



# OTREC Final Project Report

*“Business Model and Earnings Analysis for the  
Electric Vehicle Charging Market”*

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August, 2012



**OTREC**  
OREGON TRANSPORTATION RESEARCH  
AND EDUCATION CONSORTIUM



# Business Model and Earnings Analysis for the Electric Vehicle Charging Market



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OTREC is a national University Transportation Center and a partnership between Portland State University, the University of Oregon, Oregon State University and the Oregon Institute of Technology. Through collaboration with transportation agencies, industry and other universities, OTREC aims to address the transportation needs of Oregon, the Northwest, and the nation. OTREC sponsors research, education and technology transfer projects at our partner universities with a grant from the U.S. Department of Transportation. Projects contribute to USDOT objectives including: safety, environmental sustainability, livability, state of good repair and economic competitiveness.

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## Abstract

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After a brief introduction to the project and the team's approach, this paper outlines the current status of the current electric vehicle supply equipment (EVSE) market situation including industry dynamics and the industry segmentation that were created as well as challenges and opportunities. It describes the most important EV charging business models, namely the Property Partner and the different Solution Providers and determines the viability of these business models by conducting an industry flow analysis, a sensitivity analysis, and an operational feasibility analysis. After ranking existent business models according to their attractiveness, findings are combined to derive final recommendations for every business model in particular. An overall conclusion of the project rounds off the analysis.

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## Nomenclature

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4Ps	Product, Price, Promotion & Place
ADA	Americans with Disabilities Act
BEP	Break-Even-Point
BEY	Break-Even-Years
CAGR	Constant Annual Growth Rate
CRM	Customer Relationship Management
CSR	Corporate Social Responsibility
DS	Device Supplier
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment
FRS	Full Range Supplier
ICE	Internal Combustion Engines
kWh	Kilowatt-hour
M&A	Mergers and Acquisitions
PP	Property Partner
R&D	Research and Development
ROI	Return on investment
SG&A	Selling, General, and Administrative
SS	Service Supplier
SP	Solution Provider

## Executive Summary

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This paper entitled “*Business Model and Earnings Analysis for the Electric Vehicle Charging Market*” intends to examine the feasibility of business and profit models in the electric vehicle (EV) charging industry, derive a ranking according to the business and profit models’ attractiveness, and provide recommendations.

Given the dynamics of the EV market, i.e. increasing expansion of EVs and electric vehicle supply equipment (EVSE), annual market growth is forecasted at 52% from 2011 to 2017. Apart from these enormous growth opportunities the industry also faces many challenges such as a lack of public awareness, increasing competition, flawed industry perception, limited power availability, reduction of subsidies, and missing international standards.

Given the market complexity we segmented the industry along the supply chain into three Solution Providers: (1) Device Suppliers (responsible for the front end of the supply chain, namely equipment manufacturing, distribution, and installation), (2) Service Suppliers (involved at the back end of the supply chain with network management and operations), and (3) Full Range Suppliers (taking over all products and services along the supply chain). A key partner that is always involved in commercial charging solutions is the Property Partner, whose involvement begins with the installation of the equipment. As the name suggests these players provide the space on their property for charging stations.

The profit model analysis was focused on the Full Range Supplier and led to the following conclusions: (1) Full Range Suppliers have an unstable profit model that depends on a few key factors, (2) Full Range Suppliers currently cannot cover all their corporate expenses with charging revenue, (3) membership plans with yearly fees attract customers, but lower the margin per charging event, and (4) DC quick charging has the potential to become the most attractive source of revenue for Full Range Suppliers.

The profit model findings for Property Partners has resulted in the following findings: (1) Offering charging stations is a relatively safe investment for Property Partners, (2) Property Partners’ contribution to initial set-up costs can impact the project’s profitability severely, (3) composition of charging infrastructure (no. of L2 and DC chargers) is key to success, and (4) Property Partners have a stable profit model that depends on a few key factors.

The energy and cash flow approach focused more on the consumer perspective and analyzed the dynamics between Property Partner and Solution Provider. The combination of both business models results in three possible operating structures to provide commercial charging to the EV driver: (1) Property Partner + Device Supplier, (2) Property Partner + Full Range Supplier, or (3) Property Partner + Device Supplier + Service Supplier. Though energy always flows from the utility company through the charging station to the EV itself, the flow of cash depends on the role of the Solution Provider: In the first scenario the Property Partner owns and operates the station. Profitability varies according to whether the Property Partner charges per hour, per charging event, or offers free charging. In the second scenario, the currently most common model, given the distribution of risk and level of investment, Full Range Suppliers are the more profitable partners. In the third scenario, revenue sharing agreements allow comparable profitability for both parties; however, the Property Partner has the higher investment and thus higher risk.

The EV driver ROI analysis assessed the breakeven point of an EV investment over time under the consideration of different variables. The finding that, unless charging exclusively at home, a balanced charging mix is most beneficial allows the assumption that commercial charging is expected to increase.

Regarding the sensitivity analysis, we included the following four relationships: (1) Full Range Supplier profits and charging events per day, (2) price and charging demand, (3) Property Partner profits and daily charging events per charger, and (4) Property Partner profit and charging time. This led to insights, such as:

(1) after two charging events per day profit increase per event is marginal, (2) price is elastic, meaning small price increase leads to great drop in demand.

The Operational Feasibility study proved that each model is operationally feasible (based on successful partnerships, placement of charging stations, promotion, legal and security requirements, etc.) though not necessarily financially viable at the moment due to high dependence outside money

Our Business model attractiveness conclusion has led to the following ranking: 1<sup>st</sup> place - Property Partner, 2<sup>nd</sup> place - Device Supplier, 3<sup>rd</sup> place - Full Range Supplier, and 4<sup>th</sup> place - Service Supplier. Based on this ranking we have come up with the following recommendations.

**Property Partners:**

- (1) Consider DC quick chargers despite higher set-up costs
- (2) Stay below 50% contribution to initial device/installation cost
- (3) Heavily promote the charging stations to ensure usage and gain associated image benefits

**Full Range Suppliers:**

- (1) Maintain a minimum of charging events per day to cover direct costs
- (2) Be careful to change existing pricing

**Device Suppliers:**

- (1) Concentrate on innovation of core competency: Manufacturing
- (2) Connect with industry players to improve forecast accuracy and secure demand

**Service Suppliers:**

- (1) Initiate and grow network effects early with targeted marketing measures
- (2) Focus on reliable customer service for current and potential EV users to generate network effects
- (3) Invest in quantification of network effects to exploit additional revenue opportunities and prove attractiveness to Property Partners

The EV charging industry is still in its infancy and in part highly depends on external funding to support its growth, as well as the necessary infrastructure to further the EV movement. Our research has shown that though operationally feasible, some business models are currently not able to sustain themselves financially due to the dependence on outside money. In conclusion, the coming years will show whether the projected growth in the EV market will serve these business models to achieve an ROI.

# 1. Project Introduction

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With increasing awareness of the environment electric vehicles are enjoying more attention than ever. As the electric vehicle (EV) market is expanding - more than 80 different models are expected by 2013 according to Gartner & Wheelock - EVSE is also increasing in numbers. Many solutions have been provided ranging from free charging, to small fees per charging event, to subscription-based charging that provides unlimited charging events. Equally as many have already decreased in popularity since mass consumer adoption has been slower than anticipated (Gartner & Wheelock, 2011). Yet the market is still in its emerging stages and highly subsidized, which has created flaws in financial dynamics. Consequently, viable business and profit models have yet to be proven successful and profitable in the long-term.

Given these market conditions and its commitment to sustainable transportation, OTREC has declared EVs one of its hot topics. Our study entitled "*Business Model and Earnings Analysis for the Electric Vehicle Charging Market*" intends to tackle this issue and examine the feasibility of business and profit models in the current EV market and, thus, derive a ranking according to the business & profit model attractiveness, and provide a recommendation for what possesses the most promise for the future.

In the following paragraphs the exact scope of the project will be outlined, the problem statement formulated, and the project deliverables defined.

## 1.1. Problem Statement

Given the projected EV charging market development and the uncertainty in this emerging market, where market success factors are still undetermined, many questions remain unanswered. So far there has not been a suitable profit model that optimally leverages the benefits of the EV charging market development. In order to better address the transportation needs of Oregon and the Northwest, OTREC needs an evaluation of the different EV charging business models to determine which show the most promise for financial as well as commercial success.

This paper will evaluate existing EV charging business and profit models and recommend the optimal solution for the market. The recommendations aim at making EV charging stations a profitable investment for the different EVSE operators.

## 1.2. Procedure and Scope

The project was grouped into three phases: (1) Identification and evaluation of existing business models, (2) evaluation of respective profit models, and (3) development of business model comparison and recommendations. Each phase took different EVSE operators into consideration: Public and private (for a detailed definition see **Exhibit 1**).

The geographical scope for this project included the states of Oregon, Washington, and California, as they are among the leading launch markets for electric vehicles in the United States. Differences between Oregon, Washington, and California will be mentioned in this paper; however, the main concentration of the analysis lay in Oregon. The private sector covered and related the different incentives offered by the respective states. However, subsidies and grants did not present a major focus, as these generally only serve as initial investment aids and will therefore lose relevance over time.

### Phase 1: Identification and Evaluation of Existing Business Models

The first part of the project analyzed the current business models of the EV charging industry. By conducting primary research as well as filtering relevant secondary material, business model bulletins (meaning a

brief report in form of a presentation, giving key insights into the business model through a business model canvas, risk profile, and 4Ps analysis) were developed that summarize key characteristics of each business model. By means of a self-developed framework, a direct comparison of business model specific characteristics was enabled.

#### Phase 2: Evaluation of Respective Profit Models

In the second phase of the project, the team shifted its focus from the previously evaluated business models to the respective profit models. The MBA team identified key metrics that serve as indicators for economic performance. After applying these metrics to the different profit models, the team created a ranking based on feasibility of the identified profit/business models. As a last step, a detailed analysis of respective strengths and weaknesses of the various models was determined.

#### Phase 3: Development of Business Model Comparison and Recommendations

The final phase of the project was comprised of a comparison of the different profit/business models based on key metrics such as financial sustainability, risks and opportunities, etc. In the end, the team ranked the various business models according to their attractiveness and formulated recommendations based on the outcome of our research and analysis.

### 1.3. Project Deliverables

This document comprises one of the project deliverables of this project. Additionally, a final presentation was created. This presentation includes the findings and recommendations that the MBA team has come up with for the OTREC client team. Also the client will be granted access to all expert interviews, all developed financial models for future use as well as a detailed version of the identified business models bulletins.

## 2. Status Quo EV Charging Industry

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The EV charging industry is still evolving in many aspects. Currently it can be regarded as an emerging market, with only 25% of study respondents proud to own an EV (Intel, 2011). As “[t]he growth of EV charging equipment sales correlates strongly with the volume of sales and choices of [plug-in electric vehicle] (PEV) models” (Gartner & Wheelock, 2011) there is still immense opportunity of growth for EVs as well as EV charging station infrastructure. Nonetheless, the industry structure is complex and already full of players covering different value propositions. The MBA team segmented the industry based on a supply chain approach that focuses on how and where interaction with the end consumer occurs as well as relationships between the industry players (which will be described in further detail in Section 2.3. and **Exhibit 2**). Moreover, a PESTEL and Porter’s 5 Forces analysis (see **Exhibit 3 and 4**) provide further industry insight and background information.

### 2.1. EV Charging Industry Dynamics

As an emerging market the EV industry is expected to be very dynamic over a period of several years. The EVSE market can expect substantial growth between 2011 and 2017, corresponding to the exploding growth in EVs sold. The annual growth rate of the market is forecasted at 52%. In **Figure 1** the charging station unit sales by region are depicted for this time period.

Commercialization and success will depend on EV charging rates (EV-specific rates for electricity) among other things, which is a factor that yet remains undetermined due to much federal funding that is still granted by the U.S. government for EV infrastructure, manufacturing, and network development.

As EVSE unit sales increase, revenue is also expected to rise from \$400 million in 2011 to \$4.3 billion in 2017 at a constant annual growth rate (CAGR) of 48.9%. Additionally, the EVSE cost for equipment is expected to decrease by 7% annually during this period. In North America EVSE unit sales will grow even more than the global average from under 30,000 in 2011 to 423,961 by 2017, at a CAGR of 56%.

Chart 7.1 Total EV Charging Station Unit Sales by Region, World Markets: 2011-2017

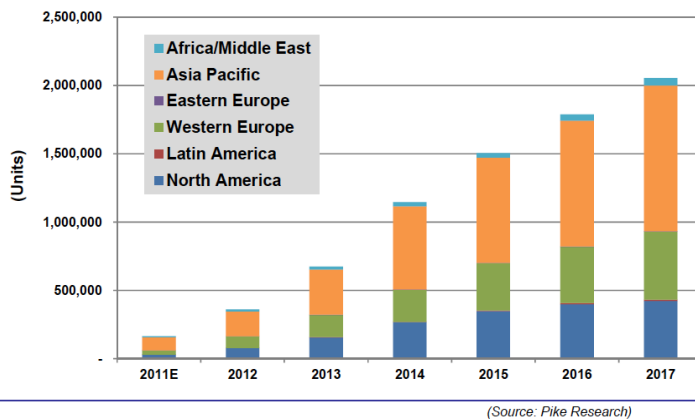


Figure 1: EV Charging Station Sales by Region 2011-2017

in 2017 and this segment will increase from 6% to 14% of global EVSE sales, making this the fastest growing segment of the market. The largest segment will be the public one with 2.4 million EVSE installations globally. Private charging will make up 1.75 million EVSE sales by 2017.

“The EVSE market is divided between residential (intended for use by a single person or family) and three categories of commercial equipment: Workplace, public, and private. [...] By 2015, residential EVSE will make up 34% of the market, with nearly as many public charging spots added.” (Gartner & Wheelock, 2011) At the end of 2017 there will be approximately 2.5 million EVSE installations in residencies worldwide. Workplace charging equipment sales will grow by 74.8% annually to reach 288,000 units

## 2.2. Industry Challenges and Opportunities

Given the fact that this industry is still so young it has many challenges and uncertainties to overcome.

**Lack of Knowledge:** It is difficult for consumers to have an overview of the industry and share the positive outlook that is portrayed by experts. Respondents of Mintel surveys (Mintel, 2011a/b) are unnecessarily worried about the longevity of the battery of EVs. Many of these respondents also feel that buying a small car with a gas engine is still better for the environment than vehicles with hybrid engines. Also, electric vehicles have the reputation of being a slow, boring version of a “real car”, rather than being a true alternative. The radical switch of consumer perceptions will be a significant barrier to overcome and may determine the success or downfall of the mainstream market.

**Public Awareness:** Lack of knowledge goes hand in hand with absent public awareness of potential as well as current EV users. Lack of awareness of where the EV stations are located as well as lack of trust in functionality of public charging stations does not benefit the consumer adaptation speed.

**Investment Failure:** Costs will continue to represent a substantial barrier to entry for many competitors and the risk of failure is ever present. The niche market application DC charging equipment can cost 10 to 20 times as much as a Level 2 AC charger, leading to greater fees associated with “on demand” charging. “Global sales of DC charging equipment will grow from less than 3,000 units in 2011 to more than 115,000 units annually by 2017.” (Gartner & Wheelock, 2011) Consequently, higher risks will bear higher returns.

**Competition:** The competition in the market (see Key Industry Players in (Gartner & Wheelock, 2011)) increases the barriers to entry and rivalry between existing firms. This is relatively low however, given that the overall market will grow for the next years.

**Industry Perception:** Though projections remain positive, the overall industry can be threatened by the claim that harvesting rare natural resources for EV batteries may actually make them less sustainable and less environmentally friendly than assumed (Zehner, 2012).

**Power Availability:** Charging might have an “impact on grid operators’ ability to generate and distribute sufficient power to meet the additional load. In some areas, peak demand could be increased or the peak hours extended later into the evening if customers are not incentivized to charge off-peak” (Gartner & Wheelock, 2011).

**Subsidies:** Important, if not substantial, demand drivers such as governmental financial support will diminish substantially starting in 2013 when the EV project is over (Hillman, 2012). Without this economic stimulus of approximately \$24 million annually, uncertainty about corporate growth and supply spreads.

**International Standards:** The lack of international standards makes a worldwide adoption and expansion difficult (Gartner & Wheelock, 2011). This has a negative effect on the intense competition, only increasing the level of rivalry to push players out of the domestic market, which could threaten the overall industry. This is one of the factors that adds to the level of overall market complexity.

However, as stated in the previous section there is enormous growth potential in this emerging market, providing many opportunities for a vast amount of players, which could offset all of the challenges named.

Fuel savings are a huge demand stimulus for the growth of the EV market as are the further technological developments to make EVs more valuable (efficiency of vehicles, battery power range, and mile per kWh of energy stored) (Gartner & Wheelock, 2011).

## 2.3. EV Charging Industry Segmentation

Due to the industry’s complexity mentioned in previous sections, segmentation according to the industry’s supply chain provides a clearer structure, represented in **Figure 2**. Our analysis was structured according to Property Partners and Solution Providers (consisting of Device Suppliers, Service Suppliers, and Full Range Suppliers), which were defined as the main business models.

**Property Partners:** Property Partners play a key role in the implementation process of the electric vehicle charging station infrastructure. Just as the name suggests, Property Partners provide space on their property for the charging stations. There are various types of Property Partners that can be classified into four segments: (1) Public institutions and cities, including public parking garages, public parking lots, train stations and airports, (2) hotels, (3) retailers (Fred Meyer, Ikea, Walgreens, Walmart, etc.), and (4) restaurants and cafés (Starbucks, McDonalds). In this project, we focused on the last three sub-categories since public institutions, cities and municipalities often times don’t have a clear business case for offering the stations.

**Solution Providers:** Ernst & Young proclaim that differentiation is still limited and that many players still have unconvincing revenue models in this industry (Ernst & Young, 2011). Nonetheless, companies occupy varying roles as Solution Providers along the value chain. Thus, we have segmented this group into three sub-categories: (1) Device Suppliers, (2) Full Range Suppliers, and (3) Service Suppliers. Each of these Solution Providers has a distinct business with EV charging services that can range from free charging, to small fees per charging event, to subscription-based charging that provides unlimited charging (Gartner & Wheelock, 2011). The companies range from pure equipment suppliers to data management companies to network operators. According to Proudfoot & Luftig, strategies vary depending on (1) the belief of whether Level 2 or DC-charging constitute the main charging need, (2) whether revenue generation from advertising as opposed to revenue from charging is valid, and (3) on the success of subscription-based models (Proudfoot & Luftig, 2012).

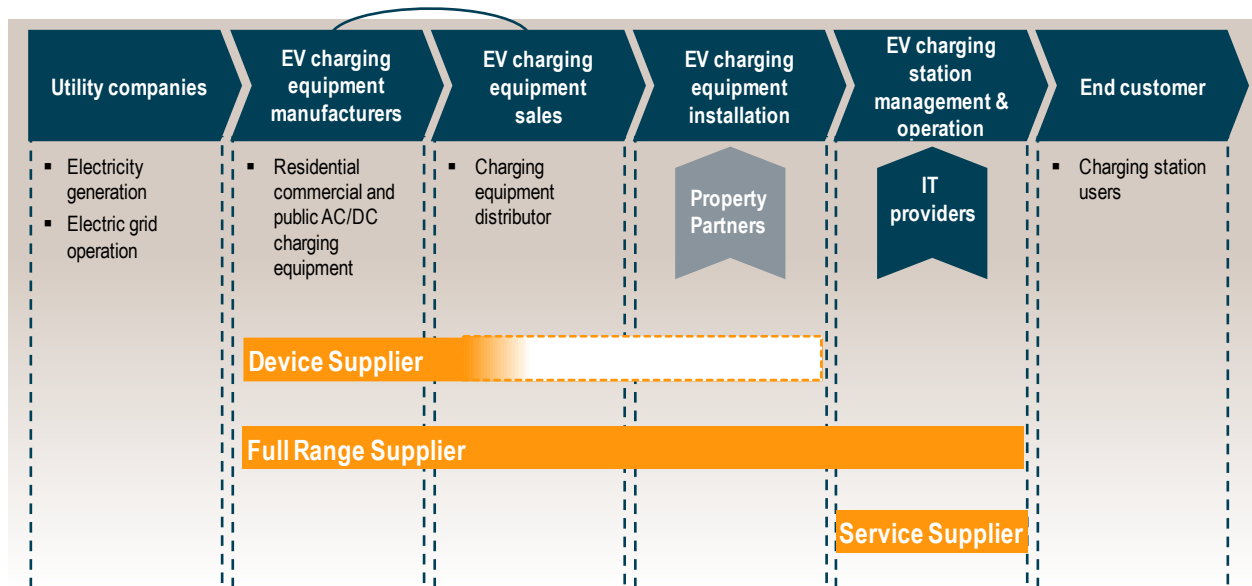


Figure 2: EV Charging Industry Supply Chain Model

Utilities are key partners to each of the other industry players and their business model and EV involvement is briefly discussed in the following section.

**Utilities** are thus far only involved in the front end of EV supply chain, since they supply the charging station infrastructure and the actual power. They are not yet involved with the end consumer, even though according to Howard, EV charging will majorly effect utilities' revenues (Howard, 2012). They still only serve as electricity distributors residentially and commercially (e.g. at the workplace). Andersson confirmed that the utilities' role in the current market is limited to informing consumers about the current EV charging station offers. Utilities serve the purpose of supporting EV manufacturers, inviting them to participate in the community, to display their technology, and to share information to help the community learn (Andersson, 2012).

According to Proudfoot & Luftig, the roles of utilities' are still not clearly defined, since even though they do not sell or install EVSE, they play a role in how customers interact with the system (Proudfoot & Luftig, 2012). Howard agrees and sees the EV charging trend as a threat to utilities due to the possibility of power over-demand for the current grid and an opportunity owing to the plan of an improved grid system (smart grid) (Howard, 2012). Currently, utilities purchase power from generators but also generate power themselves. Utilities will have to change rate plans in order to incentivize drivers to charge at off-peak times (Proudfoot & Luftig, 2012) to continue or change their structure. Given their level of preparation they could prosper or suffer. Their program and policies could potentially act as a barrier (Proudfoot & Luftig, 2012). In future Howard expects regulations to lessen and, thus, third party charging regulations in Oregon to potentially be eliminated (Howard 2012). Therefore, utilities will not continue to end their customer relationship "at the meter but get involved in EV charging station market. As a result, a transition is possible from key partner to competitor.

Due to these uncertainties in development still left in the market, utilities will not be explored further in this paper and will be limited to their role as key partners to Property Partners and Solution Providers. Property Partners and Solution Providers will be analyzed in further detail in the following section of this paper.

## 3. EV Charging Business Models

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### 3.1. Business Model No.1: The Property Partner

As Property Partners provide space for charging stations, they are an integral part of the EV charging supply chain. They contribute to the EV drivers' possibility to charge their vehicles outside their home and work, thereby reducing range anxiety. When interested in offering EV charging, the Property Partners have three possibilities to cooperate with Solution Providers, which will be depicted further in the following section. Please refer to **Exhibit 5** for a graphic representation.

#### 3.1.1. Business Model Distinction

**Solution I:** The Property Partner purchases the charging station from a Device Supplier. In this case, the Property Partner has to cover the device and installation expenses himself unless he takes part in a state-funded EV project. Then he would have no or only limited expenses with regard to the purchase and installation of the stations. The Property Partner runs the station independently and also decides whether to bill customers for station usage or not.

**Solution II:** The Property Partner enters a contract with a Full Range Supplier who not only supplies and installs the stations but also operates them as part of a network. The Property Partner can decide how much he wants to be involved in the station management and price setting, but in general it is the Full Range Supplier who is responsible and determines the prices. Revenue can be shared between Full Range Supplier and Property Partner, depending on respective agreements.

**Solution III:** A last option for a Property Partner is to purchase the stations from a Device Supplier and then partner with a Service Supplier who takes over the station management by adding the station to his network. Once again, the Property Partner can decide to what level he wants to be engaged in station operations and price setting, but usually the Service Supplier takes over the responsibilities of membership and network management. As opposed to Solution II, Device Supplier and Service Supplier can be entirely different companies whereas the Full Range Supplier is one integrated company that provides products and services all along the supply chain.

Taking a Business Model Canvas approach (**Exhibit 6**) we identified three areas to be the main drivers of Property Partners' EVSE business model apart from the value proposition: (1) Key partners, (2) customer relationships, and (3) revenue streams. Above all stands the Value Proposition for the customers.

**Value Proposition:** Property Partners offer charging stations at places that EV consumers already visit frequently in their day-to-day lives. This increases convenience as well as time efficiency and makes charging stations more accessible, thus creating value for the customer.

**Key Partners:** They are a crucial component for the successful installation, promotion, and management of the Property Partners' charging stations. Key Partners are Solution Providers, sources of funding (e.g. government), and utilities. The nationwide EV project for example pays for a certain amount of equipment and installation costs.

**Customer Relationship:** Besides the monetary value that will only be generated with increasing usage, the EV charging stations create value for the Property Partners by strengthening customer relationships. The portrayed image may attract new customers and bind already existing ones even if they do not use the extra service, which can also serve as differentiator from the competition.

**Revenue Streams:** Property Partners are able to capture the value the EV charging stations, created through direct and indirect revenue streams. In some cases, revenue-sharing agreements between a

Property Partner and a Full Range or Service Supplier grant the Property Partner a certain percentage of the stations' revenue. In addition, the charging station can indirectly generate a revenue increase of the Property Partner's actual business by (1) attracting new customers due to increased media attention, (2) increasing shopping time and money spent (e.g. to kill waiting time until EV is fully charged), and (3) acquiring new customers who are looking for a charging opportunity.

The Property Partners' motivation to install charging stations on their property can be attributed to a number of factors.

**Philanthropic Reasons:** Some Property Partners claim that by offering the EV charging stations they want to contribute to a more sustainable world and a "better tomorrow" (Green Retail Decisions, 2011).

**CSR Strategy:** Offering EV charging stations and thereby supporting the EV movement enables Property Partners to minimize their impact on the environment and fulfill their strategic commitment to smaller carbon footprints etc. (e.g. trade-offs: One EV charging station vs. green-house-gas emissions from operations).

**Serving Customers' Needs:** As an increasing number of customers is driving EVs, or is at least considering purchasing one, retailers want to meet customers' demand for charging stations. Furthermore, EV drivers and new customers might be attracted to the Property Partner by providing them with a reason to stop, shop, or eat while topping-off their EV.

**Additional Customer Service:** Property Partners hope to enhance the customers' experience and ultimately increase customer loyalty by providing this additional service to their customers.

**Customer Acquisition:** Especially when partnering with Service or Full Range Suppliers charging station usage is expected to increase, thus growing the customer base for Property Partners as well.

Apart from these motives, there are a number of opportunities that further drive Property Partners' motivation to offer this additional service to their customers. These will be elaborated on in the following section.

### 3.1.2. Risk Profile

There are various risks for Property Partners when installing the EV charging stations on their property.

**Lack of EV Industry Knowledge:** Retailers such as Fred Meyer or cafés such as Starbucks, have their core competencies in their respective businesses but lack detailed knowledge of the EV industry.<sup>1</sup> By offering their property for the installation of EV charging stations, the Property Partners enter into an entirely new field of business; one they have no previous connection to and lack expertise of. This change creates additional uncertainty within the Property Partners' businesses: Responsibilities for the charging stations have to be assigned, costs related to the stations have to be managed, and the stations' influence on daily business operations has to be dealt with. Additionally, the lack of knowledge creates a dependence on the partnering Solution Providers.

**Lack of Public Awareness:** Promotion of the charging stations plays a crucial role for Property Partners to ensure public awareness of the stations and, consequently, guarantee public recognition for the Property Partners' "green initiative" and sustainability commitment. Without a certain level of awareness among EV drivers on where to find the stations, the risk persists that usage along with public appreciation will be minimal, devaluing the return on investment (ROI).

**Investment Failure:** Due to the uncertainty regarding the EV industry's future, Property Partners bear the risk that their investment will not pay off and that the stations installed may become obsolete. This

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<sup>1</sup>This is an impression the team received through interviews with various Property Partners

scenario happened to retailer Costco, who began installing chargers in 2006, which are now outdated by current charging standards.

**Inequality of Customer Treatment:** EV drivers often enjoy perks such as EV-only parking spots close to the store entrance, tax breaks and credits for PEV purchases, etc. Given that the number of gas car drivers outnumbers EV drivers by far, the Property Partners' aim to be recognized for their green efforts may backfire due to the disapproval of the majority of their non-EV customers (Brandon, 2012).

Despite these risks, numerous opportunities drive Property Partners' motivation for hosting EV charging stations. Please refer to **Exhibit 7** for a SWOT analysis including additional opportunities, beyond the ones stated below:

**Deeper Consumer Insights:** Once Property Partners find a sophisticated way to collect data on charging station users valuable consumer-insights as well as greater knowledge of customer behavior and preferences can be identified. Combining findings with EV users' shopping tendencies may provide new marketing opportunities and ways to address customers.

**Extending the Customer Experience:** Given the physical presence of charging stations customers will inevitably associate them with the company and its brand. Hence, the parking lot becomes an extension of the customer experience as the stations prolong the engagement time the customer has with the Property Partner. According to a Harvard Business Review article, customer experiences "spring from concrete, controllable elements – the [so-called] touchpoints" (Richardson, 2010). In this case, the charging stations serve as such a touchpoint. This can create additional marketing opportunities or simply engage with the customer one last time before his shopping experience ends.

**Brand Image Benefits:** Property Partners can draw upon the symbolic value that EVs imply: A strong correlation between EVs and "green". By offering EV charging, Property Partners are likely to be perceived as a green, sustainable, and environmentally-conscious company/retailer/hotel, etc. Furthermore, Property Partners may gain the perception of being an industry leader and a first-mover by being amongst the very first to offer EV charging to customers.

**Advertising and Publicity Opportunities:** Some Solution Providers offer networks that can display a Property Partner's merchandise and promotions to the EV drivers (e.g. the Blink network). Moreover, the installation of EV charging stations often times triggers the media's interest, resulting in free media coverage and publicity.

**Competitive Differentiator:** The charging stations have the potential to distinguish a Property Partner from its competitors because a rather unique service is offered to customers.

**Additional Source of Revenue:** Some Property Partners see charging stations as an additional business opportunity to generate profit through revenue sharing with Full Range or Service Suppliers.

### 3.1.3. Marketing & Sales

In order to assess marketing and sales opportunities of EV charging stations, we looked at the 4Ps (Product, Price, Promotion, & Place) the Property Partners can control to create a suitable marketing mix. **Exhibit 8** shows the 4Ps framework in more detail.

**Product:** The charging stations can be considered as the "product" offered by Property Partners to their customers. This product involves the service of being able to charge your vehicle conveniently while being able to enjoy products and services that go beyond recharging.

**Price:** The level of Property Partner engagement in pricing activities varies from case to case. If cooperating with a Full Range Supplier influence on pricing decisions is limited, while Service and Device

Supplier rarely interfere with the Property Partner's pricing ambitions. The same accounts for revenue: If charging is actually billed, generated cash flows can be shared based on revenue-sharing agreements with the cooperating Solution Provider. A high degree of uncertainty still revolves around consumers' price sensitivity, which makes price setting a challenge. Factors that may influence a pricing strategy include (1) customer demand, (2) the competitive environment, (3) and the other products offered by a Property Partner.

**Promotion:** The level of education of EV users and even non-users about the stations and their locations determines the stations' usage. To counteract confusion and misinformation Property Partners should get people to understand "what [the] product is, what they can use it for, and why they should want it" (Ehmke, Fulton & Lusk, 2005). Property Partners who actively promote their stations should ensure that their marketing message is consistent with their overall marketing image in order to get the target audience's attention and to be authentic. A list of promotional activities can be found in **Exhibit 8**.

**Place:** The location of the stations plays a crucial role for successful usage. Optimally, Property Partners' stores, hotels, restaurants, etc. are located in a convenient way for consumers to access. Factors that influence "charging site locations include: (1) Distance to major interstates and transportation routes and (2) distance to other network charging facilities" (ECOTality, 2011). An article by Forbes online reinforces that the location of EV charging stations does matter. Locating them next to a transit hub or in proximity of restaurants and shops that provide hospitality services adds value to the customer. Placing the charging stations in "an urban place, in a safe, visible area seems to be worth something and is greatly appreciated" (Gerdes, 2012). As far as distribution channels go, Property Partners are supplying directly to the end customer, the EV driver.

### 3.1.4. Profit Model

The profit model of Property Partners is in most cases similar to that of a capital investment project, where a bigger cash outflow is followed by smaller, relatively stable cash inflows.

**Assumptions:** All assumptions for this profit analysis are listed in **Exhibit 9**. The most important ones to name the fundamentals of this section are: (1) EV battery capacity of 21 kWh, (2) Level 2 and DC energy output of 6 kWh and 60 kWh per hour charged, (3) charging time of 30 min for Level 2 and 17min for DC, (4) daily charging events per station are assumed to be 2, and (5) EV charging infrastructure of two Level 2 chargers and one DC quick charger at Property Partner's site.

**Key Findings:** The BLINK Network and IKEA Portland served as primary references for this analysis since both organizations either provide sufficient information on the Internet or disclosed information during interviews. In total four key findings were identified:

#### Finding No.1: Offering charging stations is a relatively safe investment for Property Partners

As **Figure 3** indicates, most Property Partners should be able to see a relatively early return on their investment. Assuming two daily charging events per station and a 10% contribution to device/installation costs, after 19 months the investment already breaks even. If the two charging events per day on each station can be met, a monthly profit of \$338.24 is possible. Assuming a station lifetime of 12.5 years (or 150 months) and cost of capital of 10% (little risk involved), the Net Present Value of the project

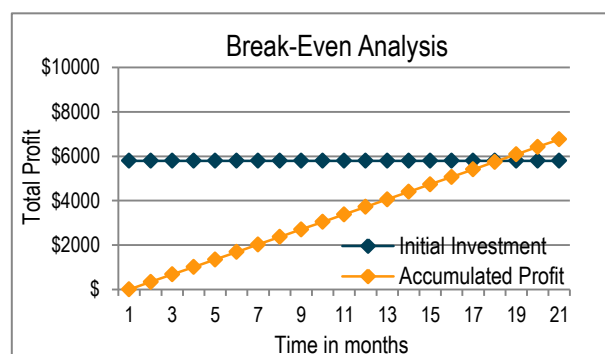


Figure 3: Break Even Analysis for Property Partner

amounts to \$3,382.37. Under the same circumstances in this scenario a Property Partner should be able to achieve an ROI of 65% for the first year, which is far above many other capital investments.

Finding No.2: Property Partners' contribution to initial set-up costs can impact the project's success severely

The factor that impacts a Property Partner's ROI most is the initial set-up cost and its contribution, especially if DC devices are involved. As **Figure 4** suggests, Property Partners have little chance of getting a financial return if they pay more than 50% of device/ installation costs when at least one DC device is included. Monthly profit drops sharply at 50%, because depreciation costs kick in, as ownership of the chargers transfers from the Full Range or Device Supplier to the Property Partner. During the inter-

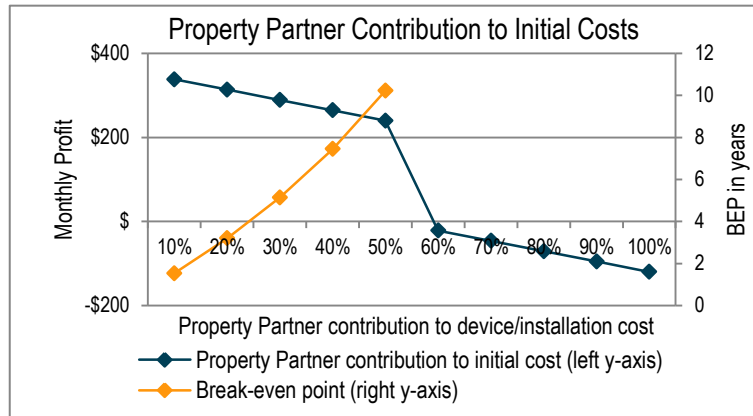


Figure 4: Property Partner Contribution to Initial Cost

views different contribution rates were discovered, in most cases however the Property Partner decided to contribute to initial device and installation costs as little as possible to avoid late Break-Even-Points or financial loss (a value of less than 20% seems reasonable for a timely BEP).

Finding No.3: Composition of charging infrastructure (no. of L2 and DC chargers) is key to success

Another thing that stood out during this analysis is the variance in financial results depending on what kind of chargers were offered at the Property Partners site. **Figure 5** summarizes the main findings in monthly revenue and profit. Quite obviously scenario 6 (2x DC chargers) achieves the greatest monthly profit. On the other hand this scenario faces tremendous initial set-up costs, making the overall investment questionable. Also interesting is the finding that whenever a DC quick charger is involved (scenario 5-9) the profit margin jumps to a range of 37.7%-38.1%. Level 2 chargers on their own (scenario 1-4) have profit margins around only 34%. All values were calculated based on a 10% Property Partner contribution to initial set-up costs.

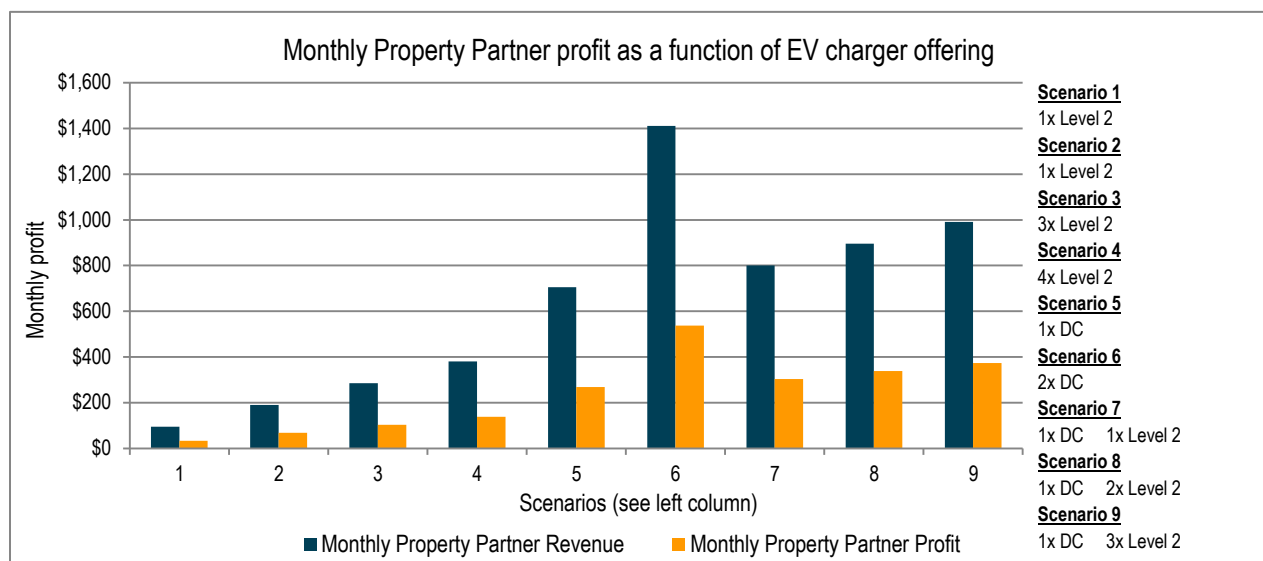


Figure 5: Impact of Composition of Charging Infrastructure on Revenue and Profit

#### Finding No.4: Property Partners have a stable profit model that depends on a few key factors

The two primary factors that impact Property Partners' profits are: (1) Revenue-sharing agreements and (2) average duration of charging events.

As for the **(1) Revenue-sharing agreements**, the majority of all Full Range Suppliers'/Property Partners' collaborations follow a strict 50/50 approach. Since the EVSE industry is young and inexperienced however there is definitely room for negotiation. An above-average contribution by the Property Partner to initial set-up costs for instance (>10%) serves as a good argument for 60/40 deals.

Also, **(2) Average duration of charging events** is crucial for Property Partners. Given the above-mentioned assumptions, a charging site with one DC and two Level 2 chargers creates the most profit at an average charging time of 17 minutes (because of the DC involvement). In contrast, a charging site with three Level 2 chargers is most beneficially used if all charging events are as short as possible (one minute per charging event for instance). This discrepancy stems from the different billing techniques. Level 2 charging is billed on the basis of every hour started, whereas DC charging is billed at every minute started. Consequently, the Property Partner makes most money if DC chargers are used to charge the entire battery (17 minutes) and Level 2 chargers are used as shortly as possible after every new billing interval (one minute).

In summary, the Property Partners have a relatively solid business case. Handling initial device/installation costs properly seems to be the most challenging part. Since all other major cost factors are provided for, the Property Partners only bear electricity costs (usually only variable electricity costs per kWh, since any base fees are covered by core business activities), which are tied to usage, thus, making financial losses unlikely.

### 3.2. Business Model No.2: The Solution Providers

Solution Providers supply EV charging station solutions (products and services) along the supply chain from the development of EV charging equipment manufacturing over equipment sales and installation to charging station management and operation(see **Figure 2**).

#### 3.2.1. Business Model Distinction

**Device Suppliers** account for the front end of the supply chain as they offer charging equipment and installation as well as general guarantee services. **Full Range Suppliers** provide entire charging solutions: From the charging equipment to the station's management and network integration. **Service Suppliers** work at the end of the supply chain in direct contact with the end consumer; thus, supporting charging station owners to integrate, manage, and maintain a charging station network. In the following section each Solution Provider will be analyzed in more detail according to their business model with its specific strengths, weaknesses, risks, and opportunities.

##### 3.2.1.1. Device Suppliers

As Device Suppliers focus their business model on the front end of the supply chain their main basis of competition circles around their brand (reputation), the design of their products, as well as their pricing structure. First-movers have a distinct advantage as they have the know-how, expertise (human capital) and patents to protect their intellectual property. They provide customized charging solutions for residential, commercial, or working environment purposes and often services such as installation and repair as well as maintenance of equipment. For the full Business Model Canvas analysis see **Exhibit 10**.

### 3.2.1.2. Full Range Suppliers

Players in this segment offer one-stop-shop solutions. This means they offer counseling (helping their customers identify needs), design of a customized solution, manufacturing, sale, installation of equipment, and network management (including Customer Relationship Management (CRM) as well as typically management of cash flows). By offering all products and services along the supply chain, it is on the one hand easier for Full Range Suppliers to provide value to their customers, however, it is more difficult for them to differentiate themselves from other Full Range Suppliers and beat the expertise of Device and Service Suppliers. Therefore, branding, convenience and usability of their solution, accessibility, and margins increase in significance. A more elaborate Business Model Canvas analysis can be found in **Exhibit 11**.

### 3.2.1.3. Service Suppliers

Focusing on the back end of the supply chain with service and network management, Service Suppliers base the value of their model around the integration of their network, maintenance, and overall management service they offer to end consumers and Property Partners. Their network services include repair/maintenance as well as software services (e.g. smart grid applications). Additionally, they provide daily customer services that are centered on CRM and customer assistance (hotlines, customer education, etc.). These players are less dependent on know-how, yet their network management skills, partnerships, and customer relationships are essential to their success (cf. **Exhibit 12** for Business Model Canvas).

## 3.2.2. Risk Profile

Risks for each segment of the Solution Providers vary. For a detailed analysis of each segment see SWOT Analyses **Exhibits 13, 14, and 15**.

### (1) Device Supplier

For the Device Supplier, risks mainly range around the uncertainty of the market. First of all, it is uncertain whether a push or a pull strategy will be adopted in the market. A pull strategy means that consumers pull the product through the market due to the high demand (and increased buyer power). A push strategy on the other hand means that Device Suppliers create products and then push them downstream in the supply chain. As the market matures it is likely that the former will become increasingly important as the interest and knowledge about EVs is awoken among end consumers. With this, a lack of inventory control also poses a risk to Device Suppliers as they might be forced to hold inventory without the certainty of future sales.

Moreover, as this industry is very dependent on technological progress, innovation-driven business will leave competitors behind that lack necessary flexibility, R&D, and funding to keep up with the dynamic market conditions.

Although all EV manufacturers for the North American market agreed to a universal standard for the charging station connector - SAE J1772 in 2010 according to Sapp, there are still missing standards worldwide in equipment and technology that will make expansion difficult for players long-term (Sapp, 2011).

Furthermore, supply chain exposure is very high for Device Suppliers: Due to their limited control of the supply chain they face the risk of increased rivalry with direct competitors (other Device Suppliers) while at the same time also their customers supply similar products and are furthermore vertically integrated (Full Range Suppliers).

Ernst & Young states that companies active in this sector will also face the commodity challenge: low cost/high volume but will also have to revamp their product to stay in business, which is to be capital inten-

sive. Thus, creating a balance between innovation and capital restrictions poses a huge threat (Ernst & Young, 2011).

Limited consumer insight, i.e. the lack of contact with the end consumer, hinders knowledge transfer that is indispensable for success. Customer preference of customized and individualized products makes in-depth consumer relationships critical.

Opportunities for Device Suppliers include but are not limited to demand forecasts. Ernst & Young mentions that tangible demand for products is expected in the next three to five years, providing a large, untapped market (Ernst & Young, 2011). Also, corporate knowledge and experience are a basis of competition through innovation and branding. Moreover, high barriers of entry owing to high knowledge requirements and large capital investments provide an opportunity as well as limited competition short-term (lack of technology and know-how given the early market stage and high entry barriers), and limited substitutes.

### (2) Service Supplier

Limited initial contact possibilities of potential customers (as distribution flows mainly through the virtual market place and EV fairs) make initial penetration of the market difficult for Service Suppliers. On top of that, customers expect to be educated by service-providing companies, as there is an initial lack of knowledge in the market about solutions (Ernst & Young, 2011). The initially low barriers to entry mean less substantial investments are needed to create a functioning network, yet that the competition in this segment will also be higher. This is especially true as automotive OEMs move towards service orientation (Ernst & Young, 2011), eroding Service Supplier's market share mid- to long-term.

Nonetheless, network effects give occasion to immense opportunities long-term. The larger the network of users becomes the more revenue will be generated and the more value-added to the consumer experience, enticing more consumers to enter this network. This creates huge entry barriers for the competition especially as geographical expansion occurs mainly naturally in emerging markets. Expansion will not be dependent on the government (though aided by it), but infrastructure will appear given to supply and demand.

Though supply chain exposure is a problem, mergers and acquisitions (M&A) possibilities with Device Suppliers could solve this, since their differing supply chain focus complements the other's focus and allows for short-term partnerships as well as mid- to long-term mergers or acquisitions.

### (3) Full Range Supplier

Full Range Suppliers are exposed to a combination of the risks that Device and Service Suppliers face such as push vs. pull strategy or user education and have access to similar opportunities (network effects, geographical expansion), yet also must confront the following threats and take advantage of these subsequent unique opportunities: Given the wide range of areas the Full Range Suppliers cover with their business model, a lack of focus could potentially threaten these companies' core competency. Limited resources such as human and financial resources are difficult to distribute to all targeted supply chain segments. Thus, the diversification of products and services provided, though a legitimate strategy creates budgetary, organizational, and value-based threats.

These players are still dependent on first movers to convince consumers of the products and services provided. As it is very difficult to overcome the chasm of innovators and early adopters to the mainstream market (Moore, 2002), users rely on word of mouth and recommendations when choosing companies. As these are still lacking a transition could take years unless first movers are able to convince the market. Given the lack of adaption each individual customer bears more importance, increasing buyer bargaining power. This very high market risk goes hand in hand with increasingly high product risk, thus, not allowing for a balance

between risk and return. Consequently, high customer value cannot be underestimated and more value placed on customer acquisition and retention.

Furthermore, revenue models are not yet fully tested and it is uncertain how revenue and profits will be generated in future, especially when government subsidies disappear considering that consumers are being trained to expect free services (Gartner & Wheelock, 2011). On the other side, one-stop-shop Solution Providers allow for increased customer convenience, providing a substantial basis for differentiation long-term, and supply chain control, reducing the risk of competition while gaining another competitive advantage (vertical integration). This vertical integration gives the greatest market opportunity overall in the industry due to the level of control and diversification (mitigation of risk) it offers.

In addition, data flow opportunities allow for unique solutions with a focus on data and consumer insight through multiple contact points with OEMs, software providers, Property Partners, and end consumers. Thus, Full Range Suppliers could become centralized “hub” of information for the entire industry.

### 3.2.3. Marketing & Sales

An analysis of current marketing and sales structure was conducted for the different segments (see **Exhibit 16, 17 and 18**). For further detailed product information see “Business Model Distinction”.

**Promotion:** Across all three segments promotion is very similar: Emphasis on customized, targeted B2B marketing is vital for optimal supply chain integration and the creation of long-term, sustainable partnerships, especially for Device Suppliers. Full Range Suppliers and Service suppliers must also highlight B2C marketing in order to be successful. Word of mouth recommendations are crucial for B2B and B2C success in order to cross the chasm into mass market (see Risk Profile). Additionally, in a young industry „one thing leads to another“ as industry promotions and advertising increase consumer awareness and growth occurs naturally. Industry-wide promotions are often equated with first-mover companies that have already established customer relationships. So, first-mover advantages are significant. Full Range Suppliers also have the additional advantage of risk leverage, i.e. their solution is attractive to other EV projects, creating additional natural promotions through partnerships. Network opportunities are perhaps the most important form of promotion, especially considering the current distribution channels.

**Place:** Products are often promoted through the virtual market place, EV fairs, discussion forums, automotive OEMs, and dealerships (i.e. through partnerships). Retail could additionally become an important network in the future as the mass market is targeted.

**Pricing** varies according to segment: For Device Suppliers an average L2 device amounts to \$2,000 - \$3,000 and \$10,000 - \$50,000 for DC (Hillman, 2012). Manufacturers are aiming for a minimum margin of 15%, but industry insiders agreed that margins of up to 50% are possible as soon as increasing demand allows scale effects in production (Bates, 2012). Service Suppliers can either price their network on a prepaid or subscription (membership) basis that bills either per month, per year, or multi-year. On top of that, the distinction between flat rate charging (paying only once and providing unlimited service) and additional charging per time, session, or kWh is made. For instance 350 Green has a \$21 sign-up fee for CharJit card and afterwards free charging at SemaConnect and \$2 at Coulomb stations (350 Green, 2012). This is also true for Full Range Suppliers. Blink offers its Blink Plus Plan at a \$30 annual membership fee and an additional \$1 charge/ hour. Pricing and profits will be focused on further in the following section.

### 3.2.4. Profit Model

The profit models of the three identified solution suppliers differ quite drastically with regard to both financial risk and reward. As agreed throughout the project this section primarily focuses on Full Range Suppliers.

**Assumptions:** All assumptions for this profit analysis are listed in **Exhibit 19**. The most important assumptions are: (1) EV battery capacity of 21 kWh, (2) Level 2 and DC energy output of 6 kWh and 60 kWh per hour charged, (3) charging time of 1.5h for Level 2 and 17min for DC, and (4) daily charging events per station are assumed to be 1.5.

**Key Findings:** In the course of this analysis the BLINK Network/ECotality served as primary reference since the company is the only public Full Range Supplier and is quite transparent with its charging and billing plans. All costs used for this analysis are direct costs (excluding company-wide SG&A or R&D costs), which consequently lead to direct profit figures. In total four key findings were identified.

#### Finding No.1: Full Range Suppliers have an unstable profit model that depends on a few key factors

One of the most critical factors is charging events per day, as it is the key driver for both charging revenue and profit. According to this analysis Full Range Suppliers run the risk of making losses already at 0.6 charging events per day for one station (for BLINK Plus), which is equivalent to roughly four charging sessions per week. As soon as charging events per day for one station fall below 0.4 (less than three session per week), Full Range Suppliers definitely face losses.

The Q1 2012 usage report of the EV Project reveals that in average one Level 2 EV Project charging station hosts 0.72 charging events per day, which

would result in a small profit for each charging session (EV Project, 2012). **Figure 6** shows BLINK's profitability in the Portland area as a function of "charging events per day for one station". As of August 2012 the BLINK network runs 80 Level 2 and 3 DC chargers in the Portland Metro area.

Other critical factors include average charging time per charging event, and local electricity costs.

#### Finding No.2: Full Range Suppliers currently cannot cover all their expenses with their charging revenue

Based on the above-mentioned assumptions this analysis yields a direct yearly profit (from charging EVs) for BLINK of approx. \$102,000 for the Portland area. As a Full Range Supplier however, BLINK/ECotality faces costs along the entire value chain. The company's 2012 10k report states ECotality's SG&A and R&D costs at \$28.34M, which is the biggest cost item. Even if ECotality/Blink managed to replicate its profit from the Portland area in all 51 US metropolitan areas with a population <1,000,000 people, the company could not cover its costs. Besides revenue from EV charging, ECotality makes money by directly selling their charging devices and offering all kinds of services, such as: Charger installation services, contract R&D regarding EV topics, and EV consulting services.

Even with all these additional sources of revenue ECotality could not cover its expenses in 2012 and experienced a net loss of \$22.5M. It seems that the Full Range Supplier's profit model is a bet on the future. According to ECotality's June 2012 Investor Presentation the company estimated the EVSE market at

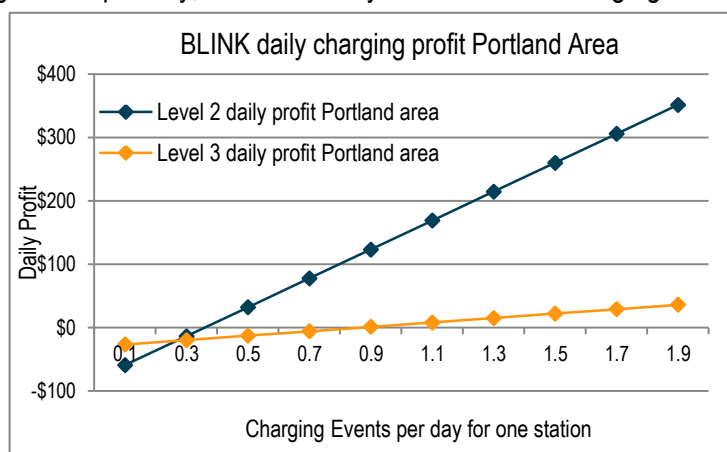


Figure 6: BLINK Daily Charging Profit (Direct), Portland Area

\$56M in 2011, for 2017 however ECotality projects a market size of \$1.1B (ECotality, 2012). With a market twenty times bigger than today a company-wide profit from charging EVs in 2017 seems possible.

Finding No.3: Membership plans with yearly fees attract customers, but lower the margin per charging event

As mentioned before the BLINK Network offers three different charging plans: (1) BLINK Plus, which includes a \$30 membership fee per year but results in a reduced variable fee of \$1 per hour charging, (2) Blink Basic, which has no membership fees (but a BLINK account with registered credit card) and a variable charging fee of \$1.5 per hour, and (3) Blink Guest, which simply is a pay-as-you-go charging fee of \$2 per hour.

With the above-mentioned input factors this analysis shows a considerable difference in profitability among the three billing methods. With an increasing amount of yearly charging events the \$30 flat rate payment is being countered by the lower variable costs. With an average charging time of 1.5 hours, at 31 charging events per year BLINK already receives less money from a person charging via its BLINK Plus plan than compared to a person charging with BLINK Basic. The same is true for BLINK Guest, if an EV user signs up for BLINK Plus and charges more than 16 times per year. Then the BLINK Network receives less money compared to this person charging under the BLINK Guest plan.

BLINK’s motivation for yearly fees with reduced variable rates is (1) to attract more customers to compensate for lower variable rates, (2) to leverage their business with EV users, who stay below the two thresholds (31 and 16 charging events per year), and (3) to create predictable cash flow upfront for investments.

Finding no.4: DC quick charging is the most attractive source of revenue for Full Range Suppliers

Despite its high device and installation costs DC quick charging will be the most beneficial charging method for Full Range Suppliers. Taking the roughly \$50,000 for device and installation into account, DC quick chargers can generate a profit per charging event of \$4.90 (under the assumption of \$0.75 per minute charged), which is equivalent to a 38% profit margin. Factoring in the DC stations’ ability to host considerably more charging events per day than Level 2 stations (because of reduced charging time) makes DC quick chargers a real revenue driver. **Figure 8** depicts the yearly profit of the roughly 80 BLINK Level 2

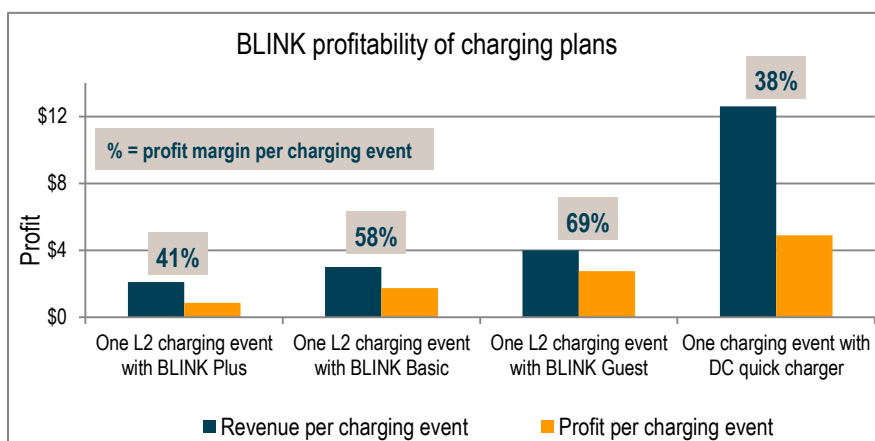


Figure 7: BLINK Revenue and Profit per Charging Event (Direct Revenue vs. Direct Cost)

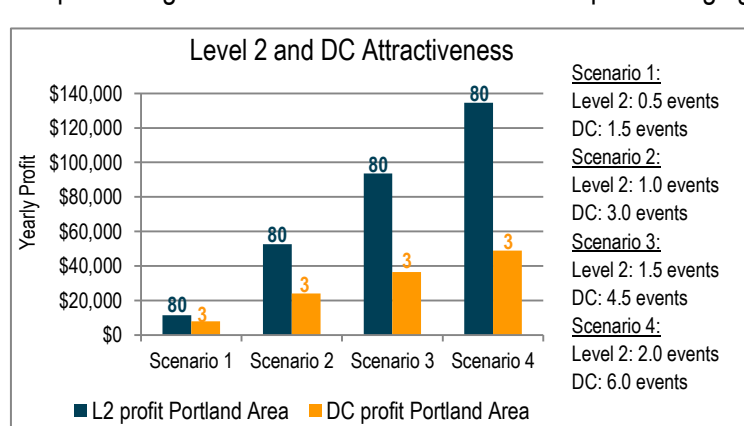


Figure 8: Level 2 vs. Level 3 Attractiveness

chargers and 3 BLINK DC quick chargers in Portland. In this graph the underlying assumption is that DC quick chargers are capable of handling three times more charging events per day. One can see that the

three DC quick chargers bear tremendous potential for profits since they easily substitute the profit of 30 Level 2 chargers.

In summary, the Full Range Supplier's profit model is designed for a future mass market. Under current conditions a self-sustaining business independent of third party money is not financially possible. The lack of charging volume is definitely a key issue, thus requiring substantial government funds. **Exhibit 20** shows exemplary government funding using the example of ECOtality Inc.

## 4. Viability of Business Models

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After a detailed look at the industry's main business models individually, this viability analysis will concentrate on their interaction. Perspective 1 will particularly focus on the dynamics between Property Partners and Solution Providers, thus bringing the information of the two main business models stated above together. Perspective 2 points out key metrics and examines their impact on decision making for the end user as well as Solution Providers in general. Perspective 3 focuses on qualitative indicators, determining each business models' feasibility and thus value. The final ranking puts findings into perspective, identifying the attractiveness of the different business models.

### 4.1. Perspective 1: Energy and Cash Flow Approach

In order to assess the different business models' viability within the EV industry, main dynamics and "flows" need to be understood. The industry consists of two major flows: The Energy Flow and the Cash Flow.

The Property Partner has three available options to pair with a Solution Provider in order to offer EV charging: (1) Property Partner + Device Supplier, (2) Property Partner + Full Range Supplier, and (3) Property Partner + Device Supplier + Service Supplier. While the Energy Flow remains the same for any commercial charging solution, Cash Flows and profitability potential for the involved parties vary (see **Exhibit 5** for Property Partner Solutions and **Exhibit 21** for visual representation of industry flows). Energy is provided by the utility company and flows through the Property Partner's charging station into the EV user's car. Considering a typical big-sized retailer like Ikea, the amount of costs handed down to the EV user will most likely not exceed 0.1% of total energy consumption, thus only causing minimal expense (cf. **Exhibit 22** for expected electricity demand). The involved cash, however, can flow in different ways, mainly depending on the role and/or existence of a Full Range Supplier.<sup>2</sup>

The following feasibility analysis of the different solutions will take an increase in EV charging events as well as an increase of EV drivers using the charging station into account in order to identify profit relationships and dynamics. While the profit analysis above (3.1.4. and 3.2.4.) concentrates on the two business models' perspectives individually, the Cash Flow Approach combines the positions and shows the players' relationship. As opposed to the very practical scenarios displayed in the profit analysis, this approach is rather theoretical and examines the profitability relationship with increasing scales.

**Assumptions:** Specific assumptions about the scenarios of the three solutions will be stated in the corresponding paragraphs as well as the assigned exhibits. However, a few main assumptions were made on a general basis and apply to solutions I-III: (1) All Scenarios are looking at the return of only one charging station, (2) charging time is expected to be 1.5 hours, (3) assumed cost positions are estimated for a big retail store (Fred Meyer, Ikea, etc.), (4) charging is always billed by the full hour, regardless of the actual standing time, and (5) initial Investments (Marketing and site preparation (\$650), charging station (\$2,500), installation (\$1,000)) are amortized over connector/ station lifetime according to utilization.

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<sup>2</sup> When choosing to self-manage purchased charging stations, cash flows from the end consumer directly to the Property Partner

### Solution I: Property Partner (PP) and Device Supplier (DS)

Purchasing a charging station from a Device Supplier (charging station manufacturer), the Property Partner becomes an independent owner and operator of the station, carrying all the risk and costs as well as earning all the generated revenue. Device Suppliers' responsibility starts and ends with the charging station itself unless in close partnership with a service or Full Range Supplier. As manufacturer they are looking at a minimum margin of 15%, reaching for as high as 50% (Bates, 2012), making their part of the supply chain a valid business case regardless of usage.

As of 2012, the following possibilities of billing have been implemented by Property Partners: Scenario I - Free charging, Scenario II - Charging per charging event, and Scenario III - Charging per charging hour.

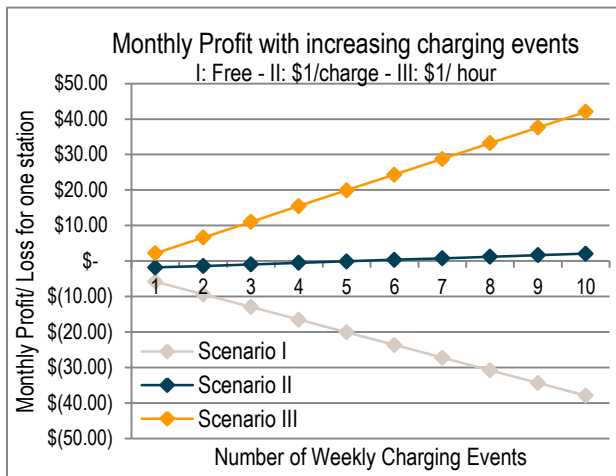


Figure 9: Monthly Profit (Solution I)

Running the scenario for a big retail store, with an expected charging time of 1.5 hours, **Figure 9** shows the profitability development for the different scenarios with increasing usage of the station. Depreciation of purchased equipment is based on usage, creating limited losses in the initial phase. Additional assumptions as well as detailed calculations can be found in **Exhibit 23**.

However, the Property Partner owns the stations and needs to cover the initial spending of \$3,500 for installation, machine and marketing. Since the station is not integrated into a network, it is expected to be used mainly by the retailer's current customers, creating potential for a value increase of current customers as opposed to higher revenue due to new shoppers. The dependence on the retailer's customers' adaption is crucial to make this solution a reasonable business case, increasing the importance of strategic fit of charging station, corporate identity, and target group.

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### Solution II: Property Partner (PP) and Full Range Supplier (FRS)

The typical configuration is the Full Range Supplier and Property Partner relationship, like ECOtality closely cooperating with Ikea. Please refer to **Exhibit 24** for the detailed financial model. Looking at the individual margins achieved under stated assumptions allows for insight into the expected dynamics of the relationship as well as reveals major challenges that are either already present or anticipated with increasing usage.

When looking at increasing numbers of users with the same charging habit as well as increasing number of charging events per EV user (**Figure 10**), both parties are able to become profitable. The marginal impact of every added charging event or every additional user however varies significantly, generating steeper growth for ECOtality. While ECOtality's direct costs stay the same, Ikea's cost increase with every charged kWh which explains this development. Besides the cost benefit for ECOtality, the annual membership fee increases the monthly revenue by an extra \$2.50 per member, allowing a huge upside with an increasing scale of memberships.

In a configuration like ECOtality and Ikea, Ikea clearly has the lower risk but also a limited upside. With ECOtality offering to cover at least most of the charging station itself as well as the installation, Ikea does

not face any major initial investment costs.<sup>3</sup> This scenario is run under the consideration of hourly billing. Under the assumption that users spend 1.5 hours at Ikea, they are still billed 2 hours of charging.

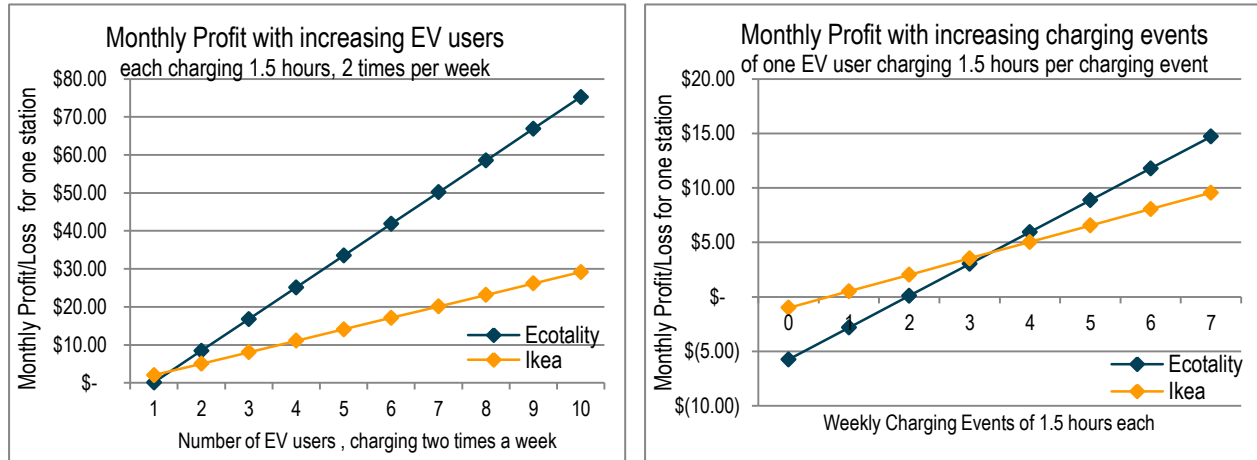


Figure 10: Monthly Profit (Solution II)

If charging were billed by the minute, the dynamics would look similar, however with slower increasing profits per charging event/ per EV user. In order to measure the attractiveness of this investment for the different parties, qualitative measures should not be left aside. The charging station itself generates the reported revenue for the Property Partner. Additional revenue due to an increase in the actual business is not considered but very likely, would increase the growth and expected return.

To summarize it can be said that:

- (1) The Property Partner has neither a lot to lose nor a lot to win when it comes to direct profit and loss associated with the charging station. As outlined in section 3.1., however, the indirect financial benefits for the Property Partner can be significant.
- (2) The Full Range Supplier needs to invest heavily, but has the chance to achieve a higher direct return per charging station.

The above scenarios are built displaying the current partnership of the two partners, which indicates that ECOtality covers charging station and installation costs. This has been possible due to enormous governmental subsidies offsetting overhead and capital investments. Approach II (**Exhibit 24a**) shows a different way of estimating the Full Range Suppliers costs based on the current cost structure of ECOtality. With Cost Of Goods Sold adding up to 97.5% of revenue, and Operating Expenses of 82% of revenue, the company will not be able to perform without governmental support, making the above displayed relationship rather unrealistic for the future. The Property Partner would have to participate in the initial financing of the charging station, increasing the investment's risks while the anticipated return remains limited.

### Solution III: Property Partner (PP), Device Supplier (DS) and Service Supplier (SS)

The third possibility for a Property Partner is to purchase the charging station from a Device Supplier and then "hire" a Service Supplier to manage the station and integrate it into an already established network to increase usage and attract new customers. Although rather rare in the current market, cooperation is likely to consist of the following cash flows; (1) membership fee paid by the end user to the Service Supplier, (2) network fee paid by the Property Partner to the Service Supplier, (3) EV Charging fee paid by the end user to the Property Partner (see **Exhibit 25** for visual illustration).

<sup>3</sup>PR, Marketing and Signage costs are expected but not required.

The network fee will most likely be a percentage of the generated revenue of one charging station to allow a flexible upside, while a fixed limited monthly amount will be agreed on to limit the Service Supplier’s risk. **Exhibit 26** states detailed assumptions and shows the calculations, which lead to the following findings:

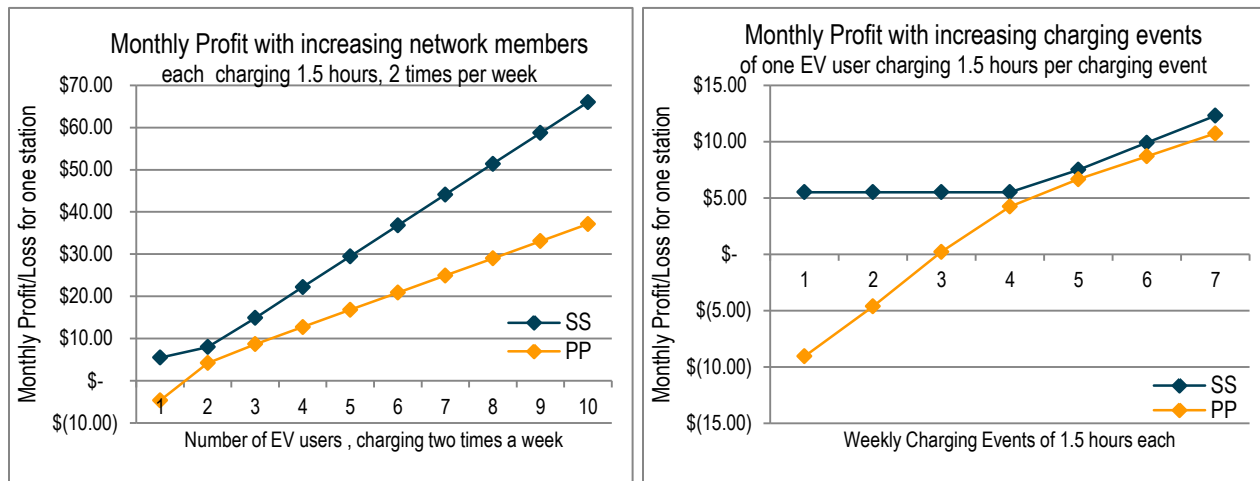


Figure 11: Monthly Profit (Solution III)

As can be derived from **Figure 11**, this solution generates limited risk for the Service Provider, whose value only depends on the size of his network. The more members, the more valuable the service, because the traffic increase per station is respectively higher. Since the usage of the station predicts Property Partner profitability, the Service Supplier offers added value and the cooperation of these two players can turn into a win-win relationship.

Although tables show a higher profit potential for the Service Suppliers, the attraction of new customers as well as the expected increase in shopping time of current customers who start charging their EV at the retailer will generate additional revenue for the Property Partner, indirectly caused by the charging station.

Financially, Solution III is most beneficial for the involved players, however still dependent on user adaptation. The most common and biggest obstacle of all solutions is the initial set up process. Starting, growing, and expanding a network is crucial to make relationships along the supply chain valuable. Contact and networking is where Full Range Suppliers of Solution II have a clear advantage: Since they are involved on every level, awareness is expected to be higher – making it easier to grow a community.

## 4.2. Perspective 2: Sensitivity Analysis of Key Factors

Previous sections already touched on the volatility of outcomes depending on changing key factors. This perspective will consist of two angles and consider effects on end user as well as charging providers.

### 4.2.1. Key Metrics for the EV User

The crucial growth factor of the EV industry is EV usage, which primarily depends on the adaptation rate of potential users.<sup>4</sup> This adoption rate is driven by the end consumers’ ROI, determined by value perception, and financial benefits. The following section will identify the impact of key factors on the end consumers’ ROI, as well as give an idea about the main dynamics that are likely to dominate the segment.

Investing in an EV will pay off in the long run because although the initial investment is higher, the operating costs are significantly lower, especially for internal combustion engines (ICEs). But how long does it exactly

<sup>4</sup> Additional growth drivers: EV manufacturing volume, environmental changes, increasing sustainability awareness, and governmental subsidies.

take for the EV user to see financial benefits? The analyzed scenario gives an answer to that question by displaying yearly costs of owning an EV vs. a non-EV (initial investments included). “Break-even years” (BEY)<sup>5</sup> are used as comparable and support derived insights.

**Assumptions:** The main assumptions for this analysis are that (1) cars are purchased with a 5 year loan at 6% interest, (2) the EV purchase comes with an additional investment in a residential charging station which costs are amortized over the connector’s/ station’s lifetime according to utilization, (3) when the EV driver is using home and commercial charging he is expected to charge twice daily; once at home and once at the commercial charging station, (4) the EV user is part of a charging network and pays according rates for every charging hour as well as a membership fee.<sup>6</sup>, (5) commercial charging is only billed by the hour.

**Exhibit 27** gives further detail on assumptions. Examined key factors impacting the BEP for the end user are (1) charging behavior, (2) membership plans, and (3) miles driven.

Charging Behavior: Unless charging exclusively at home, a balanced charging mix is most beneficial

Although strict home charging is the cheapest charging solution, it is unrealistic to assume that the EV will

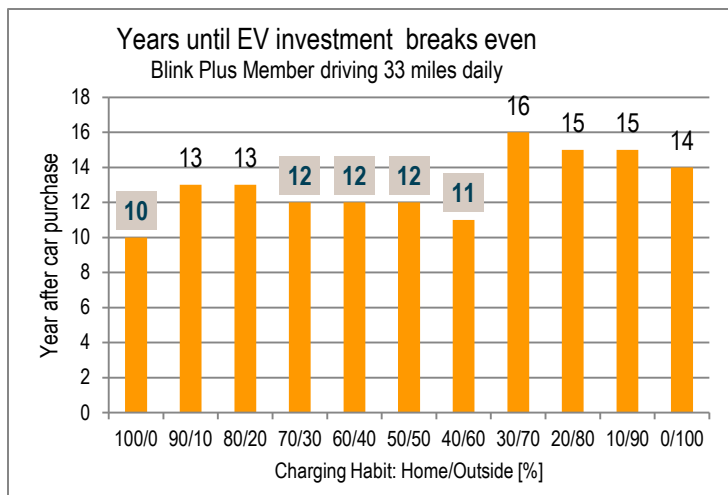


Figure 12: BEP Analysis as Function of Charging Behavior

never be charged outside of home. Leaving residential and workplace charging opportunities aside, the EV driver has two other charging options: Public and private charging. These commercial charging stations can be hosted by Property Partners or run by other third party providers such as car rental agencies, condominium buildings, etc. (Gartner & Wheelock, 2011).

**Figure 12** shows how the individual charging behavior can affect the period of time needed for the EV to become the cheaper means of transportation. While it is cheapest to only charge at home, it is interesting to see that a rather balanced

mix of charging options results in a quicker break-even time than a focus on home charging. This dynamic is caused by the commercial stations billing by the full hour. In practice this means that people charging only 10-30% out of home still pay the full hour every time they drive up to the station. This is the same amount than if they were charging 40-60% of their electricity demand outside, but less electricity than what they have to pay extra when filling up at home.

Membership Plans: Per hour charge rate determines efficiency of membership plan

Networks have been benefitting the EV movement greatly, simply by building trust among the EV users. The mass-confusion in the market (Dickey, 2012), can be avoided by becoming member of a charging community. Picking the right payment plan can determine if the EV will never pay off or in as quickly as 11 years.

<sup>5</sup>The break-even year (BEY) refers to the year in which the EV pays off and leads to continuously lower overall costs in comparison to a non-EV.

<sup>6</sup>Membership plans are based on BLINK membership plans

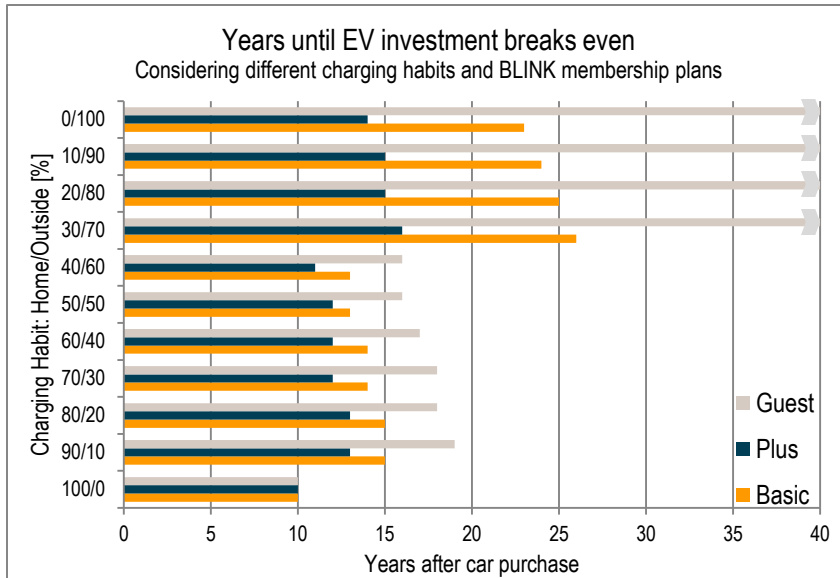


Figure 13: BEP Analysis as Function of Membership Plans

BLINK serves as an example in this case as they offer three different membership plans with different terms as already mentioned in section 3.2.4.

Figure 13 shows that as long as commercial charging is considered an option, the Plus plan will lead to the best results. The big difference between charging 60% outside and charging 70% outside is due to the billing cycle. It takes more than one hour to charge 70% of the needed daily demand, which is why the user will have to pay a full two hours of charging.

Daily miles driven: Marginal impact of one mile increases with fewer miles driven

An increase in daily mileage increases operating costs for a non-EV, reducing the time to reach the break-even year significantly. The more miles assumed as daily driving performance, the smaller the impact of one additional mile, leading to decreasing impact with increasing distance covered (see Figure 14). Also, the fewer miles driven, the bigger the impact of different charging habits, making the personal charging mix (between home and outside) a meaningful indicator. Major jumps (for example from 17 year to 25 (30 miles, 40/60 – 30/70)) can again be explained by the fact that commercial charging will bill by the full hour, regardless of the time and electrical charge actually drawn. If the daily mileage is below 20 miles, a break-even point is not realistic, eliminating the monetary incentive to purchase an EV.

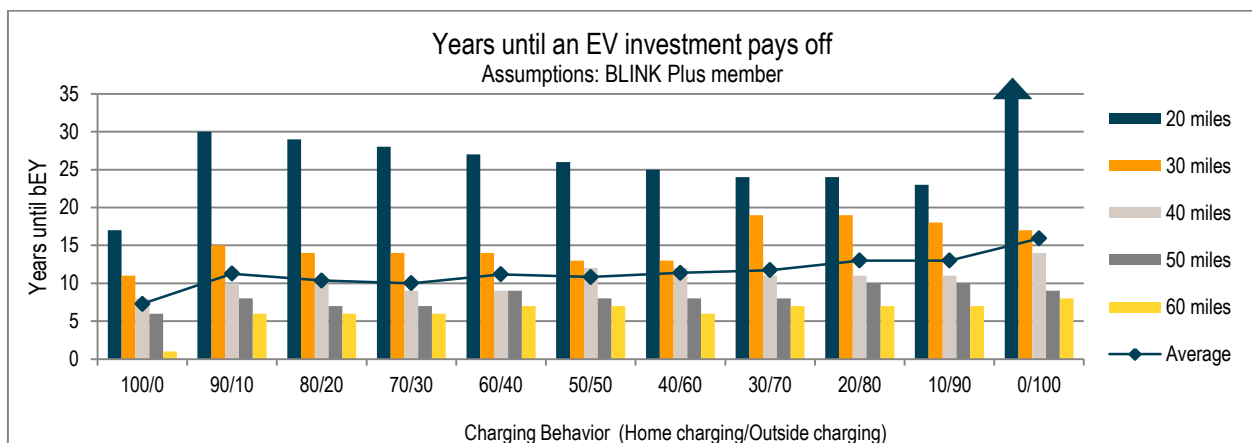


Figure 14: BEP as Function of Daily Mileage

4.2.2. Key Metrics of Charging Providers

The following analysis covers two sensitivity relations for both the (1) Full Range Suppliers and the (2) Property Partners. All calculations are based on assumptions stated in the sections 3.1.4 and 3.2.4. Also Exhibits 9 and 19 provide the necessary raw data for all graphs.

**(1) Full Range Supplier**

Two relationships are of primary interest for the Full Range Supplier. Firstly, the sensitivity between profits and charging events per day and, secondly, the sensitivity between price and charging demand.

Sensitivity no. 1: Full Range Supplier Profits & Charging Events per Day

Figure 15 shows a relatively sharp increase in profitability per charging event for all charging plans for approximately 1.5 to 2.0 charging events per day. Beyond 2.0 charging events per day all curves level off and show only a marginal increase in profitability per charging event for further charging events per day. The primary reason for this development is that all fixed costs are spread over more charging events per day, thereby limiting the individual fixed cost coverage of one charging event. For Full Range Suppliers this means that beyond 2.0 charging events per day every additional charging event will add a constant profit to the overall profit of the station.

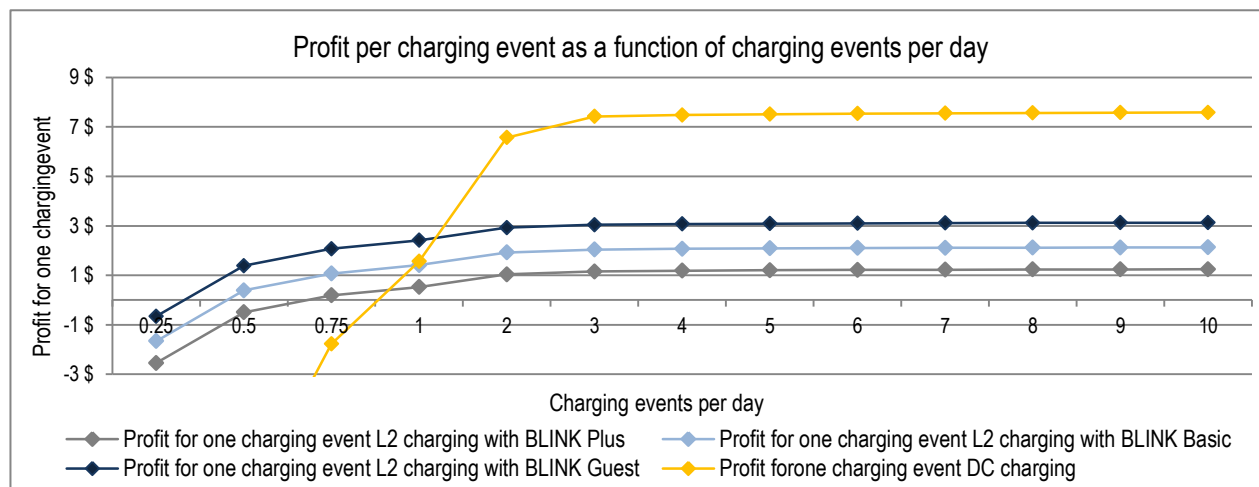


Figure 15: Profit per Charging Event as Function of Charging Events per Day

Sensitivity no. 2: Price & Charging Demand

In economics the relationship between the price of a good and the demand for the good is called elasticity. Calculating elasticity is possible by using the formula indicated in Figure 16. For all values of E between -1 and 0 the demand for a good is called “inelastic”, which means changes in price affect the demand for a good only marginally. For all values of E between -∞ and -1 the demand for a good is called “elastic”, which means changes in price have a severe impact on demand for that good. For a specific elasticity estimation of the good “EV charging services” large-scale empirical research is necessary in order to quantify ΔQ (the change in quantity or the consumers’ reaction).

$$E = \frac{\frac{\Delta Q}{Q}}{\frac{\Delta P}{P}} = \frac{\frac{\text{CHANGE in quantity demanded}}{\text{ORIGINAL quantity demanded}}}{\frac{\text{CHANGE in price}}{\text{ORIGINAL price}}}$$

Figure 16: Elasticity Formula

However, from the preliminary findings of the EV-Owner Survey (MacArthur, 2012) (especially question 30) an educated guess for the elasticity of “EV charging services” is possible. According to EV users, \$7 seems to be the upper limit for DC quick charging. Also, demand for DC quick charging dropped by almost 50% when changing the price from \$5 to \$7. Information such as this depicts “EV charging” and especially “DC fast charging” as a purely elastic good. For the purpose of this analysis a good guess would be a price elasticity of demand (E) somewhere between -2 and -3. Figure 17 depicts three monthly scenarios showing how profits react on the relationship between price changes and subsequent changes in demand.

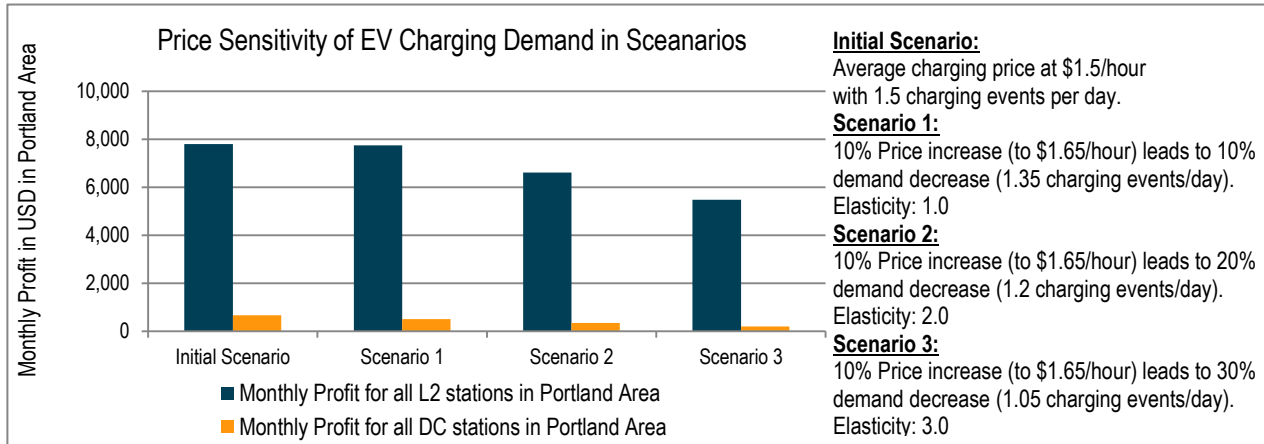


Figure 17: Price Sensitivity of EV Charging Demand in Scenarios

## (2) Property Partner

For Property Partners the most interesting sensitivity relationships are the impact of daily charging events per charger and average charging time on profits.

### Sensitivity no. 3: Property Partner Profits & Daily Charging Events per Charger

As expected monthly profit and revenue have a positive correlation with an increasing number of daily charging events per charger. Also, the break-even point moves from almost 30 months for one daily charging event to less than 5 months for 7 daily charging events (see **Figure 18**).

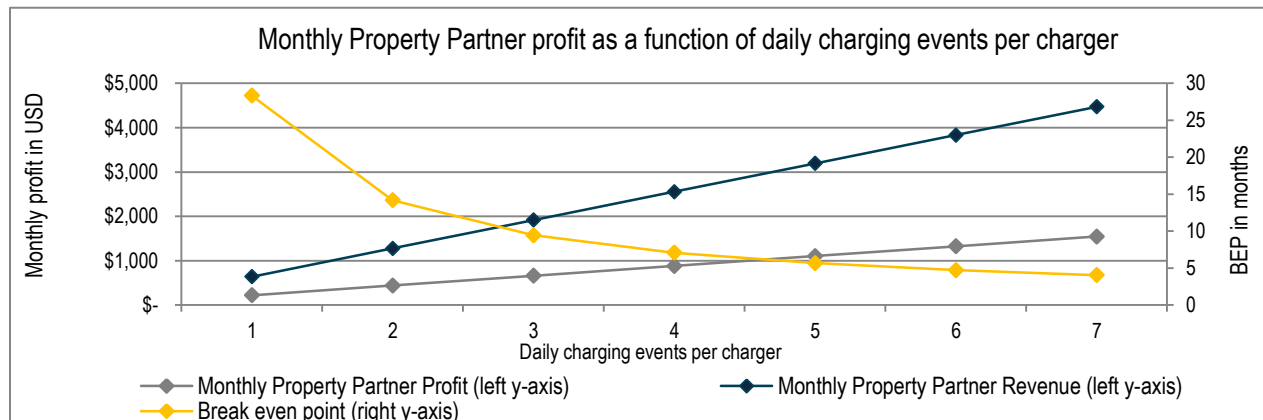


Figure 18: Impact of Composition of Charging Infrastructure on Revenue and Profit

### Sensitivity no. 4: Property Partner Profit & Charging Time

**Figure 19** depicts an increasing monthly profit for Property Partners as the average charging time increases. The graph is divided into three sections indicating three different Property Partner scenarios. The first one, a retail store assumes a customer charging time of 30 minutes. Scenario 2 illustrates a restaurant visit and assumes roughly 120 minutes of charging. Finally, Scenario 3 shows a visit at a movie theater, which means a charging event of up to 2.5hours.

The jumps in monthly profitability are based on the difference between actual charging time and billing time. EV users are charged at the beginning of every Level 2 charging hour, regardless of whether they make a full 60-minute charge or leave after 5 minutes.

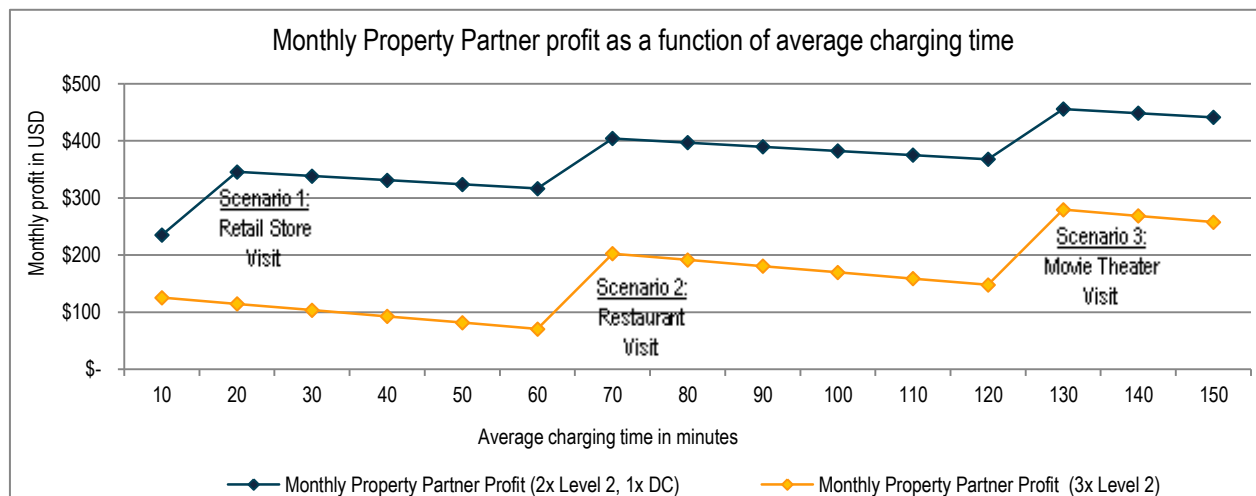


Figure 19: Monthly Property Partner Profit as Function of Average Charging Time

### 4.3. Perspective 3: Operational Feasibility of Business Models

Besides theoretical justification, a valid business model needs to be feasible under real life circumstances. Today's economy and society is difficult to serve and introduce to new standards, challenging theoretically proven success-concepts. The following section will concentrate on micro level challenges faced by the different charging providers.

#### 4.3.1. Property Partner

In order to guarantee the operational feasibility of the Property Partner's business model and consequently the effective usage of the EV charging stations, various factors have to be taken into account.

**Successful Partnerships:** Given the importance of Key Partners to the Property Partners' business model, a successful partnership with the Solution Provider is crucial for the operational feasibility of the business model. This includes effective communication on a regular basis. Numerous contractual issues have to be cleared upfront such as the length of the partnership, a maintenance agreement regarding the charging stations, etc. Furthermore, a clear accounting procedure has to be agreed upon. In the case of a revenue-sharing agreement, both parties have to settle on how the accounting of the stations' revenue will work in practice: Will there be a shared bank account and revenues are divided 50-50? Will the revenue from the stations first be transferred to the Full Range Supplier who then disburses to the Property Partner at the end of each month? Lastly, the cooperation with other Key Partners as for example utilities have to be taken into consideration. Special contracts with local utilities might result in favorable electricity rates or off-peak hours charging might be particularly incentivized.

**Placement of the Charging Stations:** To make EV charging stations operationally feasible, a number of aspects have to be considered regarding the placement of the stations. First and foremost, Property Partners as well as partnering Solution Providers generally aim at a low-cost EVSE installation, which is usually close to a Property Partner's entrance.<sup>7</sup> However, these prime locations can be "detrimental to the image of EVs in that ICE drivers feel the preferential treatment given is unfair and especially so if the space is frequently vacant" (ECotality, 2011). While ECotality discourages placing EV charging stations in preferential locations near the entrance, Property Partners will have to balance the placement of the stations against the financial aspects of the installation. Secondly, depending on the size of a Prop-

<sup>7</sup>Due to the proximity to in-store electricity.

erty Partner's parking lot and the amount of space accessible, Property Partners might have to build entirely new EV designated parking spots so as not to "remove one of the accessible spaces originally required for the facility" (ECotality, 2011). Thirdly, Property Partners have to ensure specific signage is in place that clearly marks parking spots as EV charging only. Absence of signage may lead to non-EVs parking in EV designated parking spots.

**Promotion of the Stations:** As already mentioned in the Property Partners' 4Ps (**Exhibit 8**) analysis, the promotion of the station plays a crucial role, to ensure operational feasibility. Without educating and informing EV users about the EV charging stations' existence, usage will be minimal and so will the hoped-for benefits.

**Legal and Security Requirements:** In order to be feasible, Property Partners' EVSE business model has to meet legal requirements. For example, compliance with the US Americans with Disabilities Act (ADA) has to be guaranteed. Although federal accessibility standards do not specifically address EV charging stations, it is "nevertheless required to incorporate ADA accessibility requirements in the design of commercial charging station equipment and installation plans" (ECotality, 2011). Also security and safety measures have to be kept in mind to enable a safe usage of the stations.<sup>8</sup>

**Intra-Organizational Issues:** There are various factors contributing to operational feasibility of the business models that take place within the Property Partners' organization. First of all, top management needs to support the firm's EVSE project. Upper management sets the tone and an example within the organization's culture. Without the CEO's or top-level management's approval and support, the EV initiative will only be embraced halfheartedly. Senior management's support is also crucial for budgetary issues that will become increasingly relevant once government subsidies decrease. Secondly, "operational feasibility is dependent on human resource availability" (Kendall & Kendall, 1999). Property Partners have to realize the human factor's relevance for the EVSE success. In some cases this means that a Property Partner has to employ new employees who deal specifically with the EV stations.<sup>9</sup> Furthermore, Property Partners have to ask themselves a general question upfront: Is the charging going to be a business or a service? It is crucial to decide whether the stations are supposed to generate revenue or not before starting a corporate EVSE project. "Deploying EV chargers is a business decision before it's a technical one" (Kalb, 2012).

Our research shows that at the moment, the Property Partners' business model is relatively safe and indeed operationally feasible. This is mainly triggered by the government subsidies, grants and support of the EV industry. All researched/interviewed Property Partners were either part of the EV Project or another state-funded EV initiative, minimizing their risk since initial investments are usually covered entirely. Furthermore, Property Partners can choose their level of engagement in accordance with the Full Range Suppliers, often leading to no responsibility whatsoever for the maintenance and operation of the stations.

Concluding, Property Partners can only benefit from participating in these state-funded EV projects, with a minimal level of risk but presumably many intangible gains such as increased publicity and media coverage, image and brand benefits. However, once these state-funded initiatives end it is questionable to what extent Property Partners can and want to continue providing EV charging.

#### 4.3.2. Solution Provider

**Customized Solution:** Offering customized charging stations like the Device Supplier Shorepower (Bates, 2012) is operationally more difficult than offering a standardized version, yet it helps avoid cus-

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<sup>8</sup>Such as additional video monitoring to avoid misuse or vandalism as well as provide resistance to weather.

<sup>9</sup>For example a PR agent to handle media coverage and inquiries

customer resistance by making the solution as easily accessible and usable as possible for the consumer. Thus, for instance, devices that already have a credit card slider also face fewer problems according to Cieslik-Miskimen, because they are adjusted to customer needs (Cieslik-Miskimen, 2012).

**Product Innovation and Expansion:** Many difficulties concerning the operation of EV charging stations have not yet been worked out. The lack of infrastructure, deficiency of devices and software, and lack of efficiency in network management are still very realistic problems. In order to counteract these issues ECOtality for instance has decided to conduct extensive feasibility and infrastructure planning studies, providing a detailed action plan for its successful execution and continued maintenance. "Through innovation, acquisitions, and strategic partnerships, ECOtality accelerates the market applicability of advanced electric technologies to replace carbon-based fuels" (Cieslik-Miskimen, 2012). Additionally, the Blink network has decided to bring its total number of charging stations to approximately 6,700.

**IT Integration:** Furthermore, Service or Full Range Suppliers that outsource their IT or software needs in the future may have operational advantages over those players who do not. By getting a third party to handle payment (ChargePoint, 2012) and system management they need less personnel, avoid maintenance, and provide the best solution to their customers. Their operational costs is likely to be lower, even though their overall costs might be higher due to the third party services that they require. Through separate IT providers' effective controls to protect against fraud and to guarantee accuracy and the security of data and information is provided for.

**Close Cooperation:** The better the cooperation with key partners (OEMs, utilities, the U.S. government, and IT providers) the more likely Solution Providers are to be recommended to customers (Andersson, 2012) and the better and broader their product offering will be. This will allow for better customer segmentation, which in turn leads to operational improvements.

**Focus on Customer Convenience:** Currently, customers are fed up with the amount of networks they must join to take advantage of the EV charging station offers and are reluctant to carry too many membership cards with them just to be able to charge their EV (MacArthur, 2012). A consolidation of networks would ease this inconvenience. On the other hand, the players that are able to forgo this issue are preferable to customers by providing as many payment options as possible. In this sense many Service Suppliers have a distinct advantage in that they provide membership cards that serve as debit cards, which the users can deposit money on. This greatly simplifies their operations and makes charging easier for the consumer.

To improve consumer convenience and improve efficiency, Full Range and Service Suppliers should allow for reservations of stations ahead of time, provide station mapping, smart phone apps, and a variety of mobile and in-car navigation systems (ChargePoint, 2012). Having the users involved in the planning and development of networks and equipment will increase benefits based on improved customer insight. This will ultimately allow for internal optimization of processes (equipment location, network needs, etc.).

Up to now, Solution Providers offer business models that are operationally workable though perhaps financially underdeveloped. The charging station solutions fulfill their purpose overall, meaning they are able to meet basic customer needs, yet real consumer convenience is still lacking. The overall acceptance of solutions provided for EV charging stations by the mass market depends on improvements in convenience, wherefore Solution Providers' business models must be tweaked to create sustainable levels of operation.

## 4.4. Business Model Attractiveness Conclusion

This conclusion is intended to pool the knowledge of the paper sections 2, 3, and 4 and to create a final business model ranking based on attractiveness. Since business model attractiveness is a rather loose term this ranking consists of six subcategories: (1) Profitability (time to break even, ROI, operational margin), (2) Self-sustaining in the future (independence of subsidies, revenue volatility), (3) General Risk (dependence on outside factors, competitive situation), (4) Opportunities to expand (innovation, portfolio/ geographical expansion, vertical integration), (5) Satisfaction of an urgent customer need (Jobs-to-be-done, customer need), and (6) Operational feasibility (partnerships, IT integration, legal/security requirements). Every subcategory features a maximum of ten points for every business model.

	Property Partner	Full Range Supplier	Device Supplier	Service Supplier
(1) Profitability	8	4	7	6
(2) Self-sustaining in the future	5	3	7	6
(3) General Risk <sup>10</sup>	9	4	8	5
(4) Opportunities to expand	2	9	5	5
(5) Satisfaction of an urgent need	7	7	6	5
(6) Operational feasibility	9	6	6	7
<b>TOTAL</b>	40	33	39	32

Although the Property Partner and the Solution Providers depend on each other to provide commercial charging, the following conclusions will be on the business model level, assuming a healthy economic environment for each player.

### Business Model Conclusion: **Property Partners**

The Property Partners are the winners of our business model attractiveness ranking. The high performance is mainly attributable to the (1) profitability and (6) operational feasibility of the Property Partners' business model. As the profit model analysis showed offering charging stations is a relatively safe investment for the Property Partners. Without much effort and risk, Property Partners have the chance of making a profit besides their actual core business. Of course, the ROI depends on their initial investment but in general Property Partners do not have too much at stake with the EV business model. Yet, the high scores are partially offset by low rankings in (2) self-sustaining in the future and in (4) expansion opportunities. How self-sustaining the business model will be without government subsidies is yet to be determined.

### Business Model Conclusion: **Device Supplier**

Among the four discussed business models the Device Supplier has the second most solid business case. Large companies such as GE, Schneider Electric, and Siemens offer charging stations profitably as one product line out of many. But also smaller companies, such as ClipperCreek compete successfully in the EV industry. The biggest benefit for Device Suppliers is their ability to focus all corporate activity on manufacturing. Despite the fact that Device Suppliers sell into the EV market, they hardly participate in the daily charg-

<sup>10</sup>The higher the number the less risky the business model: 1 = highly risky, 10 = no risk at all

ing of electric vehicles. Most device manufacturers draw a clear line regarding what they do and what they do not do. This allows the establishment of economies of scale and minimizes risk and exposure to the young and volatile EV market.

**Business Model Conclusion: Full Range Supplier**

What makes the Full Range Supplier rather unattractive is the model's high dependency on external funding. Under current EV charging market conditions Full Range Suppliers struggle to make their business case. Furthermore the model faces relatively long time spans for its charging stations to break even. On the positive side Full Range Suppliers are the only players who are fully vertically integrated and thus able to serve the entire EVSE supply chain. In case the business model takes off financially as the charging volume increases, no margin is lost throughout the supply chain. Another positive effect of this vertical integration is access to multiple sales channels for devices, which is an advantage over Device Suppliers.

**Business Model Conclusion: Service Supplier**

Service Suppliers are ranked as the least attractive business model due to a number of reasons. While Service Suppliers only require low upfront investments and can generally be categorized as operationally feasible, the risk factor of the business model cannot be neglected. Low barriers of entry enable new companies to enter this business thereby increasing competition. At the same time Service Suppliers have to stand up to Full Range Suppliers who include the Service Suppliers service in their one-stop-shop solution. Yet, on the other hand Service Suppliers are only marginally affected by government subsidies, thus scoring relatively high in the self-sustaining category. Expansion opportunities, e.g. geographical expansion, exist. However, vertical integration is rather unlikely given the more capital-intensive and complex business that is the Full Range Suppliers'.

## 5. Business Model Best Practices

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### 5.1. Future Industry Trends

Given the uncertainties in the EV charging station market and the immaturity of the market with no solid business models (Bates, 2012), predicting future developments is at best imprecise. Nonetheless, certain probable trends can be derived from our current industry analysis (cf. PESTEL and Porter's 5 Forces analyses in **Exhibits 3** and **4**) and expert interviews.

**Improvement of EV Perception:** Electric vehicles have the reputation of being a slow, undynamic and boring yet expensive version of a gas car. Current users keep emphasizing their initial misperception and positive surprise of the actual driving experience. With spreading experience reports, the general perception is likely to change and turn the EV into a seriously considered alternative to a gas car. This development is also supported by continuous technological innovation of EVs, balancing their weaknesses (range, speed limit, price, etc.)

**Better Value for Less Money:** Continuous technological innovation and progress improves battery performance while cutting costs on production (Gartner & Wheelock, 2011). This trend will offset the EV's reputation as pricy investments and help overcome the weaknesses related to the vehicles' ease of use (range, speed, battery life, road performance etc.)

**Increasing Gas Prices as Financial Stimulus:** In addition to the decreasing EV costs, the increasing gas prices create another EV purchasing incentive. Not uncommonly, gas costs are one of a household's main expenses, leading to financial cuts in other areas. Although still higher in sales price, EVs can create cost savings after a few years, a well know fact that will increase EV consideration with increasing gas prices (Hillman, 2012).

**Car Sharing to Leverage High Investment Costs:** Limited space and increasing prices have come along with a social preference for sharing. Car sharing is a major field and already common in urban areas. This development can hold major growth potential for the EV industry, as car sharing companies like Zipcar see their long-term benefit of reduced operating costs and already invest heavily in shared EVs (Zipcar, 2012). Private car sharing will allow EV users to leverage the initial investment of the EV's purchase.

**DC Fast Charger, a Financially Sound but Limitedly Appreciated Service:** DC fast charging is the fastest and most convenient way to charge an EV, most comparable to the traditional gas station stop. However, missing standards, knowledge and availability have increased consumers' doubt about this particular charging option (Motavalli, 2012). Although highly honored in written theory, EV user surveys showed that DC fast charging is not (yet) as appreciated and utilized as expected (MacArthur, 2012). High purchasing and installation costs will further limit availability, slowing down the adoption process, especially as long as free Level 2 charging can still be found (Besson, 2012). The main driver increasing profitability and generating financial incentives to install commercial DC fast chargers is usage, which is not likely to increase until above mentioned "flaws" are eliminated.

**Level 2 Charging Will Become the Mid-Term Standard:** Level 2 charging is currently the most common way to charge an EV. The early majority is slowly adapting to EVs and is introduced to the simple, quick and economic level 2 chargers. Once accepted, it will take time to accept another option, especially at considerable higher costs. When utilizing residential charging solutions, EVs usually charge over night, eliminating the need for a quicker process. The same is valid for charging at the work place. High investments (in DC fast chargers) in commercial charging solutions are also limited due to the foreseeable financial distress caused by expiring governmental subsidies (EV project).

**EVs as Medium to Store, Move, and Manage Power:** Utility companies see the potential of EVs, or more precisely their batteries, to become energy transporters. In the far future EV users could be able to give and take electricity to and from the smart grid, creating great opportunity for utilities (Howard, 2012). With this future chance in mind, the utilities' interest in the EV industry growth is justified and explains potential financial as well as operational support.

**Governmental Push Towards Sustainable Solutions:** Although the main governmental initiative (EV project, providing approximately \$100 million for EV solution implementation) is expected to expire in 2013, governments emphasize their long-term commitment to sustainability. Their observed cooperation with major players of the industry (car manufacturers, charging station manufacturers, Solution Providers, etc.) is proof for their true commitment to help this trend to gain foothold and influence the future (Zehner, 2012). By exploring the possibilities to create a functioning industry in which players can survive independently is the key to generate healthy growth that will sustain without funding in the long run.

## 5.2. Recommendations on Business Model Level

This final section includes recommendations for every business model based on the analysis above. Although the industry consists of many unknowns and independent variables due to its early development stage, the team has identified key triggers and associated measures that will help the different business models to survive. Given recommendations are backed with findings from the research and analysis to justify their expected success.

Recommendations for **Property Partners:**

(1) Consider DC quick chargers despite higher set-up costs

- DC quick chargers are real revenue drivers. Section 3.2.4 (especially **Figure 8**) shows that one DC charger can substitute the profit of roughly 10 L2 chargers if used appropriately.

(2) Stay below 50% contribution to initial device/installation cost

- At a 50% contribution to device/installation costs, Property Partners will face problems to break-even with their investment. If ownership of the devices is transferred to the Property Partner depreciation becomes an issue and makes profitability over the station's lifetime questionable.
- The optimal contribution is below 20% in order to ensure a timely break-even-point.

(3) Heavily promote the charging stations to ensure usage and gain associated image benefits

- Use already existing marketing channels from core business activities to exploit advertising and publicity opportunities.
- Expand marketing efforts to reach both EV users and non-EV users to educate them about the stations' existence while simultaneously informing about the Property Partners' "green" business.
- Further investments in partnerships with either Full Range Suppliers or Service Suppliers may lead to additional promotion of the stations as these Solution Providers advertise them through their networks.

**Recommendations for Full Range Suppliers:**

(1) Maintain a minimum of charging events per day to cover direct costs

- Under normal circumstances (see assumptions for sections 3.1.4 and 3.2.4) 0.6 charging events per day for one charging station are enough to cover direct cost.
- Every charging plan requires a slightly different amount of charging events per day to ensure direct profitability. Blink Plus: 0.66, Blink Basic: 0.42, Blink Guest: 0.3, but in average 0.6 is enough.
- In order to cover corporate overhead substantially higher numbers have to be achieved.

(2) Be careful to change existing pricing

- EV charging can be considered an elastic good ( $E = \text{roughly } -2 \text{ or } -3$ ), which means demand will react sharply to price changes.
- Part of the problem is that EV owners have substitute products readily available: Home charging, free chargers, etc.

**Recommendations for Device Suppliers:**

(1) Concentrate on innovation of core competency: Manufacturing

- For large EV charger manufacturer clear boundaries limit exposure to volatile and young EV market.
- Smaller EV charger manufacturers with a clear focus on the EV market should drive product innovation to establish their territory in the market and, thus, differentiate on the basis of product design, functionality, and ease of use.
- Bigger EV charger manufacturers should use cross-functional process innovation to drive price dynamics in the market and leverage economies of scale and scope while providing customized solutions.

(2) Connect with industry players to improve forecast accuracy and secure demand

- Partnerships with Service Suppliers exploit growth synergies and allow direct competition with Full Range Suppliers without endangering expertise due to diversification.
- Extended customer relationship through maintenance services generates regular revenue streams.

- Investments in B2B marketing allow recruiting an excellent sales force, promoting activities such as information seminars, distributing newsletters, and white papers as well as engaging in CRM to secure relationships, brand awareness, and customer retention.

#### Recommendations for **Service Suppliers**:

##### (1) Initiate and grow network effects early with targeted marketing measures

- Initially low entry barriers can be taken advantage of to differentiate service early.
- Guerilla marketing increases viral word of mouth impact, network awareness and customer exposure, especially among younger target groups by involving users in development process of network through competitions, games, etc.

##### (2) Focus on reliable customer service for current and potential EV users to generate network effects

- Synergies can be generated by exploiting core competency: service. Offering memberships for non-EV users to join informational network helps reach future EV users.
- Excellent service and member management increases EV users' willingness to pay as well as station traffic – factors that drive a Property Partner's decision to partner with a Service Supplier.
- High investment in IT solutions secures best range of services (payment options, tracking consumers' charging habits, etc.) and functionality.
- Station reservation ahead of time grows consumer convenience and improves efficiency. Station mapping, multiple payment options, smart phone apps, and a variety of mobile and in-car navigation systems add to ease of use.

##### (3) Invest in quantification of network effects to exploit additional revenue opportunities and prove attractiveness to Property Partners

- Data on consumer habits and insights are valuable assets, especially in new, emerging markets expected to experience major growth.
- Create closed loop system with marketing and IT solutions (and other internal functions) for optimal results.

## 6. Conclusion

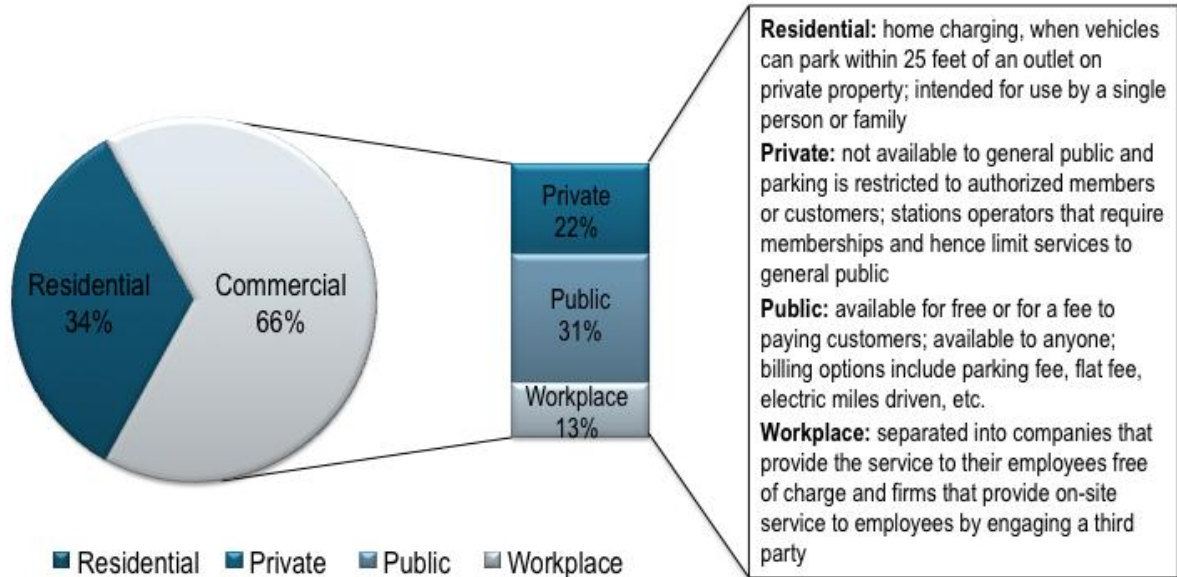
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The team has had the opportunity to dedicate their final university project to one of the most promising industries that has the potential to literally change the world. Trying to structure an unstructured environment challenged our abilities and was a first insight into how future tasks in the business world will look like. Academic theory is helpful but most of the time it has to be taken to the next level, something we were able to practice with this project about an immature and new industry. Despite all the things we realized we do not know, this project has enabled us to gain a lot of knowledge, resulting in EV industry experts reaching out to us for opinions and information. The passion of industry experts, the initiative of single supporters, and the dedication of involved players has been a refreshing and inspiring journey and it felt great to be part of this "movement".

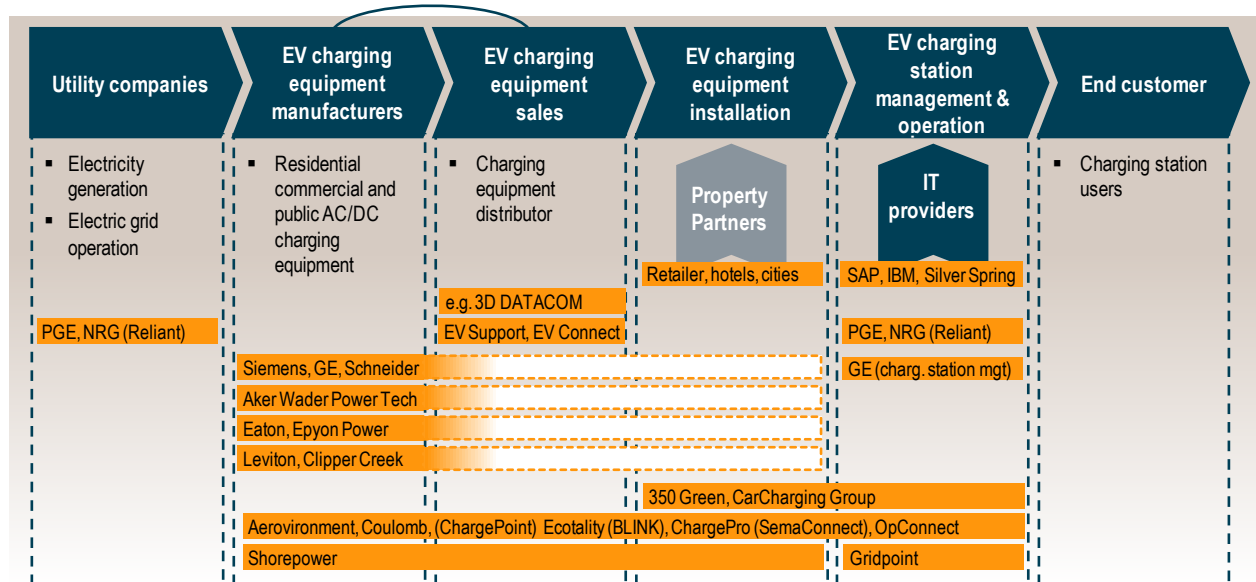
We believe that our findings can be relevant and advancing for the industry and hope that our recommendations will be considered for future charging solutions. We are excited to see this industry grow and hope for healthy growth, balancing environmental -, and economic interest.

## 7. Exhibits

### 7.1. Exhibit 1 – EVSE Market Segmentation, World Markets 2015



### 7.2. Exhibit 2 – Supply Chain Diagram



### 7.3. Exhibit 3 – Porter's 5 Forces

<p><b>MEDIUM threat of NEW ENTRIES, due to...</b></p> <ul style="list-style-type: none"> <li>...<b>Capital requirements</b> to enter (equipment, infrastr.)(+)</li> <li>...Considerable <b>switching costs</b> (partnerships and key resources)(+)</li> <li>...<b>Economies of scale</b> (cost advantages) (+)</li> <li>...High impact of <b>network effect</b> (+)</li> <li>...High <b>maintenance</b> costs (low equipment life) (+)</li> <li>...High <b>variable costs</b> (increasing electricity prices, network effects, etc.) (+)</li> <li>...New market with <b>few players</b> and many <b>open niches</b>(-)</li> <li>...Limited product <b>differentiation</b>(-)</li> <li>...<b>Government regulations</b> favoring national corporations (-)</li> <li>...Lack of int. equipment and automotive <b>standards</b> (-)</li> </ul>	<p><b>LOW BUYER bargaining power, due to...</b></p> <ul style="list-style-type: none"> <li>The bigger the network the more <b>valuable</b> the service (+)</li> <li>Buyers take over most valuable <b>advertising</b> 'spreading word of mouth (+)</li> <li>Limited differentiation of products (+)</li> <li>Few substitute products in EV segment (-)</li> <li>Few buyers in the current market (-)</li> <li>Low level of <b>education</b> among buyers (-)</li> <li><b>Low volume</b> product purchases (-)</li> <li>Low risk of <b>backward integration</b> (-)</li> </ul>
<p><b>MEDIUM threat of RIVALRY, due to</b></p> <ul style="list-style-type: none"> <li>...<b>New market</b> (-)</li> <li>...<b>Many</b> competitors (+) but different market niches where competitors are <b>strategically diverse</b> (-)</li> <li>...High <b>industry growth</b> (-)</li> <li>...Undifferentiated products (+)</li> <li>...High <b>fixed and variable costs</b> (+)</li> <li>...Competitors from <b>different industries</b> (car rental, taxis) (+)</li> </ul>	
<p><b>MEDIUM SUPPLIER bargaining power, due to...</b></p> <ul style="list-style-type: none"> <li>...<b>Many suppliers</b> available in niche markets (-)</li> <li>...High level of substitutes (-)</li> <li>...<b>Forward integration</b> risks (+)</li> <li>...Uneducated buyers and relatively <b>low price sensitivity</b>(+)</li> <li>...Relative dependence on <b>partnerships</b> with car manufacturers, utilities, and government (+)</li> </ul>	<p><b>HIHIGH threat of SUBSTITUTES, due to...</b></p> <ul style="list-style-type: none"> <li>...<b>Several alternatives</b> to "get-the-job-done" (bike, train, bus, combustion engine cars) (+)</li> <li>...<b>More established alternatives</b> to "get-the-job-done" (+)</li> <li>...Cheaper initial investment of non-EV cars (+)</li> <li>...<b>Superior substitute performance</b> (range, battery life, etc.) (+)</li> <li>...Lack of trust due to high <b>innovation</b> and <b>uneducated buyers</b> (+)</li> </ul>

## 7.4. Exhibit 4 – PESTEL Analysis

<b>Political</b>	<ul style="list-style-type: none"> <li>▪ The vacillating price of petroleum and geopolitical turmoil often associated with its sale is considered to be a risk by many governments, non-governmental organizations, and individual citizens</li> <li>▪ A “baseline” of charging infrastructure <b>subsidized</b> by local and federal government is being installed across the United States during the 2011-2012 timeframe</li> <li>▪ The U.S. DOE offers <b>grants</b> established by the 2009 stimulus package as well as through the Clean Cities Transportation Sector Petroleum Reduction Technologies Program. The Commerce Department provides <b>funding</b> via Economic Development Administration (EDA) grants. The Federal Highway Transportation Administration and Federal Transit Administration also provide funding through the Congestion Mitigation and Air Quality (CMAQ) program.</li> <li>▪ Tax Relief acts</li> <li>▪ CAFÉ standards favor alternative technology investment</li> </ul>
<b>Economic</b>	<ul style="list-style-type: none"> <li>▪ General increasing price awareness of society increases critical review of personal expenditures (residential charging will come as overall part of energy/ electricity consumption → payments during off peak rates)</li> <li>▪ Economical viability of non-residential charging mainly depends on charging solution.</li> <li>▪ Transportation has played crucial role in U.S. economic growth development</li> <li>▪ Owning EV as second car option</li> <li>▪ Industry dependency on oil prices (gas) and other economic factors</li> <li>▪ Although geopolitical instability and economic crises have traditionally been the primary causes of gasoline price movements, increased demand from high-growth emerging markets combined with limited supply will likely continue to drive price increases</li> </ul>
<b>Sociocultural</b>	<ul style="list-style-type: none"> <li>▪ Vehicle electrification and the associated charging infrastructure are viewed as a more secure alternative to petroleum that creates jobs. This is increasingly influencing personal, commercial, and public purchases of transportation equipment</li> <li>▪ Consumers prefer traditional gasoline engines but alternatives gaining traction</li> <li>▪ Buyers willing to spend only \$1,000-3,000 extra will have a tough time finding an electric vehicle at that price</li> <li>▪ Highest-income households are not as willing to spend on hybrids and electric vehicles</li> </ul>
<b>Technological</b>	<ul style="list-style-type: none"> <li>▪ High innovation marks industry (e.g. EVSE technology has also been integrated with conventional parking meters by companies like Siemens, enabling parking fees to be incorporated into the cost of power delivery)</li> <li>▪ Future improvements in battery technology will increase the energy efficiency of the vehicles, the battery power range, and the miles per kWh of energy stored, making PEVs and charging equipment a better value</li> <li>▪ Alternative technologies such as battery swapping (China), or wireless charging</li> <li>▪ The CHAdeMO Association was started in early 2010 to promote and develop fast DC charging technology originally developed by TEPCO. By the second quarter of 2011, the group consisted of 315 members, including energy companies, utilities, automakers, component suppliers, and charging equipment companies.</li> <li>▪ Commercial EVSE adds a layer of authentication and encryption technology to secure the charging equipment and the data in a public environment. Public equipment can include several types of card swipe or contactless systems; a system specific to the EV charging manufacturer, a third-party system (such as for a utility, retailer, or employer), or a credit card payment system</li> <li>▪ Utilities employing smart grid developments in their business models</li> <li>▪ Equipment connection standards (regional standards) and safety standards</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>▪ Increasing environmental concerns favor EV market and infrastructure development (dependence on foreign oil, unstable and rising energy costs, ICE CO2 and other greenhouse gas emissions)</li> <li>▪ Industry and business concepts support sustainability and can benefit current “Green.-Trend” and increasing environmental awareness of personal impact and carbon- footprint</li> <li>▪ High cost of limited natural resources that are needed for EV batteries and manufacturing</li> <li>▪ The Japanese earthquake affects supply chain for vehicles and parts</li> </ul>
<b>Legal</b>	<ul style="list-style-type: none"> <li>▪ Legal regulations potentially benefit national corporations</li> </ul>

### 7.5. Exhibit 5 – Possible Charging Solutions for Property Partners



Property Partner purchases charging station from **Device Supplier (DS)** to provide charging to the public.



All costs covered by Property Partner (Equipment, Electricity, Management)

Property Partner partners with **Full Range Supplier (FRS)** who supplies charging station linked to a network to provide charging to network members.



Cost sharing of Equipment, PP pays Electricity, FRS manages network\*

Property Partner purchases charging station from **Device Supplier (DS)** and partners with **Service Supplier (SS)** who adds the station to a network and manages members.



Property Partner pays Equipment and Electricity, SS manages the network

\* Typical relationship

### 7.6. Exhibit 6 – Business Model Canvas Property Partners

<p><b>Key Partners</b></p> <ul style="list-style-type: none"> <li>▪ Solution Providers (Material, Key &amp; Service Suppliers)</li> <li>▪ Sources of funding (e.g. the EV project, ODOT, governmental agencies, etc.)</li> <li>▪ Utilities</li> <li>▪ Cities and/or municipalities</li> </ul>	<p><b>Key Processes</b></p> <ul style="list-style-type: none"> <li>▪ Determining the optimal store location for charger installation usually in cooperation with the Solution Provider</li> <li>▪ Price-setting, in cooperation with Solution Provider</li> <li>▪ General cooperation with Solution Providers</li> </ul> <p><b>Key Resources</b></p> <ul style="list-style-type: none"> <li>▪ The property, i.e. parking lots</li> <li>▪ Electricity</li> <li>▪ The Property Partner's business itself (e.g. department stores, cafes,...)</li> </ul>	<p><b>Value Proposition</b></p> <ul style="list-style-type: none"> <li>▪ Property Partners offer charging stations at places that EV consumers already visit frequently in their day-to-day lives, where they live, eat, shop and spend their free time. This increases convenience, reduces time and makes charging stations more accessible.</li> <li>▪ Convenient and accessible EV charging stations in communities along major commuter routes. Often times searchable through a charging station locator</li> </ul>	<p><b>Customer Relationship</b></p> <ul style="list-style-type: none"> <li>▪ Stations strengthen customer relationship and loyalty by:             <ul style="list-style-type: none"> <li>➢ incentivizing customers to shop/stay at a certain Property Partner</li> <li>➢ providing an additional service for their customers</li> </ul> </li> </ul> <p><b>Channels</b></p> <ul style="list-style-type: none"> <li>▪ Press releases &amp; media coverage</li> <li>▪ Online: Twitter feeds &amp; Property Partners' homepage</li> <li>▪ Solution Providers' maps and apps (Property Partners are mentioned as official charging stations)</li> </ul>	<p><b>Customer Segments</b></p> <ul style="list-style-type: none"> <li>▪ So far, no information is available with regard to customer segment specifics. Property Partners are only starting to collect data on the users of their stations</li> <li>▪ <u>Assumption</u>: Given that the EV movement is still in its infancy, most EV users are amongst the "Innovators" and "Early Adopters" of the Consumer Adoption Cycle (<i>Geoffrey Moore, Crossing the Chasm</i>)</li> </ul>
<p><b>Cost Structure</b></p> <ul style="list-style-type: none"> <li>▪ Installation costs (though most of the installation costs are so far covered by state/government subsidies. However, this will change with the end of the EV project, etc.)</li> <li>▪ Electricity (usually the property partner's responsibility to provide the power for the stations)</li> <li>▪ <u>Assumption</u>: expenses are manageable for the Property Partners</li> </ul>		<p><b>Revenue Structure</b></p> <ul style="list-style-type: none"> <li>▪ Revenue-sharing agreements with Solution Providers in some cases</li> <li>▪ Indirect revenue streams generated through:             <ul style="list-style-type: none"> <li>➢ New customers who are attracted by charging stations</li> <li>➢ Customers spend money in the property partner's actual business to kill the waiting time</li> <li>➢ Media attention: often times free because of media interest in EV industry</li> </ul> </li> </ul>		

### 7.7. Exhibit 7 – SWOT Property Partners

STRENGTHS to maintain...	WEAKNESSES to balance...
<ul style="list-style-type: none"> <li>▪ Property Partners' <b>brand equity</b></li> <li>▪ Low financial risk due to government support</li> <li>▪ Already <b>existing marketing channels</b> that can be used to promote the EV stations</li> <li>▪ Already existing high <b>customer traffic</b> due to core business activity</li> </ul>	<ul style="list-style-type: none"> <li>▪ Lack of <b>EV industry knowledge</b></li> <li>▪ <b>Dependence</b> on Key Partners</li> <li>▪ Creates additional <b>responsibilities</b></li> </ul>
OPPORTUNITIES to grow...	THREATS to overcome...
<ul style="list-style-type: none"> <li>▪ Deeper <b>consumer insights</b></li> <li>▪ Extension of the <b>customer experience</b> To the parking lot</li> <li>▪ Brand image benefits</li> <li>▪ Competitive <b>differentiator</b></li> <li>▪ Additional source of <b>revenue</b></li> <li>▪ <b>Advertising</b> and publicity opportunities</li> <li>▪ EV <b>industry</b> is expected to <b>grow</b> immensely</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Ubiquity</b> of charging stations would destroy the competitive differentiator potential</li> <li>▪ <b>Obsolescence</b> of chargers due to changing standards</li> <li>▪ <b>Uncertainty</b> regarding the future of the EV industry</li> <li>▪ Changing <b>public perception</b> of EVs</li> <li>▪ Lack of <b>government subsidies</b> for EV charging stations</li> <li>▪ Expected growth of actual business's revenue won't appear</li> </ul>

### 7.8. Exhibit 8 – Marketing Mix Property Partners

PRODUCT	PRICE
<ul style="list-style-type: none"> <li>▪ <b>Charging Stations:</b> This product involves the service of being able to charge your electric vehicle at a certain Property Partner while being able to enjoy other products and services offered there, that go beyond the re-charging.</li> <li>▪ <b>Additional Products and Services:</b> Many Property Partners are active in diverse business fields such as retail, restaurants/cafes or hospitality and hence offer their intrinsic products and services as well.</li> <li>▪ <b>Convenience and Accessibility:</b> In general the customers (i.e. EV drivers) benefit from charging stations located in accessible and convenient places</li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Varying Degree of Involvement in Price Setting Activities:</b> Sometimes Property Partners are engaged in price setting, in other cases it's the Solution Provider's responsibility</li> <li>▪ <b>Uncertainty Regarding Price Sensitivity:</b> The high degree of uncertainty that still revolves around consumers' price sensitivity makes price setting a challenge for both Property Partners and Solution Providers.</li> <li>▪ <b>Relevant Factors for Price Setting:</b> Customer demand and the customer's perceived value for the "product", the competitive environment as well as other products and services offered at a Property Partner.</li> </ul>
PROMOTION	PLACE
<ul style="list-style-type: none"> <li>▪ <b>Promotion as Determinate for Charging Stations' Usage:</b> Educating EV users about the stations and their locations is a precondition for their usage.</li> <li>▪ <b>Word-of-Mouth</b></li> <li>▪ <b>Coupons:</b> Obtainable at the chargers as an incentive to go shopping at a Property Partner</li> <li>▪ <b>Online:</b> Twitter feeds, Facebook presence, Property Partners' homepage, etc.</li> <li>▪ <b>Media Coverage and Press Releases</b></li> <li>▪ <b>Solution Providers' Maps and Apps:</b> Property Partners are mentioned as official charging stations</li> </ul>	<ul style="list-style-type: none"> <li>▪ Place of the Stations Plays a Crucial Role for Their Usage: Convenient locations easily accessible</li> <li>▪ <b>Place-Influencing Factors:</b> Distance of the Property Partner to interstates and transportation routes, safe and visible area, electricity supply (proximity to the store)</li> <li>▪ <b>Direct</b> Distribution to End Customer: Property Partners' position at the end of the EV charging industry supply chain enables them to directly "sell" to the end customer</li> </ul>

### 7.9. Exhibit 9 – Profit Model Property Partners (1/3)

## Profit Model - Property Partners: What is the Property Partners' profit for offering EV charging stations?

CALCULATION INPUT:	All Assumptions are highlighted in red font			
<b>(1) Charging station set up:</b> Our assumption is that the property partner is running two Level 2 chargers and one DC charger. The output in kWh for a charger depends on the Volt and Ampere specifics of the charger and the actual charging time: <a href="http://www.evscroll.com/Electric_Car_Charging.html">http://www.evscroll.com/Electric_Car_Charging.html</a> offers a good calculator to identify kWh output. For a Level 2 (240 Volts, 30 Ampere, 1h Time) charger the kWh output is 6 kWh (after accounting for losses and other items); For a DC quick (480 Volts, 200 Ampere, 1h Time) charger the kWh output is 60kWh (after accounting for losses and other items).	Amount of Level 2 chargers	Amount of DC chargers	Level 2, kWh output for 1 h charging	DC, kWh output for 1 h charging
	2	1	6	60.0
<b>(2) Car charging capacity:</b> Capacity in kWh varies for each model: Nissan Leaf = 24kWh, Chevy Volt = 16kWh, Ford Focus Electric = 23kWh; The average for the purpose of this calculation is 21kWh	Nissan Leaf battery capacity in kWh	Chevy Volt battery capacity in kWh	Ford Focus E battery capacity in kWh	Average battery capacity in kWh
	24.0	16.0	23.0	21.0
<b>(3) Charging volume and charging behavior:</b> Our assumption is that an average EV charging station at a Property Partner's location serves 2 cars/day. The average charging event loads 14% of the battery in 30 minutes (Level 2). For Level 3 in 30 minutes the entire battery is loaded (80%), the charger is assumed to stop and click out after 17 minutes.	Average charging time during store visit in min	L2 Battery charging in %	DC Battery charging in %	Daily charging events per charger
	30	14%	80%	2
	Yearly charging volume of all stations in kWh			
	16,416			

### 7.9. Exhibit 9 – Profit Model Property Partners (2/3)

<b>COSTS PART 1 - OPERATING COSTS:</b>				
<b>(4) Electricity Costs</b> Under the PGE Schedule 89P the Basic charge is \$1000/month and the price per kWh is 6.087 Cents (On Peak) <a href="http://www.portlandgeneral.com/our_company/corporate_info/regulatory_documents/pdfs/price_summaries/01_01_2012/E18_P16_1-1-12_Price_Summaries_Standard%20Service%20Schedules.pdf">http://www.portlandgeneral.com/our_company/corporate_info/regulatory_documents/pdfs/price_summaries/01_01_2012/E18_P16_1-1-12_Price_Summaries_Standard%20Service%20Schedules.pdf</a> . Since the base charge is covered by the Property Partner's ordinary business activities, only the variable energy costs are considered. These can be transformed in yearly or monthly costs.	Monthly base charge	Price per kWh	Yearly energy costs for all charging stations	Monthly energy costs for all charging stations
	\$ 1,000.00	\$ 0.06087	\$ 999.24	\$ 83.27
<b>COSTS PART 2 - INITIAL COSTS:</b>				
<b>(5) Contribution to device and installation costs</b> Our interview partners stated Level 2 device costs at around \$2,500. As of July 2012, device costs for DC quick chargers were significantly higher at around \$50,000. Also, installation for every device is assumed to be \$1000, which includes structural work (laying cables) and aesthetic work (painting, signs, etc.). The Property Partner's contribution to device and installation costs is crucial. Our assumption is that in average Property Partners contribute 10% to the overall device and installation costs. In order to break the investment costs down into monthly costs, an average lifetime of roughly 19 years is calculated on the basis of 13,000 cycles for a connector. Connectors are made for roughly 10,000-15,000 cycles.	Level 2 charger device cost	DC charger device cost	Installation cost Level 2 & DC charger	Prop. P. contribution to device/installation cost
	\$ 2,500.00	\$ 50,000.00	\$ 1,000.00	
	Amortization time for device/installation cost	Average connector life time in cycles	Monthly costs	
	19.35	13000	\$ 24.55	
<b>(6) Advertisement and promotion costs</b> Our interviews revealed that some the Property Partners advertised their stations in various ways. Our assumption is an average of \$450 per site for initial publicity to kick off station usage. In order to incorporate these costs into our analysis we spread the \$450 per site over a stations' lifetime.	Advertisement costs per site	Yearly amortization of advertisement costs over station lifetime	Monthly amortization of advertisement costs over station lifetime	
	\$ 450.00	\$ 23.26	\$ 1.94	
<b>COSTS PART 3 - FINANCIAL COSTS:</b>				
<b>(7) Depreciation of charging stations</b> Depreciation costs are only applicable if the Property Partner's ownership of the devices is <50%.	Yearly depreciation if over 50% ownership	Monthly depreciation if over 50% ownership		
	0	\$ -		
<b>(8) Cost of Capital</b> Offering EV charging stations can be viewed as an investment from a strictly financial point of view. As an investment, the costs should be outweighed by additional revenue through (1) a better image, (2) an increased publicity, or (3) a greater consumption of EV users. Like for any other corporate investment there are opportunity costs, which is why costs of capital should be considered.	Project risk assumption	Cost of Capital		
	Low	10%		

### 7.9. Exhibit 9 – Profit Model Property Partners (3/3)

<b>REVENUE:</b>				
<p><b>(9) EV Charging Services Sale:</b>                      One of our findings from the interviews is that in most cases the Key Supplier/Service Supplier takes care of billing EV users. For this calculation we can rely on BLINK network figures, as BLINK cooperates heavily with many Property Partners:                      The BLINK Network offers different options: <b>Option 1:</b> BLINK Plus: \$30 annual membership fee + Level 2 charging costs of \$1/hour; <b>Option 2:</b> BLINK Basic: No membership fees, but Level 2 charging costs of \$1.5/hour; <b>Option 3:</b> BLINK Guest: No membership fees, but Level 2 charging costs of \$2/hour.                      According to BLINK, they don't charge money for DC usage as of 07/18/2012. For the future we assume \$0.75 for 1 minute of DC charging to complete this calculation</p>	BLINK Plus: Annual membership fee	BLINK Plus: Level 2 charging costs per hour	BLINK Basic: Level 2 charging costs per hour	BLINK Guest: Level 2 charging costs per hour
	\$ 30.00	\$ 1.00	\$ 1.50	\$ 2.00
	BLINK: DC charging costs per minute	Actual BLINK billing time (regardless of usage)		
	\$ 0.75	1		
<p><b>(10) Revenue for Level 2 and Level3 chargers:</b>                      Our assumption for all Level 2 charging stations users of this particular Property Partner is that 10% are BLINK Plus members, 40% are BLINK Basic members and 50% are BLINK Guest users. Also it is important to state that our assumption for Level 3 is that after 17 min (or 0.28h, since (21 kWh x 80%) / 60 kWh) = 0.28h) the EV is fully charged and the charger stops. Also, there is a revenue-sharing between the Property Partner and the Key Supplier in place.</p>	% of BLINK Plus EV users among all L2 users	% of BLINK Basic EV users among all L2 users	% of BLINK Guest EV users among all L2 users	Monthly revenue for Level 2 chargers
	10%	40%	50%	\$ 190.40
	Monthly revenue for DC chargers	Revenue sharing agreement	Monthly Revenue of Property Partner	
	\$ 705.60	50%	\$ 896.00	
<b>PROFIT:</b>				
<p><b>(12) Monthly Profit of Property Partner (without increased revenue):</b>                      Subtracting the (1) Ongoing electricity costs, (2) Initial device/installation costs, and the (3) Advertisement costs from the (4) Charging revenue yields the profit.</p>	Monthly profit of Property Partner	Daily profit of Property Partner	Yearly profit of Property Partner	
	\$ 338.24	\$ 11.27	\$ 4,058.85	
<p><b>(13) Monthly profit from a financial point of view:</b>                      From a strictly financial perspective this project faces cost of capital of 10%, which lower the profit because of the time value of money and opportunity cost.</p>	Project NPV for 150 months of charging revenue	Monthly profit after Cost of Capital consideration	Property partner ROI for first year	Breakeven time for Property Partner (months)
	\$ 3,382.37	\$ 22.55	65%	18.5

### 7.10. Exhibit 10 – Business Model Canvas Device Supplier

<b>Key Partners</b>	<b>Key Processes</b>	<b>Value Proposition</b>	<b>Customer Relationship</b>	<b>Customer Segments</b>
<ul style="list-style-type: none"> <li>▪ Suppliers</li> <li>▪ Utilities</li> <li>▪ Service providers</li> <li>▪ Software providers</li> <li>▪ Automotive OEMs</li> </ul>	<ul style="list-style-type: none"> <li>▪ Customized manufacturing</li> <li>▪ Installation</li> <li>▪ Distribution</li> <li>▪ Maintenance/ Repair</li> </ul> <p style="text-align: center;"><b>Key Resources</b></p> <ul style="list-style-type: none"> <li>▪ Know-how, experience (human capital)</li> <li>▪ Patents (intellectual)</li> <li>▪ Innovative technologies</li> <li>▪ Functional base Device</li> </ul>	<ul style="list-style-type: none"> <li>▪ Build, sell, and install customized charging stations to meet individual need</li> <li>▪ Points of differentiation between companies:                             <ul style="list-style-type: none"> <li>○ Design</li> <li>○ Branding/ reputation/ status</li> <li>○ Pricing structure</li> <li>○ Cost structure</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Manufacturing and sale of equipment</li> <li>▪ Installation</li> <li>▪ Repair/ Maintenance</li> <li>▪ Consulting</li> </ul> <p style="text-align: center;"><b>Channels</b></p> <ul style="list-style-type: none"> <li>▪ Mainly direct B2B sales online, or personal contact at fairs, through connections</li> <li>▪ Responsible for awareness, evaluation, purchase, delivery</li> </ul>	<ul style="list-style-type: none"> <li>▪ Businesses (work place)                             <ul style="list-style-type: none"> <li>○ Level 2</li> <li>○ DC</li> </ul> </li> <li>▪ Residents (at home charging)                             <ul style="list-style-type: none"> <li>○ Level 1</li> <li>○ Level 2</li> </ul> </li> <li>▪ Government                             <ul style="list-style-type: none"> <li>○ Level 2</li> <li>○ DC</li> </ul> </li> </ul>
<b>Cost Structure</b>		<b>Revenue Structure</b>		
<ul style="list-style-type: none"> <li>▪ Device</li> <li>▪ Installation</li> <li>▪ Economies of scale and scope for large players</li> <li>▪ Warranty services</li> </ul>		<ul style="list-style-type: none"> <li>▪ Sale of devices (dynamic pricing depending on the supplier)</li> <li>▪ Service charge for installation and maintenance/ repairs</li> </ul>		

### 7.11. Exhibit 11 – Business Model Canvas Full Range Supplier

<b>Key Partners</b>	<b>Key Processes</b>	<b>Value Proposition</b>	<b>Customer Relationship</b>	<b>Customer Segments</b>
<ul style="list-style-type: none"> <li>▪ Government</li> <li>▪ Municipalities</li> <li>▪ Utilities</li> <li>▪ Customers</li> <li>▪ Suppliers</li> <li>▪ Software provider</li> <li>▪ Automotive OEMs</li> </ul>	<ul style="list-style-type: none"> <li>▪ Manufacturing and Installation</li> <li>▪ Distribution</li> <li>▪ Maintenance/ Repair</li> <li>▪ Platform and network: Membership card</li> </ul> <p style="text-align: center;"><b>Key Resources</b></p> <ul style="list-style-type: none"> <li>▪ Brand</li> <li>▪ Know-how, experience (human capital)</li> <li>▪ Patents (intellectual)</li> <li>▪ Functional base Devices</li> <li>▪ Network management</li> </ul>	<ul style="list-style-type: none"> <li>▪ Providing integrated one-stop-shop solution                             <ul style="list-style-type: none"> <li>○ Build, sell, and install charging stations to meet individual need</li> <li>○ Service and Management</li> <li>○ Possible software providers</li> </ul> </li> <li>▪ Distinct advantages:                             <ul style="list-style-type: none"> <li>○ Branding</li> <li>○ Convenience/ Usability</li> <li>○ Accessibility</li> <li>○ Margins</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Self-service at station</li> <li>▪ Automated services or Personal assistance</li> <li>▪ Direct contact: manufacturing, installation, sale, marketing, R&amp;D, consulting, mgmt/ integration</li> </ul> <p style="text-align: center;"><b>Channels</b></p> <ul style="list-style-type: none"> <li>▪ Direct B2B and B2C sales online, or personal contact at fairs, through connections</li> <li>▪ Responsible for all channel phases</li> </ul>	<ul style="list-style-type: none"> <li>▪ Residents                             <ul style="list-style-type: none"> <li>○ Level 1</li> <li>○ Level 2</li> </ul> </li> <li>▪ Government or Retail</li> <li>▪ Businesses</li> <li>▪ Cities                             <ul style="list-style-type: none"> <li>○ Public charging</li> <li>○ Project management</li> </ul> </li> <li>▪ Utilities                             <ul style="list-style-type: none"> <li>○ Consulting</li> </ul> </li> </ul>
<b>Cost Structure</b>		<b>Revenue Structure</b>		
<ul style="list-style-type: none"> <li>▪ Device</li> <li>▪ Installation</li> <li>▪ Service costs</li> </ul>		<ul style="list-style-type: none"> <li>▪ Sales</li> <li>▪ Service</li> <li>▪ Different payment plans through membership card</li> </ul>		

### 7.12. Exhibit 12 – Business Model Canvas Service Supplier

<p><b>Key Partners</b></p> <ul style="list-style-type: none"> <li>▪ Government</li> <li>▪ Municipalities</li> <li>▪ Customers</li> <li>▪ Property Partners</li> <li>▪ Full Range Suppliers</li> <li>▪ Device Suppliers</li> <li>▪ Automotive OEMs</li> </ul>	<p><b>Key Processes</b></p> <ul style="list-style-type: none"> <li>▪ Platform and network: Membership card</li> <li>▪ Problem solving: maintenance</li> </ul> <p><b>Key Resources</b></p> <ul style="list-style-type: none"> <li>▪ Network management</li> <li>▪ Brand</li> <li>▪ Know-how</li> </ul>	<p><b>Value Proposition</b></p> <ul style="list-style-type: none"> <li>▪ Service and Management             <ul style="list-style-type: none"> <li>○ Integration into network</li> <li>○ Maintenance</li> <li>○ Convenience/ Usability</li> <li>○ Accessibility</li> </ul> </li> </ul>	<p><b>Customer Relationship</b></p> <ul style="list-style-type: none"> <li>▪ Self-service at station</li> <li>▪ Automated services or Personal assistance</li> <li>▪ Direct contact: maintenance, consulting, management/ integration</li> </ul> <p><b>Channels</b></p> <ul style="list-style-type: none"> <li>▪ B2C and B2B direct sales</li> <li>▪ Web site</li> <li>▪ Fairs</li> <li>▪ Responsible for "after sales"</li> </ul>	<p><b>Customer Segments</b></p> <ul style="list-style-type: none"> <li>▪ Residents             <ul style="list-style-type: none"> <li>○ Level 1</li> <li>○ Level 2</li> </ul> </li> <li>▪ Government or Retail</li> <li>▪ Businesses</li> <li>▪ Cities             <ul style="list-style-type: none"> <li>○ Public charging</li> <li>○ Project management</li> </ul> </li> <li>▪ Utilities             <ul style="list-style-type: none"> <li>○ Consulting</li> </ul> </li> </ul>
<p><b>Cost Structure</b></p> <ul style="list-style-type: none"> <li>▪ Service costs</li> </ul>		<p><b>Revenue Structure</b></p> <ul style="list-style-type: none"> <li>▪ Service</li> </ul>		

### 7.13. Exhibit 13 – SWOT Device Suppliers

STRENGTHS to maintain...	WEAKNESSES to balance...
<ul style="list-style-type: none"> <li>▪ <b>Brand Reputation</b> (Quality and Price)</li> <li>▪ <b>Price and Cost Structure</b> <ul style="list-style-type: none"> <li>▪ Dependent on volume, efficiency in production, requested customer features</li> <li>▪ Average margin 15% - 50%</li> </ul> </li> <li>▪ <b>Key Resources</b> <ul style="list-style-type: none"> <li>▪ Human capital: know-how and experience</li> <li>▪ Intellectual capital: patents</li> </ul> </li> <li>▪ <b>Product Positioning</b> <ul style="list-style-type: none"> <li>▪ Design, Marketing and advertising</li> </ul> </li> <li>▪ <b>Simple Distribution Network</b> <ul style="list-style-type: none"> <li>▪ Online sales and/ or Personal contacts</li> <li>▪ Networking important</li> </ul> </li> <li>▪ <b>Variety in Customer Segments</b> <ul style="list-style-type: none"> <li>▪ Level 2, DC, and DC manufacturing</li> <li>▪ Business, residential, and government</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Expansion Strategies</b> <ul style="list-style-type: none"> <li>▪ Long-term existent ceiling once infrastructure has been created domestically</li> <li>▪ Internationally difficult due to lack of standards</li> </ul> </li> <li>▪ <b>Customer Relationships</b> <ul style="list-style-type: none"> <li>▪ Ltd number of customers, over-emphasis on individual</li> </ul> </li> <li>▪ <b>Revenue Structure</b> <ul style="list-style-type: none"> <li>▪ Dynamic pricing for devices (unclear revenue, profit, and margin structure)</li> <li>▪ Installation and maintenance charging</li> </ul> </li> </ul>
OPPORTUNITIES to grow...	THREATS to overcome...
<ul style="list-style-type: none"> <li>▪ <b>Demand Forecasts</b> <ul style="list-style-type: none"> <li>▪ Tangible demand expected in next 3-5 years</li> <li>▪ Large, untapped market</li> </ul> </li> <li>▪ <b>Corporate Knowledge and Experience</b> <ul style="list-style-type: none"> <li>▪ Innovation, Branding</li> </ul> </li> <li>▪ <b>High Barriers of Entry</b> <ul style="list-style-type: none"> <li>▪ Knowledge requirements, Capital Investment</li> </ul> </li> <li>▪ <b>Limited Competition</b> <ul style="list-style-type: none"> <li>▪ Lack of technology and know-how</li> </ul> </li> <li>→ will change mid-term as Solution Suppliers innovate</li> <li>▪ <b>Limited Substitutes</b> <ul style="list-style-type: none"> <li>▪ Not considering residential charging as alternative</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Push vs. Pull Strategy</b> Will consumers pull products through market or Device Suppliers push them downstream?</li> <li>▪ <b>Technological Progress</b> Innovation-based business will leave players behind that lack flexibility, R&amp;D, and funding</li> <li>▪ <b>Missing Standards</b> Lack of adoption of worldwide (or even nationwide) standard in equipment and technology</li> <li>▪ <b>Supply Chain Exposure</b> Little control over supply chain exposes Device Suppliers to risk of balancing increased rivalry with competitors while maintaining good relationships with customers who supply similar products while being vertically integrated (Full Range Suppliers)</li> <li>▪ <b>Low Cost/ High Volume Challenge</b> Creating a balance between innovation and capital restrictions to avoid becoming a commodity</li> <li>▪ <b>Limited Consumer Insight</b> <ul style="list-style-type: none"> <li>▪ Lack of contact with end customer</li> <li>▪ Preference of customized or individualized products</li> </ul> </li> </ul>

### 7.14. Exhibit 14 – SWOT Service Suppliers

<b>STRENGTHS</b> to maintain...	<b>WEAKNESSES</b> to balance...
<ul style="list-style-type: none"> <li>▪ <b>Price and Cost Structure</b> <ul style="list-style-type: none"> <li>▪ Low initial capital investments (no distribution, manufacturing, or inventory costs)</li> <li>▪ Costs increase proportionally to revenue</li> <li>▪ Variability in network options provided to consumers</li> </ul> </li> <li>▪ <b>Customer Relationships</b> <ul style="list-style-type: none"> <li>▪ Access to end consumer insight</li> <li>▪ Personal as well as automated services for day to day activities</li> </ul> </li> <li>▪ <b>B2B and B2C Marketing</b> <ul style="list-style-type: none"> <li>▪ Network opportunities</li> <li>▪ Word of mouth</li> <li>▪ Cooperation with Device Suppliers</li> </ul> </li> <li>▪ <b>Consulting Ability as Differentiator</b></li> <li>▪ <b>Provision of own Debit Card</b> <ul style="list-style-type: none"> <li>▪ Facilitated network usage and membership</li> <li>▪ Key partnership with software providers</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Initial Brand and Network Deficiency</b> <ul style="list-style-type: none"> <li>▪ Unknown companies</li> <li>▪ Lack of customer base and relationships</li> </ul> </li> <li>▪ <b>Lack of Diversification Ability</b> <ul style="list-style-type: none"> <li>▪ Over-dependency on network/ platform success and network effects</li> <li>▪ No risk mitigation</li> </ul> </li> <li>▪ <b>Revenue Structure</b> <ul style="list-style-type: none"> <li>▪ Limitation of real revenue streams</li> <li>▪ Unwillingness of consumers to pay for service</li> </ul> </li> </ul>
<b>OPPORTUNITIES</b> to grow...	<b>THREATS</b> to overcome...
<ul style="list-style-type: none"> <li>▪ <b>Network Effects</b> The larger the network of users becomes the more revenue will be generated and the more value-added to the consumer experience</li> <li>▪ <b>M&amp;A Possibilities with Device Suppliers</b> Differing supply chain focus complement each other and allow for short-term partnerships as well as mid- to long-term mergers or acquisitions</li> <li>▪ <b>Geographical expansion occurs naturally in emerging markets</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Demand Forecasts</b> Generated value could be overstated since network value increases with user number (adaptation of network remains largest uncertainty )</li> <li>▪ <b>Limited initial Contact Possibilities of Potential Customers</b> <ul style="list-style-type: none"> <li>▪ Virtual Market place</li> <li>▪ EV fairs</li> </ul> </li> <li>▪ <b>Lack of Knowledge</b> Customers are expected to be educated</li> <li>▪ <b>Initially low barriers to entry</b></li> <li>▪ <b>Automotive OEMs move towards service orientation</b> Increased competition and eroding market share mid- to long-term</li> <li>▪ <b>High Exposure to Supply Chain Low Cost/ High Volume Challenge</b> Little control over supply chain exposes Service Suppliers to risk of balancing increased rivalry with competitors while maintaining good relationships with suppliers that provide the same service while being vertically integrated (Full Range and Device Suppliers)</li> </ul>

### 7.15. Exhibit 15 – SWOT Full Range Suppliers

STRENGTHS to maintain...	WEAKNESSES to balance...
<ul style="list-style-type: none"> <li>▪ <b>Brand Reputation</b> (Quality and Price)</li> <li>▪ <b>Price and Cost Structure</b> <ul style="list-style-type: none"> <li>▪ Dependent on volume, efficiency in production, requested customer features, margins</li> <li>▪ Average margin 15% - 50%</li> <li>▪ Low initial capital investments for network (no distribution, manufacturing, or inventory costs);</li> <li>▪ Costs increase proportionally to revenue</li> <li>▪ Variability in network price options provided to consumers</li> </ul> </li> <li>▪ <b>Key Resources</b> <ul style="list-style-type: none"> <li>▪ Human capital: know-how and experience</li> <li>▪ Intellectual capital: patents</li> </ul> </li> <li>▪ <b>Customer Relationships</b> <ul style="list-style-type: none"> <li>▪ Access to end consumer insight</li> <li>▪ Personal as well as automated services for day to day activities</li> </ul> </li> <li>▪ <b>B2B and B2C Marketing</b> <ul style="list-style-type: none"> <li>▪ Network opportunities</li> <li>▪ Word of mouth</li> <li>▪ Cooperation with Device Suppliers</li> </ul> </li> <li>▪ <b>Consulting Ability as Differentiator</b></li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Initial Brand and Network Deficiency</b> <ul style="list-style-type: none"> <li>▪ Unknown companies</li> <li>▪ Lack of customer base and relationships</li> </ul> </li> <li>▪ <b>Expansion Strategies</b> <ul style="list-style-type: none"> <li>▪ Long-term existent ceiling once infrastructure has been created domestically</li> <li>▪ Internationally difficult due to lack of standards</li> </ul> </li> <li>▪ <b>Customer Relationships</b> <ul style="list-style-type: none"> <li>▪ Ltd number of customers, over-emphasis on individual</li> </ul> </li> <li>▪ <b>Revenue Structure</b> <ul style="list-style-type: none"> <li>▪ Dynamic pricing for devices (unclear revenue, profit, and margin structure)</li> <li>▪ Installation and maintenance charging</li> </ul> </li> <li>▪ <b>Too much Variety</b> <ul style="list-style-type: none"> <li>▪ Diversification vs. Niche</li> <li>▪ Customer segments</li> <li>▪ Cost and revenue structure</li> </ul> </li> </ul>
OPPORTUNITIES to grow...	THREATS to overcome...
<ul style="list-style-type: none"> <li>▪ <b>Demand Forecasts</b> <ul style="list-style-type: none"> <li>▪ Tangible demand expected in next 3-5 years</li> <li>▪ Large, untapped market</li> </ul> </li> <li>▪ <b>Corporate Knowledge and Experience</b> <ul style="list-style-type: none"> <li>▪ Innovation, Branding</li> </ul> </li> <li>▪ <b>High Barriers of Entry</b> <ul style="list-style-type: none"> <li>▪ Knowledge requirements, Capital Investment</li> </ul> </li> <li>▪ <b>Limited Competition</b> <ul style="list-style-type: none"> <li>▪ Lack of technology and know-how</li> </ul> </li> </ul> <p>→ will change mid-term as Solution Suppliers innovate</p> <ul style="list-style-type: none"> <li>▪ <b>Limited Substitutes</b> <ul style="list-style-type: none"> <li>▪ Not considering residential charging as alternative</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ <b>Push vs. Pull Strategy</b> Will consumers pull products through market or Device Suppliers push them downstream?</li> <li>▪ <b>Diversification</b> <ul style="list-style-type: none"> <li>▪ Limited resources cannot cover targeted supply chain segments</li> <li>▪ Lack of focus and potentially core competence</li> </ul> </li> <li>▪ <b>Dependence on First Movers</b> <ul style="list-style-type: none"> <li>▪ Overcome chasm to penetrate majority</li> </ul> </li> <li>▪ <b>Lack of User Education and Knowledge</b></li> <li>▪ <b>High customer value through one-stop-shop solution</b> Each individual customer bears more importance → Increased buyer bargaining power threatens suppliers</li> <li>▪ <b>Revenue Models</b> <ul style="list-style-type: none"> <li>▪ Expectation of free services on consumer's side</li> <li>▪ How will revenue be generated?</li> </ul> </li> </ul>

## 7.16. Exhibit 16 – 4 P's Device Suppliers

### Product

- **(Customized) Charging Stations**
  - Residential
  - Commercial
  - Working Environment
- **Services**
  - Installation
  - Repair/ Maintenance

### Price

- Depends on production process, requested features, and ordered quantity
  - Average price L2: ~ \$2,000 - \$3,000
  - Average price DC: ~ \$10,000 - \$50,000<sup>2</sup>
- Price wars already ensuing and becoming basis of competition e.g. GE offers L2 for \$1,000
- Average margin xx %

### Promotion

- **B2B marketing** for optimal supply chain integration and partnerships
- **Word of Mouth** recommendations crucial for B2B and crossing the chasm into mass market
- In young industry „one thing leads to another“, industry promotions and advertising increase consumer awareness
- **First-mover advantage:** industry-wide promotions often equated with company to first establish customer relationships
- **Network opportunities:** EV events, fairs, and discussion forums

### Place

- Cooperation with government, municipalities, and other Solution Providers
- Virtual market place
- EV fairs
- Retail represents a future distribution channel as mass market stage is reached

## 7.17. Exhibit 17 – 4 P's Service Suppliers

### Product

- **Station Network Management**
  - Repair/ Maintenance services
  - Software services (smart grid application)
- **Daily Customer Services**
  - Customer Relationship Management (CRM)
  - Daily customer assistance (hotlines, customer education, etc.)

### Price

- Depends on Service requested and size of network
- **Network Pricing Structure**  
Prepaid or subscription based charging (membership) (per month, per year, multiyear)
  - Flat rate charging
  - Additional charging per time, session or kWh basis  
e.g. 350 Green \$21 sign-up fee for CharJit card, free charging at SemaConnect and \$2 at Coulomb stations<sup>4</sup>

### Promotion

- **Cooperation** with Device Suppliers and companies interested in providing/ integrating EV charging
- **B2B marketing** for optimal supply chain integration and partnerships
- **Word of Mouth** recommendations crucial for B2B and attracting consumer mass market
- **First-mover advantage:** industry-wide promotions often equated with company to first establish customer relationships
- **Network opportunities:** EV events, fairs, and discussion forums

### Place

- Virtual Market place
- EV fairs
- Retail represents a future distribution channel as mass market stage is reached

## 7.18. Exhibit 18 – 4 P's Full Range Suppliers

### Product

- **One-stop-shop solution**
  - Counseling - identifying customer need
  - Develop customized solution
  - Manufacturing/ Sale/ Installation of equipment
  - Network management/ CRM
  - Management of cash flows

### Price

- Highly variable prices for usually differing membership plans
- **Network Pricing Structure**  
Prepaid or subscription based charging (membership) (per month, per year, multiyear)
  - Flat rate charging
  - Additional charging per time, session or kWh basis  
e.g. Ecotality Plus \$30 annual membership + \$1 charge/hour<sup>3</sup>
- High product margins through vertical integration of solutions provided

### Promotion

- **B2B** marketing for optimal supply chain integration and partnerships
- **Word of Mouth** recommendations crucial for B2B and crossing the chasm into mass market
- In young industry „one thing leads to another“, industry promotions and advertising increase consumer awareness
- **First-mover advantage**: industry-wide promotions often equated with company to first establish customer relationships
- **Network opportunities**: EV events, fairs, and discussion forums
- **Risk leverage**: solution is attractive to other EV projects

### Place

- Virtual Market place
- EV fairs
- Retail represents a future distribution channel as mass market stage is reached
- Automotive OEMs and dealerships

### 7.19. Exhibit 19 – Profit Model Full Range Supplier (1/3)

#### Profit Model - Full Range Suppliers: What is BLINK's profit for one of their Level 2 and DC quick chargers per charging event?

CALCULATION INPUT:		All Assumptions are highlighted in red font			
<b>(1) Car charging capacity:</b> Capacity in kWh varies for each model: Nissan Leaf = 24kWh, Chevy Volt = 16kWh, Ford Focus Electric = 23kWh; The average for the purpose of this calculation is 21kWh	Nissan Leaf battery capacity in kWh	Chevy Volt battery capacity in kWh	Ford Focus E battery capacity in kWh	Average battery capacity in kWh	
	24.0	16.0	23.0	21.0	
<b>(2) Output per charger:</b> The output in kWh for a charger depends on the Volt and Ampere specifics of the charger and the actual charging time: <a href="http://www.evscroll.com/Electric_Car_Charging.html">http://www.evscroll.com/Electric_Car_Charging.html</a> offers a good calculator to identify kWh output. For a Level 1 (120 Volts, 12 Ampere, 1h Time) charger the kWh output is 1.44 kWh [Note: For a 1500 Watt appliance it's 110 Volt, but for EVs its 1650 Watts which brings it closer to 120 Volt]; For a Level 2 (240 Volts, 30 Ampere, 1h Time) charger the kWh output is 6 kWh (after accounting for losses and other items); For a DC quick (480 Volts, 200 Ampere, 1h Time) charger the kWh output is 60kWh (after accounting for losses and other items).	Level 1, kWh output for 1 h charging	Level 2, kWh output for 1 h charging	DC quick charger, kWh output for 1 h charging		
	1.4	6.0	60.0		
<b>(3) Charging volume for one EV charging station:</b> Our assumption is that an average EV charging station serves 1.5 cars/day. The average charging event loads 44% of the battery for Level 2 chargers in 1.5 hours (Figures from EV Project Q1 2012 report for Oregon). DC quick chargers load 80% of the battery in 0.28 hours. The average days / year is 365 . Consequently the yearly charging volume for a Level 2 charger and a DC quick charger can be calculated.	Battery charging in % for all Level 2 users.	Average charging time for X% of battery charging	Battery charging in % for all DC quick charger users.	Average charging time for X% of battery charging (DC quick)	
	44%	1.5	80%	0.28	
	Daily charging events	Yearly charging volume of one L2 station in kWh	Yearly charging volume of one DC quick station in kWh		
	1.5	5,059	9,198		
<b>(4) Electricity Purchasing:</b> Under the PGE Schedule 89P the Basic charge is \$1000/month and the price per kWh is 6.087 Cents (On Peak) <a href="http://www.portlandgeneral.com/our_company/corporate_info/regulatory_documents/pdfs/price_summaries/01_01_2012/E18_P16_1-1-12_Price_Summaries_Standard%20Service%20Schedules.pdf">http://www.portlandgeneral.com/our_company/corporate_info/regulatory_documents/pdfs/price_summaries/01_01_2012/E18_P16_1-1-12_Price_Summaries_Standard%20Service%20Schedules.pdf</a> Also, according to BLINK there are 80 Level 2 stations in a metropolitan area such as Portland and roughly 3 DC quick stations.	Monthly base charge	BLINK L2 charging stations in Portland Metro area	BLINK DC charging stations in Portland Metro area	Price per kWh	
	\$ 1,000.00	80	3	\$ 0.06087	
<b>(5) Electricity Costs per kWh charged for BLINK:</b> One kilowatthour charged includes the base fee of \$1000/month (fix) and the variable costs of \$0.06087 per kWh. Therefore the fixed yearly \$12,000 and the variable \$0.06087 can be converted into "energy costs per kWh charged" by dividing the \$12,000 by the total yearly charging volume of one L2 and DC charger and adding the variable \$0.06087.	BLINK's total energy costs per kWh charged				
	\$ 0.0886				

### 7.19. Exhibit 19 – Profit Model Full Range Supplier (2/3)

<b>DIRECT COSTS:</b>					
<b>(6) Electricity Costs per hour charged for BLINK:</b> If BLINK's costs for one kWh are roughly \$0.067 and one hour of Level 2 charging has an output of 6 kWh the cost for one charging event can be calculated. Additionally, the costs of one charging event with a DC quick charger can be calculated the same way.	Level 2 energy costs per charging event (1.5h)	DC quick charger energy costs per charging event (0.28h)			
	\$ 0.82	\$ 1.49			
<b>(7) Installation Costs per hour charged for BLINK:</b> Our interviews partners stated Level 2 device and installation costs at around \$3,500. As of July 2012 installation and device costs of DC quick chargers were significantly higher at around \$50,000. Installation for both systems is assumed to be at roughly \$1000. Since the average lifetime for connectors is estimated (BLINK) to be 13,000 cycles, the lifetime of the charger can be calculated. Subsequently, the device/installation cost can be spread over the entire lifetime charging volume of a L2 and DC quick charger, which yields "device/installation cost per kWh charged".	Level 2 charger device cost	DC charger device cost	Installation cost Level 2 & DC charger	Amortization time for device/installation cost	
	\$ 2,500.00	\$ 50,000.00	\$ 1,000.00	15	
	Average connector life time in cycles	BLINK's total device/installation cost per kWh charged with L2	BLINK's total device/installation cost per kWh charged with DC		
	13000	\$ 0.0461	\$ 0.3696		
<b>DIRECT REVENUE:</b>					
<b>(8) EV Charging Services Sale:</b> The BLINK Network offers different options: <b>Option 1:</b> BLINK Plus: \$30 annual membership fee + Level 2 charging costs of \$1/hour; <b>Option 2:</b> BLINK Basic: No membership fees, but Level 2 charging costs of \$1.5/hour; <b>Option 3:</b> BLINK Guest: No membership fees, but L2 charging costs of \$2/hour. Also, BLINK bills for every hour of charging, even if only a few minutes were actually used.	BLINK Plus: Annual membership fee	BLINK Plus: Level 2 charging costs per hour	BLINK Basic: Level 2 charging costs per hour	BLINK Guest: Level 2 charging costs per hour	
	\$ 30.00	\$ 1.00	\$ 1.50	\$ 2.00	
	Actual BLINK billing time (regardless of usage)				
	2				
<b>(8) EV Charging Revenue for one event:</b> Calculation of revenue per event on BLINK Plus, Basic, and Guest basis.	BLINK Plus, revenue for one charging event	BLINK Basic revenue for one charging event	BLINK Guest revenue for one charging event		
	\$ 2.12	\$ 3.00	\$ 4.00		
<b>(9) EV Charging Revenue for one event:</b> Calculation of revenue per event on BLINK Plus, Basic, and Guest basis. BLINK is assumed to have the following distribution: 10% all customers are BLINK Plus members, 40% are BLINK Basic members, and 50% are considered BLINK Guest.	Daily Revenue with Level 2 stations in Portland Area	Monthly Revenue with Level 2 stations in Portland Area	Yearly Revenue with Level 2 stations in Portland Area	Daily Revenue with DC quick chargers in Portland Area	
	\$ 409.38	\$ 12,281.42	\$ 147,377.10	\$ 56.70	
	Monthly Revenue with DC quick chargers in Portland Area	Yearly Revenue with DC quick chargers in Portland Area			
	\$ 1,701.00	\$ 20,412.00			

### 7.19. Exhibit 19 – Profit Model Full Range Supplier (3/3)

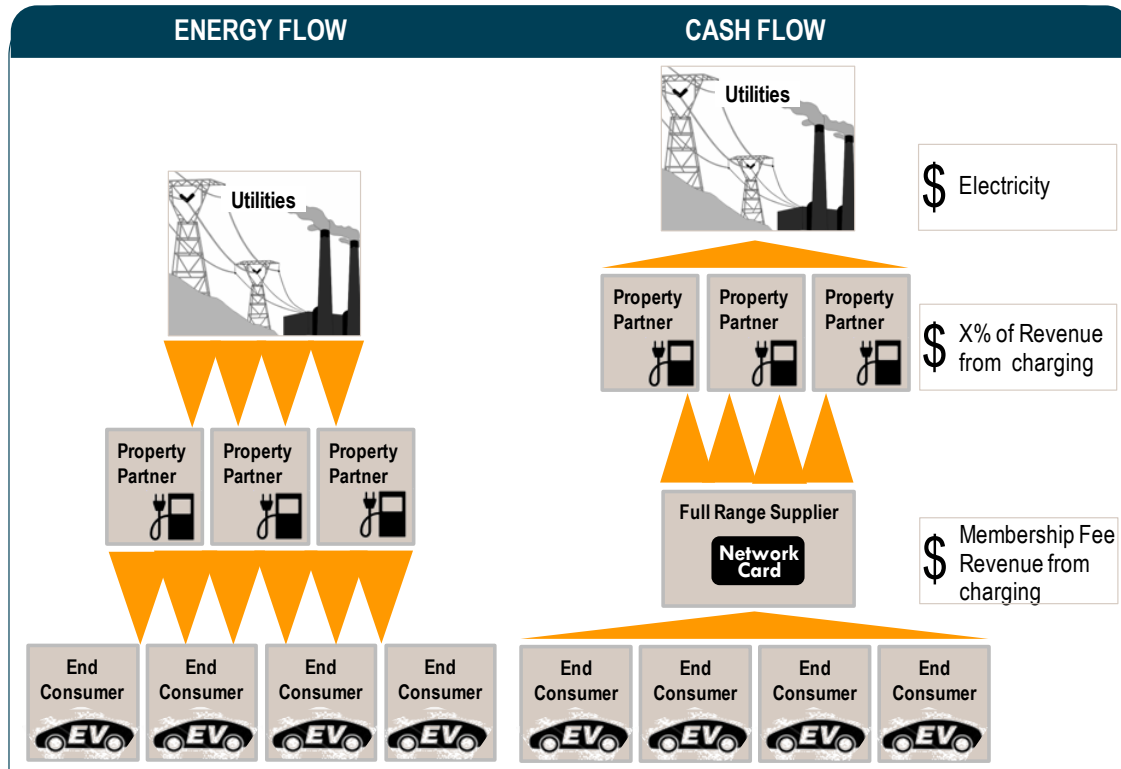
<b>PROFIT:</b>				
<p><b>(10) BLINK charging profit:</b>                      Direct Revenue - Direct Costs = Direct Profit for Level 2 and DC quick charging. According to BLINK, they don't charge money for DC quick charging as of 07/18/2012. For the future we assume \$0.75 for 1 minute of DC quick charging to complete this calculation. Also, 0.28 hours of DC quick charging is equivalent to 17 minutes of DC quick charging for calculation purposes.</p>	Profit L2 charging with BLINK Plus	Profit L2 charging with BLINK Basic	Profit L2 charging with BLINK Guest	Profit for 17 min. DC quick charging
	\$ 0.87	\$ 1.75	\$ 2.75	\$ 4.90
	Average revenue per charging event stemming from \$30 membership fee			
	\$ 0.12			
<p><b>(11) BLINK charging profit per day / month / year:</b>                      With 80 Level 2 and 3 DC quick charger in the Portland Metro Area, BLINK is assumed to have the following distribution: 10% all customers are BLINK Plus members, 40% are BLINK Basic members, and 50% are considered BLINK Guest. Consequently the daily, monthly, and yearly profit can be calculated.</p>	Daily Profit with Level 2 stations in Portland Area	Monthly Profit with Level 2 stations in Portland Area	Yearly Profit with Level 2 stations in Portland Area	Daily Profit with DC quick chargers in Portland Area
	\$ 259.97	\$ 7,799.05	\$ 93,588.63	\$ 22.05
	Monthly Profit with DC quick chargers in Portland Area	Yearly Profit with DC quick chargers in Portland Area		
	\$ 661.64	\$ 7,939.62		

## 7.20. Exhibit 20 – Government Support on Federal &amp; State Level (ECOtality Inc.)

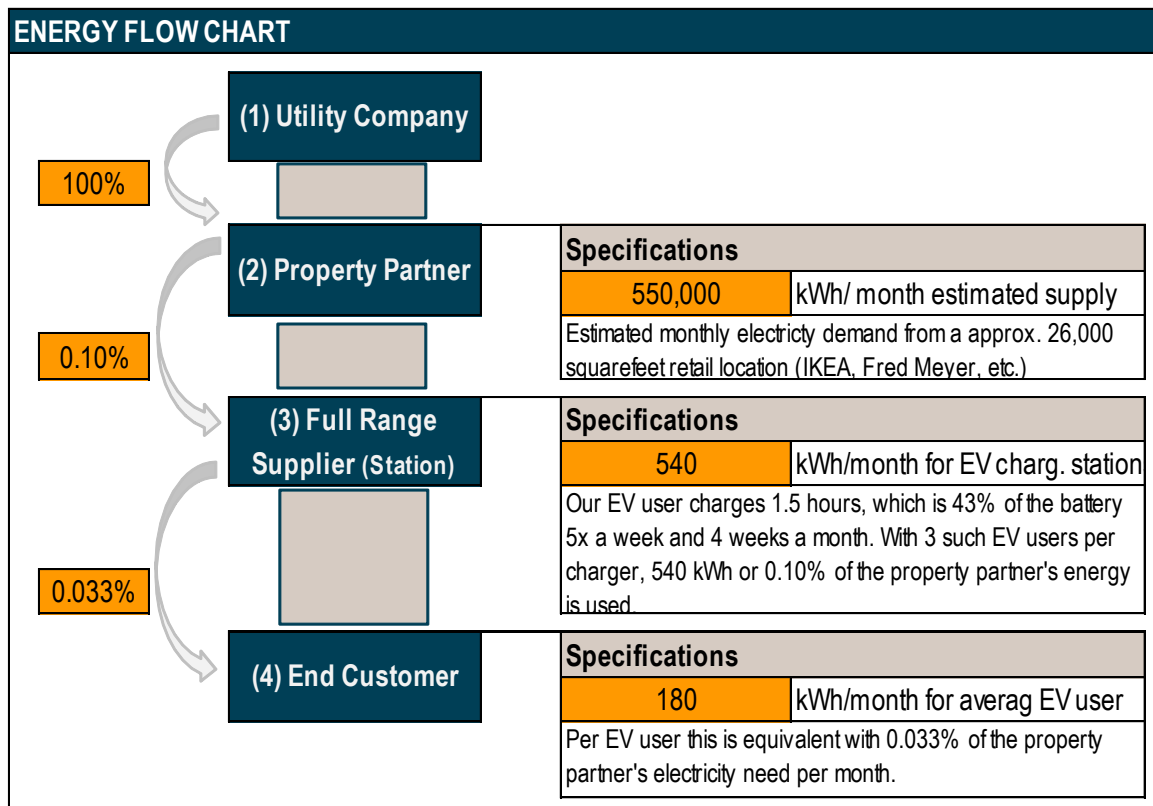
<u>Funding Agency</u>	<u>Contract Amount</u>	<u>Award Date</u>	<u>Scope of Work</u>
DOE	Cost-share grant of \$99.8 million* (includes \$13.4 million for Idaho National Labs netting \$86.4 million to ECOtality)	Sep-09	Collect data on EV usage for Nissan LEAF vehicle owners in AZ, CA, OR, TN and WA
DOE	Cost-share grant of \$15.0 million (includes \$1.2 million for Idaho National Labs netting \$13.8 million to ECOtality)	Jun-10	Collect data on EV usage for Nissan LEAF and Chevy Volt owners and include Los Angeles and Washington, D.C.
DOE	\$26.4 million	Sep-11	Advanced Vehicle Testing and Evaluation
AVTA – DOE	\$10.5 million	Jun-05	Advanced Vehicle Testing including battery management and fast charging systems
California Energy Commission	\$8.0 million	Aug-09	Support the deployment of a charging infrastructure and EVs in the San Diego region
Bay Area Air Quality Management District	\$2.9 million	Feb-11	Oversee the installation of home charging stations and DC fast charging stations throughout the Bay Area
State of Tennessee	\$2.5 million	Feb-11	Expansion of Memphis into The EV Project
Victorian Electric Vehicle Trial	\$0.8 million	Nov-10	Deploy Blink residential and commercial chargers in the state of Victoria, Australia for testing and data collection
* Project to date through of December 31, 2011, ECOtality recognized \$24.1 million in revenue related to The EV Project.			

Source: ECOtality (2012). Annual Report 10k 2011, Retrieved from <http://investor.ECOtality.com/>

### 7.21. Exhibit 21– Industry Flows (Solution II)



### 7.22. Exhibit 22- Expected Monthly Energy Demand per EV user



### 7.23. Exhibit 23 – Cash Flow Chart Solution I (1/2)

Values in orange fields are adjustable Chosen values serve as example

Yellow Cells allow to chose from drop down menu Cost positions in red are assumptions

Grey Cells will adjust to drop down menu choice

Average capacity of Nissan Leaf (24kWh), Chevy Volt (16kWh), FordFocus Ebattery (23kWh)

Assumptions		
The electric vehicle has a	21	kWh capacity
The vehicle is charged	1.00	times per week with a Level 2 charger
Depending on locati	Restaurant	every charging event charges
Electricity Costs are estimated at	\$0.06087	per kWh
Property Partner invests	\$ 650.00	per charging site in initial marketing, site preparation and signage
Scenario I: EV charging offered for free (revenue increase of traditional business supposed to balances associated costs)		
Scenario II: EV charging charged by charging event	\$ 1.00	
Scenario III: EV charging charged by hour	\$ 1.00	

Under the PGE Schedule 89P

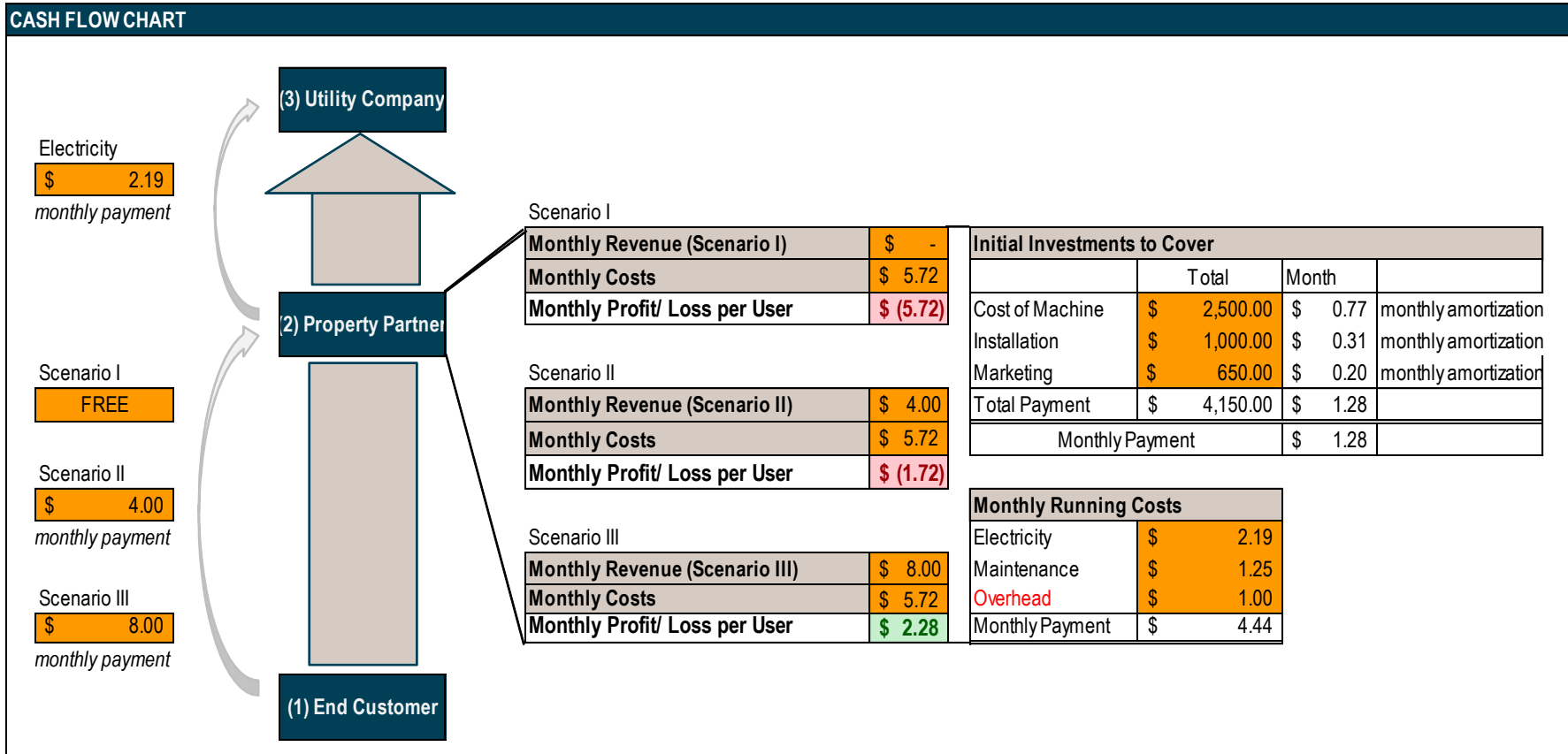
43% of the battery which will take 1.50 hour(s) 2 hours billed

Assumptions about charging station		
Charging Station is Level 2 with	6.0	kWh output per hour of charging
Cost of Machine	\$ 2,500	initial investment
Installation costs	low	initial investment
Maintenance	\$ 15.00	annually
Station, installation and site preparation costs (marketing, signs, etc.) are amortized over average connector li		

Lifetime of charger is based on the lifetime of its connector (13,000 cycles) (Blink)

13,000 cycles

7.23. Exhibit 23 – Cash Flow Chart Solution I (2/2)



### 7.24. Exhibit 24 – Cash Flow Chart Solution II (1/3)

Values in orange fields are adjustable

Yellow Cells allow to chose from drop down menu

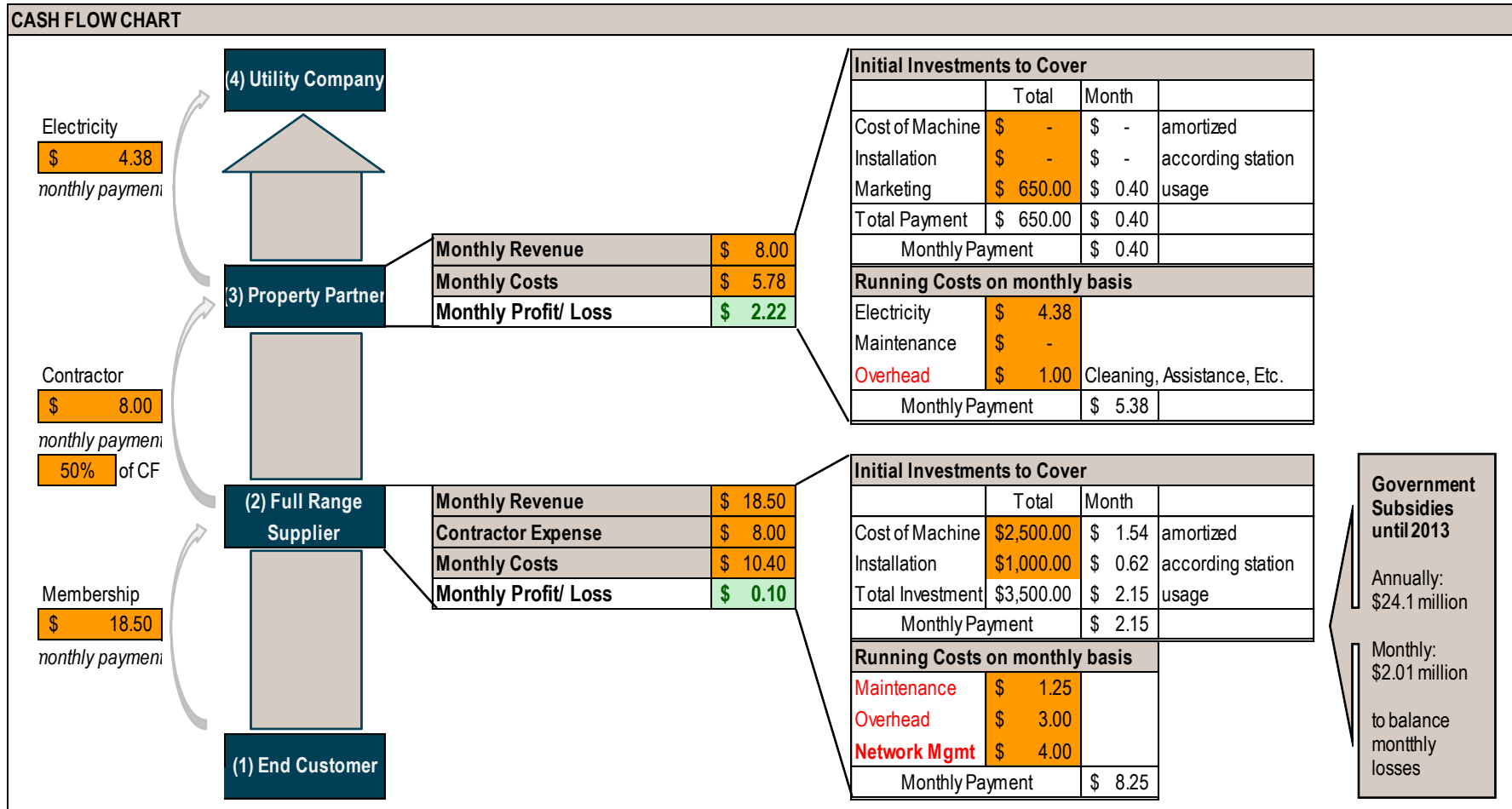
Cost positions in red are assumptions

Grey Cells will adjust to drop down menu choice

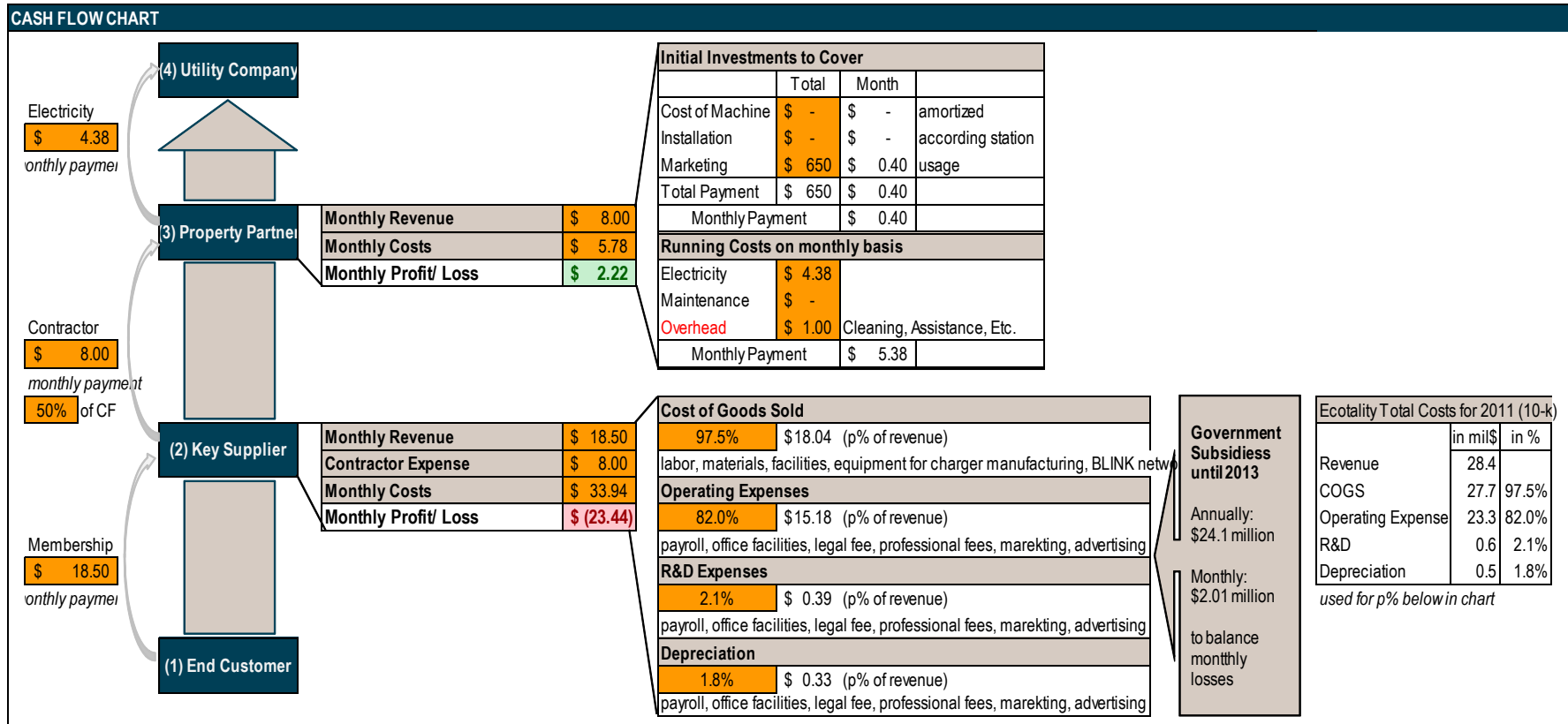
Assumptions about charging event		Average capacity of Nissan Leaf (24kWh), Chevy Volt (16kWh), FordFocus Ebattery (23kWh)	
The electric vehicle has a	21 kWh capacity		
The vehicle is charged	2.00 times per week with a Level 2 charge.	Under the PGE Schedule 89P	
Number of end consumers	1		
Every charging event charges	43% of the battery which will take	1.50 hour(s) per charging event	2 hour(s) billed
Driver is a BLINK member with	Plus member plan	\$ 30.00 Annual fee	\$ 1.00 per hour of charging
Electricity Costs are estimated at	\$ 0.06087 per kWh		
Property Partner invests	\$ 650.00 per charging site in initial marketing, site preparation and signage		

Assumptions about charging station		Lifetime of charger is based on the lifetime of its connector (13,000 cycles) (Blink)	
Charging Station is Level 2 with	6.0 kWh output per hour of charging		
Cost of Machine	\$2,500.00 initial investment	Cost Sharing: 100% Ecotality	0% Property Partner
Installation	\$ 1,000.00 initial investment	100% Ecotality	0% Property Partner
Maintenance	\$ 15.00 annually	100% Ecotality	0% Property Partner
Station, installation & site preparation costs (marketing, signs, etc.) are amortized over ave. connector		13,000 cycles	

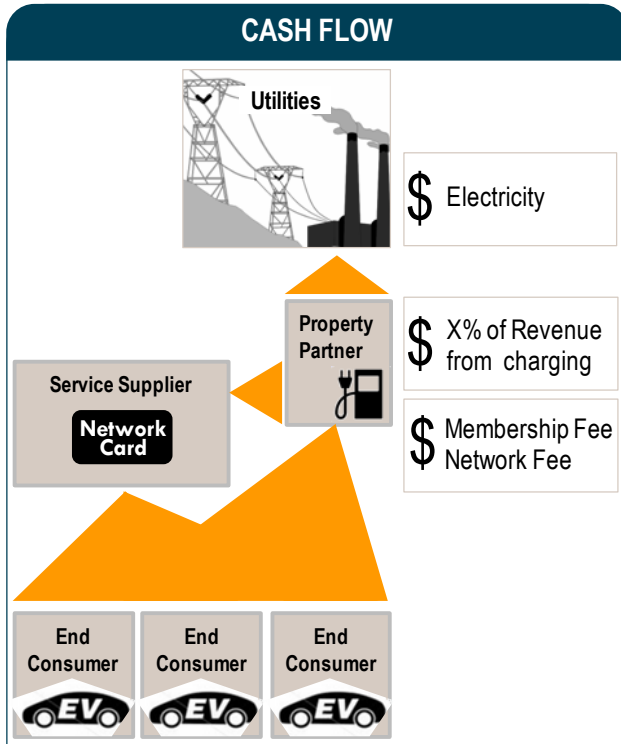
### 7.24. Exhibit 24 – Cash Flow Chart Solution II (2/3)



### 7.24. Exhibit 24a – Cash Flow Chart Solution II (3/3)



### 7.25. Exhibit 25– Cash Flow (Solution III)



### 7.26. Exhibit 26 – Cash Flow Chart Solution III (1/2)

Values in orange fields are adjustable Chosen values serve as example

Yellow Cells allow to chose from drop down menu Cost positions in red are assumptions

Grey Cells will adjust to drop down menu choice

Average capacity of Nissan Leaf (24kWh), Chevy Volt (16kWh), FordFocus Ebattery (23kWh)

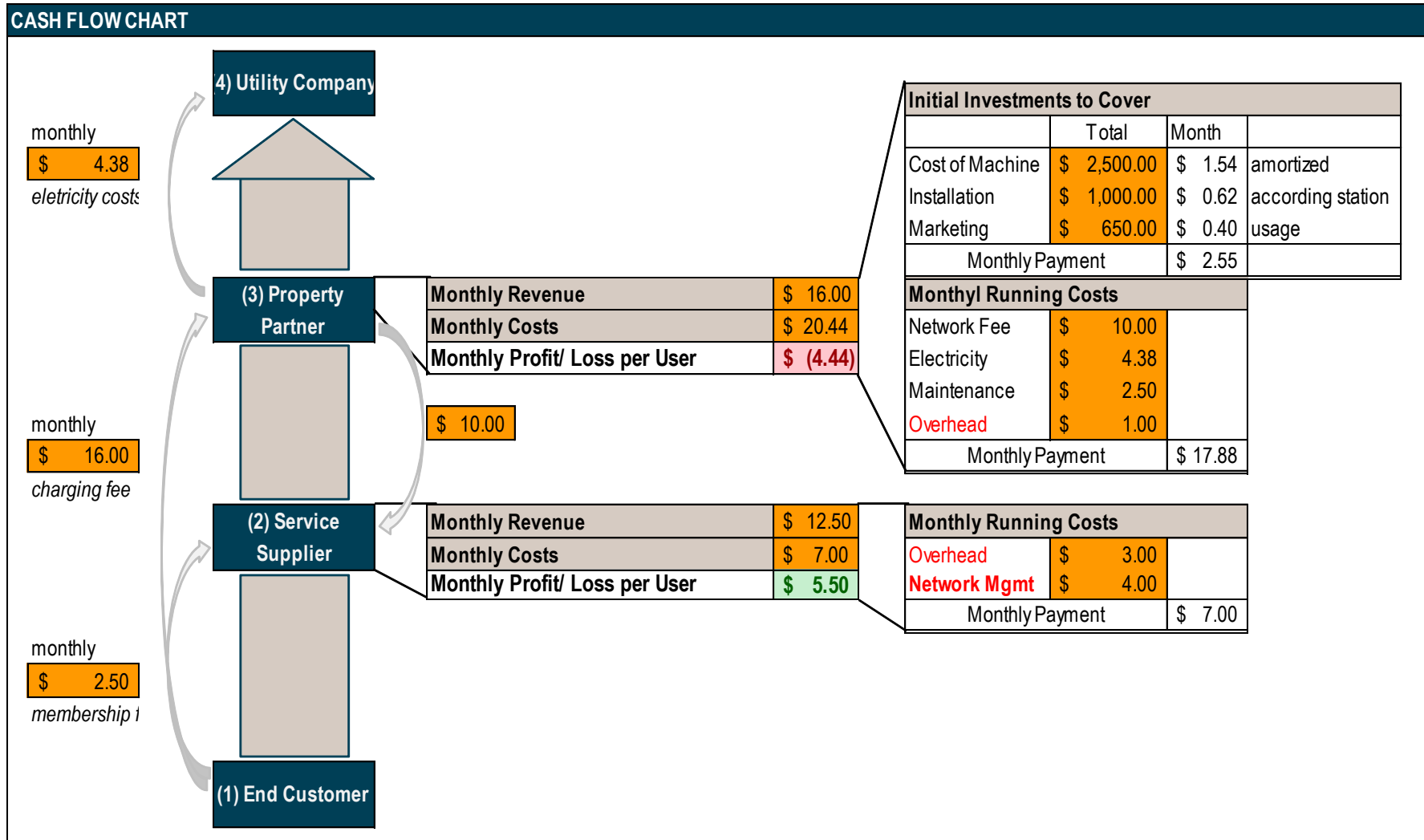
Assumptions	
The electric vehicle has a	21 kWh capacity
The vehicle is charged	2.00 times per week with a Level 2 charger
Number of end consumers	1
Depending on the location	Restaurant every charging event charges 43% of the battery which will take 1.50 billed hours
Electricity Costs are estimated at	\$0.06087 per kWh
Property Partner invests	\$ 650 per charging site in initial marketing, site preparation and signage
Property Partner offers charging for	\$ 1.00 per started hour
Service Supplier offers subscription plan for	\$ 30.00 annual member fee
Property Partner pays Service S	30% of generated reveue from station to be part of the network, at least howev \$ 10.00 Amount billed \$ 10.00
Revenue generated from charging is the property partner's revenue	

Under the PGE Schedule 89P

Assumptions about charging station	
Charging Station is Level 2 with	6.0 kWh output per hour of charging
Cost of Machine	\$ 2,500 initial investment
Installation costs	low \$ 1,000 initial investment
Maintenance	\$ 30.00 annually
Station, installation and site preparation costs (marketing, signs, etc.) are amortized over average connector 13,000 cycles	

Lifetime of charger is based on the lifetime of its connector (13,000 cycles) (Blink)

7.26. Exhibit 26 – Cash Flow Chart Solution III (2/2)



## 7.27. Exhibit 27– Assumptions Consumer ROI

<b>SUMMARY (Monthly)</b>			
Home Charge (60%) / Outside Charge (40%), Blink Plus Member, 33 miles daily, 30 days/ month			
	<b>EV</b>	<b>Non EV</b>	<b>Difference</b>
Preperation Cost	\$ 6.92		\$ 6.92
Financing Vehicle			
Year 1-5	\$ 563.10	\$ 356.05	\$ 207.05
Year 5+	\$ -	\$ -	\$ -
Operating Costs			
Maintenance	\$ 173.41	\$ 186.08	\$ (12.67)
Fuel	\$ 46.20	\$ 131.04	\$ (84.84)
Total (Year 1-5)	\$ 789.63	\$ 673.17	\$ 116.46
Total (Year 5+)	\$ 226.53	\$ 317.12	\$ (90.59)

Detailed outline on the next page.

Case Comparison EV v. Non-EV																																		
<table border="1"> <thead> <tr> <th colspan="2">Nissan Leaf</th> </tr> </thead> <tbody> <tr> <td>Purchase Price</td> <td>\$ 32,500.00</td> </tr> <tr> <td>Miles/ kWh</td> <td>3.3</td> </tr> <tr> <td>Daily kWh demand</td> <td>10.000</td> </tr> <tr> <td>Direct daily costs (Home Charge)</td> <td>\$ 0.76</td> </tr> <tr> <td>Daily charging time L2</td> <td>1.67</td> </tr> </tbody> </table>	Nissan Leaf		Purchase Price	\$ 32,500.00	Miles/ kWh	3.3	Daily kWh demand	10.000	Direct daily costs (Home Charge)	\$ 0.76	Daily charging time L2	1.67	<p><b>Katja:</b> Car comparable in features and driving comfort.</p> <p><b>Katja:</b> at a 6 kWh charging speed</p>	<table border="1"> <thead> <tr> <th colspan="2">Nissan Altima</th> </tr> </thead> <tbody> <tr> <td>Purchase Price</td> <td>\$ 20,550.00</td> </tr> <tr> <td>Miles/ Gallon</td> <td>27.5</td> </tr> <tr> <td>Daily gallon demand</td> <td>1.200</td> </tr> <tr> <td>Direct dialy costs</td> <td>\$ 4.37</td> </tr> </tbody> </table>	Nissan Altima		Purchase Price	\$ 20,550.00	Miles/ Gallon	27.5	Daily gallon demand	1.200	Direct dialy costs	\$ 4.37										
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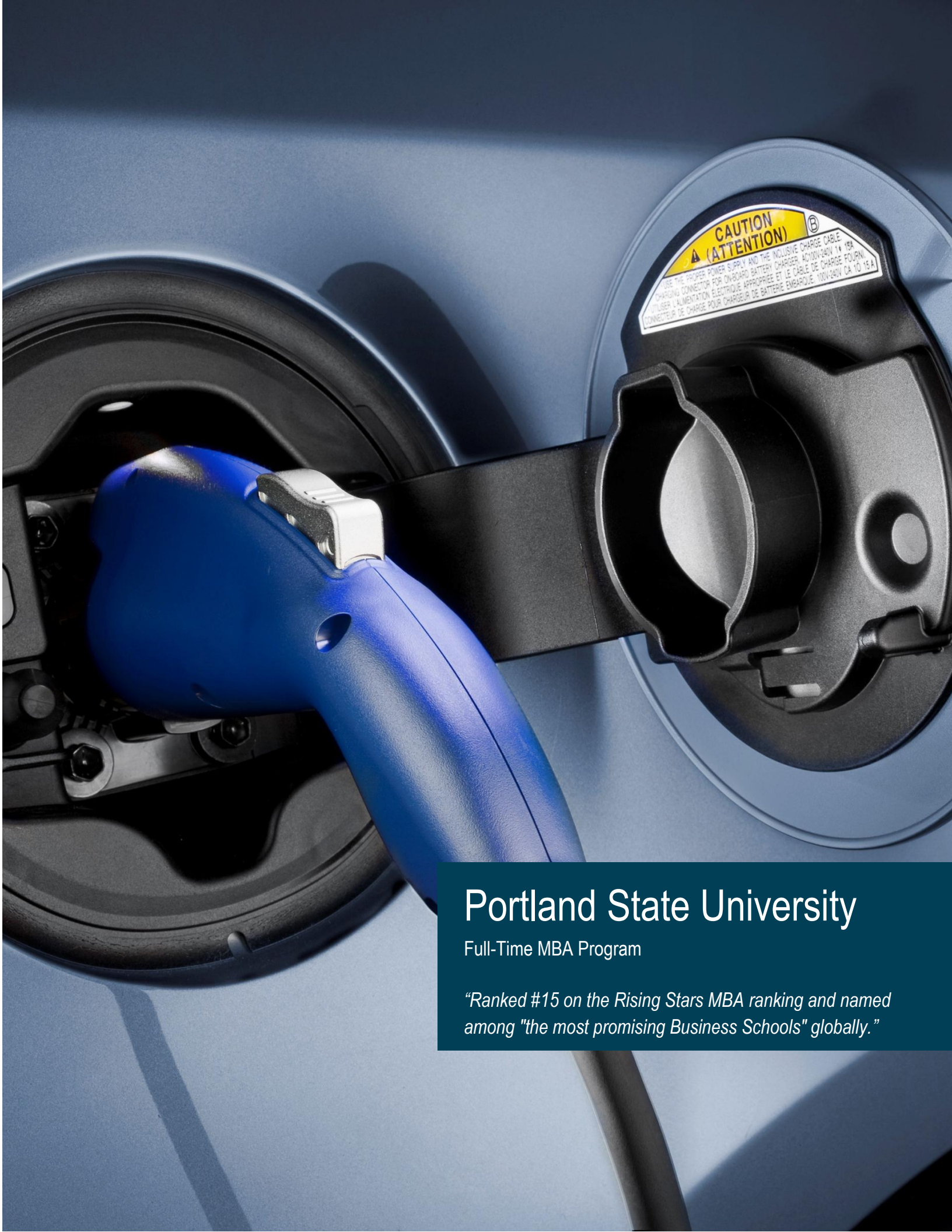
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