing companies, and then PayPal, which earned him $165 million when it was acquired by eBay. His next start-ups were SpaceX, which would develop space launch vehicles, and SolarCity, which aimed to become "the Walmart of solar panel installations."

Tesla Motors Inc., founded in 2003, was named after Nikola Tesla, the pioneer of electric motors and electrical power systems in the late 19th century. In 2004, Musk became lead shareholder and chairman of Tesla Motors. He took over as CEO in 2008, and two years later Tesla Motors' shares began trading on the NASDAQ market.

Tesla's first car, the Roadster, launched in 2007, was a sensation. Priced at $109,000, it was a luxury sports car. Capable of accelerating from 0 to 60 miles per hour in less than four seconds, it was faster than most Ferraris. Its range of 260 miles on a single charge far exceeded that of the plug-in cars being developed by other automakers. The car became a favorite of Hollywood celebrities and a statement of environmental responsibility by the super-rich. The car's battery was built by Tesla from lithium-ion battery units supplied by Panasonic, its body was built by Lotus in the UK, and it was delivered direct to the final customer without using dealers. Only 2,500 Roadsters were produced between 2007 and 2012, but it attracted huge publicity and is credited with changing public perceptions of electric cars.

The Model S was Tesla's first mass production car. A prototype was displayed in March 2009 and the car was launched in 2013. The Tesla S was a four-door, five-seater sedan (with an additional third seat to accommodate two children) that came with different battery options (up to 85 kilowatt-hours) and a list price between $52,400 and $72,400. The car had a modular design developed on a flexible platform that would support multiple variants. Despite its high price (compared to other mass-market sedans), Tesla claimed that the Model S's overall user cost was about $1,800 per year—similar to that of comparable gasoline cars—as a result of Tesla's higher purchase price being offset by savings on fuel and maintenance.

The car was built at the former NUMMI plant at Fremont, California that Tesla had acquired from Toyota for $42 million. It was sold directly to consumers without using franchised dealers—the standard approach to sales and after-sales services in the auto business. Instead, Tesla opened its own directly managed showrooms in major cities throughout the world. This direct sales model conflicted with the laws of several US states, which required retail sales of automobiles to be undertaken through independent dealers. Tesla was soon involved in a flurry of legal battles. In New Jersey, New York, Maryland, Ohio, and Pennsylvania, Tesla was successful in getting state laws changed to allow it to directly sell its cars to the public; in Texas, it failed.

The Tesla S was greeted by a torrent of rave reviews. Tesla's 2014 Annual Report observed:

> Since its launch, Model S has won several awards, including the prestigious Motor Trend Car of the Year for 2013. Surveys by Consumer Reports gave Model S the highest customer satisfaction score of any car in the world in 2013 and gave Tesla Service the best overall satisfaction rating in the entire automotive industry in 2015. Model S also earned the highest safety rating in the United States by the National Highway Traffic Safety Administration.[4]

In addition to unsurpassed range and remarkable acceleration, it was praised for its stability and handling. The car's electronics were considered an advance upon those available from any other automaker. The driver's console featured a touch-screen that controlled almost all the car's functions, eliminating the need for most knobs and other controls; the car used a wireless fob instead of a key; and its software allowed the driver to adjust the car's suspension and steering behavior.

The Model S was to be followed by the Model X, a crossover between a sedan and an SUV (sport utility vehicle), built upon the same platform as the Model S, and to be launched in the third quarter of 2015.

Tesla's Technology

Tesla regarded itself as a technological leader within electric vehicles:

> Our battery pack and electric powertrain system has enabled us to deliver market-leading range capability on our vehicles at what we believe is a compelling battery cost per kilowatt-hour. Our battery packs use commercially available lithium-ion battery cells and contain two to three times the energy of any other commercially available electric vehicle battery pack, thereby significantly increasing the range capabilities of our vehicles. Designing an electric powertrain and a vehicle to exploit its energy efficiency has required extensive safety testing and innovation in battery packs, motors, powertrain systems and vehicle engineering.
>
> Our proprietary technology includes cooling systems, safety systems, charge balancing systems, battery engineering for vibration and environmental durability, customized motor design and the software and electronics management systems necessary to manage battery and vehicle performance under demanding real-life driving conditions.

However, Tesla's Sportster and Model S had, for the most part, combined existing automotive, electric motor, and battery technologies with little radically new innovation. In terms of electric motors, the technology was mature and well diffused. Tesla produced its electric motors in-house and possessed several patents relating to refinements in their design (e.g., a liquid-cooled rotor). However, the critical technical advantages of Tesla's electric motors related to their overall integration within the electrical powertrain and the software that managed that system.

Batteries

Electrical storage represented the most formidable challenge facing electrical vehicle manufacturers. The lithium-ion battery was first introduced by Sony in 1991, and soon became the dominant type of battery for laptop computers and other rechargeable electronic devices. By 2005, all the automakers developing electric vehicles had adopted lithium-ion batteries because of their superior power to weight ratio as compared with alternative battery types. For electric cars, lithium-ion cells are first combined into modules then the modules are combined into battery packs. Battery packs are controlled by software that monitors and manages their charging, usage, balancing, and temperature. The leading producers of lithium-ion batteries are shown in Table 2.

The leading automakers had each partnered with a battery producer to develop and supply batteries for their electric cars. Renault–Nissan, under the leadership

TABLE 2 The world's top-ten producers of lithium-ion batteries (in megawatt-hours)

	1st Quarter 2015	2014
Panasonic	888	2,726
AESC	361	1,620
BYD	196	461
Mitsubishi/GS Yuasa	135	451
LG Chem	114	886
Samsung	105	314
Wanxiang	62	0
Beijing Pride Power	47	121
Tianneng	38	77
SB LiMotive	37	0
Total	1,983	6,656

Source: http://cleantechnica.com/2015/05/06/10-biggest-electric-car-battery-manufacturers-are/, accessed July 20, 2015.

of Carlos Ghosn, was the most enthusiastic pioneer of electric vehicles, investing over $5.6 billion in its electrical vehicle program (which included the Nissan Leaf). This investment included a battery plant in Tennessee developed in collaboration with NEC. General Motors had partnered with LG for its supply of lithium-ion batteries.

Investments in battery plants were motivated by two factors, first, projection of a shortage of capacity for lithium-ion batteries for electric vehicles and, second, by the presence of a steep learning curve in battery production. This meant that there were substantial savings in unit costs for those producers able to expand their battery production the fastest.

Unlike Nissan, which had collaborated with NEC to develop a lithium-ion battery for its cars from scratch, Tesla used off-the-shelf lithium-ion cells bought from Panasonic. The cells were considerably smaller than those used by Nissan, hence requiring a much larger number (7,000) for the Roadster as compared with 192 for the Nissan Leaf, but avoiding some of the problem of overheating associated with lithium-ion cells.[5]

In July 2014, Tesla announced an agreement with Panasonic to build the world's biggest manufacturing plant for lithium-ion batteries. By 2020, the plant would have the capacity to manufacture 35 gigawatt-hours of battery cells and 50 gigawatt-hours of battery packs. The facility, the "Gigaplant," would cost about $5 billion—of which Tesla would invest $2 billion, Panasonic between $1.5 billion and $2 billion, and the state of Nevada would provide $1.25 billion in grants and tax breaks. The plant was located near Reno, Nevada and would begin production during 2017. The plant's annual output would exceed the entire global output of lithium ion batteries in 2013. Tesla's goal in building the plant was, first, to ensure sufficient supply of battery packs for its cars and, second, to bring down the cost of lithium-ion batteries from a cost of about $260 per kilowatt-hour in early 2015 to about $120 by 2020.

The Gigaplant would also allow Tesla to expand its sales of storage batteries for homes and businesses. At a product launch event on April 30th, 2015, Elon Musk announced its Powerwall—a battery pack for home use. Tesla offered two types of Powerwall: one to provide storage for solar-generated power (the 7 kWh model costing $2000) the other as emergency backup (the 10 kWh model costing $3500). With solar panels from SolarCity, Musk could now offer a total home generation system. In addition, Tesla would launch its Powerpack—a large capacity power storage unit for business and utilities at a cost of $250 per kilowatt-hour. Only a week after their launch, Bloomberg estimated that Tesla had taken $179 million in orders for Powerwalls and $635 million for Powerpacks. As a result, all Tesla's 2016 scheduled production of these two products had been pre-sold.[6]

Of Tesla's patents and patent applications up to the end of 2012, one-third related to batteries and another 28% to battery charging.[7] Its battery patents related mainly to the configuration of batteries, their cooling and temperature management, and systems for their monitoring and management. Tesla undertook limited research into battery chemistry, but monitored closely developments elsewhere (see Exhibit 1). Musk was skeptical of claims of major breakthroughs in battery technology, noting that most battery inventors were "long on promises and short on delivery." However, in May 2015, Tesla hired Jeff Dahn of Dalhousie University, one of the inventors of the nickel-manganese-cobalt battery.[8]

Despite widespread excitement that Tesla's revenues from batteries could outstrip those from cars, *Scientific American* noted that, first, Tesla did not possess any breakthrough technology in batteries and, second, while Tesla had some cost advantages over other suppliers of battery packs, it was not clear that this cost advantage was sustainable.[9]

The Quest for a Better Battery

The quest for a cheaper way of storing electricity was viewed as one of the greatest challenges in industrial R & D, most efforts focused upon improving lithium-ion batteries. Technical developments included:

- developing electrodes that combined lithium with other elements (Electromechanical Technologies Group at Berkley Livermore National Laboratories);
- providing thin-film coatings for the positive electrode (Stanford University);
- Using solid or gel-like electrolytes (Oak Ridge National Laboratory).

Innovatory battery technologies were also being developed by start-up companies:

- The British appliance maker Dyson, together with General Motors, had invested in Sakti3, which was developing solid-state batteries that had a potential cost-to-power ratio of $100 per kilowatt.
- EOS Energy Solutions was producing huge zinc-based batteries whose cost of $160 per kilowatt-hour made it viable for utilities to store electricity.

Sources: "Charge of the Lithium Brigade," *The Economist Technology Quarterly* (May 30, 2015); "Battery Revolution: A Clean Leap Forward," *Wall Street Journal* (March 16, 2015).

Battery Charging

If the range of its cars was one clear advantage that Tesla had over its competitors, the other was in battery charging. Tesla's Superchargers offered the world's fastest recharging of electric vehicle batteries. A Supercharger delivered up to 120 kWh of direct current directly to the battery. As a result, a 30-minute charge from a [illegible] compared to just 30 miles with a 30-minute charge from a public charging station. The speed of the Supercharger is a result of the technology embodied in the Supercharger, the architecture of Tesla's car battery packs, the high voltage cables that feed the battery, and the computer system that managed the charging process. At the end of 2014, Tesla had 380 Supercharger stations in North America, Europe, and Asia which provided free charging to Tesla owners. In addition, there were 1000 locations in hotels and other locations in North America and Asia with Tesla wall connectors for free charging of Tesla cars.

In June 2015, Tesla had about 64 patents relating to its charging system. These related to the design of connectors and cables, systems for voltage and optimal charge rates, management systems for charging stations that charged multiple vehicles, and several other aspects of the charging process.

However, despite the superiority of Tesla's proprietary changing system, this did little to assist the general inadequacies of the electric vehicle charging infrastructure. The critical problem was not a shortage of charging stations but multiple systems. There were two problems:

1. There were two competing technical standards for fast charging: the CHAdeMO standard supported by Nissan, Mitsubishi, and Toyota and the SAE J1772 standard supported by GM, Ford, Volkswagen, and BMW. Tesla's proprietary charging system was not compatible with either, hence to use the large number of CHAdeMO and SAE J1772 charging stations, Tesla owners needed to buy special adapters.
2. Multiple networks of charging stations with different systems of payment. In the US the biggest network of fast-charging stations was owned by ChargePoint, which required users to purchase an annual subscription. In China, the leading provider of charging stations was the State Grid, a major electricity supplier. However, its charging stations could not charge Tesla cars. In several European countries, leading automakers (notably Renault–Nissan and Daimler) had collaborated with national power utilities (e.g., EDF in France and ENEL in Italy) and national governments to provide national networks of charging stations in each country. Tesla had built its own network and bundled the cost of charging into the price of the car.

Tesla Opens Its Patents

From its earliest days, Tesla had taken a rigorous approach to protecting its intellectual property. In its 2012 Annual Report it stated:

> Our success depends, at least in part, on our ability to protect our core technology and intellectual property. To accomplish this we rely on a combination of patents, patent applications, trade secret, including know-how employee and third party non-disclosure agreements, copyright laws, trademarks, intellectual property

licenses and other contractual rights to establish and protect our proprietary rights in our technology.[10]

Hence the amazement when, on June 12, 2014, Elon announced:

> Tesla Motors was created to accelerate the advent of sustainable transport. If we clear a path to the creation of compelling electric vehicles, but then lay intellectual property landmines behind us to inhibit others, we are acting in a manner contrary to that goal. Tesla will not initiate patent lawsuits against anyone who, in good faith, wants to use our technology.[11]

The announcement was followed by a flurry of speculation as to the reasons why Tesla would want to relinquish its most important source of competitive advantage in the intensifying battle for leadership in electric vehicles. In the ensuing debate, four possible rationales emerged:

- Elon Musk's personal commitment to the displacement of petroleum fueled automobiles by electric vehicles;
- a calculated judgment that Tesla's interest would be better served by speeding the development of an electric vehicle infrastructure and a bigger, more efficient set of firms supplying parts and services to Tesla than by holding on to its proprietary technologies;
- an attempt to influence the emergence of standards in the industry so that Tesla's approaches to battery design, charging technology, electric powertrains, and control systems would dominate the electrical vehicle industry;
- the desire to boost Tesla's visibility and reputation within the industry.

Professor Scott Shane of Case Western University expressed surprise over Tesla's decision: typically the only way that startups can offset the resource advantages that incumbent firms possess is by building a strong patent portfolio. However, Shane went on to observe that the biggest challenge facing Tesla was not competition but the slow adoption of electric cars, hence, "the benefits of spurring customer adoption of electric cars outweigh the costs of strengthening competitors."[12]

Writing in the *Harvard Business Review*, Paul Nunes and Joshua Bellin probed the strategic considerations motivating Tesla's opening-up of its intellectual property. They pointed first to Tesla's view of its business environment as an interactive ecosystem rather than as a traditional industry. Tesla's view was more Silicon Valley than Detroit, including its abandoning of traditional dealer networks in favor of selling direct to consumers and its patterns of collaborative interactions with the suppliers of electronic hardware and software. Within its ecosystem, Tesla's primary role was as an innovator of electrical storage and battery solution, by adopting an open-source approach to its technology, Tesla could strengthen its centrality within its ecosystem.[13]

However, the fact remained that Tesla's technical strengths were not primarily its patent portfolio—indeed, Tesla's patent portfolio was smaller than those of most major auto companies (Table 3). Tesla's strengths were much more in the know-how needed to combine existing technologies in order to optimize vehicle performance, design, add-on features, and the overall user experience.

TABLE 3 Automobile companies' patents relating to electric vehicles, 2012

Company	Number of US patents
General Motors	686
Toyota	663
Honda	662
Ford	446
Nissan	238
Daimler	194
Tesla Motors	172
Hyundai	109
BMW	41

Sources: M. Rimmer, "Tesla Motors: Intellectual Property, Open Innovation, and the Carbon Crisis," Australian National University College of Law (September 2014); M. Shah, "Auto Industry May Ignore Tesla's Patents," Envision IP (June 26, 2014).

Disrupting the Auto Industry

Tesla's willingness to share its patents only added to the uncertainty over the extent to which Tesla represented a disruptive force within the auto industry.

Tony Seba, a prominent advocate of clean energy, argued that "the electric vehicle will disrupt the gasoline car industry (and with it the oil industry) swiftly and permanently ... Even worse from the standpoint of gasoline and diesel cars, the EV [electric vehicle] is not just a disruptive technology; the whole business model that the auto industry has built over the past century will be obliterated."[14]

Others downplayed the whole issue on the basis, first, that Tesla's patents did not represent a significant barrier to other companies and, second, it probably did not make much sense for Tesla to devote time and money to litigating infringements of its patents. Professor Karl Ulrich of Wharton Business School stated: "I don't believe Tesla is giving up much of substance here. Their patents most likely did not actually protect against others creating similar vehicles." He suggested that patents are increasingly less about protecting innovations from imitation as strategic bargaining chips: "Big technology-based companies amass patent portfolios as strategic deterrence against infringement claims by their rivals ... Tesla is essentially deciding it doesn't want to spend money litigating patents, which is a great decision for its shareholders and for society."[15]

In the debate over, whether or not the electric automobile represented a disruptive innovation, Clay Christensen and his team at Harvard Business School, were emphatic that Tesla's electric cars were definitely not such a disruptive force. While classic disruptive innovations typically target overserved customers with lower-performance products at a lower price (or open up entirely new market segments), Tesla offered incrementally higher performance at higher prices. A further feature of disruptive innovation is that incumbents typically have low incentives to adopt the disruptive innovation—yet all the major auto firms had been working on developing electric cars for years. If Tesla is not a disruptive force, who is in the automobile market? A more likely source, according to Professor Christensen's associate Tom

Bartman, was the neighborhood electric vehicle: a cheap, low-powered, easy-to-park vehicle that is well suited to urban transportation and can readily be upgraded for use on public roads.[16]

If Tesla Motors was going to meet strong competition from exceptionally well-resourced competitors—companies such as GM, Renault–Nissan, Ford, Daimler, VW, and BMW—it lacked clear technological advantages over these firms, and if it also was likely to meet competition from the manufacturers of NEVs in mass-market electric cars, how feasible was Elon Musk's goal that Tesla would be "a leading global manufacturer and direct seller of electric vehicles and electric vehicle technologies"?

Appendix

TABLE A1 Tesla Motors Inc. financial data ($million)

	2014	2013	2012	2011	2010
Revenues	3,198	2,013	413	204	117
Gross profit	882	456	30	62	31
Research and development	465	232	274	209	93
Operating profit	(187)	(61)	(394)	(251)	(147)
Net profit	(294)	(74)	(396)	(254)	(154)
Total assets	5,849	2,417	1,114	713	386
Total long-term obligations	2,772	1,075	450	298	93
Capital investment	970	264	239	198	105

Notes

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4. Tesla Motors, Inc. 10-K report for 2014: 4.
5. See Tesla Motors, HBS Case No. 9-714-913 (2014): 7.
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