

Dov Dvir
Orit Emet

Better Place – Revolutionary Idea: The Vision and Reality

In the 2005 Forum of Young Global Leaders at Davos, Switzerland, participants were asked about their personal vision regarding an important issue: how can we create a better world in 2020? This question changed the course of Shai Agassi's life. Agassi, an entrepreneur and a brilliant and successful manager in the international corporation SAP, took on the challenge and argued that the world would be a better place once it overcame its dependence on oil. Trying to bring about a reality that is free of oil products, Agassi focused on the key industry that consumes approximately 45% of the global oil output – the transportation industry. Agassi researched alternative solutions to the internal combustion engine, such as fuel cells, hydrogen and ethanol, but found them to be impractical in the near future; therefore, he focused on the technological development of a motor powered by a rechargeable electric battery. Agassi was certain that if electric cars will be convenient and cheap, everyone would prefer them. Determined to lead a paradigm shift in the automotive industry and make electric cars competitive with internal combustion vehicles, Agassi developed a model that answers the two main barriers to electric transportation: high costs and inconvenience. On the matter of cost, he proposed separating between ownership of the car and ownership of the battery, while on the matter of convenience, he proposed laying out an extensive electrical infrastructure that would include charging spots and battery swap stations. The battery swap stations will enable doubling the limited battery range. Batteries would not be included in the car's price and drivers would pay a monthly service fee for electrical infrastructure services.

In 2007, Shai Agassi founded Better Place, a venture designed to realize his technological and social vision. Agassi raised development capital at the amount of USD 200 million, an outstanding amount for a startup company. The next stage, and a significant milestone on his way to commercialization, was to enter an agreement with the Renault-Nissan automobile manufacturer group, dealing with Renault's development and manufacture of an electric car featuring a swappable battery, with Better Place undertaking on its part to acquire 100,000 electrical cars and build a suitable electrical infrastructure. Better Place built, within a short period of time, an extensive electrical infrastructure in Israel and in Denmark, and established international collaborations which included Australia, the Western US, Canada and Hawaii, in addition to an experimental project in Japan. In addition, Better Place developed charging posts, automatic battery swap stations and smart, integrative management software for the charging network, the first of its kind anywhere in the world. This software allows ride management and smart navigation, and directs the driver to the closest charging spot or battery swap station in real time. Better Place invested 850 million dollars, mostly in the development and construction of electrical car infrastructure throughout the world, before it even started selling electric cars. This investment was based on the assumption that having no appropriate infrastructure is a barrier to consumer demand. The company focused, in the technological feasibility stage, more on proving the model's viability and less on economic

efficiency, in order to be able to continue attracting investors, car manufacturers and other customers.

In its years of operation, Better Place successfully raised much development capital and aroused wide public interest and international publicity. Thousands of articles reviewed and followed its activities with great interest. The vision took shape through a Renault electric car, the Renault Fluence Z.E. (Zero Emission). The car, with a declared driving range of 100 miles (approx. 160km) was launched in July 2011. In Israel, it was sold at a price of NIS 125,000, excluding monthly charging service fees. Consumers, who were required to acquire new buying and driving habits, were not quick to adopt the innovative new vehicle. In reality, the driving range was only 110km, and in Israel, much public criticism was heard regarding the concern of a potential monopoly for Better Place, together with the understanding that the electric car is expensive and is not so green, since electricity in Israel is generated from nonrenewable resources.

Better Place expected to sell 100,000 cars in 5 years, in Israel and Denmark. This when in 2007, the number of electric cars sold globally was less than 1,000. This number in Israel constituted half of all internal combustion engine vehicles sold in that year. The Company built in Israel, by 2013, 1,800 charging posts and 31 battery swap stations. The expectation to sell hundreds of thousands of cars was proven false, and only around 1,000 cars were sold in Israel, and 400 cars in Denmark.^[3] In 2012, after six years of operation and USD 850 million in raised capital, due to the poor operational performance and lacking another auto manufacturer willing to manufacture an electric car with a detachable battery, investors stopped injecting additional funds into the company, and in May 2013 Better Place filed for bankruptcy. Following a failed 2-year attempt at resurrecting the Company, it was finally shut down completely.

At the same time, "2013 marked the year in which global sales of Nissan's fully battery electric LEAF reached 100,000 units, and Tesla has already sold 25,000 of its recently introduced Model S".^[28] Sales marked a dramatic rise of 230% in comparison with the previous year's sales, with double the number of models on offer. In Norway, sales exceeded twelve percent of all sales, as the result of aggressive government incentives. It seemed that the electric car industry had progressed from the development stage to a more mature and stable stage (Exhibit 1). New players appeared on the market and technological improvements were made, including an electric battery that enables a driving range of approximately 400km. The electric car started establishing a secure place for itself in the auto industry. A McKinsey report stated: "... After decades in which the traditional internal combustion engine (ICE) has been the dominant automotive powertrain, the industry has started to diversify its powertrain portfolio." The first alternative was the internal combustion engine vehicle, the second was the hybrid vehicle, which has gained a significant market share in the last two decades, and finally the third alternative was an electric vehicle powered by a rechargeable battery.^[27]

Better Place went bankrupt, was shut down and is no more. Many people discussed this matter in an attempt to understand Better Place's failure. Many asked whether it could it have gone otherwise. Insights can be obtained by examining the company's vision, the way it conducted its business, important decision making at key junctions and the reality in which the company operated. Better Place served as a catalyst in changing petroleum product consumption patterns in the world in general and in the auto industry in particular. The vision of reducing oil dependence has started materializing. Establishing the place of the electric car in the auto industry, as well as Agassi's ambitious 2008 goal to sell 100,000 electric cars in 5 years, was realized not by Better Place but by the Renault-Nissan Group and by Tesla.^[27]

Origins of the electric car: The first electric vehicle was invented in the late 19th century. It was quiet, easy to operate, and travelled at a speed of 110 km/h with a range of 100 km between charges. A few years later, the internal combustion engine, running on fuel, was

developed. The electric vehicle started disappearing from the transportation scene despite its great potential. Some of the reasons for this were Henry Ford's development of mass production, the increased availability of oil and the widespread development of the United States' system of roads.^[32] The electric vehicle was expensive, had limited driving range and required prolonged charging of its lead battery.^[29] In 1896, Hartford Electric offered replacement battery services, in order to overcome the limited driving range of electric vehicles. The company provided this service until 1924. The mass production of electric vehicles ended in 1930, except for forklifts, and miniature cars for golf courses, hospitals, electric scooters and electric trains. In 1972, Daimler-Benz presented an electric van, the LE306, which was equipped with a quick battery swap mechanism – the discharged battery was pulled to one side while at the same time a new, charged battery was pushed in from the other side. 89 units were manufactured and used for trials in electric propulsion. The van had a driving range of only 65km. The US Postal Service bought electric distribution vehicles from American Motors in early 1975, but in light of the limited driving range, their manufacturing was ceased.^[5]

The market's development: Between 1970 and 1980, the market saw an increased interest in electric vehicles, in light of global warming and the anthropogenic climate crisis resulting from human activities, mainly industrial activities and the burning of fossil fuel to generate energy and for transportation. It seemed the change trend and the global climate instability would have far-reaching implications.^[8] Awareness of this issue led to the legislation of environmental regulations in the US, such as the Clean Air Act, designed to protect public health by regulating emission levels of air pollutants emitted by fixed and mobile sources. The enacted regulations led to plans with ambitious goals for "zero air pollution" vehicles,^[32] (Exhibit 2).

The macroeconomic environment: The energy crisis that began in 1973 and the increasingly pessimistic forecasts regarding the availability of oil enhanced the prestige of the electric car. Sharp increases in oil prices reflected a trend of volatility with global economic implications. Experts attributed the increase in oil prices to several factors: on the one hand, there was the increasing demand to oil products due to the economic development of China and India, which caused a significant increase in the number of motor vehicles; while on the other hand, with respect to supply, reports by the US Department of Energy pointed to a decrease in petroleum resources in the world and reinforced concerns regarding the depletion of oil resources.^[12] Notwithstanding increased public attention, the electric vehicle and electric battery technology could not compare with traditional vehicles, in either price or reasonable driving range, and therefore objectives were frequently changed. Still, new investments led to innovative developments in the auto industry as the result of the changing transportation scene.^[32]

New developments – vehicles with an alternative engine: auto manufacturers worldwide stepped up their R&D efforts with the purpose of promoting the manufacturing of vehicles with decreased pollution levels, using alternative technologies such as hybrid, electric, ethanol powered and hydrogen fuel cell vehicles. In 1997, Toyota presented the first mass produced hybrid vehicle – the Toyota Prius, which had a gasoline engine and an electric engine side by side. The double mechanism solved the issue of the electric battery's range. The benefits of this method were: decreased motor noise, better fuel economy and a decrease of approximately 40% in emission levels, in comparison with an internal combustion car of a similar size. Toyota established itself as the market leader, winning several awards for innovativeness, design and environmental protection. In light of its success, the hybrid car entered key markets. In 2008, Honda presented competing hybrid vehicles, the Honda Civic, Accord and Insight, marking the beginning of the competition over the "green car." Hybrid vehicle sales in the US since 2000 increased significantly, reaching approximately 300,000 vehicles in 2007. The Prius, since its launch, has seized each year a share of approximately

50% of total hybrid vehicle sales. In Japan, most auto manufacturers have marketed hybrid models in 2010.^[32]

Hydrogen powered vehicles: In 1997, GM developed a vehicle powered by hydrogen fuel cells. The vehicle was double in weight in comparison with a similar, conventionally powered car. The same year, Daimler-Benz allocated USD 350 million, together with Ballard Oil Company, to create a hydrogen powered engine, with an annual manufacturing forecast of 100,000 vehicles by 2005. In 2001, Chrysler launched the Chrysler Natrium, which manufactured the hydrogen itself. The car is very quiet and has a range of 300 miles. Its main problem is that the fuel cells are expensive to manufacture, due to the rare materials they require, among them platinum.^[13]

Electric vehicles until 2005: In 1996, General Motors made great effort to mass produce a family electric car, the EV1, with a driving range of 50 miles, for the postal services; however, due to high costs, production was stopped in 2001.^[31]

Shai Agassi's model: Shai Agassi, a computer engineer, founded at the age of 23, together with his father Reuven Agassi, a startup company called Quicksoft. The company dealt with software marketing and was sold to Apple. In 1996, they founded another startup company, called Top Tier Software. The company searched for a solution to the surplus of information accumulated from different software in an organization. Their unique approach to solving new problems was to look for existing solutions to other problems, and utilize them in solving present problems.^[18] Agassi was involved in all key functions in the company, from the development of its strategic plan to technological development and finances. The company was sold to the international corporation SAP in March 2001 in consideration for USD 400 million, and Agassi was appointed the President of the Products and Technology Group at SAP AG. In 2004, Agassi was picked by Time Magazine and the CNN website as one of 20 'most influential' people worldwide. Agassi came up with a techno-social vision that champions the reduction of global dependence on oil, and developed a model to enable the transition to electric transportation worldwide. Agassi approached heads of state to try and get them interested in the model. Shimon Peres, President of the State of Israel, supported the idea in light of how realizing this vision could contribute to Israel and the world. Together they approached several international auto manufacturers. The only one to accept was Carlos Ghosn, CEO of Renault-Nissan. Ghosn said he has both the right car and the right battery. Renault-Nissan skipped the hybrid vehicle stage, Ghosn's explanation being the minimal saving in fuel consumption in hybrid vehicles, which is only twenty percent, and Ghosn's belief as a result, that the hybrid car will not herald countries' freedom from their dependence on oil.^[1] Better Place signed an Agreement with Renault in January 2008, at the heart of which was Renault's development and manufacturing of an electric car with a detachable battery and Better Place's purchase of 100,000 cars over five years and deployment of compatible electric infrastructure.^[6] Agassi quit his prestigious position in SAP in March 2007 and started raising capital to realize his vision. Idan Ofer, through the Israel Corporation, invested USD 100 million, and Michael Granoff together with Morgan Stanley Bank invested an additional USD 70 million. Agassi believed a larger amount is necessary, and Idan Ofer agreed to invest USD 30 million of his private capital.^{[6] [17]}

In October 2007, Better Place LLC was founded and incorporated as an international corporation pursuant to the laws of the State of Delaware, USA. The Company operated in Palo Alto and in Rosh Haayin in Israel. Shai Agassi served as the CEO of the international corporation while Idan Ofer served as the Chairman. The Company's CEO in Israel was Maj. Gen. (Ret.) Moshe Kaplinsky. In 2009, the Company changed its legal status to that of Better Place Inc. The company's vision was: to decrease global dependence on petroleum and accelerate the use of electric transportation, with the goal of reducing air pollution – most of which is generated by the use of gasoline and diesel powered vehicles – while complying with environmental regulations and standards.^[6] In late 2008, journalist Thomas Freedman wrote

in Haaretz an article titled *Shai Agassi is the Next Steve Jobs*. In his article he stated that Agassi is offering a new transportation platform, just as Steve Jobs presented an alternative to the music industry's model.^[15]

The economic model: Agassi developed an economic model that offered a solution to the main problems of electric vehicles: high cost and inconvenience due to the limited driving range and the lack of compatible charging infrastructure. In order to allow electric vehicles to compete in the market, he created an overall solution that will create unique added value to consumers. In 2007, an electric vehicle battery cost approximately \$15,000 and constituted the main factor in the high initial cost of electric vehicles. Agassi proposed to separate ownership of the electric vehicle and ownership of the battery. Better Place would purchase the battery and rent it to the consumer in consideration for a monthly fee by use, and thus the price of the electric vehicle will be made equal to the price of an internal combustion engine vehicle. The principle of the separation of ownership will allow customers to gradually pay the battery costs. This solution was taken from the mobile telephone industry, where consumers pay their network service providers for telephone call minutes. The company's goal was to create value at a lower total cost. The electric vehicle would be priced like a fuel powered vehicle, with the cost of electricity cheaper than the cost of fuel. The electric vehicle has few moving parts, and therefore the cost of regular maintenance would be significantly lower. According to Better Place's estimate, the cost of maintenance should be 40% lower, and over time, the overall ownership of the car would be profitable to the consumer. The company estimated that the costs to its customers would be: \$0.08 in electricity per mile in 2010, \$0.04 per mile in 2015 and \$0.02 per mile in 2020. The price would decrease in light of expected technological improvements in the battery, as its lifespan increases, reducing the overall cost. These costs do not include the service fees for charging and swapping batteries. Agassi estimated that the electric vehicle would cost approximately one half of an ordinary vehicle, and undertook to purchase 100,000 cars in five years. In a TED talk he gave in February 2007, Agassi explained that his estimate relies on McKinsey's forecast of one million electric cars by 2020. The model also provided a solution to the issue of convenience. The driving range limitation created "a range anxiety" among drivers. The company would act to build and deploy a comprehensive infrastructure envelope for electric vehicles that would include: charging spots, battery swap stations and charge management software. The charging spots and battery swap stations would serve as "gas stations" for electric vehicles for long distance drives. The swap station would operate automatically, similarly to a carwash facility, without the driver having to leave the car. An automatic mechanism would replace the discharged battery with a fully charged battery, in less than five minutes.^[29] The price paid by the consumer would cover charging costs and accessory costs with respect to maintenance and warranty. For Better Place, consumers' monthly payments would constitute partial financing for the great investment required for spreading charging and battery swap infrastructure throughout the world. The swap station was planned to cost \$500,000 per unit. Better Place planned to deploy approximately 150,000 charging points and 100 swap stations in the first market at a cost of approximately USD 200 million. The cost of manufacturing the batteries was estimated at USD 12,000, with a shelf life of 2,000 recharges or 8 years. Better Place would have to hold a stock of batteries in the quantity of cars sold plus additional batteries to be placed at swap stations.^[32]

The company's operation: In its beginning in October 2007, Better Place had 60 employees and operated at two centers, in Palo Alto and in Rosh Haayin. It already worked to expand its international operation in Israel, Denmark, Australia, the USA and Canada. The initial target audience it aimed at was organizations that manage car fleets with significant mileage.^[6] Better Place also developed a special-purpose pricing model for other market sectors, in accordance with their regular driving needs. The company was dedicated to quality and a high level of service while promoting and complying with international standards. One example is the charging posts. The company was not satisfied with the charging posts on the market. The company's engineering and marketing teams specified the safety, engineering, design and

operational requirements for charging posts, and two Israeli companies were picked to lead their construction. For the design, Better Place hired the international design firm New Deal Design (Exhibit 4). Electric charging required development of smart charging posts which would allow extending battery life, directing cars to available charging posts and managing the charging of a million cars, without putting an excessive burden on the national electric grid.

The Company worked to create a wide spread of charging spots in private and public parking spots (parking lots, shopping malls, hotels, companies holding large car fleets etc.) and also invested in the unique development of a battery swap station (Exhibit 3). The cost of development in reality was approximately USD 3 million. At the automatic swap stations, charging the discharged batteries was scheduled for "dead" hours, when the load on the national electric grid is minimal.^[6] In addition, the Oscar software was developed, enabling smart and integrative management of the electric vehicle charging grid. The software is based on two interfaces. The first was installed on a computer screen in the electric car, , connected to Better Place's charging infrastructure, including a navigation system that allows the driver to locate, in real time, nearby charging spots and battery swap stations. The information allows efficient route planning while taking into consideration the energy needs of the car and the electric grid. A second interface, installed in a command and control center at the company's headquarters, enables the management of hundreds of thousands of electric cars that are connected to the electric grid and receive charging services. In addition, this included regular customer support service, 24 hours a day, which would perform preliminary problem identification and remote troubleshooting. The system would calculate electricity consumption costs and would charge the consumer in accordance with his consumption. Better Place made great efforts to become a global supplier of electric vehicle infrastructure services. Therefore, in its operation, it was not satisfied with covering just one link in the present value chain of the transportation and infrastructure industries, but rather offered a completely new system of arrangements and functions. With respect to the transportation infrastructure, it worked together with local and national authorities to lay out a brand new transportation infrastructure that included new charging spots and battery swap stations. In the auto industry, it acted as an importer that also provides comprehensive charging and maintenance services to drivers. Its success depended on forming successful partnerships with car manufacturers, municipalities, electricity authorities and governments, and in securing financing for the project.^[6]

Barriers to entry, opportunities and risks: Electric vehicles are a convenient alternative to the internal combustion engine vehicles. They are quiet and create less pollution and can thus meet stringent emission regulations. Therefore, the electric vehicle is a significant threat to the traditional auto industry and to countries whose economy depends on oil production. The electric vehicle industry presented opportunities as well as risks. As a developing industry, it required a huge investment of capital in the development of new infrastructure. In the automotive industry, economics of scale are important, consumers are loyal to brands and new car models are planned four to six years in advance. In 2011, the Trajtenberg Committee in Israel published a report stating that the automotive industry is subject to significant centralization. The data pointed to a market failure deriving from the significant weight of leasing companies in the procurement of new vehicles, on the one hand, and their interest in used car prices on the other hand.^[9] Investment in infrastructure is one of the few fields where direct government involvement is justified, in light of the low return to an investor in comparison with market returns. The developing electric vehicle industry also entailed regulatory risks: "Electric mobility is backed with much legislation. Better Place in its operation may face the risk of failing to comply with regulatory requirements in different countries, from assembly sites to aspects of battery life. Lithium ion car batteries are a new product and may cause a hazard if used incorrectly, whether inside or outside the car, in the process of their storage, in car accidents or when disposed of as waste. Better Place's future success depends on the adoption of its solution by the wide public."^[6] The driver of the

electric car is required to adopt new approaches relating to several aspects, such as: a car that includes a detachable battery, a different way of paying for the car, different form of ownership of the car and different charging practices that materially differ from familiar fueling practices. In addition, the driver was required to assume risks related to uncertainty as to the reliability and safety of the electric car, as well as uncertainty regarding the car's value after a certain period of use, the regulations that would be enacted and their economic implications. Another risk was the manner of commitment to Better Place. Since it is impossible to charge the car independently, there was a concern that Better Place would establish itself as a monopoly without any alternative or competition. These risks and questions could be clarified only after a certain trial run.

Electric vehicle industry – players in the market: Like Better Place, several additional players were active in the market, attempting to grab as large a market share as possible – auto manufacturers, government agencies and various technology developers and integrators. Governments had a significant effect on the forming market. Most auto manufacturers started manufacturing hybrid vehicles. The market did not signal any clear trend yet, and each company relied on several partnerships that were crucial to its success in the electric vehicle industry.^[32]

Auto manufacturers and electric vehicles: In 2009, most auto manufacturers invested in the development of electric vehicles – General Motors, Toyota, Chrysler, Mitsubishi, Ford, BMW and Hyundai. Honda was the exception, declaring that battery technology has not yet matured. Honda CEO Takeo Fukui said in 2009, "*We are thinking about plug-in hybrids, but we aren't thinking about commercializing one right away.*"^[32] Unlike Honda, General Motors invested much in the development of the Chevrolet Volt, and continued its investment in infrastructure to support the manufacturing of a plug-in hybrid car. The company reached sales of 100,000 Chevrolet Volt cars in 2015. Toyota announced its plans for the development of a plug-in model similar to the popular Prius. Planning, included the sale of one million hybrid cars in 2010 and offering a hybrid version of all models.^[32] In addition, new auto manufacturers entered the electric vehicle market, for example Tesla, the first American manufacturer to manufacture a fully electric car. In 2008, the Tesla Roadster entered the market, featuring a lithium ion battery with a driving range of 320 kilometers per charge. The car was designed for a luxury niche market and was marketed at a starting price of \$100,000. Only 1,000 cars were manufactured in 2009; however, the company expanded its manufacturing ability and by 2015, 100,000 cars were sold. In October 2014, the Company launched an upgraded model, the P85D, in which two engines are installed, with two optional battery types (which differ in capacity and offer different driving ranges under the same road conditions and driver behavior).^[16]

Renault-Nissan launched in March 2009 the Nissan Leaf electric car, with a declared range of 160 km per charge. Renault-Nissan formed a partnership with San Diego Energy, which would build the electric charging infrastructure and even buy cars from Renault electric in the scope of 12% of San Diego's car fleet. Renault-Nissan entered a partnership with the French and Swiss energy authorities. These partnerships could have pushed out smaller startup companies. In April 2009, Nissan joined ECOtality Inc. in the USA, a chargeable battery company, which shortened charging times for electric car batteries, instead of swapping the batteries. ECOtality proposed that the electric car industry move toward rapid charging.^[32] In 2011, the Renault Leaf was declared the international car of the year and by 2013 it sold 100,000 cars.

Partnership with an auto manufacturer: On January 21, 2008, Better Place signed a memorandum of understandings with Renault, under which Renault would develop and manufacture an electric car with a replaceable battery. Better Place would incur development, maintenance and operation costs of the mobility grid for electric cars in Israel and Denmark. Better Place undertook sales of 100 thousand electric vehicles in Israel and Denmark in 2011-

2016. Renault undertook that the cars would be equipped with advanced lithium batteries, to be jointly manufactured with Nissan and Japanese corporation NEC, and that the performance level would be similar to that of a 1.6 liter internal combustion engine car. Manufacturing was planned to start in 2011.^[6] Better Place selected the lithium ion battery, which was the most advanced technology. Different companies throughout the world worked to improve battery performance with respect to driving range, and to extend shelf life and reduce costs. The agreement did not prevent Renault from developing other technologies and working with other companies on the development of fixed battery electric cars.^[32] In May 2008, in a press conference in Tel Aviv, the company presented a prototype of the electric car. Shai Agassi estimated that Renault would be willing to invest approximately USD 1.5 billion in the development of an electric car with a swappable battery. This partnership formed a first and important milestone on the road to realizing the business model.

Infrastructure industry: the electric infrastructure industry expanded quickly. New players such as Park and Power, Electromotive, ECotality and Eaton formed strategic partnerships with governments, authorities and auto manufacturers. Better Place promoted competition in the charging station market with the aspiration of setting global standards, in order to accelerate the adoption process of the electric car. Different infrastructure developers worked with a business model different from that of Better Place. Some focused on rapid charging technology for fixed battery cars, which would enable charging 80% of the battery in less than 30 minutes, posing a direct challenge to Better Place's battery swap stations. The authorities as electricity suppliers and grid administrators were key to the development of charging infrastructure. In certain cases, infrastructure developers cooperated with authorities to build charging stations, for example Better Place and Hawaii Gas. In other cases, auto manufacturers worked directly with authorities, such as the San Diego electric authority in partnership with Renault-Nissan (San Diego Gas & Electric-Nissan Partnership). In any case, it was clear that the successful development of charging infrastructure depends on authorities' ability to provide electricity without creating an overload on the electric grid. Better Place formed partnerships with main electricity authorities in certain markets, such as DONG Energy in Denmark and AGL in Australia. These authorities assumed responsibility for supplying electricity from renewable resources and assisting in laying out the charging infrastructure.^[32] In Israel, gas and coal powered power plants operate. Since electric cars could not by law be connected directly to an ordinary power socket, the company engaged in a memorandum of understandings with the Israel Electric Corporation with regard to the building of charging stations and their management in public places.^[6]

The Commercialization Plan

Israel: after signing the agreement with Renault, Better Place had to pick the place to run the project. Israel is a not-too-big transportation island and therefore an ideal laboratory. Better Place assumed that Israel, which strives for energy security, would adopt the electric car, which allows reducing economic and environmental dependence on oil. The government did enact a reduced purchase tax on an electric car, at 10% as opposed to 80% on an internal combustion engine car. In December 2009, President Peres announced in the Copenhagen Climate Change Conference that Israel would set a goal of reducing 20% of its greenhouse gas emissions by 2020.^[10] In 2009, 90% of drivers in Israel drove less than 70 km per day.^[32] As for drivers travelling longer distances, Better Place planned to lay out infrastructure from Dan in the north to Eilat in the south, including installation of charging posts at workplaces.^[6] The first electric car manufactured by Renault was planned to enter the market in 2011. In late 2008, the Company started installing 800 charging points for a field test planned for fall 2009. In March 2011, the Company inaugurated in Kiryat Ekron, the first battery swap station.^[3] Agassi declared that *"by 2020, more than 50% of all cars sold in Israel will be electric, and we expect sales of 35,000 cars as early as 2011."*^[23] The company established and laid out a charging infrastructure that allows driving throughout almost all of the country by September

2012. In 2013, 1,800 charging posts were spread across Israel, and 33 battery swap stations were under construction.^[3]

Denmark: Denmark is one of the world's most advanced countries in terms of energy conservation and use. Twenty percent of Denmark's energy is supplied through one of the world's largest offshore wind turbine farms, constructed by DONG Energy. The government of Denmark offers incentives for buying vehicles with zero polluting emission, for example the country charges a tax of up to 180% on the purchase of an internal combustion engine car, as opposed to zero percent tax on electric cars. Jens Moberg, a former senior executive in Microsoft, was appointed the CEO of Better Place Denmark and Head of the Europe, Middle East and Africa Business Development Department.^[11] In January 2008, Better Place entered an agreement with DONG Energy for the deployment of charging and battery swap infrastructure for electric cars in Denmark. The companies raised EUR 103 million for investment. Better Place announced that it would lay out in Copenhagen 50 to 60 charging stations and 100 battery swap stations. In March 2011, Better Place opened in Copenhagen, in collaboration with Renault, the first visitors' center in Europe. In late 2009, as part of the Copenhagen Climate Change Conference, Better Place held a successful pilot in which it conducted charging tests of dozens of electric vehicles using 60 charging posts which were controlled from the control center in Israel. The Fluence Z.E. was sold in Denmark at a price of \$37,000, with an extra \$1,500 for a home charger. An annual subscription plan, calculated on the basis of mileage, cost between \$3,300 and \$6,700 a year. By spring 2013, 1,400 charging spots were built in Denmark. Better Place declared that the first national charging grid was realized in Denmark in December 2012. Most charging points and battery swap stations were located in Copenhagen, Aarhus and Odense (Denmark's largest cities), as well as in over 40 small towns throughout the country.^[26]

Fluence Z.E. (Zero Emissions): In July 2011, the Company launched the swappable-battery electric car: Fluence Z.E. (**Exhibit 5**). In January 2012, the first cars arrived at Israel, where they were sold at a price of NIS 125,000 in addition to a charging payment package by kilometer. The declared driving range was 160 km. The basic package was priced according to NIS 0.65 per kilometer, at the gasoline price at the time of NIS 8.25 per liter, equivalent to a fuel consumption of 12.7 km per liter^[2] (**Exhibit 6**). The car has a conservative appearance, similar to the normal engine Renault, except for an additional 14 cm in length, designed to store the battery in the rear. The car has an electric 95 horsepower engine, energized by a 250 kg lithium ion battery. The trunk is 317 liters in volume, in comparison with 500 liters in an average family sedan. In Better Place's estimate, the all-round solution of a vehicle and electricity services would reduce the annual maintenance cost of the vehicle by 20%. The expectation for a low-cost family sedan in Israel was proven false, as was the expectation that large organizations and the public sector would adopt the vehicle. Field tests demonstrated that the driving range in reality was only 110 km. By the end of 2012, only 556 cars were sold, in comparison with a sales forecast of 4,000; however, consumers expressed their satisfaction with driving comfort and the quality of service they received.

International spread: Better Place achieved significant progress in markets like Israel and Denmark by the end of 2009. Additional countries and regions such as Australia, the San Francisco Bay Area, Hawaii and Ontario – Canada's most populated province – expressed their desire to join the project.^[32]

Australia: Better Place considered Australia an important market, due to the country's size. Australia is comparable in area to the USA; its population is approximately 21 million people who drive approximately 12 million cars. In 2009, fuel cost the consumer \$0.74 per liter, a price significantly lower than the price in Israel or Denmark. Better Place assumed that if it could succeed in the world's largest island, this will serve as a definite proof that the model can work in any country, regardless of its size. On October 22, 2008, Better Place formed a partnership with Australia's largest energy supplier, AGL, and with the Macquarie bank,

which was supposed to raise the one billion Australian dollars required for the purpose of establishing the electric infrastructure. Better Place chose Canberra as its starting point for the national electricity infrastructure deployment plan. The plan included the establishment of the charging grid in 2011, with the electric cars' arrival scheduled to 2012.^[32]

Japan: the first Asian country in which Better Place operated was Japan, which formed a large market for hybrid cars. The government offered tax benefits to promote electric cars. Japan's population in 2007 was 127 million residents driving 80 million cars. The price of fuel to the consumer was 2.5 times the price in the United States, \$1.42 per liter. In December 2008, the Company was invited by the Japanese Minister of the Environment to join the first governmental trial project of the electric car, together with auto manufacturers Honda, Mitsubishi and Subaru. Better Place was the only foreign corporation invited to participate in the project, held in the city of Yokohama. In 2009, the company presented the first battery swap station, and following the successful demonstration, Better Place received the concession from the Japanese government to conduct a pilot with electric taxi cabs. The test marked an important opportunity for the company, since in Tokyo alone, more than 60,000 cabs operate.^[32]

United States: At the end of 2008, Better Place announced its plan to develop electric vehicle infrastructure in California and Hawaii. California was a leader in its policy for adopting zero emissions transportation, and the company considered this an opportunity to develop infrastructure in its home country. In November 2008, Better Place collaborated with the governments of San Francisco, Oakland and San Jose in California. Better Place's purpose was to turn the Bay Area into the USA's electric car capital. The company estimated that laying out the charging and battery swap infrastructure would cost USD 1 billion. Better Place planned to conduct a trial with 31 electric taxi cabs in the San Francisco bay in Q1 2012. Despite progress in certain markets in the United States, Better Place did not succeed in making progress in the US as a whole, because of the fact that it would require approximately USD 200 billion to establish a supporting infrastructure for electric cars in such a large area.^[32]

Hawaii: The 50th state of the Union championed the shift to renewable energies, and therefore constituted an appropriate market for Better Place. On December 2, 2008, Agassi and the Governor of Hawaii announced that they would establish an electric grid that would include public charging posts and battery swap stations by 2012. Better Place planned to build approximately 75,000 charging posts and 20 battery swap stations, at an investment of USD 100 million.^[32]

Canada: The area of Ontario is approximately 10% of the total area of Canada, and its population is approximately 12 million residents (approximately one third of Canada's total population) who drive 7 million vehicles. Ontario is the leading oil producer in Canada. The price of fuel in November 2008 was \$0.76 per liter. On January 15, 2009, Better Place signed a cooperation agreement with the Province of Ontario for laying out infrastructure for electric cars. The plans included the development of an electric car demonstration center in Toronto and research, conducted by the government, on finding the best ways to accelerate the process of adopting the electric car. One of Canada's largest electricity producers, Bullfrog Power, was supposed to supply the energy for the project.^[32]

Economic cooperation? In a very short period of time, by the end of 2009, Better Place established itself as a global player. Better Place invested approximately USD 170 million in the international project, before even proving the validity of its economic model and before generating revenues. The company consisted of approximately 300 employees, most of who worked in the USA, Israel, Australia and Denmark. Each country presented unique opportunities and challenges and it was still unclear which of these operations will be successful and bear fruit.^[32]

In the company's first year of operation, a global economic crisis broke out. In 2008, oil prices soared to a peak price of USD 150 per barrel. In 2009, General Motors went bankrupt and the US government invested more than USD 10 billion in bailing it out. The economic crisis impacted the auto market, and car sales throughout the world came to almost a complete stop.^[7] On the other hand, in April 2009, the British government announced that it offers an incentive of \$7,500 to any buyer of an electric car. The Chinese government offered an incentive of up to USD 8,800 for the purpose of purchasing a hybrid or electric car, and started investing in electric charging stations. In January 2010, Haaretz published an article titled "Better Place Generates 200% Returns for Israel Corporation," stating that *"Better Place announced this week that it had attracted \$350 million ... reflecting a post-money valuation of Better Place of about \$1.25 billion. ... HSBC ... is directly investing \$125 million, Israel Corporation and individual members of the Ofer family will put in \$94 million ... Better Place chairman Idan Ofer said that when Better Place was established, he could not have imagined where the company would be after just two and a half years.' ... 'The auto industry was in crisis, and auto manufacturers went bankrupt or were forced to ask governments for assistance,' said Agassi. 'The technical question was solved in May, when we saw a car rise and descent from the battery swap station several times, and the question around the business model was solved now. To establish a company such as Better Place, it is necessary to work with the state, you need a car and most of all you need capital.' 'In the last year it was very difficult to raise funds, and good investors inject money to the first company operating in the field. Other companies will take a lot of time until they are able to build the infrastructure, 'Charles Stonehill (CFO of Better Place) explains why no companies similar to Better Place were founded. As to the possibility that Better Place will start working in cooperation with other auto manufacturers besides Renault, Stonehill said 'we are in contact with several manufacturers and are conducting different technical trials. We estimate that in the near future we will be able to announce additional partnerships.'*^[22]

Better Place worked to promote collaborations with additional auto manufacturers, such as the German auto companies, but was unsuccessful in that. Graham Smith, VP External Affairs at Toyota, said *"Toyota sees no clear business advantage with Better Place"*.^[28] General Motors rejected collaborating with the company in light of the lack of economic profitability in this small niche. Better Place worked on the technological feasibility phase and put great effort into proving the validity of its model, but manufacturers were not impressed by sales in Israel and Denmark, and it was necessary to show success on the scale of Europe or China.^[17] On the other hand, laying out widespread infrastructure required great capital and much time, and funds were running out without the company successfully meeting its sales forecasts and without it recruiting any additional auto manufacturer or developing a new model of an electric car with better performance. In 2011, Better Place consisted of approximately 700 workers, and succeeded in raising USD 200 million more. The Israel Corporation invested in this round approximately USD 55 million.^[6] However, in 2012, in light of the poor operational performance and minimal sales, the Company failed to raise additional capital necessary to continue its operation and filed an application for temporary liquidation in May 2013.

Recovery stage: In the recovery stage, half of the 700 employees were dismissed, and it was decided to focus on Israel and Denmark only. An article published in The Marker on October 9, 2012, reported *"... one week ago, Better Place's board of directors decided to appoint CEO of Better Place Australia, Evan Thornley, to replace Shai Agassi. Agassi started serving only as a director in the company and his influence over its management was significantly diminished. Agassi said then that 'five years ago I followed the vision of ridding the world of its addiction and dependence on oil, and in the last month I drove across the State of Israel from Dan to Eilat. Very few people succeed in making such a complex vision into a reality in five productive years. I am proud of the team that developed this vision, and am sure of its ability to take the company forward into the next stage. 'Better Place found itself in a cash shortage in Q3 2012. The company that held in its accounts as of Q2 2012 cash and cash*

equivalents at the scope of USD 131 million, asked its shareholders, first and foremost the Israel Corporation (28.2%) which invested up to that point USD 229 million and Idan Ofer, the controlling shareholder in Israel Corporation (8.1%) to inject into the company USD 150 million. Shai Agassi was dismissed from his position after the company burned USD 600 million and was far from achieving its operational objectives. Better Place, which undertook to purchase from Renault 100 thousand electric cars of the Fluence Z.E. model, and estimated that it would sell 4,000 cars in 2012, sold only 457 cars in Israel by the end of September 2012, and recorded revenues of EUR 1.9 million in the first half of 2012, far from its objective of EUR 11 million in 2012."^[4] The attempted recovery failed and the company was closed two years later.

Interview findings: below are the principal findings from interviews conducted with 14 senior executives of Better Place in 2014.

Entrepreneur and international CEO of the Company Shai Agassi: Shai Agassi was described by most executives as a charismatic person who knows how to convince others, but is not open to adopting opinions different from his own. One executive said, *"I sometimes heard him and was not convinced, but I am sure that some people met Steve Jobs and did not understand him either, and so then you think maybe Shai can see things I can't see, you are intelligent enough to ask the questions and be critical, but also humble enough to think he is smarter and sees things better."* Some laughingly said that that's *"Shai's mathematics."* Several executives stated that Agassi is a better entrepreneur than he is a manager.

Vision: Reducing global dependence on petroleum while creating a global revolution in the auto industry. Most executives stated that according to Agassi, this revolution had to be big and fast, because it is crucial. *"The 2008 economic collapse would happen every seven years, oil prices can't keep rising and reach USD 147 per barrel, and if the price rises above USD 160, war would break out."* Most executives said that the vision was right, but operational conduct was not.

Behavioral norms and decision making processes: Several executives stated that when they were in agreement with the way taken and with the decisions made, they won a "you're one of us" tag, while if they expressed any objection, they were defined as "a nonbeliever" or "not one of our own" or "weak of faith." In decision making processes in the beginning of the process, there were long brainstorming sessions, but over time, use of brainstorming gradually disappeared, as were the dissenting voices.

Uneconomical conduct: Most executives believed that in light of the large volumes of capital raised, the company's economic conduct was not efficient. Some stated that the company tried to do many things simultaneously. The company worked on developing extensive international activity while also dealing with innovative developments of charging posts, battery swap stations and a one-of-a-kind, unique smart management software. As one executive said, *"we had to invent everything, even things that already existed, for example the charging points we developed. There were already 25 manufacturers of charging posts in the world, with variance between them."* Another executive stated that *"we became a product company rather than a solution company."* Money was spent fast in light of too many liabilities compared to minimal revenues. The matter of economic efficiency was secondary, and excessive optimism abounded. In light of this, there was no money left to promote the sales of the electric car. When the planned economic parameters, also, failed to meet the test of reality, these facts did not lead to any change in the financial plan. Management was performed without control and without planning other alternatives, even after it arose that there was a large gap between the strategy and the reality in any component. In terms of pricing, any planned component deviated from the plans, and there was no correction process. Some of them stated that this was Better Place's way and that the vision was a global one, and

therefore Better Place had to demonstrate success on a global scale and for this reason expenses were so high.

Agassi's rationale for the regular conduct: Several executives stated that Agassi explained the uneconomic conduct as follows: since we are in the phase of proving technological feasibility, the goal is not economic efficiency. Therefore, it does not matter how much it is going to cost, what matters is that we need to act and progress quickly, so that we can show that the model is effective. We have to set up electric infrastructure fast and at any price; otherwise we cannot raise any more money. Another explanation was that it is necessary to overcome the first financial hurdle until we reach a turning point where people understand and then all economic problems would be solved all at once. Another explanation was that we do not make any compromises, we do only what is the best.

Organizational inefficiency: Half of the executives stated that the organizational structure was inefficient, for example holding two managements. For two years, the company did not have a CFO or a COO. Some of the interviewees stated that in light of the fast expansion and operation in several areas, as well as the parallel development of several complex products, the organization became too big. A few stated that there were also 'political' struggles among them.

Human capital: Some of the executives stated that most of the executives and people working for Better Place were of very high quality and were willing to compromise and work at lower level positions and for a lower salary. Most executives believe that the manpower that was recruited was not right for the company's needs. The company usually recruited IT personnel and not professionals that understood the automotive world. Several executives believed that there is a fundamental difference between software and hardware – software is built in the trial and error method, where a preliminary version is built and run, and then bugs are found and corrected, and a new version is created, over and over again. In battery swap stations and cars you cannot do that. You need the performance to be perfect even before the trial run. One executive stated that at a certain point, the company had 1,200 employees, a high figure for a company at this stage, burning a million dollars a day.

High level of identification: Annual surveys showed a very high level of identification with the vision and the organization. Employees considered working for the company a mission and had very strong faith that this was the right way. Like several executives said, "the atmosphere was electrifying to people. Most people were willing for their salary and position to go down, and even today would be willing to come back and work for the company".

Swappable battery car versus rapid charging: Most executives believed that a battery swap station is necessary, on the basis of the assumption that most transportation would become electric. Therefore, it would not be possible to use rapid charging, which would create a significant load on the electricity grid. It was debatable when this would happen. Better Place looked far into the future and therefore built infrastructure that would serve the population even in the far future, even if that happens in around 20 years.

The battery: According to some of the executives, the technology was not mature enough to fit the business model, both in terms of the battery's capacity and in terms of cost. It was clear to them that they are ahead of the technology on the matter of the battery. According to some of the executives, the decreased range, from 160 km to 110 km in reality, took a large segment of potential consumers out of the equation.

Charging posts: Some of the executives stated that there were charging posts on the market and that in the first stage it was possible to use a regular electric socket costing approximately \$100. The cost of the unique charging post that was developed was approximately \$1000.

Battery swap station: Several executives said that the short period of time in which it was required to establish a grid in Israel, building the battery swap stations throughout Israel within two years, led to the selection of locations that were not optimal and for which a high price was paid. On the other hand, creating a battery swap network so quickly was one of the company's most significant achievements. One executive stated that the approach to the development of the battery swap stations was as if these were software, while in the development of the stations, each change creates high additional costs. Some of the executives stated that the development of the battery swap stations was unnecessary.

Visitors center: One of the executives stated that building the visitors center at a cost of USD five million, including expensive maintenance and operation, was an unnecessary expense.

Should a car be developed independently? Several executives said that a lot of discussions were held by the board on the question of whether the company should manufacture a car itself. All along they understood that they should avoid become an auto company, that this would be a very expensive and almost impossible adventure. Such a decision would move the company away from its strategy as an infrastructure company. However, this question always hovered about.

Choosing Israel: The country charged a 10% tax on electric cars, compared to 80% on a car with an internal combustion engine, and provided regulatory support. On the other hand, attempts for receiving direct financial support from the state were rejected, since there was no practical model on which the state could rely. The fact that the Israel Corporation was the primary investor generated resistance to further funding on the government's part. *"We thought we'd receive government support and that people would adopt the idea as a national plan, but it was exactly here we ran into the greatest resistance. The government did not buy vehicles itself and did not provide free electricity to electric cars."* Some of the executives stated that choosing Israel was not the right decision, since it did not impress auto manufacturers such as General Motors, Chrysler and other companies, and it was impossible to prove that the model worked on large scales. Some stated that they should have started in Europe.

Denmark: Some of the executives stated that in Denmark, Renault is a negligible player. The cold has an adverse effect on the battery, and although there was a big tax benefit in Denmark, Danes do not tend to buy large cars such as the Fluence Z.E.

Leasing companies in Israel: Some of the executives stated that choosing Israel was problematic in light of the high rate of leasing, as a result of which fuel economy does not matter to the end customer. In addition, one executive said "we failed in creating a connection with leasing companies, because we did not approach them as partners."

What could have been done differently: Some of the executives stated that it was possible to begin on a smaller scale, but at the same time said that this would have been problematic, because then it would have been impossible to recruit a global auto manufacturer. According to several executives, Agassi insisted on creating a grid in Israel from Dan to Eilat. The constraint of building the infrastructure too fast came at a high cost. It would have been possible to suffice with creating a grid for the center, and trying to turn the project into a national project, all of the profits from which would go to the state.

Billing system manufactured by Amdocs: Most executives stated that an unnecessary investment was made in the purchase of the billing system from Amdocs. The software was planned to serve millions of customers, while it was possible to start smaller. Others stated that this infrastructure was necessary in the long run.

The auto manufacturer, Renault: According to some of the executives, the behavior and attitude toward Renault led to a poor relationship that undermined the project's management. One executive explained that Nissan said that it would not cooperate with the Nissan Leaf, and Agassi declared war on it and argued with the CEO of Nissan, who later on became the CEO of Renault. As a result, Renault did not support the project, but also did not kill it. Another executive said, *"The French are very sensitive, and we angered them quite frequently."* It was understood that there was a significant problem in personal relations, and the relationship deteriorated. Another executive stated that the relationship deteriorated because there was no expression of appreciation for the trust and effort that they made. Renault was not seen as a partner to the vision. We could have offered them to split the profit for every travel mile in consideration for a discount on the vehicles.

The destructive effect: Several executives stated that the problem was the "timing." Better Place tried to solve a problem that the auto industry did not wish to solve. As far as all manufacturers are concerned, as long as there are customers willing to buy an ordinary vehicle, no other solution is required and the price of fuel is meaningless. We wanted to change the auto industry, where there is a direct contact between the customer and the manufacturer, and they would not give this up. Auto manufacturers' profit is divided into three parts: a third from the sale of the vehicle, a third from repairs and servicing, and a third from selling additional accessories. The introduction of an electric vehicle undermines the first third and the second third, too, since regular servicing disappears almost completely. Auto companies have no motivation to enter this field, and therefore it does not matter whether or not Agassi spoke nicely. Another executive stated that the pressure exerted on auto companies grew, both politically and publically, and as a result it would have been better for them to act on a small scale and say that they are making efforts in this direction, while devoting most of their activities to internal combustion engine cars, in a way that does not harm their operation and profitability.

Auto manufacturers: Most executives stated that the problem was cooperating with additional auto manufacturers, in light of the global economic crisis and the "destructive effect" of the electric car. One said *"when you meet engineers, who have been working on combustion engine technology for years, and you tell them this engine will not be relevant, and fuel will not be relevant, they find this very difficult to accept and prefer for this process to be gradual rather than revolutionary. We came to create a revolution. We have no time, the world has no time!"* The fact that additional agreements with auto manufacturers were never signed did not raise the alarm. We thought they were afraid of us. One executive said that BMW proposed that Better Place provide them with charging services for electric cars, but we rejected this proposal because of the lack of economic profitability. There were also several times when GM agreed to work with us. They did not want to start with a commitment identical to Renault's, but were willing to conduct a pilot with 50 taxi cabs in one US city, a proposal turned down by Agassi. Another executive said that the reason was that it is important for auto companies to be the face that the customer sees.

Fluence Z.E.: According to most executives, the price of the car sold to Better Place was 60%-70% higher than the ordinary engine Fluence, which reduced the tax benefits. There was a conflict of interest in Renault between the ordinary Fluence, which they did not want to undermine, and the electric Fluence model bearing the same name. Renault instructs a servicing routine of servicing every 15-20 thousand kilometers, although there is no justification for this in an electric car. At the end of the day, Better Place reached a compromise with Renault, and they agreed to service every 30,000 km or once a year. Several executives stated that the car's appearance was too conservative.

Customer satisfaction: Several executives said that people loved and still love the car and were happy with the high level of service they received.

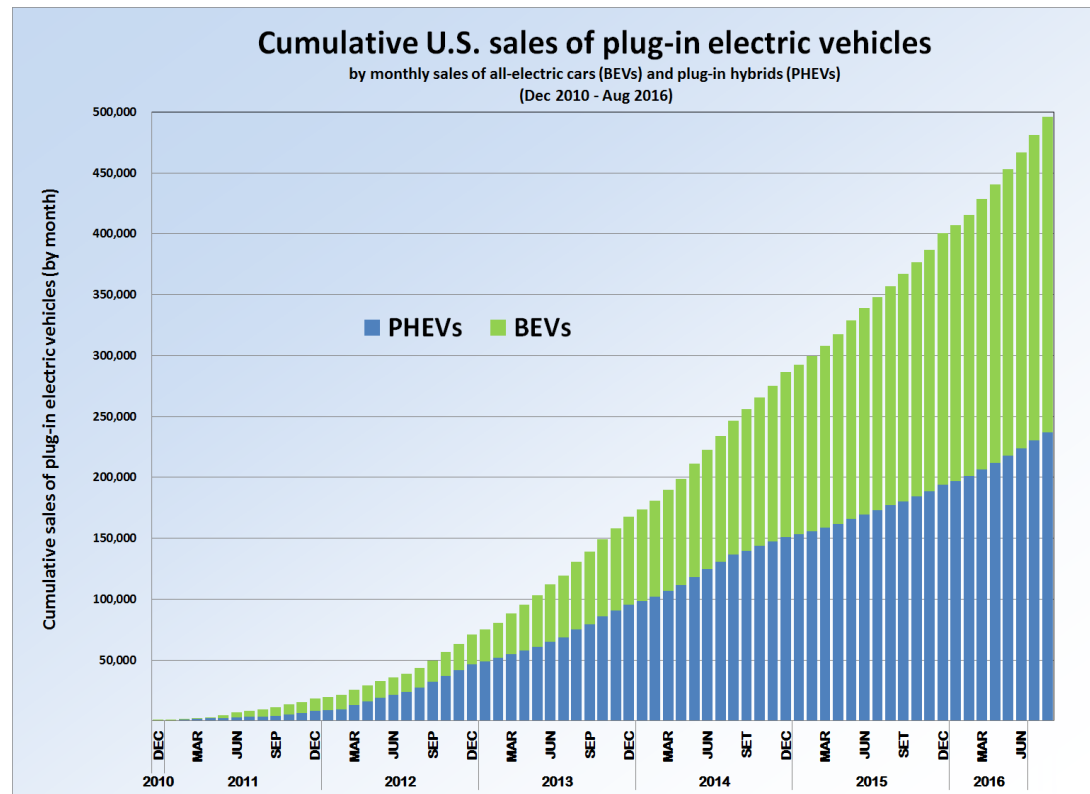
What could have been done differently in the sale process: Several executives stated that it would have been possible to subsidize the first cars and afterwards work on improving battery performance. Others said that it was possible to cancel the sales team and finance half of the car's cost. One executive said it would have been possible to subsidize vehicles for private customers or leasing companies, while it was also said that Better Place objected to a move of this type since it might have pointed to a lack of economic feasibility, which would not allow recruiting additional investors.

The board of directors: Five directors served on the board, out of which, two directors were appointed by Better Place on its behalf.

Some of the executives stated that the board of directors consisted of people that did not understand the auto industry, and were therefore passive. For two years, the company was managed without a CFO or administrative manager. Losses were not thought of as losses for the company, but as a natural process for a new startup company. The directors were excited by Agassi and his vision. There were technological successes and it was possible at all times to show progress on the ground. This magic prevented the directors from identifying black flags, such as the failure to collaborate with another auto company, failure to sign agreements with the California government and failure to receive support from the US government.

Exhibits

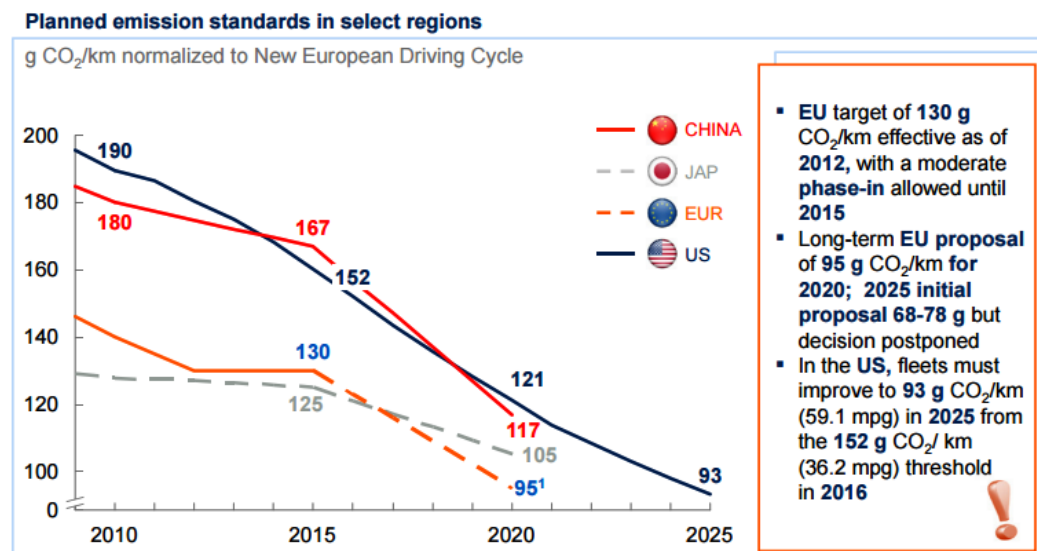
Exhibit 1 Cumulative US Sales of Plug-In Electric Vehicles



Source: "Electric car use by country", Wikipedia

Exhibit 2 Planned Emission Standards

Governments around the world are setting ambitious targets for light vehicle CO₂ emissions



Source: Mckinsey, (April 2014), Evolution: Electric vehicles in Europe

Exhibit 3 Better Place Battery Swap Station



Source: Shafir Production Systems Ltd. website
<http://www.shafir.co.il/Project.aspx?pID=12>

DO NOT COPY

Exhibit 4 Better Place Charging Spot

Source: Article – "Peres and Erdan Checked Agassi's Electric Car", Moto magazine website, December 17, 2009

Exhibit 5 Renault Fluence Z.E.

Source: Article – "Shai Agassi Dismissed from his Position in Better Place," Shahr Hazelcorn, Walla news website, October 2, 2012

Exhibit 6 Costs Entailed in Buying an Electric Car

Better Place: Costs Entailed in Buying an Electric Car			
Plan	Charging plan (excluding the car's purchase at a cost of NIS 121,200)		Car and service package**
	Pay as you go	Pay in advance*	
Years of commitment	3	3-4	3
Minimum kilometers	1,000 per month	40, 50, 60 or 80 thousand	40 thousand
Cost	NIS 0.65 per kilometer	NIS 0.55 per km	148 thousand for car + charging subscription

* A financing plan is available through Igud Bank, spread out into monthly payments. ** Service – charging, batteries, towing service etc.

All prices are determined in advance for 3 or 4 years.

Source: Globes website, "Better Place – Pay per Kilometer of Driving – NIS 0.65 per kilometer

<http://www.globes.co.il/news/article.aspx?did=1000765579>

Exhibit 7 Summary of Data from the Financial Statements, December 31, 2010, Better Place

BETTER PLACE INC (hereinafter: "Better Place")

A summary of data from the financial statements of Better Place for December 31, 2010, is presented below:

	December 31,2010	December 31,2009
	USD millions	USD millions
Current assets	339	95
Noncurrent assets	48	10
	<u>387</u>	<u>105</u>
Current liabilities	30	20
Noncurrent liabilities	38	30
Liabilities to preference shareholders	437	57
Capital deficit	(118)	(2)
	<u>387</u>	<u>105</u>
For the year ended December 31		
	2010	2009
	USD millions	USD millions
Operating expenses	133	83
Financing expenses	38	20
Loss attributed to non controlling interest	(4)	(2)
Loss per year	<u>167</u>	<u>101</u>
		2008
		USD millions
		32
		2
		-
		<u>34</u>

Source: Israel Corporation's 2010 Financial Statements

Exhibit 8 Comparison of Different Transport Technologies**Drive Different - Alternatives Transport Technologies**

Technology	Fuel cell	Electric engine	Chargeable hybrid	Natural gas
	A mechanism for generating electricity within the car, using compressed hydrogen and air, which supplies energy to an electric engine	An electric engine that receives energy from a large battery, charged from the electric grid	A car combining a strong electric engine with a large battery and an internal combustion engine. This enables it to drive for tens of kilometers without using polluting fuel, until the engine goes into action and charges the battery.	Converted gasoline engine that runs on liquefied natural gas
Examples	Toyota Fuel Cell Sedan, Honda FCX Clarity	Renault Twizy, Nissan Leaf, Tesla Model S	Toyota Prius Plug-In, Mitsubishi Outlander PHEV	Gas versions are available for almost all well-known models
Total driving range	480km	100-450km	800km	Approx. 500km
Advantages	High energy compression, optional rapid fueling, no emission of air pollutants from the vehicle	The charging infrastructure is relatively cheap to build, the car itself does not pollute	Combines clean electric power for shorter ranges with the quick fueling capability of internal combustion engines	A relatively cheap and simple technology. Natural gas may be cheaper than gasoline in Israel
Disadvantages	There is no hydrogen refining and fueling infrastructure, the cars are expensive to manufacture	Limited driving range, long charging time, high car cost	More expensive than comparable cars, pollution (although lesser)	Does not significantly reduce pollution
Status	The most appropriate technology for replacing the internal combustion engine, but it is still not mature	At this stage of the development of batteries, the technology is most appropriate for miniscule vehicles or prestigious cars with a large battery	The technology that is closest to maturity, which will become more common as the price of batteries is lowered	We will probably see many such cars in Israel, if the price of gas will be as low as expected. The technology is especially right for reducing pollution from buses and trucks.

Source: The Marker, *After the Electric Car's Failure: Hydrogen is the Future*, Daniel Shmil, October 20, 2014

Bibliography

HEBREW RESOURCES:

1. Senor, D. & Singer, S., 2009, *Start-up nation: The story of Israel's economic miracle*, Matar Publishing House, Israel.
2. Elkobi, R., June 1, 2013, 'Renault Fluence Z.E.: Road test – Fluence with a large battery', *Cartube Magazine*, retrieved from: <http://www.cartube.co.il/>
3. Better Place, (no date), Wikipedia, retrieved on May 25, 2016, retrieved from: https://he.wikipedia.org/wiki/%D7%91%D7%98%D7%A8_%D7%A4%D7%9C%D7%99%D7%99%D7%A1
4. Gabizon, Y. & Shmil, Y., October 9, 2012, 'After the dismissal: Agassi quits Better Place board of directors', *Dynamo Magazine, The Marker*, retrieved from: <http://www.themarker.com/dynamo>
5. Hazelkorn, S., February 19, 2012, 'Like Agassi and Better Place, only in the nineteenth century', *Ynet Magazine*, retrieved from: <http://www.ynet.co.il>
6. Israel Corporation Ltd., *Periodic Report for 2011*, retrieved from:
7. http://media.corporate-ir.net/media_files/irol/17/170379/Reports/2011AFRS_he.pdf
8. Financial Crisis (2008), (no date), Wikipedia, retrieved on May 20, 2016, from *Financial crisis, 2008*:
9. [https://he.wikipedia.org/wiki/%D7%94%D7%9E%D7%A9%D7%91%D7%A8_%D7%94%D7%9B%D7%9C%D7%9B%D7%9C%D7%99_%D7%94%D7%A2%D7%95%D7%9C%D7%9E%D7%99_\(2008\)](https://he.wikipedia.org/wiki/%D7%94%D7%9E%D7%A9%D7%91%D7%A8_%D7%94%D7%9B%D7%9C%D7%9B%D7%9C%D7%99_%D7%94%D7%A2%D7%95%D7%9C%D7%9E%D7%99_(2008))
10. Israel Energy Forum, October 2013, *Zero Carbon Emission Report, a Vision for 2040*, retrieved from https://il.boell.org/sites/default/files/zero_carbon.pdf
11. Trajtenberg Committee (no date), Wikipedia, retrieved on May 20, 2016, from *Trajtenberg Committee Report*:
12. https://he.wikipedia.org/wiki/%D7%95%D7%A2%D7%93%D7%AA_%D7%98%D7%A8%D7%9B%D7%98%D7%A0%D7%91%D7%A8%D7%92
13. 2009 United Nations Climate Change Conference, (no date), Wikipedia, retrieved on May 20, 2016, from *2009 United Nations Climate Change Conference*:
14. https://en.wikipedia.org/wiki/2009_United_Nations_Climate_Change_Conference
15. Horesh, S., January 27, 2009, *Better Place and DONG Energy Raised EUR 103 Million For Investment in the Electric Charging Grid in Denmark*, Globes, retrieved from:
16. <http://www.globes.co.il>

17. Price of Oil, (no date), Wikipedia, retrieved on May 12, 2016, from price of oil:
18. https://he.wikipedia.org/wiki/%D7%9E%D7%97%D7%99%D7%A8_%D7%94%D7%A0%D7%A4%D7%98
19. Shmil, D., October 20, 2014, 'Drive different, after the electric car's failure: Hydrogen is the future', *Dynamo Magazine, The Marker*, retrieved from:
20. <http://www.themarker.com/dynamo>
21. Lithium-ion battery, (no date), Wikipedia, retrieved on June 10, 2016 from *Lithium-ion battery*:
22. https://he.wikipedia.org/wiki/%D7%A1%D7%95%D7%9C%D7%9C%D7%AA_%D7%9C%D7%99%D7%AA%D7%99%D7%95%D7%9D-%D7%99%D7%95%D7%9F
23. Friedman, T., 'Shai Agassi is the next Steve Jobs', December 14, 2008, *Haaretz*, retrieved from:
24. <http://www.haaretz.co.il/misc/1.1366935>
25. Zuckerman, R., 'Tesla - an electric car you actually want', *Ynet*, retrieved from:
26. <http://www.ynet.co.il/home/0,7340,L-8,00.html>
27. Interviews conducted in 2014 with 14 senior executives in Better Place.
28. Raviv, O., 'Shai Agassi: I don't work for money', *Ynet*, retrieved from: <http://www.ynet.co.il>
29. Battery electric vehicle, (no date), Wikipedia, retrieved on June 10, 2016, from *Battery electric vehicle*: https://en.wikipedia.org/wiki/Electric_vehicle_battery
30. Shauli, E., February 10, 2012, 'Renault Fluence Z.E.: Road test (local launch)', *Auto Magazine of the Mako Group*, retrieved from: <http://www.auto.co.il/default.aspx>
31. Schwarz, Y., Portugal, October 19, 2011, 'Renault Fluence Z.E. road test', *Auto Magazine of the Mako Group*, retrieved from: <http://www.auto.co.il/default.aspx>
32. Shechter, A. & Shmil, D., January 25, 2010, '200% return for Israel Corporation on its investment in the electric car project', *Haaretz*, retrieved from: <http://www.haaretz.co.il>
33. Shmil, D., September 15, 2009, 'Shai Agassi: "50% of cars sold in Israel in 2020 will be electric," the entrepreneur said at the Frankfurt Car Show; Agassi: We Will Sell 35 Thousand Cars in 2011', *Dynamo Magazine, The Marker*, retrieved from: <http://www.themarker.com/dynamo>
34. Fuel cell, (no date), Wikipedia, retrieved on June 10, 2016 from *Fuel cell*:
35. https://he.wikipedia.org/wiki/%D7%AA%D7%90_%D7%93%D7%9C%D7%A7

ENGLISH WEBSITES:

1. Better Place (no date), in *Wikipedia*, retrieved May 15, 2016 from:
2. https://en.wikipedia.org/wiki/Better_Place
3. Borup, M., 2014, Electric mobility case study for Denmark: Case study: *Better Place – an effort of creating new actor roles and infrastructure for electric car mobility*, retrieved from: http://orbit.dtu.dk/files/100673125/Electric_mobility_case_study_for_Denmark.pdf
4. McKinsey, April 2014, Evolution: Electric vehicles in Europe: gearing up for a new phase?, retrieved from:
5. http://www.mckinsey.com/~/media/McKinsey%20Offices/Netherlands/Latest%20thinking/PDFs/Electric-Vehicle-Report-EN_AS%20FINAL.ashx
6. Schwartz, N. D, Dec. 1, 2009, Denmark, Ambitious plan for electric cars, the *New York Times*, Retrieved from: <http://www.nytimes.com/>
7. TED Ideas worth spreading: (Filmed 2009, February), A new ecosystem for electric cars
8. https://www.ted.com/talks/shai_agassi_on_electric_cars?language=he
9. The 2009 TIME 100, April 30, 2009, *TIME*, retrieved from: <http://time.com>
10. United States Department of Energy, September 15, 2014, *The history of the electric car*, retrieved from: <http://energy.gov/articles/history-electric-car>
11. W.D.I William Davidson Institute at the University of Michigan, May 13, 2010, *Better Place: Charging into the future?*, retrieved from:
12. <http://www.erb.umich.edu/Research/CaseStudies/BetterPlace.pdf>
13. World oil market chronology from 2003 (no date), in *Wikipedia*, retrieved May 15, 2016 from: https://en.wikipedia.org/wiki/World_oil_market_chronology_from_2003