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3rd Place

Business Model Innovation by Better Place: A Green Ecosystem for the Mass Adoption of Electric Cars

Prof. Ramalingam Meenakshisundaram and Besta Shankar
ICMR Center for Management Research, Hyderabad, India

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“After a century of being joined at the hip, the car industry and the oil industry are headed for a divorce. Cars are about to leave behind the dirty fuel—in this case, gasoline—that has powered them. It’s going to have dramatic consequences throughout the energy and car industries.”¹

Vijay Vaitheeswaran, Correspondent at *The Economist* and co-author of ‘Zoom: The Global Race to Fuel the Car of the Future’

“It’s a subscription system much like cellular providers have. You sign up for a certain number of miles a month.”²

Shai Agassi, Founder and CEO of Better Place

“It makes so much sense from the environmental point of view as well as the business point of view.”³

Idan Ofer, Chairman of Israel Corp⁴ and Board Chairman of Better Place

“When I first heard about it, I thought it was just another crazy idea. It sounded far-fetched. Then I sat down and listened, and it just might make sense. (... However) Change doesn’t happen quickly in the auto sector.”⁵

Stephen Girsky, Managing Director, Centerbridge Partners⁶

INTRODUCTION

Better Place, formerly Project Better Place, a start-up company founded in October 2007 in Palo Alto, California, in the US, was a winner of the 2009 AMR Research Sustainable Leadership Award for Clean Technology⁷. According to the *Wired* magazine⁸, Better Place was the fifth largest start-up in the history of business ventures till March 2009⁹. Shai Agassi

¹ Francesca Di Meglio, “Eyeing a Future of New-Fuel Cars,” <http://www.businessweek.com>, October 4, 2007.

² Chuck Squatriglia, “Shai Agassi Wants to Sell Electric Cars Like Cell Phones,” <http://www.wired.com>, October 30, 2007

³ Steve Hamm, “\$200 Million for Electric Cars?” <http://www.businessweek.com>, October 29, 2007.

⁴ Israel Corp, the largest holding company in Israel, has diversified interests — in fertilizers and specialty chemicals, energy, shipping, and transportation. It derives 70 percent of its revenues from international trade. Source: www.israelcorp.com (Accessed on June 1, 2009)

⁵ Steve Hamm, “\$200 Million for Electric Cars?” <http://www.businessweek.com>, October 29, 2007.

⁶ Centerbridge Partners, New York, founded in the year 2006, is one of the leading private equity firms in North America. It makes investments mostly in North America-based companies. Source: <http://investing.businessweek.com>.(Accessed on June 1, 2009)

⁷ This award recognized companies that are “trailblazers in clean technology development including alternative energy, clean tech market service provision, grid delivery systems, smart technology and information, energy storage devices and platforms, and other enabling technologies.”

Source: “Dell, HP, Better Place, Tririga Earn Sustainability Awards,” <http://www.environmentalleader.com>, May 29, 2009.

⁸ Wired is a monthly magazine in English published from San Francisco. It covers topics related to business, lifestyle, and leadership.

Source: www.wired.com

⁹ Rachel Pulfer, “Venture Capital: A Modern Midas,” www.canadianbusiness.com, March 16, 2009

(Agassi), the company's founder and CEO, was ranked third in the list of '100 Most Creative People 2009'¹⁰ prepared by Fast Company¹¹, New York. He was also included in the '2009 Scientific American 10', a list of 10 people selected by the *Scientific American* magazine¹² for their endeavors to ensure that technological evolution contributed to the betterment of society¹³.

Agassi, who resigned from SAP AG¹⁴ as the President of its Products and Technology Group in March 2007, started Better Place with the ambition of setting up an ecosystem – including a 'smart grid' of charging stations and battery swapping facilities -- for electric vehicles. These charging stations were to be powered by electricity generated from renewable sources such as solar energy and wind energy. Consumers could swap their batteries at the swapping facilities in less time than it would take to fill a car's fuel tank with gasoline (gas) at a conventional gas station. Such a grid was expected to encourage widespread adoption of electric vehicles, reduce the dependence on fossil fuels¹⁵, and contain the levels of environmental pollution.

Better Place intended to become "the premier global provider of electric vehicle services, accelerating the transition to sustainable transportation."¹⁶ Agassi took a cue from the business model of the telecom industry where consumers could choose a subscription plan with a certain number of minutes per month, with the handset cost being subsidized based on the tenure of the plan to which the consumer had committed himself/herself. Better Place's innovative business model proposed to offer transportation services to consumers through miles per month subscription plans, with the cost of the electric car being subsidized based on the tenure of the plan.

By June 2009, nations such as Israel, Australia, Denmark, Japan, and some states of the United States and Canada had taken initiatives to provide a favorable regulatory environment for electric vehicles and partner with the company to build the required infrastructure.

BACKGROUND

Automobiles contributed to a significant share of the global demand for fossil fuels (**Refer to Exhibit I for the increasing share of the transportation sector in global oil consumption**). The internal combustion engines (ICE)¹⁷ in the vehicles made use of

¹⁰ www.fastcompany.com

¹¹ Fast Company is US-based business magazine (10 issues per year) in English covering areas such as innovation, digital media, technology, leadership, design, and social responsibility of the companies. It is known for reporting on individuals who come out with creative ideas in the marketplace.

Source: www.fastcompany.com (Accessed on June 3, 2009)

¹² The Scientific American Magazine is published from New York. The magazine, which was started in August 1845, is one of the oldest publications in the US. It reports on innovations in research.

Source: www.scientificamerican.com

¹³ "Scientific American 10: Guiding Science for Humanity," www.scientificamerican.com, June 2009.

¹⁴ SAP AG, headquartered in Walldorf, Germany, is one of the world's leading software services companies and has a focus on Enterprise Resource Planning (ERP) software products. It earned revenues of € 11.58 billion for the financial year 2008 and had a customer base of over 82,000 spread across in more than 120 countries.

Source: www.sap.com (Accessed on June 2, 2009)

¹⁵ Coal, oil, and natural gas, found in the top layer of the earth's crust, are known as fossil fuels. These fossil fuels are formed by the decomposition of animal and plants remains buried over million years ago. Fossil fuels are not renewable energy sources as they cannot be replenished once they have been used. Source: www.nripc.org

¹⁶ "Fifty Best Tech Start-ups: The Next Google?" www.businessweek.com.

¹⁷ Internal combustion engines are engines in which the combustion of fuel (like gasoline) produces high energy. This energy is used to run the components such as pistons, which in turn, generate the required mechanical energy to move vehicles such as cars and scooters. Source: www.howstuffworks.com

gasoline or diesel, which were derived from petroleum. Overdependence on the finite reserves of fossil fuels forced many nations to explore ways to increase the fuel efficiency of automobiles and also to find alternatives to fossil fuel.

Further, there was a growing concern over the harmful emissions caused by burning fossil fuels for transportation. According to the International Energy Outlook 2009 released by Energy Information Administration (EIA)¹⁸ of the US Government, worldwide Carbon dioxide (CO₂)¹⁹ emissions from the combustion of various fossil fuels such as coal, oil, and natural gas were expected to exceed 40 billion metric tons by 2030 (**Refer to Exhibit II for the projected trend in worldwide emissions of Carbon dioxide from 2006 to 2030**).

The large-scale adoption of electric vehicles for transportation, especially in the passenger vehicles segment (cars and utility vehicles), was seen as a way to reduce the dependence on fossil fuels. Electric vehicles were both fuel-efficient and environment-friendly to run. Automakers had come up with several innovations such as hybrid electric cars, plug-in hybrid electric cars, and pure electric cars (**Refer to Table I for an overview of these three types of electric cars**).

Table I
Hybrid, Plug-in Hybrid, and Pure Electric Cars

Type	Description	Examples
Hybrid electric	Hybrid cars possess internal combustion engines (ICE) and a rechargeable energy storage system. Hybrid cars use most of the power from the ICEs and electric motors provide additional power when needed. The energy storage system is recharged automatically by the engines (when the load is low) and from regenerative braking.	Honda Insight Toyota Prius
Plug-in hybrid electric	Plug-in hybrid cars have internal combustion engines and electric batteries. Battery power is used instead of ICEs at low speeds at which ICEs are less efficient. The batteries can be recharged from an external power source.	BYD Auto's F3DM (China)
Pure electric (Battery electric)	Pure electric cars do not contain internal combustion engines but run solely on the power from the rechargeable batteries. They are environmentally friendly vehicles which do not produce harmful emissions or heavy noise.	Tesla Roadster (USA) Th!nk City (Norway) Reva (India) BMW Mini-E

Compiled from www.fueleconomy.gov, www.thegreencarwebsite.co.uk, www.herelectricvehicle.com, www.projectgetready.com, and www.wikipedia.org

¹⁸ Energy Information Administration (EIA), Washington, D.C, is an independent statistical organization under US Department of Energy providing data and forecasts on energy related matters. It was established in 1977 by the US Government to assist policy making regarding the economy and environment.
Source: www.eia.doe.gov (Accessed on June 2, 2009)

¹⁹ Fossil fuels are hydrocarbons; on combustion of hydrocarbons, CO₂ is a main product. It is one of the greenhouse gases that trap heat in the atmosphere. Greenhouse gases are responsible for global warming, leading to an increase in the average temperature of the earth.

Although hybrid electric vehicles and plug-in hybrid electric vehicles made use of the energy storage system or battery, they could contribute only to a limited extent to the twin objectives of reducing dependency on fossil fuels as well as eliminating emissions from fossil fuel combustion in automobiles. However, pure electric vehicles that were powered solely by the battery could contribute to a great extent to the achievement of these twin objectives. In some countries, the government started subsidizing the purchase of electric cars. Countries like Israel, which were greatly concerned with energy security²⁰ issues, realized the potential of the electric cars and initiated measures to increase the percentage of such vehicles on the road.

Although electric cars proved to be fuel-efficient and environmental-friendly, they had some limitations from the consumer perspective (**Refer to Table II for the advantages and disadvantages of electric cars**).

Table II
Advantages and Disadvantages of Electric Cars

Advantages	Disadvantages
<ul style="list-style-type: none"> • Zero direct emissions of greenhouse gases (However, electric vehicles contribute to indirect emission of greenhouse gases, if the batteries are charged by electricity generated from fossil fuels) • High energy efficiency when compared to vehicles run on petrol or gasoline. • Very low noise emission while operating 	<ul style="list-style-type: none"> • Limited driving range (about 100 km to 160 km) per charge • Time consuming to recharge the batteries, in the range of 4 hours to 8 hours • Absence of a widespread network of charging stations at convenient locations in the city and along highways • Expensive to replace the batteries; increased total cost of ownership. An electric car (including the battery) was expected to cost about US\$ 50,000 in the US, while a comparable fossil-fuel based car was priced at less than US\$ 20,000. • Low speed limit when compared to automobiles with internal combustion engines.

Adapted from “How Better Place Plans to Revive the Electric Car,” www.cnet.com.au, February 11, 2009; and other sources.

These limitations hindered the mass adoption of electric cars globally. In earlier electric cars, lead batteries were used and the disposal of depleted batteries posed an environmental hazard. The adoption of lithium-ion²¹ batteries addressed this concern to some extent; it also improved the driving range per charge and the lifetime of the batteries. However, the

²⁰ National governments are concerned about gaining uninterrupted access to energy sources to meet their current and future energy requirements for sustained economic growth and development. When a nation is able to meet all its energy requirements without importing energy or energy sources, it is said to be energy independent.

²¹ Batteries made from lithium (Li), a light and highly reactive metal, which were mostly used to power cell phones, laptops, etc. They possess high energy density, more rechargeable cycles, and long life; and they lose charge slowly when not in use. Due to the above features, they were regarded as a suitable choice for electric cars.

inconvenience of long-distance travel, the time taken to recharge the batteries, and the absence of a widespread network of charging stations continued to inhibit the growth in demand for electric cars.

BETTER PLACE'S BUSINESS MODEL

The aim of Agassi's innovative ecosystem for electric cars was to facilitate mass adoption of this cleaner technology by consumers by making it more affordable and convenient to own as well as operate an electric car. In this disruptive business model, consumers could sign up with Better Place for subscription plans under which they had to use a certain number of miles a month for a certain number of years. In turn, they received an electric car on lease. And in cases where the consumer signed up for a long-term subscription plan such as for six years, the company was even ready to give a free car. The cars were provided with lithium ion batteries which were believed to be the best in battery technology available for electric vehicles when Better Place commenced operations.

The unique selling proposition of this scheme was that the consumer could choose to either charge the batteries at a vast network of charging stations at convenient locations or simply swap the drained batteries for new ones at designated battery swapping facilities. Moreover, each car was equipped with global positioning system (GPS) device for determining the geographical location and intelligent software that could alert the driver as to the level of battery charge, the estimated distance that the car could travel with the available charge, and the locations of nearby charging stations and swapping facilities in the Better Place grid. As a result, a Better Place consumer could enjoy the advantages of electric cars but not suffer from the associated limitations. Commenting on the technology that enabled this innovative ecosystem, Evan Thornley, Head for Better Place in Australia, said "*What it means for the world is there is now a viable technology for mass adoption of electric vehicles (EVs).*"²²

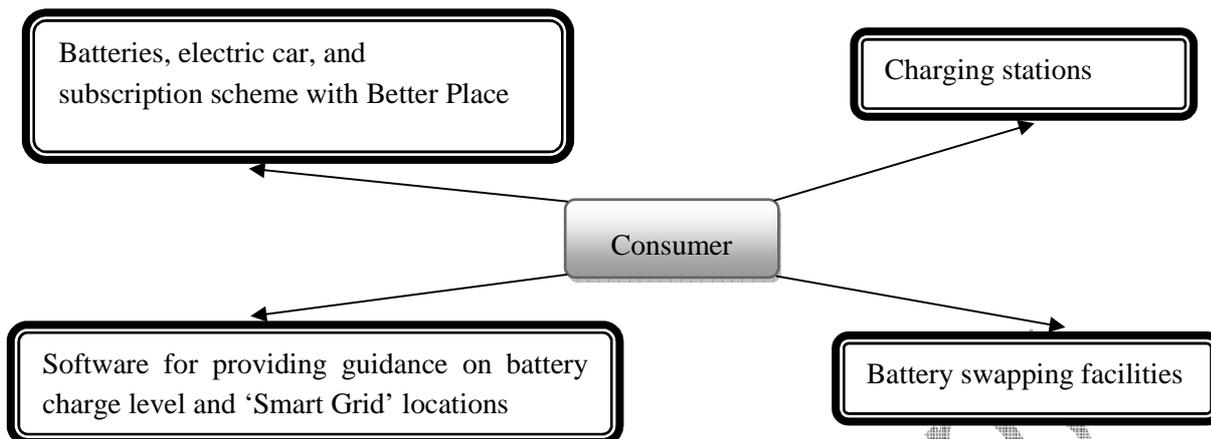
By using renewable energy sources to power the charging stations wherever possible, Better Place attempted to eliminate even the indirect emissions of greenhouse gases due to the operation of electric cars. Thus the Better Place ecosystem for electric cars was positioned as not only consumer-friendly but also environment-friendly, making the world a truly 'better place' to live in. However, it required a high level of start-up capital for building the infrastructure for the smart grid. Agassi raised US\$ 200 million²³ initially for this new venture by convincing investors about the viability of the business model and its contribution to environmental sustainability: Israel Corp invested US\$ 100 million while the remaining amount was contributed by multiple investors including VantagePoint Venture Partners²⁴, a leading investment firm in cleaner technology.²⁵

²² Peter Alford, "Cars all electric in 20 years': Evan Thornley," www.theaustralian.news.com.au, May 13, 2009.

²³ Steve Hamm, "\$200 Million for Electric Cars?" <http://www.businessweek.com>, October 29, 2007.

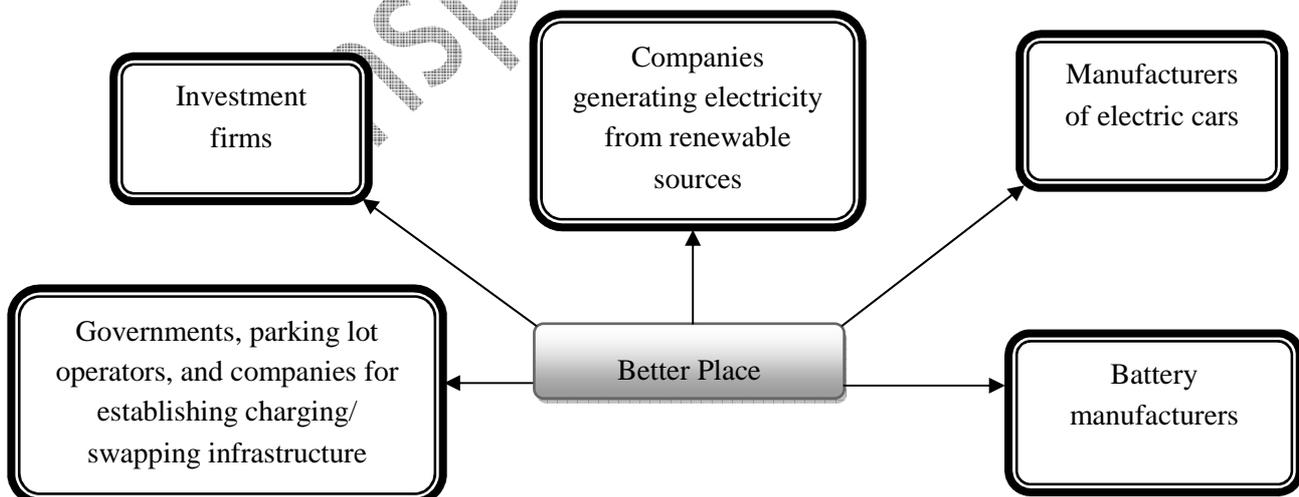
²⁴ Vantage Point, based in California, is one of the leading US venture firms that make investments in the sectors of clean technology, information technology, and healthcare with a special focus on Asia. As of June 2009, it had capital amounting to US\$4.5 billion. Source: www.vpvp.com (Accessed on June 3, 2009)

²⁵ "Venture Fund Bets Billion on Cleantech," www.thestar.com, December 1, 2008.

Figure I - A: The Better Place Business Model and the Consumer

Better Place entered into alliances with electric car manufacturers, battery manufacturers, and renewable energy producers. Such alliances were seen as win-win opportunities for all the concerned entities. Steve Howard, CEO, The Climate Group²⁶, said, *“This project will bring electric vehicles to life in a truly low carbon way. It will demonstrate how the electric vehicle and renewable energy industries can act in synergy to strengthen the economic argument for both.”*²⁷

It also partnered with governments, parking lot operators, and companies to install charging stations. Commenting on the innovative business model of his company, Agassi said *“Existing technology, coupled with the right business model and a scalable infrastructure can provide an immediate solution and significantly decrease carbon emissions.”*²⁸

Figure I - B: The Better Place Business Model and the Alliances

²⁶ The Climate Group is a not-for-profit organization that works internationally to find solutions to the climate change. It is headquartered in the UK and has offices in the US, Europe, Australia, China, Hong Kong, and India with a membership of over 50 that includes companies, governments, and other regional organizations. Source: www.theclimategroup.org (Accessed on June 1, 2009).

²⁷ www.betterplace.com

²⁸ Karin Kloosterman, “Making Electric Cars Sell Like Cell Phones,” www.treehugger.com, November 23, 2007.

The Smart Grid

Better Place's network consisted of integrated charging stations and battery replacement services for its subscribers. The company supplied lithium ion-based batteries which provided extended life time and long range and were environmentally safe. Better Place claimed that its automated battery swapping facilities could replace depleted batteries with charged batteries within three minutes and that there was no need for the driver to even get out of the car.

The software used in the electric cars, which was designed and developed by Better Place, ensured complete information for the drivers. It displayed the energy level in the battery and the nearest battery recharging and swapping facilities available. It calculated the distance traveled by the cars for which they were charged by the company. It also had a provision for the drivers to handle their parking and charging spots conveniently, and was able to book the charging spot in advance²⁹. Customers needed to pay for the electricity consumed at the existing commercial rates. Better Place claimed that cost per unit distance traveled by its electric cars would be just 1/7th of the cost for vehicles powered by ICEs³⁰.

GLOBAL PRESENCE

A favorable regulatory environment was a pre-requisite for this business model to be successful in any geographic region. This could be in terms of funds for setting up the smart grid, tax incentives to the various partners in the Better Place ecosystem, and tax incentives to consumers who subscribed to the electric car transportation services of Better Place. The company entered into agreements with two densely populated but small countries -- Israel and Denmark, and a sparsely populated big country -- Australia. The states of California and Hawaii in the USA, and the province of Ontario in Canada took the initiative in this regard within their respective countries. Japan too expressed an interest in the unique business model proposed by Better Place.

Better Place in Israel

Although situated in the Middle East region, Israel was poor country in terms of oil reserves and depended heavily on oil imports for its energy requirements. Due to its political enmity with a few countries, it faced oil supply ban from those countries. Israel had a vision of becoming energy independent by 2020 by reducing its oil dependency to zero.

As of 2008, nearly 90 percent of the car users in Israel drove about 45 miles a day.³¹ Also, the average distance between urban centers in Israel was less than 100 miles, making it easier to establish a nationwide smart grid. With effect from August 1, 2009, the government gave tax exemptions and subsidies for the purchase of electric cars, and increased the import duties on fossil fuel-based cars.

In December 2008, Israel agreed to partner with Better Place to build the charging network. It was estimated that the Better Place business model would bring down the average monthly

²⁹ "Electric Cars Make for a Better Place," www.roadtraffic-technology.com, December 19, 2008.

³⁰ Derek Fung, "How Better Place Plans to Revive the Electric Car," www.cnet.com.au, February 11, 2009.

³¹ "Electric Cars Make for a Better Place," www.roadtraffic-technology.com, December 19, 2008.

fuel expenditure by an Israeli from US\$ 250 per month to US\$80 per year.³² Israel generated a vast amount of renewable energy from solar power which could be utilized to feed the smart grid.

Better Place planned to have 100,000 electric cars on Israel's roads by 2011. It partnered with the Renault-Nissan alliance³³ to market the electric cars in Israel once the infrastructure was put in place.³⁴ In the initial stage, the company wanted to roll out several models of electric cars with different subscription pricing packages, and to subsidize the cars to reduce the total cost of ownership.

Better Place in Denmark

Denmark is a small country with a good population density and an established infrastructure for wind power³⁵. On an average, every Dane travelled a distance of 41 km daily.³⁶

Denmark had been at the forefront in taking initiatives to reduce its impact on the environment and it was among the top nations that had shown strict compliance to various environmental agreements.³⁷ It adopted an Energy Policy in February 2009, with the main goal of reducing Denmark's dependence on fossil fuels. The key features of this policy were:

- Goal of increasing of renewable energy constitution to 20% in gross energy consumption by 2011
- Reducing the gross energy consumption by 4% by 2020 compared to 2006
- Tax exemptions for electric cars extended until 2012 starting from 2008
- Framing of policies by the end of 2009 to promote plug-in-hybrid cars.

In pursuing its environmental initiatives, Denmark promoted the adoption of electric cars through various subsidies, taxes, and environmental projects. Among the various types of taxes levied on cars, registration tax accounted for more than half of the on road price of the cars. Denmark exempted electric cars from registration tax until 2012, bringing down the price drastically. Electric cars were also exempted from others taxes such as ownership tax, vehicles excise duty, countervailing charges, and road taxes. There were no tax exemptions for hybrid cars in Denmark as of September 2009. According to Shai Agassi, the price of the electric car in Denmark was expected to come down from US\$ 60,000 to US\$ 20,000 due to these tax exemptions.³⁸

In Denmark, Better Place signed up with DONG Energy which had wind power installations. The electric vehicles were to be supplied by the Renault-Nissan alliance. Anders Eldrup, CEO of DONG Energy, said, *"With this project, we hope to contribute substantially to reducing CO₂ emissions from Danish cars. At the same time, we will achieve a new way of storing the*

³² Karin Kloosterman, "Making Electric Cars Sell Like Cell Phones," www.treehugger.com, November 23, 2007.

³³ The Renault-Nissan Alliance, formed in 1999, is a partnership between French automaker Renault and Japanese automaker Nissan Motors. The alliance has emerged as a strong contender in the global automotive sector. By the end of the financial year 2008, this alliance was the third largest in terms of sales in the world, and had a market share of 9 percent globally. Source: www.renault.com (Accessed on June 3, 2009)

³⁴ "Renault-Nissan, Project Better Place Announce First Electric Vehicle Mass Market," www.japancorp.net, January 21, 2008.

³⁵ Electricity generated from wind energy

³⁶ "Statistical Yearbook 2009," www.statbank.dk.

³⁷ "Environmental Agreement Compliance (Most Recent) by Country," www.nationmaster.com.

³⁸ "Tax Exemption Attracts Automakers to Denmark," www.wellsphere.com, November 7, 2008.

*unstable electricity output from wind turbines, as electric vehicles are typically charged during the night, when the exploitation of power generation is low. This provides optimum exploitation of our resources for the benefit of the environment.*³⁹

Better Place in Hawaii

Hawaii, a small island state, provided a favorable environment for Better Place to set up its infrastructure. Further, the state government had a vision of increasing the contribution of pollution-free sources to energy generation to as high as 70 percent.⁴⁰

By the end of 2008, Hawaii had tied up with Better Place to electrify its transportation by building the necessary infrastructure such as a charging network and swapping facilities. Better Place signed a Memorandum of Understanding with electricity generating companies in Hawaii for the supply of renewable energy to their charging stations, and planned to place the electric cars manufactured by the Renault-Nissan Alliance in the market by 2012.⁴¹

Better Place in Australia

As of October 2009, Australia was ranked seventh highest in the world in terms of per capita car ownership, with approximately 15 million cars in use.⁴² Unlike Israel, Denmark, or Hawaii, Australia was a large landmass with urban centers separated by huge distances. Further, it had a low population density. There were doubts about the viability of the Better Place model under such unfavorable conditions. However, the company went ahead with its plans for Australia. *“We figured out it’s time to pick a bit of a bigger island to demonstrate our ability to scale,”*⁴³ said Agassi in reply to a question on the company’s venture into Australia.

Better Place planned to construct several charging/swapping stations in the three big cities of Melbourne, Sydney, and Brisbane. The company also planned to construct a charging station every 25 miles on the highways connecting these three cities. For sourcing electricity for the network, it tied up with AGL Energy, one of the major electricity producers in Australia. To meet the necessary investment for building the infrastructure, it collaborated with Macquarie Capital Group⁴⁴, Sydney. Better Place aimed to release the electric cars supplied by the Renault-Nissan alliance on Australian roads by 2012.

As of 2009, Australia’s expenditure on fossil fuels for transportation ranged between AU\$ 20 billion and AU\$ 30 billion per annum.⁴⁵ Better Place estimated that the replacement of fossil fuels by renewable energy in the transportation sector would drastically reduce its expenditure on energy to about AU\$4 billion per year.⁴⁶

³⁹ “Project Better Place to Sell Electric Cars in Denmark,” www.greenbang.com, March 27, 2008.

⁴⁰ Jeff St. John, “Better Place Goes to Hawaii,” www.greentechmedia.com, December 2, 2008.

⁴¹ “Better Place Electric Cars head to Hawaii,” www.reuters.com, December 2, 2008.

⁴² David Ehrlich, “Better Place to Charge Up Australia,” <http://cleantech.com>, October 23, 2008.

⁴³ David Ehrlich, “Better Place to Charge Up Australia,” <http://cleantech.com>, October 23, 2008.

⁴⁴ Macquarie Capital Group is a global provider of banking, financial, advisory, investment, and fund management services. As of March 2009, it operated in over 70 countries and had an employee strength of nearly 12,700. It managed assets worth AUD 243 billion. Source: www.macquarie.com.au (Accessed on June 10, 2009)

⁴⁵ The wide range was largely due to the fluctuation in the price of crude oil in terms of US dollars, and the fluctuations in the currency conversion exchange rate between the US dollar and the Australian dollar.

⁴⁶ Derek Fung, “How Better Place Plans to Revive the Electric Car,” www.cnet.com.au, February 11, 2009.

Better Place in California, USA

Better Place entered into an agreement with the state of California in the US to build the charging infrastructure for the electric cars. The company planned to complete the infrastructure and launch its electric vehicle services in the state by 2012.

The Bay Area that envelops the San Francisco Bay in California, famed for its high-technology businesses, took the lead in promoting electric cars as the primary mode of personal transportation. To make San Francisco the electric vehicle capital of the USA, regulatory authorities gave incentives for the companies that permitted the installation of charging stations on their premises and incentives to consumers for purchasing electric cars, besides encouraging public agencies to replace the existing cars in their fleet with electric cars.⁴⁷

Better Place in Ontario, Canada

Better Place entered into an agreement with the government of Ontario in Canada to establish its smart grid in that state. At the same time, the government was evaluating various policy initiatives to encourage the mass adoption of electric vehicles in the province. Bullfrog Power, a renewable energy generation company, signed up as Better Place's partner for powering the smart grid.

CHALLENGES TO THE BUSINESS MODEL

The Better Place business model faced many challenges in terms of consumer preferences, market suitability, competitors/substitutes, and the threat of technology changes.

Consumer preferences: Analysts said it was likely that consumers who had got used to the luxury provided by big, ICE-powered automobiles and their various features, would not be too impressed by the electric cars that would operate in the Better Place ecosystem. Moreover, the big automakers were developing plug-in hybrid cars to be launched in the market by 2010 or 2011, before Better Place could entrench itself in the market. These cars, such as the Toyota Prius (plug-in hybrid version) and the Chevrolet Volt were expected to match conventional automobiles in terms of features while providing the additional convenience of using either battery and/or gasoline according to the needs of the situation. On the other hand, subscribers of Better Place's services would have only a limited range of electric cars to begin with. Further, consumers could find it inconvenient to swap batteries at regular intervals during long trips.

Market suitability: According to analysts, the Better Place business model was best suited for small countries or big metropolitan areas, with a high population density. These places offered scope for scalability of the charging network. But in very large countries, establishing the network would be a cumbersome task and the return on investment might not be commensurate with the risks involved. Installation of charging stations needed the active support of institutions such as municipalities, parking lot operators, and companies, with many implications for the existing infrastructure. Moreover, renewable energy occupied a

⁴⁷ Uclia Wang, "Better Place to Charge up California," www.greentechmedia.com, November 20, 2008.

small proportion of total electricity generation in many countries, making it difficult for the environmental objectives of the business model to be achieved.

Competition and substitutes: As the market for electric cars was estimated to grow, companies such as Coulomb Technologies Inc., Itron Inc⁴⁸, and GridPoint Inc⁴⁹ were independently working toward establishing networks of charging stations in the US (**Refer to Exhibit III for a profile of Coulomb Technologies Inc.**). As these companies facilitated charging for any type of electric car, it was expected to boost the customer choice to a wide range of brands in electric cars. Public policy-makers in many countries could find this model more attractive in order to protect consumer interests and encourage open competition rather than support a closed ecosystem managed by a single company (or a single group of companies).

Their business model was simpler than that of the Better Place ecosystem: they offered subscription plans that were beneficial to repeat users, but subscription was not a prerequisite for using their services. Moreover, they too preferred renewable energy sources for powering their charging network, and could claim to be as eco-friendly as Better Place in eliminating greenhouse gas emissions.

The Better Place ecosystem faced competition from global automakers who had plans to manufacture plug-in hybrid electric vehicles and pure electric vehicles and did not belong to this ecosystem (**Refer to Exhibit IV for various developments in the US market for electric cars**).

The Better Place ecosystem also faced competition from automobile manufacturers such as BYD Auto of China, which had world-class R&D expertise in battery technology and was willing to set up its own charging infrastructure with rapid charging facility. In January 2009, Wolfgang Bernhart, Senior Researcher, Roland Berger Strategy Consultants GmbH⁵⁰, commented, "*BYD Auto is probably the closest...to becoming the first Chinese auto maker to crack the Western auto markets.*"⁵¹ (**Refer to Exhibit V for BYD Auto's global ambitions in the market for electric cars**).

Threat of changes in battery technology: If there was any disruptive breakthrough in battery technology with a longer range and a faster recharge, the smart grid infrastructure of Better Place with its emphasis on battery swapping, may become redundant. In March 2009, the US government, led by the President, Barack Obama, unveiled an energy plan that included an outlay of US\$ 2 billion for battery research for electric cars.⁵²

⁴⁸ Itron Inc is a Washington-based company offering products and services to the energy and water industries globally. Its portfolio included intelligent metering, data collection, and software solutions. As of July 2009, about 8,000 utilities across the world used its solutions. Source: www.itron.com (Accessed on July 24, 2009).

⁴⁹ It is a Virginia-based technology company providing software solutions to the utilities to efficiently manage electricity supply and demand. Its solutions were focused on load handling, renewable energy management in the total supply, and solutions for electric vehicles charging. Source: www.gridpoint.com.

⁵⁰ Headquartered at Munich, it is one of the leading global players in strategy consultancy. By the end of 2008, it had offices in 27 countries with employee strength of 2,100 people and annual revenues of 670 million Euros. Source: www.rolandberger.com (Accessed on August 18, 2009).

⁵¹ Norihiko Shirouzu, "Technology Levels Playing Field in Race to Market Electric Car," <http://online.wsj.com>, January 12, 2009.

⁵² "US Government to Distribute \$2 Billion in Grants for Car Battery Research," www.automonster.ca, July 23, 2009.

FUTURE OF THE INDUSTRY AND THE BUSINESS MODEL

Faced with depleting reserves of fossil fuels, volatility in the price of crude oil, and increasing concerns about environmental pollution and greenhouse gas emissions, the global automotive industry was gradually moving toward electricity as the source of power for automobiles, at least in a hybrid form.

In the United States, the bankruptcies of Chrysler Corporation⁵³ and General Motors Corporation⁵⁴ in 2009 and the government's stimulus package for the industry were expected to accelerate the push for eco-friendly vehicles. The energy plan unveiled by the US government in March 2009 had an outlay of US\$ 150 billion toward developing alternative and clean energy sources, with the government aiming to promote one million plug-in hybrid cars by 2015.⁵⁵ The plan provided federal tax exemptions ranging from US\$ 2,500 to US\$ 7,500 on the purchase of plug-in hybrid electric cars and pure electric cars.⁵⁶ Owners installing alternative fuel equipment received tax credits up to 50 percent of the cost of the equipment; for residential equipment purchase, consumers got up to US\$ 2,000 tax credit.⁵⁷

In Europe, the electric cars market was estimated to exceed 250,000 units by 2015⁵⁸, according to a study by Frost & Sullivan in October 2008. Among emerging nations, observers expected China to take the lead in electrification of road transportation.

Corporations and entrepreneurs were looking forward to a concrete agreement at the of the United Nations Climate Change Conference - Copenhagen 2009 (COP15) that would facilitate new business opportunities related to becoming a 'low carbon economy' (**Refer to Exhibit VI for the roles of government and business in controlling climate change**). Increasing fund allocation for producing renewable and clean energy such as solar energy and wind energy was expected to augur well for the electric vehicle charging network facilitators. The predictability of the cost of electricity generation from renewable sources was another positive factor in this regard. Increased pressure on corporations to be more socially and environmentally responsible was expected to induce many of them to install charging stations on their premises. Given such a favorable environment, electric cars and charging networks, which served the cause of environmental sustainability, appeared to have a bright future. However, the question remained: would Better Place's innovative business model be commercially sustainable in the long run?

⁵³ A Detroit-based automotive company that manufactures cars, minivans, sports utility vehicles, and light trucks.

⁵⁴ General Motors Corporation, one of the leading automakers based in Detroit, US, was founded in 1908. As of June 2009, it possessed manufacturing plants in 34 countries, had 244,500 employees, and sales and services outlets in 140 countries. From June 1, 2009, the company pursued reorganization and conducted operations under the US Government's Bankruptcy laws. Source: www.gm.com (Accessed on June 4, 2009)

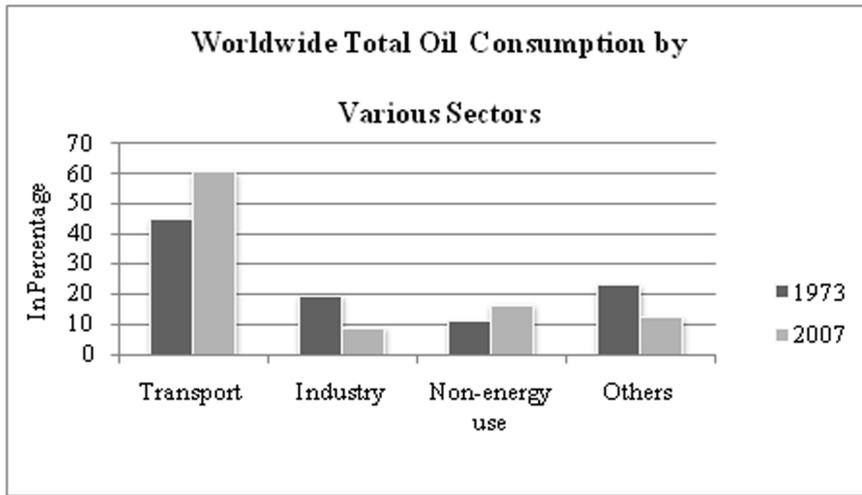
⁵⁵ Patrick E. Meyer, "Obama's Ambitious Energy Policy," www.todaysengineer.org.

⁵⁶ "US Government to Distribute \$2 Billion in Grants for Car Battery Research," www.automonster.ca, July 23, 2009.

⁵⁷ www.afdc.energy.gov.

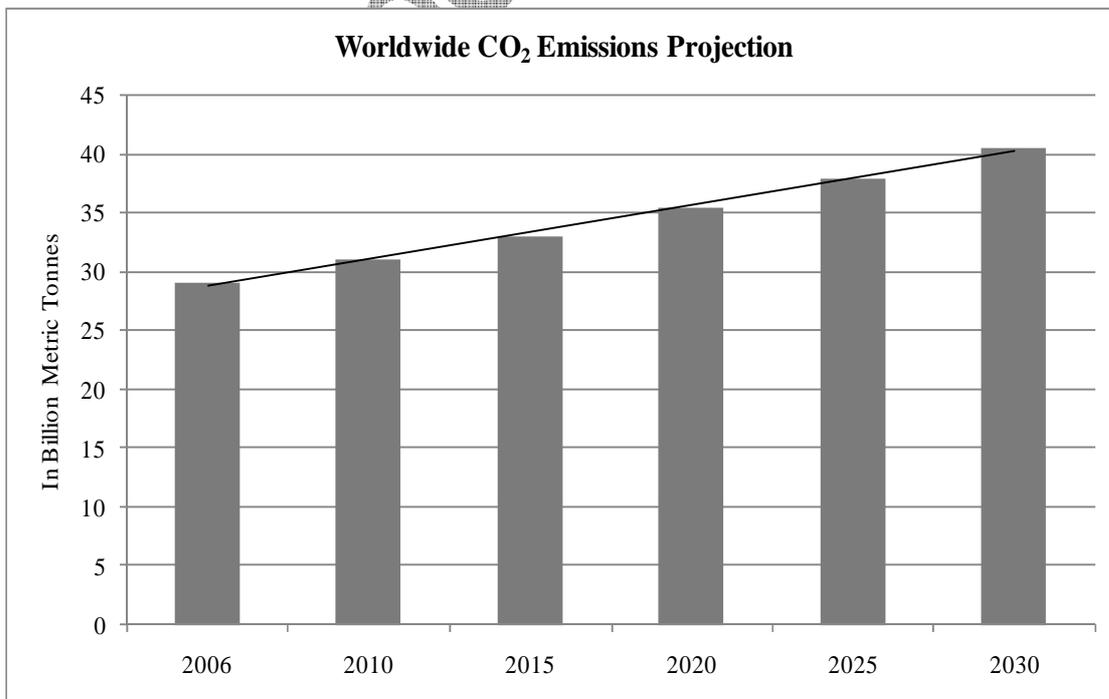
⁵⁸ "The Global Oil Paradox," awbriefing.com, October 2008.

Exhibit I: Worldwide Total Oil Consumption by Various Sectors



Adapted from Key Energy Statistics 2009, www.iea.org.

Exhibit II: Projection of CO₂ Emissions Worldwide



Adapted from International Energy Outlook 2009, www.eia.doe.gov, May 27, 2009

Exhibit III: Coulomb Technologies Inc. – A Simpler Business Model

Coulomb Technologies Inc, a California-based company, was founded in 2007 with the objective of providing charging infrastructure services for electric vehicles. From the United States, it expanded its operations to Europe, the Middle East, and Africa by partnering with various distributors in those areas. The company's offerings included selling, installing, and servicing the charging infrastructure which it called ChargePoint Network.

The ChargePoint Network included charging stations and the network operating system to control them. The charging network was divided into local groups of charging stations which were again controlled through a single gateway charging station. A gateway charging station supported communications for nearly 100 charging stations. This gateway charging station communicated with the ChargePoint Network Operating System which was hosted on a remote server of the company. This operating system established communication with the charging stations for user authentication and access to the network and also provided the customers with web-based portal access. This network automatically informed the drivers of electric vehicles -- through SMS or e-mail -- about vacant charging stations in their vicinity, provided easy access to charging for non-members of the network, gave timely information on the charging status of the batteries, and sent alerts on depletion of the charge of the batteries⁵⁹. However, the company did not provide any charging facilities at customers' homes.

Its offerings catered to both business-to-business (B2B) and business-to-consumer (B2C) markets. In the B2B market environment, it supplied charging infrastructure to municipalities, parking lots, and parking infrastructure owners. In the B2C market, it offered subscription-based charging facilities to the drivers of electric cars. Electric car drivers were offered flexible recharging options that made them use the network by paying for the charging session or by subscribing for a monthly plan that suited their charging requirements. Subscribers had the flexibility of using any charging station irrespective of the local group to which they belonged.

The company's clients included:

- City Hall, City of San Francisco
- Rampart Casino, Las Vegas⁶⁰
- Sierra Nevada Brewing Co⁶¹., Chico, California
- City of Amsterdam, the Netherlands (45 charging stations in the first phase by May 2009, growing to 200 charging stations by 2012)

⁵⁹ <http://www.coulombtech.com/products.php>

⁶⁰ Rampart Casino is one of the famous casinos in the city of Las Vegas. It offers facilities such as four star hotels, a casino, restaurants, and a spa complex. Source: www.rampartcasino.com

⁶¹ Sierra Nevada Brewing Co. is one of the leading microbreweries in America and has earned many accolades for its international standard ales and lagers. It was started in 1980 and since its inception, had come up with many innovations to conserve energy resources. Source: www.businesswire.com

As the network facilitated charging of batteries for any type of electric vehicle, it was expected to gain from the roll-out of electric cars from many companies.

Compiled from various sources.

Exhibit IV: Developments in the US Market for Electric Cars

In the US, among the cars that used electric batteries for fuel efficiency, hybrid cars had shown an upward trend; by 2008, they had gained about 2.5 percent share of the annual market for light vehicle sales. Toyota Prius had a dominant share of the hybrid cars sales in 2008, followed by Honda Insight. As there was more preference for fuel efficient cars from consumers to shield against the volatile gasoline prices, many of the major automakers in US also planned to release plug-in hybrid electric vehicles (PHEVs) and pure electric cars. General Motors was expected to release its much anticipated Chevy Volt by 2011 and had partnered with battery suppliers to hasten the process of releasing the car for sale. Other leading automotive companies such as Toyota, Ford Motor Company⁶², Chrysler Group LLC⁶³, and Honda were also in the process of producing plug-in hybrid or pure electric models **(Refer to Table A for planned releases of electric cars in the US by major automakers).**

Table A
Electric Cars to be Released for Sale in the US by Major Automakers

Automaker	Brand	Vehicle Type	Expected Year of Release in the US
General Motors	Chevy Volt	PHEV	2010
Toyota Motor Corporation, Japan	Plug-in Prius	PHEV	2012
Nissan Motor Co. Ltd., Japan	Leaf	Pure electric	2010
Chrysler Group, LLC	Dodge Circuit EV	Pure electric	2010

⁶² Based at Detroit, Ford Motor Company was one of the leading multinational automotive companies in the world. It manufactured cars, trucks, and SUVs; and by the end of financial year 2008, it had employee strength of over 200,000 people worldwide. Source: www.ford.com (Accessed on July 24, 2009).

⁶³ Founded in 1925, Chrysler Group LLC, Detroit, was an automotive company that manufactured cars, minivans, SUVs and light trucks.

Ford Motor Company	Yet to be named	Pure electric, PHEV	2011 - pure electric 2012 - PHEV
Daimler AG,⁶⁴ Germany	Smart Car	Pure electric	2012
BMW, AG, Germany.	MINI E	Pure electric	May 2009

As of 2009, there were no US automaker in the pure electric car manufacturing segment expect Tesla Motors, Inc., which exclusively catered to this segment with its Sports Utility Vehicle(SUV), Roadster. With a 53 kWh battery, the Tesla Roadster had a range of 244 miles (390 kilometers); the car was priced above US\$ 100,000. By 2011, Tesla Motors planned to launch its Model S with a range of 300 miles (480 kilometers) and priced just below US\$ 50,000.

GM invested US\$ 25 million to establish a battery lab to facilitate speedy development of the hybrid, PHEV, and pure electric cars from the company. GM also tied up with LG Chem Ltd⁶⁵ to supply battery for its Chevy Volt model and collaborated with LG Chem and Compact Power, Inc.,⁶⁶ toward improving the technology. Further, the company had worked with University of Michigan in developing curriculum for engineering related to battery technology. *“The new global GM battery lab will benefit consumers across America by helping us advance the development of battery technology in the United States and put cleaner, more efficient vehicles on the road more quickly and affordably,”*⁶⁷ said Fritz Henderson, CEO, General Motors.

Compiled from various sources

Exhibit V: BYD Auto and the Market for Electric Cars – Global Ambitions, Nurtured in China

BYD Auto, which had its origins in the BYD Company, a manufacturer of lithium-ion and other rechargeable batteries, was regarded as the world’s first mass producer of plug-in hybrid electric cars. BYD Company had entered the automotive sector in 2003 by acquiring Qinchuan Motors, Xian, and renaming it as BYD Auto. Beginning 2005, BYD Auto released a series of models based on internal combustion engine technology into the Chinese market. By the end of 2008, its F3 was one of the top car models being sold in China.

⁶⁴ Germany-based Daimler was one of the leading manufacturers of cars and trucks in the world. For the financial year 2008, it earned revenues of over 95 billion Euros and employed more than 273,000 people.

Source: www.daimler.com (Accessed on July 24, 2009).

⁶⁵ It is a Seoul-based manufacturer and exporter of chemicals and polymers, industrial materials, and electronic components. Source: www.lgchem.com.

⁶⁶ It is a Michigan-based subsidiary of LG Chem Ltd in North America that manufactures lithium-ion batteries for the automotive and non automotive segments. Source : www.compactpower.com

⁶⁷ “GM’s ‘Reinvention’ Starts With \$25 Million Battery Lab,” www.mixedpower.com, June 16, 2009.

Under the leadership of its founder Wang Chuanfu, BYD Auto ventured into the design, development, and manufacture of different types of electric cars by leveraging its expertise in battery manufacturing. In December 2008, it released its first plug-in hybrid electric car model F3DM in the Chinese market. Also in the pipeline for BYD Auto was the E6, a pure electric car scheduled for release by late 2009 in China.

As of July 2009, the Chinese government was in the process of promoting electric vehicles through various subsidies and tax exemptions to address the twin concerns of environmental sustainability and energy security. China had committed US\$ 2.2 billion in 2009 to promoting low emission vehicles in the country. According to an assessment by Bain & Company, if the electric cars were priced less than US\$ 15,000, their annual sales were expected to reach 1.5 million worldwide with sales of 200,000 units coming from China. However, China did not have adequate infrastructure for charging electric car batteries. BYD Auto planned to provide recharging facilities for its batteries by establishing charging stations.

In 2008, BYD Company had attracted worldwide attention when Warren Buffett, CEO of Berkshire Hathaway Inc, acquired a 10 percent stake in it for US\$ 230 million. BYD Auto had plans of introducing electric cars in the US by 2011. The electric vehicles segment was an emerging market in the US and it offered a level playing field for BYD Auto to compete with well-established giants in the global automotive industry. Further, the US was the second largest emitter of greenhouse gases, with China occupying the top slot.

BYD Auto planned to release the electric cars in the US at a price of about US\$ 22,000, well below the prices of other major automakers such as GM and Toyota. Its proprietary battery technology for electric cars was expected to be more energy-efficient. With the use of electrodes made of iron phosphate⁶⁸, these batteries were also less susceptible to catching fire compared to conventional Lithium-ion batteries. Further, the company could provide quick recharging facilities for its batteries: a user could recharge more than half of a battery in 10 minutes.⁶⁹ However, this quick recharging facility required 100 amperes of current whereas households provided only 20 amperes.

Compiled from various sources

⁶⁸ Iron phosphate was chosen because of its thermal stability and safety features.

⁶⁹ "BYD in Pole Position to Dominate Electric Car Market," www.climatesuccess.org, June 2, 2009.

Exhibit VI: Controlling Climate Change – The Roles of Government and Business

In the run-up to the December 2009 summit at Copenhagen on climate change, heads of several large corporations called for a strong global climate agreement that could become the foundation for them to transition their businesses into low-carbon businesses. The following excerpts are from the executive summary of a report co-published in September 2009 by the UN Global Compact Office.

There is tremendous economic opportunity in addressing climate change.

The mandate to revolutionize how we produce and consume provides one of the greatest value creation opportunities the world has ever seen. Many believe this potential could surpass even the value created in the information technology revolution. The opportunity is not restricted to either newcomers or incumbents, but is instead open to anyone ready to find solutions.

This opportunity can only be unleashed with regulatory certainty and a price on carbon.

While many companies are already moving to a lower carbon economy, they are poised to invest massively more. What they require to make the investments is a regulatory environment that is stable, and sends the market a clear signal on how to price carbon. A price on carbon, established globally, ensures a level playing field without competitive distortions or disruptions to trade.

A low carbon economy is attainable, and business is a critical part of the solution.

The CEOs profiled in this report highlight that the transition to a low carbon economy is within reach. All that is needed is a framework within which business can move forward with the transition. Not only do we have the necessary solutions today, an agreement would spur further innovation. As the implementers of a move to a low carbon economy, business has a critical role to play.

Climate change needs to be addressed by governments now.

Not ten years from now, not five years from now, but now. The effects of climate change are already evident. The transition to a low carbon economy, if advanced now, can deter the worst human and financial costs. The current economic crisis should not prevent us from moving ambitiously on an agreement. Moving on an agreement now will reduce the risks of climate change and create a more secure economic future for all.

Source: UN Global Compact Office and Dalberg Global Development Advisors, "Champions of the Low Carbon Economy: Why CEOs are Ready for a Global Climate Agreement," www.unglobalcompact.org, September 2009.

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