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# Vehicle Electrification

## More rapid growth; steeper price declines for batteries

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### Recent discussions reinforce conviction regarding EV growth trajectory

Based on recent discussions with Automakers, Battery Suppliers, and EV infrastructure co's, we continue to believe that the market underestimates the potential for growth in this segment... particularly in markets that are supported by EV friendly gov't policies and independent infrastructure co's focused on growing the penetration of such vehicles. Additionally, we've noted evidence of steeper-than-expected battery price declines which will likely bolster the consumer value proposition and potentially lead to stronger demand than we originally envisioned.

### We see Israel as one of the test beds for mass market EV penetration

We visited Better Place in Israel last week and note that the company expects to have completed deployment of its first 30,000 Charge Spots and 70 Battery Swap Stations by the late next year (Denmark will have 20,000 BP Charge Spots deployed by next year). This contrasts sharply with the much more limited EV Infrastructure activity that is occurring in markets such as Germany, Portugal, the UK, and the U.S., where governments are interested in adopting EV-friendly policies, but where there is no private sector company singularly focused on infrastructure deployment.

### And we expect a steeper adoption curve in such countries

100-150 consumers per day have been visiting Better Place's EV Welcome Center near Tel Aviv since the facility opened, and approximately 36% have signed up for an Electric Vehicle (Renault Fluence will be the first in this country, in 2H11). At a rate of 50 per day, this one dealership is on track to sell nearly 1000 vehicles per month—an impressive figure for a dealership in any country... particularly one that won't receive its first vehicles for nearly a year. While Israel has unique political and security motivations to achieve reduction in oil dependence, we believe that there can be significant takeaways for larger markets from developments there.

### Battery costs appear to be coming down faster than we expected

Based on discussions with industry experts, we projected (in a report dated November 3, 2009) that the price of Advanced Lithium Ion Energy Battery Costs would likely decline by 25% / 50% over the next 5 / 10-years (from approximately \$650/kWh in 2009), and that performance would double over the next 7-years. Several Automakers have told us that they have already seen bids in the mid-\$400/kWh range for large volume EV battery pack contracts in the 2011/2012 time-period (implying a 30% decline). A steeper price trajectory implies potential for more rapid EV penetration (payback on the investment should improve meaningfully) and high visibility on eventual scale-based cost declines, but intense competition in this area also raises concerns about profitability of battery producers.

### Sector Valuation / Risks

We utilize an EV/EBITDA valuation methodology for companies with extensive liabilities and P/E valuation methodology for companies that generate adequate free cash flow and exhibit an ability to consistently grow earnings. Principal sector risks include the outlook for successful restructuring at U.S. automakers and significantly higher/lower than expected global auto demand.

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### Industry Update

We came away from recent discussions with Automakers, Battery Suppliers, and EV Infrastructure companies with reinforced conviction regarding the growth trajectory of Electrified Vehicles, and updated views on the trajectory of battery pricing. Overall, we continue to believe that the market underestimates the potential for growth in this segment... particularly in markets that are supported by EV friendly government policies and independent EV infrastructure companies that are focused on growing the penetration of such vehicles. We visited Better Place in Israel last week, as we see Israel as one of the test beds for mass market EV penetration. The Israeli government has partnered with Better Place to deploy infrastructure to support mass adoption of Electric Vehicles, with the objective of weaning the country off of foreign oil. Israel has also offered consumers strong financial incentives through tax breaks (there is a 92% tax on purchases of ICE vehicles, whereas EV purchases carry a 10% tax), and taxes on fuel (gasoline in Israel costs approximately \$6.50 /gallon). While Israel has unique political and security motivations to achieve reduction in oil dependence, we believe that there can be significant takeaways for larger markets from developments there. Takeaways from this visit included the following:

- **Deployment of EV infrastructure appears to be happening much more rapidly in countries, such as Israel, where there is a private, financially motivated company such as Better Place.** Better Place expects to have completed deployment of its first 30,000 Charge Spots and 70 Battery Swap Stations by the late next year (Denmark will have 20,000 BP Charge Spots deployed by next year). 70,000 Charge Spots are projected for Israel by the following year. This contrasts sharply with the much more limited EV Infrastructure that is occurring in markets such as Germany, Portugal, the UK, and the U.S., where governments are interested in adopting EV-friendly policies, but where there is no private sector company singularly focused on infrastructure deployment (much of the infrastructure work in the US, for example, is being done through fragmented regional partnerships among automakers, local / state governments, regional utilities, and infrastructure equipment-makers).
- **And we expect a steeper adoption curve in such countries.** We visited the Better Place's EV Welcome Center near Tel Aviv, where consumers experience a high tech presentation that illustrates the advantages of EV ownership, followed by an EV test drive on an enclosed track, and private meeting with an EV salesperson. 100-150 consumers per day have been visiting this center since the facility opened, and approximately 36% have signed up for an Electric Vehicle (Renault Fluence will be the first in this country, in 2H11). At a rate of 50 per day, this one dealership is on track to sell nearly 1000 vehicles per month—an impressive figure for a dealership in any country... particularly one that won't receive its first vehicles for nearly a year (for reference, 150k-200k total vehicles are sold in Israel annually). In addition, Better Place indicated that they have started a dialogue with larger local companies, which provide their employees with vehicles as part of their compensation and benefits packages. The 300 largest companies in Israel own 100,000 vehicles on behalf of their employees (total Israeli vehicle parc is 2mm units). Fuel, insurance, and maintenance costs are also included, which means that companies are economically motivated to push their employees toward electric vehicles. Better Place has also already signed up 100 of the largest corporate fleet buyers.
- **Providing a significant market share growth opportunity for EV focused companies such as Renault.** Better Place has partnered with Renault, and is negotiating with several other automakers to produce vehicles suitable for its network. Given strong government support, consumer incentives, declining costs for EV technology, and rising cost for oil, we continue to believe that early deployment of EV models could become a driver of significant market share growth for Automakers that are pursuing this segment aggressively (Better Place has already ordered 100,000 vehicles from Renault). As we have noted in our EV FITT reports, we see EVs as a potentially disruptive technology that

could impact the automotive industry landscape: Market shares, residual values, pricing... all these could change meaningfully over the next 10-years.

- **Costs appear to have been coming down faster than we expected.** Based on discussions with industry experts, we projected (in our “Electric Cars—Plugged In 2” report dated November 3, 2009) that the price of Advanced Lithium Ion Energy Batteries would likely decline by 50% over the next 10-years (from approximately \$650/kWh in 2009), and that performance would double over the next 7-years. Our contacts within the Auto Industry, Battery Makers, and EV Infrastructure companies have all suggested to us that battery costs have been declining even faster. Several Automakers have told us that they have already seen bids in the mid-\$400/kWh range for battery packs for large-volume contracts in the 2011/2012 time-period (we expected \$490-\$500/kWh by 2015 and \$325/kWh by 2020). A steeper price trajectory implies potential for more rapid EV penetration (payback on the investment should improve meaningfully) and high visibility on eventual scale-based cost declines, but intense competition in this area also raises concerns about profitability of battery producers.
- **Rapid reduction of battery pricing could impair expected battery margins.** We don’t believe that the cost picture has improved significantly from the analysis we provided in our November 2009 report, but that it’s more likely that lower prices are resulting from a desire on the part of battery-makers to lock-up high volume contracts, even if it results in narrow initial margins (most battery-makers appear to be targeting mid-20% long-term gross margins). Our November analysis projected that battery-makers could achieve mid-20% gross margins at slightly below \$500 / kWh pricing in the 2015 time-frame. This was based on expectations that cost to the battery-maker would decline to approximately \$375-\$400 / kWh from about \$525 / kWh today (for an approximate 25 kWh Electric Vehicle battery pack). These declines did not require technological breakthroughs, but were driven by internal (as well as material supplier) economies of scale, freight / duty declines (as a supply chain develops near battery production sites), and increased manufacturing yield. We believe that it is unlikely that full scale-based savings can be achieved by the expected 2012 volume inflection point, as battery-maker and material supplier capacity will likely remain immature at that point.

Overall, we believe that battery-maker stocks will continue to be driven by contract announcements in the near-term, but that profitability of particular contracts will be just as critical to analyze as volume. We’d note importantly that sub-\$500 pricing does not appear to be across-the-board at this point, as lower volume contracts appear to be priced higher, and that, once the dust settles on several early high-volume contracts, capacity constraints and potential growth of grid storage applications (which appears to be significantly profitable) could well support pricing.

For those interested in more detail on Better Place and the role that alternative business models may play in EV adoption, we are re-publishing below the relevant section from our November 2009 EV FITT report.

## **Alternative Business Models Could Accelerate The Shift Toward Electrification**

Until now, all but a few established automakers have generally considered electrification out of necessity—in order to achieve intensifying fuel economy/CO<sub>2</sub> reduction mandates that would be difficult if not impossible to achieve with internal combustion technologies alone. Relatively few have seen it as an opportunity for differentiation, or growth. But we believe that this paradigm could change. Several automakers, finance, and infrastructure companies have been discussing business models that could help facilitate more rapid EV penetration.

### **An emerging group of EV infrastructure companies believe that EV's can be cheaper than ICE's, at the point of purchase**

The most advanced amongst an emerging group of EV infrastructure companies, Better Place, has based its businesses on the premise that EV purchases should be structured without batteries, so that the vehicle can be sold at the same price or lower than a conventional internal combustion powered vehicles. They believe that this will be a prerequisite for electric vehicles to capture a significant share of the mass market (i.e. the mass market will typically migrate towards products that are less expensive at the point of purchase, and more convenient to use over time). Better Place intends to provide vehicle batteries to consumers at no upfront cost, and then sell consumers "Miles"—i.e. a per mile fee, equivalent to the per mile cost of driving a gasoline powered vehicle, which would cover the cost of the battery, electricity, widespread charging infrastructure, and a return on Better Place's investment.

The notion that EV's could be less expensive than an internal combustion powered vehicle is a novel one. Even if we look out to 2020, advanced lithium ion energy battery prices are still likely to be in the \$300-\$400 per kilowatt hour range (down from roughly \$600 per kWh today). Consequently, a mid-sized EV with a 100 mile range (25 kWh) will still likely to require a \$7,500-\$10,000 battery.

But many participants in the electric vehicle value chain believe that a lower price to the consumer is still possible, based on the fact that there is already a substantial arbitrage opportunity between gasoline and electric driving. To illustrate this point, we estimate that the average small car (C-Segment vehicle such as the Ford Focus, Honda Civic, or Toyota Corolla) in the U.S. achieves 28.5 miles per gallon in mixed city and highway driving. At relatively low gas prices in the U.S. (\$2.55 per gallon currently), such a vehicle consumes 8.9 cents of gasoline per mile to drive. In markets such as Germany, France, Switzerland, or the UK, where gasoline costs are approximately \$6.00-\$8.00 per gallon, this vehicle would consume 21.1-28.1 cents per mile to drive. For comparison, we estimate that the global average price of electricity is approximately 10 cents per kilowatt hour, and that a similarly sized vehicle would achieve 4 miles per kWh, implying an e-driving cost of 2.5 cents.

### **The arbitrage opportunity is likely to increase, which is why we believe that EV penetration rates are likely underestimated**

The arbitrage opportunity should expand as gasoline prices rise (DB's Oil Team recently published a study that suggested that oil prices could reach \$175 per barrel by 2016, implying \$4.75 per gallon gasoline in the U.S. and \$8.25-\$10.25 per gallon gasoline in Europe), and as governments in many parts of the world provide electric vehicles with additional rebates, tax breaks, and other incentives (The U.S. provides a tax credit of up to \$7,500, several U.S. states exempts EV's from sales tax, France provides a €5,000 rebate, Denmark exempts EV's from VAT ranging from 150%-180%, Israel exempts EV's from taxes of approximately 92%).

The opportunity for arbitrage between gas driving vs. EV driving is among the key reasons why we believe that EV penetration rates (relative to HEV and PHEV) are likely to exceed prevailing estimates. Conveying this arbitrage to the consumer would require a paradigm

shift in the marketing of Electric Vehicles—the battery would need to be sold separately from the vehicle. Proponents of this model argue that it is a mistake to package the battery, which is a consumable, with the vehicle, for the same reason that consumers don't purchase a lifetime supply of gasoline with a vehicle, or a lifetime supply of toner/ink with a printer.

**Separating the battery from the vehicle would facilitate more rapid penetration of electric vehicles for a variety of reasons, including:**

- The business model simplifies the gasoline/electricity arbitrage for the consumer. Service companies could invest in capital (the battery), lock in energy costs (through long term power purchase agreements with electric utilities), and convey the arbitrage to the consumer by billing for a service. In the most consumer oriented models that we have seen, the service providers intend to sell “miles” to the consumer every time the vehicle plugs-in to a charging device at home, at work, or any other public parking location. There is a widely used comparison of this business model to that of a mobile phone network provider, which invests in communications infrastructure, and provides highly subsidized (or free) phones in exchange for 2-3 years worth of “minutes”. In the EV service providers' case, they would sell a 3-4 year contract for “miles”. In exchange, the service provider would supply the vehicle with a battery, install a charging device at the owner's home, and it will endeavor to install ubiquitous recharging devices in the field (i.e. at work, on the street, parking lots, supermarkets, malls, etc). The charging devices communicate with the service provider, and the service provider bills the consumer directly based on terms of the plan: 1000 miles a month, 1500 miles a month; unlimited driving (i.e. a consumer charging at home would not pay a higher electric bill, since the utility would be aware that it is buying “miles” as part of the consumer's contract service contract, and the utility has sold electricity directly to the service provider under a long term purchase agreement).
- It should facilitate lower cost. Management of batteries (i.e. maximizing returns on these investments) should facilitate cost reductions for consumers. For example, third party battery owners are expected to maximize the residual value of the batteries owned by their networks. While financial models such as the one that we describe for Better Place, incorporate an 8 year depreciable life for the battery, and a 15% residual value, data from battery manufacturers suggest that much longer life expectancies are possible. Most of the battery companies that we have spoken to are willing to guarantee a 10 year life, and 2500 full discharge/recharge cycles for their batteries. And in the lab, these companies are now demonstrating 7000 full charge/discharge cycles (19 years assuming 1 full charge/discharge cycle per day). And we would note that the battery should still have value at the end of its initial service life (end of life is defined as the point at which the battery falls below 80% of its original performance). We anticipate that service companies will aim to maximize returns by seeking secondary markets for “end of life” batteries. For example, there will likely be a market for a 100 mile automotive batteries that are only capable of 80 miles per charge (the service provider may shift such units to regions where driving distances are smaller, such as Las Vegas, or the Hawaiian Islands). End of life batteries are also expected find other applications, including electric utility needs (grid storage and ancillary services).
- It adds convenience. The service provider would be expected to install recharging infrastructure at home, and in public locations (including workplaces), and provide this information to the vehicle so that drivers are able to identify range extending resources over longer trips.
- Lowers perceived obsolescence risk. Consumers may adopt EV's more slowly if they are concerned about obsolescence of the battery, as battery technology improves. Not owning the battery eliminates the concern about investing in this asset, as it would allow the consumer to upgrade over time.

- Reduces range anxiety. Service providers are expected to provide infrastructure for range extension, including battery swap and fast charge stations.
- Simplifies the consumer relationship. Third party service providers are expected to manage the relationship between utilities and the consumer. For example, a customer living in Northern New Jersey, working in New York City, and vacationing in Atlantic City may travel through territories controlled by three or more utilities (PSE&G, ConEdison, and Atlantic Energy). But the consumer would likely want seamless roaming between the charging infrastructure provided in all of these locations.
- Reduces infrastructure investment. While the electricity demands of electric vehicles are not expected to overwhelm electric utilities' capacity (only 4% of electric utility capacity would be consumed if 25% of all U.S. vehicles were powered by electric), electric distribution infrastructure could be strained during peak charging times, or in specific areas (such as a parking lot) that have a disproportionate number of vehicles charging at once. Electric vehicle service companies have focused on network management systems and software in order to communicate with vehicles and/or charge points in order to ensure that this does not occur. Israel Electric Corp estimates that, in a scenario where all Israeli vehicles are EV's by 2020, they would require zero additional generation and transmission assets given the interaction of EV service provider Better Place. If charging were done on an ad-hoc basis, generation assets would have to increase by 21% and transmission / distribution assets would have to increase significantly.

Our analysis of Better Place's business model suggests that EV's could be economic in high gas price, and high mileage regions (or niches), even without government assistance. And the model could be adapted for other markets

We have analyzed Better Place's business model in some detail, and have concluded that the concept should be financially compelling in certain regions—from the perspective of service providers (In Israel, we estimate that Better Place may be able to achieve a 60%+ EBITDA margin; 40%+ EBIT margin; 20% pretax margin; 35%+ return on equity), consumers (zero incremental up-front cost), and automakers (significant market share opportunity). And we believe that the model can be adapted to regions with lower gas taxes or with lower annual utilization rates, with government support, different rate structures and/or lower margins.

We believe that the Better Place model could significantly alter the EV value proposition from the consumers' perspective, because it should facilitate the acquisition of an EV at zero incremental upfront cost. In the Better Place model, the consumer purchases an electric vehicle without the battery. Better Place purchases the battery on the consumer's behalf, and charges the consumer for "miles", at a price that is consistent with the cost of gasoline driving of an equivalent vehicle. For illustrative purposes, we discuss several of the assumptions behind our Better Place Israel business model in the following sections.

### **Revenue and margins should experience a strong upward trajectory in Better Place's first markets**

We believe that the Israeli vehicle market offers certain unique attributes, which makes this market an interesting test-bed for electric vehicle and EV infrastructure deployment. Interesting features of this market include:

- A relatively small market, with 2 million vehicles in operation, and approximately 150k – 200k new cars sold per year. The market is also geographically small (about the size of New Jersey), with concentrated population centers and relatively few inter-city routes, enabling rapid and efficient deployment of charge and battery swap infrastructure.
- High gas prices (\$6.50/gallon) and substantial government support should help facilitate strong demand for electric based alternatives. ICE vehicle purchases in Israel are taxed

at 92%. But under recently passed rules, EV's will be taxed at only 10% through 2014, and 30% starting in 2015.

- Fleet purchasers, including businesses, account for a relatively high 50%-60% of this market, because major employers typically provide their employees with vehicles as part of their compensation packages. Employees use these work-provided vehicles disproportionately within their households, because of lower vehicle ownership density, and because their employers pay for all of the costs associated with these vehicles (fuel, insurance, and maintenance are all covered). Consequently, average utilization of fleet vehicles in Israel is relatively high (18,600 miles per year). In addition, businesses are motivated to reduce risk associated with volatile fuel prices.

Better Place Israel is expecting to begin consumer services 3Q11. By 4Q15 and 4Q16, we have assumed that the company can capture between 4% (81,000) and 5% (110,000) of the Israeli car parc, based on the assumption that the company will add 14,000 subscribers in 2012, 16,000 in 2013, 22,000 in 2014, 25,000 in 2015, and 30,000 in 2016 (note that the company has already pre-sold 30,000 vehicles to fleet purchasers as of 4Q09, and that it is still 1.5 years away from commercial operations). We believe that the company will attempt to achieve rapid deployment of vehicles by allowing EV buyers to capture 100% of the tax savings associated with the government EV incentive program. We assume that Better Place charges consumers (or businesses, in the case of fleet purchasers) a per mile rate that is at a slight premium to the current cost per mile for gasoline. The gasoline cost per mile for C/D sized vehicles in Israel is approximately 23 cents. A 24.5 cent charge for EV's would capture some of the insurance and maintenance cost savings that is expected of EV's.

If Better Place achieves the penetration targets outlined above (81,000 subscribers by YE2015 and 110,000 by YE2016), we estimate that this region will be running at an annualized revenue run rate of over \$370 million by 4Q15 and over \$500 million by 4Q16. After subtracting operating costs, including electricity (at 2.5 cents per mile), personnel, marketing, maintenance, depreciation, and other overhead expense, we estimate that Better Place Israel could achieve an operating margin of approximately 40% between late 2015 and 2016. One of the interesting observations that we made through our analysis of the battery market is that industry participants expect battery costs to decline by 50% over the next 10-years. If this happens, it should result in significant declines in depreciation expense for companies such as Better Place. At the same time, the EV vs. ICE transportation arbitrage opportunity could increase if oil prices climb.

**Figure 1: DB Estimate of potential Better Place pricing methodology**

<b>Internal Combustion Fueling Cost</b>	
Fuel cost per gallon	\$ 6.50
Miles per gallon	28
Miles per year	18,600
ICE Fuel Cost / Vehicle / Year	<u>4,318</u>
ICE Cost / Mile	\$ 0.23
<b>Better Place EV Cost (including battery)</b>	
BP Revenue / Vehicle / Year	\$ 4,550
Customer Maint / Insurance Savings	\$ (300)
Net cost to customer	<u>\$ 4,250</u>
BP Price / Mile	\$ 0.23

Source: Deutsche Bank

**Figure 2: DB Estimate of BP Israel profitability**

	4Q of 2015 Run Rate	4Q of 2016 Run Rate
Subscribers	81,500	110,100
Revenue / Subscriber	4,560	4,560
Revenue (\$MM)	372	502
Electricity Cost	38	51
Personnel Cost	29	40
Marketing Cost	10	13
Maintenance Cost	10	13
Other Overhead	38	53
EBITDA	247	332
Depreciation	100	127
EBIT	148	205
EBIT Margin	39.7%	40.8%

Source: Deutsche Bank

**Figure 3: Total Capital Deployed (\$MM) To achieve these revenue and margin objectives, we estimate that Better Place will have invested \$1.1-\$1.3 billion in Switch Stations, Charge Spots, Batteries, and Other Fixed Assets (\$920 MM of invested capital, and the rest funded through cash flow).**

	2015YE	2016YE	Adj'd for 2020 Battery Price (\$325/kWh)
Switch Stations	25	30	30
Charge Spots	107	137	136
Batteries	914	1,160	770
Other fixed assets	12	13	12
Total Investment	1,058	1,339	948

Source: Deutsche Bank

**The investment in batteries is the most substantial investment for a Better Place network.**

We estimate that Better Place Israel will have \$914 MM invested in batteries at year end 2015 (\$722 million on balance sheet, after adjusting for depreciation) and \$1.1 billion at year end 2016 (\$861 million on balance sheet, adjusting for depreciation). The assumptions underlying these projections correspond to our battery price projections (\$14,000 per battery purchased in 2011; \$13,000 in 2012; \$11,500 in 2013; \$10,500 in 2014; \$9,500 in 2015). We incorporate an 8 year depreciation schedule for the battery into our earnings and balance

sheet forecasts. The battery investment also includes extra batteries required at battery swap stations. We estimate that a minimum of 12 batteries must be kept in inventory per swap lane in order to ensure battery availability: This is based on an assumption that a fully depleted battery can be charged over 1 hour. Therefore, in the worst case scenario, if all of the returned batteries are fully depleted, 12 batteries would ensure that a fully charged battery will be available once every 5 minutes. Proliferation of vehicle models will require higher inventory of batteries "standing by" in each lane, but statistical modeling suggests that this will not be linear (1 model requires 12 batteries per lane; 2 requires 18; 3 requires 21; 4 requires 23; 5 requires 25). We have assumed that the network in this region offers 4 different models by year-end 2014, and 5 by year-end 2015). The investment in extra batteries is not a major concern for us, as long as the returns for the network operator are sufficient to justify the incremental investment (we have assumed investment in 60 stations by YE 2016, and 25 extra batteries per station, implying 1,500 extra batteries in the network that should have 110,000 vehicles in operation).

**Swap stations represent a unique, and somewhat controversial part of the Better Place business model.** The system, which is currently being demonstrated in Yokohama Japan, and which will be deployed in Japan, Israel, Denmark, Hawaii, and other markets, involves the deployment of infrastructure for relatively efficient (less than 60 second) removal and replacement of a batteries from/to a vehicles, as well as storage and charging of multiple battery types. The battery swap lanes are designed to accommodate many different types of current and future battery designs, so that automakers are not required to design their vehicles around a battery design standard (we believe that standardization will happen, but that it will take time). The advantage of the battery swap network is that it can alleviate the "range anxiety" that can be associated with an electric vehicle (although we note that this range anxiety is likely to become less of a concern as consumers recognize that unlike gasoline powered vehicles, electric vehicles are much more frequently "topped off" with an electrical charge whenever they have access to electricity). The swap station comes into play when a vehicle is driven for more than 100 miles in a day. We believe that this will be a relatively rare occurrence: A U.S. DOT survey in 1990 found that half of all motorists in the U.S. traveled 25 miles (40 km) per day or less, and that 80% drove a maximum of 50 miles (80km) per day or less. Another advantage of a swap station is that it eliminates the need for range extending equipment on-board every electric vehicle (every Chevrolet Volt will be equipped with an on-board gasoline motor/electric generator that will extend the range of the vehicle once the battery is depleted). We have modeled Better Place Israel to correspond with the company's planned initial deployment of 50 swap station lanes, at an initial investment of \$25 million, since Better Place believes that this should be sufficient to establish infrastructure on every major inter-city route in Israel, at an interval of 20 km between each facility, and at strategic locations within cities. Additional lanes are added as the network load reaches 2,000 subscribers per lane, which is the maximum level according to BP's demographic modeling.

**In addition to switch stations and batteries, Better Place is investing in vehicle charging infrastructure in all of the regions in which it operates.** Typically, a network operator will endeavor to have at least 2 charge spots per subscriber initially (one is installed at home and one at or near work). The deployment of charging infrastructure is somewhat more complicated than it may sound, given that the recharging infrastructure needs to be able to communicate and control charging of individual vehicles in the field (Charge times are managed so as not to over-burden transmission infrastructure for a parking lot, or regional electricity distribution infrastructure during peak charging times; vehicles need to be identified and associated with owners irrespective of where the vehicle is charging). Some network operators and infrastructure suppliers (such as Coulomb Technologies) have promoted the deployment of smart charge spots, which contain communications, controls, and billing services at the charge point. Better Place's model involves less sophisticated, and less expensive charge infrastructure, and relies more heavily on the deployment of

communications and control electronics within the vehicle. We estimate that Better Place will have deployed over 77,000 charge spots in Israel by year-end 2011 (5 per subscriber). We expect Better Place to have deployed 142,000 spots by year-end 2015 (1.7 per subscriber) and 182,000 by year-end 2016, which equates to \$136 million invested in charging infrastructure (\$750 per charge spot).

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### **Sector Valuation / Risks**

We utilize an EV/EBITDA valuation methodology for our companies with extensive liabilities and P/E valuation methodology for companies that generate adequate free cash flow and exhibit an ability to consistently grow earnings. Principal sector risks include the outlook for successful restructuring at U.S. automakers and significantly higher or lower than expected global auto demand, driven by changes in credit availability, government stimulus programs, and/or changes in consumer employment levels

# Appendix 1

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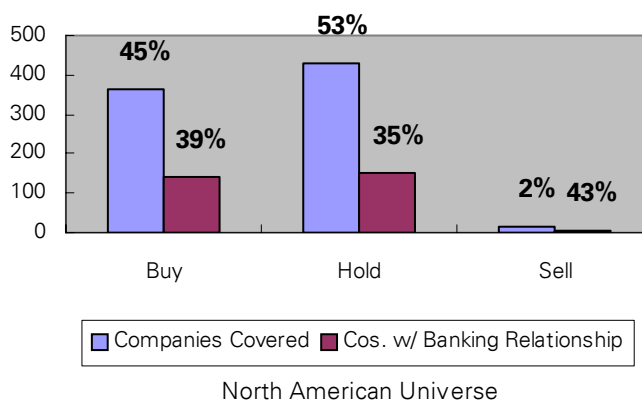
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