Aalto University - Department of Communications and Networking

ELEC-E7830 Value Network Design for Internet Services

Parkkisähkö - Final report

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Abstract

This report discusses the current market situation of electric vehicle charging service provider Parkkisähkö. In the report, the electric charging business is examined from various points of views, using tools such as value network configuration and scenario planning analysis, business model canvas etc. The goal of this report is to fully comprehend the strengths and weaknesses of electric vehicle charging business, and to provide suggestions in order to improve the business.

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1. Introduction

1.1 Motivation and the Problem Statement

We are witnessing a steady growth in the electric market in Finland. To encourage consumers in purchasing an electric vehicle, well-functioning charging services should be guaranteed. The current service model of Parkkisähkö (Parking Energy[1]) frees the end-user from most of the charging efforts, as the system is delivered to be ready-to-use and the maintenance is included in the service. However, the current business model should be improved for increasing the electric vehicle penetration. This report examines the following research questions:

- What are the strengths and weaknesses of Parkkisähkö's current business model?
- What type of improvements can Parkkisähkö implement to strengthen its business?

1.2 Research scope, method, and the structure

The scope of the report is limited to the current market situation in Finland. Furthermore, with the help of various approaches, the report compares Finland and Norway with regards to the EV charging market conditions and efforts. For instance, several interviews were conducted and the acquired information were analyzed in this report with tools such as scenario planning, value network configuration, and business model canvas. Preliminary chapters of the report introduce the technical architecture of Parkkisähkö service, and the service model is disentangled thereafter to understand their business approach in depth. Subsequent chapters address the business approach from various points of view, followed by our conclusion comprising the suggestions for improving their strategic posture.

[1] https://www.parkingenergy.com/

2. Methods

2.1 Scenario Planning

Scenario planning is a suitable tool for strategic planning in companies. The tool constructs relevant future scenarios for a company on the basis of market trends and uncertainties .

Creating these future scenarios equates a step-by-step process . Firstly, the time frame, within which these scenarios, has to be defined. Then, the key market players are identified. Consequently, the basic trends and key uncertainties are discovered. A trend in scenario planning refers to the general development or the change in the situation or in the means of behavior . They can be socio-economic or technological factors that are certain to follow a given pattern within the defined time frame. An uncertainty, on the other hand, is something that is not easily predictable within the given time frame. The goal of defining key trends and uncertainties is to figure out how they combine and how the combination affects the future of the firm.

Naturally, the next step is to form initial scenarios combining these trends and uncertainties. Once the initial scenarios are constructed, it is necessary to scrutinize them for the plausibility of occurence. There could be certain trends and uncertainties that are mutually exclusive. In such cases, the scenarios have no possibility of occurring and can hence be discarded. This procedure of weeding out implausible scenarios results in a few common themes that form the basis of relevant scenarios.

These relevant scenarios are the foundation over which final decision scenarios are constructed after sufficient research and planning. The research involves developing quantitative models that checks for scenario feasibility using empirical data. All the previous steps are iterated until models relevant for the company's future are identified (Schoemaker, 1995).

2.2 Value Network Configurations

Value networks are an interconnected framework of actors who are in a symbiotic relationship with each other. In such networks, actors play different roles and interact with each other to gain mutual benefits.

Components of a value network:

- Actors: Actors are usually businesses that interact with each other to gain value.
- Roles: Role is the set of activities performed by the actors to gain value.
- Technical Components: Interfaces provided by the actors for their roles.

Value Network Configurations (Casey et al., 2010) refers to the possible ways in which actors play their roles in value networks, while employing their technical components to gain value.

VNC design starts out by identifying the actors and their types relevant for the case under study. Eg: Assuming the case is innovations in cell phone market, Apple,Samsung etc are actors that come under the Original Equipment Manufacturer (OEM) category, while Elisa, Telia etc are the actors that come under the Mobile Network Operators (MNO) category. In order to figure out the areas where innovations can happen and define how the actors interact to provide value, the technical architecture must be created.Technical components identified from this architecture is then employed to create a VNC technical architecture, that abstracts many of the digital functions into black boxes. After this, the communication protocols for interaction between the technical interfaces are defined. The communication can happen through both business and technical interfaces. For business interfaces, it is also necessary to figure out the business role a technical component could be playing.Eg: If the technical role of Apple is as an OEM, its business role is manufacturing. Once the actors, roles, technical components and their

interfaces are setup, the VNC is complete. However, it is necessary to try different VNCs before deciding on the most relevant one. The same actor could play different roles in different VNCs. Eg: If Apple is an OEM in one VNC, it could be a service provider in another. By comparing different roles played by the same actor in different VNCs, we can determine which configuration provides the most value to the actor.

2.3 Business Model Canvas

A Business Model Canvas (Design, V., Interdisciplinarian, T. and Me, A. 2018) describes the current business model of a company in a one page outline. BMC can be also used to develop new business models or future directions that the company would like to pursue. By providing a visual overview of the company strategy, BMC enables stakeholders to understand the relationship between elements that constitute a business model. When the entire business model of a company is presented in a single page outline, the relationship between different elements becomes simpler to comprehend. As a case in point, which value proposition is relevant to a particular customer segment, which channel is the major source of revenue, and so on.

3. Case description

In our case analysis of Parkkisähkö, we are examining the market situation, possible scenarios, and our recommendations on the basis of our analysis.

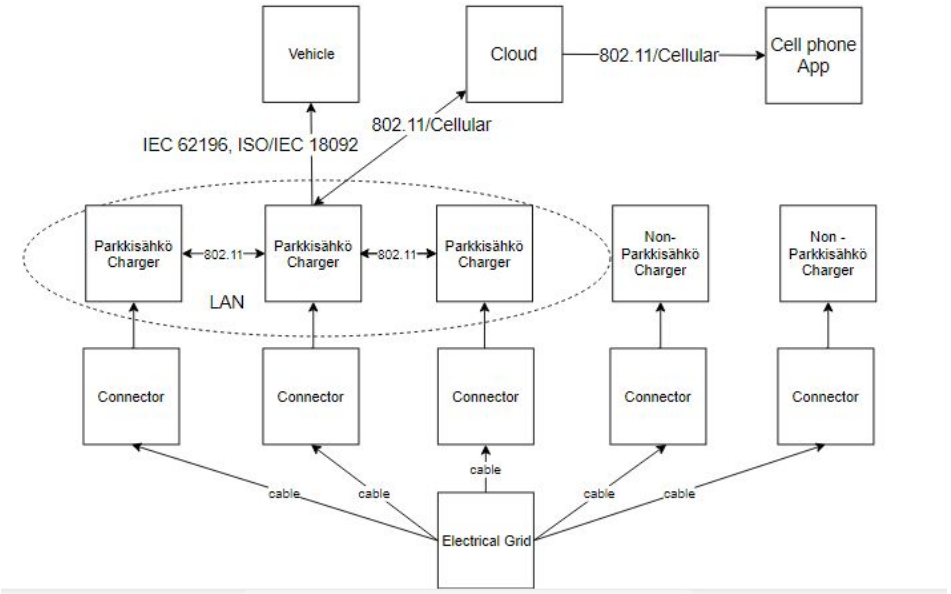
The business model of Parkkisähkö is based on rechargeable electric vehicles. The company is offering its product, a device that controls the charging process. The main benefit of the device is the ability to balance the load. In Finland, numerous housing co-operations have an existing infrastructure in place to electrically warm up automobile engines long before the ignition, reducing engine stress as an exemplary result. The existence of this infrastructure lowers the upfront investment cost of charging setup to cover all resident needs since the underground cabling into the outlets is already present. In certain cases, the cabling needs to be replaced. The existing infrastructure and the built-in load balancing feature of the charging device renders the company product less intrusive than a simple charging device without the load balancing.

Revenue is generated from the actual use of electricity once the device is installed. Certain clients possibly prefer an alternative payment plan, allowing the client to pay a monthly fee instead of an upfront cost as the devices are installed.

The company also has competitors. Liikennevirta Oy[2] could be described as the closest competitor. Judging by their website, the solution they offer is rather similar due to load balancing being offered in their product as well. Nonetheless, Parkkisähkö amasses the most inexpensive products on the current market. That certainly gives our case company a competitive edge, although no certainty exists for a permanent edge.

[2] http://www.virta.global/

3.1 Technical Architecture and Communication Protocols



End to End Block Diagram

Electrical Grid: The network of electric lines that delivers electricity from providers to consumers.

Connector: A custom solution designed by Parkkisähkö, the interface between the charger and the electrical grid. Electricity flows from the grid to connector by the means of a cable. The connector is designed such that charger installation is plug and play, thereby reducing installation hassle.

Parkkisähkö Charger: Charger for EVs designed by Parkkisähkö. Has built-in load balancing technology which distributes power evenly between all connected devices. This eliminates the possibility of overloading the grid.

Non-Parkkisähkö Charger: Charger for EVs that are not designed by Parkkisähkö. No load balancing technology in most cases.

Vehicle: The EV that is to be charged.

Cloud: The electricity use of each consumer is recorded and uploaded to the cloud for billing purposes.

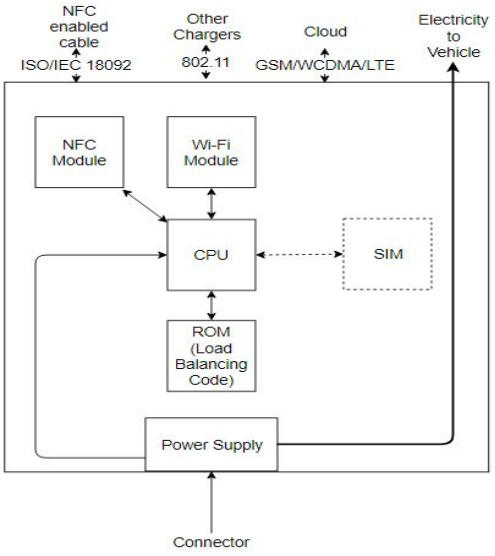
Cell Phone App: Android/IOS app that provides billing information to the consumer.

802.11: IEEE standard for wireless communication (Ieee802.org. 2018). Defined for the Media Access Control layer and the Physical layer of the OSI model. Depending on the version of the standard, devices using this protocol accesses the 900 MHz, 2.4, 3.6, 5, or 60 GHz frequency bands.

ISO/IEC 18092: The standard for Near Field Communications (NFC) defined by the International Organization for Standardization (ISO/IEC 18092:2013). NFC operates in 13.56 MHz, for which the communication mode selection mechanism is specified by the standard.

IEC 62196: International standard for Electric Vehicle connectors maintained by the International Electrotechnical Commission (IEC 62196-2:2016). The standard is applicable to plugs, socket-outlets, vehicle connectors, vehicle inlets and cable assemblies for electric vehicles.

3.3 Charger Architecture



Power Supply: The power supply unit takes AC input from the connector. Part of the AC is converted to DC and is used for powering the system. The rest is passed

onto the vehicle without conversion. The conversion and downsampling of supplied electric current is usually performed by the onboard EV chargers on the vehicle, unless the charging system is of Level 3 power level. In the latter case, the charging station has to be involved as well. However, Parkkisähkö chargers only support Level 1 and Level 2 charging so far.

ROM: The system code with the load balancing algorithm is stored in the Read Only Memory. Whenever the system boots up, the CPU loads the code from the ROM.

CPU: The Central Processing Unit is the brain of the system. It is an n-bit microprocessor capable of interfacing with multiple modules. It handles the dynamic load balancing based on the algorithm that writes and stores user information, provides user authentication facility, and also uploads billing data to the cloud server.

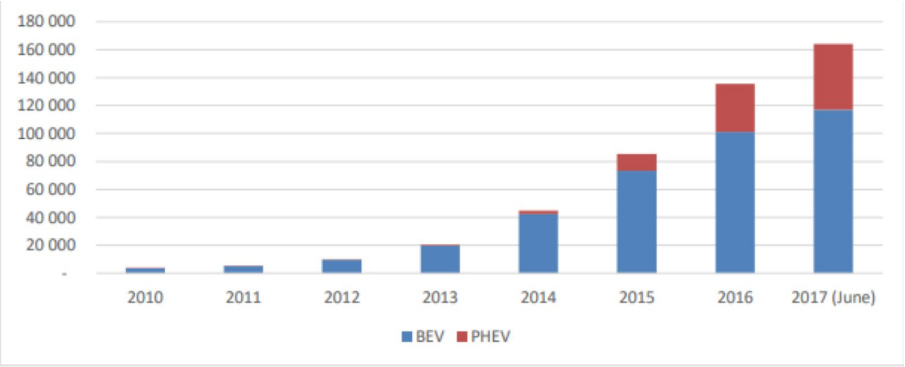
Wi-Fi Module: The Wi-Fi module is used for setting up a Local Area Network connection between multiple charging stations.

NFC Module: The NFC module is used for the system to facilitate the user authentication once the NFC cable is plugged in.

SIM: The Subscriber Identification Module is an optional feature that can be present in the charging stations. The system requires Internet connectivity to transfer data to the cloud. In places such as public parking spots with no available Internet, a master station can be established with the internet connectivity via the sim card. The station can consequently act as a Wi-Fi hotspot or it can gather data from all other stations and upload the combined data by itself.

4. Case analysis: EV Charging Case Scenario: Norway and the Nordics

The market share for battery electric vehicles (BEV) in the Norwegian passenger market, amounted to 19% as of June 2017, closely followed by plug-in hybrid electric vehicles (PHEV) with a 16% market share. The milestone of 100.000 BEVs registered dates back to December 2016. The fleet number is represented by 3% of the total fleet of 3 million passenger and light commercial vehicles in Norway, marking a unique opportunity to serve as a testing ground for charging services with early market customers. A figure below depicts the current EV fleet development. (Lorentzen et al., 2017; Norwegian Public Roads Administration, 2018; OFVAS, 2018)



The Norwegian BEV market was established much earlier, and the market boom took place after the introduction of Mitsubishi's i-MiEV model in 2010 and Nissan's LEAF model in 2011. The customers in the early market mostly consisted of urban commuters charging at home or at work and with a limited need for a public network of charging stations. Nowadays there is a growing need for a public fast-charging infrastructure to sustain the expansion of the customer base beyond the initial purchasers. Furthermore, a well-developed fast charging infrastructure is required, since BEVs become gradually the only type of vehicle in an average Norwegian household, as evident on the 2015-2017 Norwegian EV owners surveys, showcasing the increase of the percentage of BEV owners having BEV as their only vehicle(s)

from 23% to 30% from 2015 till 2017 (Lorentzen et al., 2017; Haugneland et al., 2017).

Incentives for EV adoption (Norway)

Norwegian consumers have benefited since the 90s from strong incentives for having EVs in their households. Most incentives in Norway are directed toward BEVs. As Norway, along with Denmark, has the highest purchase taxes on new cars in the world, heavy financial incentives align the purchase cost of a BEV with a comparable ICEV. (Bjerkan et al., 2016)

Vehicle purchase taxes are normally very high in Norway. The vehicle registration tax alone consists of taxes on vehicle weight, engine power, CO2-emissions, and NOX-emissions. The tax is progressive, and it can amount for heavier vehicles with large engines and high emissions to beyond 15000 Euros. Accordingly, tax for a typical compact vehicle can amount to 6000 Euros, while for a small vehicle the tax could be 2000 Euros. However, this is not the case with EVs, since BEVs are exempted from this tax and the compact-sized PHEVs typically lack registration tax as the low CO2-emission value of these vehicles grants a deduction from the tax on the other elements. (Figenbaum and Kolbenstvedt, 2016)

Hybrids are not included in the taxation scheme, although the tax is based on engine power as well as CO2 and NOx emissions, therefore rendering the total tax value for these vehicles as well. BEVs are also exempted from the value added tax (VAT) of 25% as of lately in Norway. Aforementioned tax exemptions substantially affect EV purchase costs (Bjerkan et al., 2016). BEVs and hydrogen cars also cover the lowest rate of the vehicle license fee, resulting in lower, although repetitive savings than from the other tax incentives. Other financial incentives for BEVs in Norway include exemption from road tolling and ticket fees on ferries in most counties, as well as an access to bus lanes and free parking on municipal public parking for BEVs. A thorough review of Norwegian incentives can be found in a dedicated study by Figenbaum and Kolbenstvedt (2013). In addition, owners of BEVs may also charge at

no cost on various public charging stations, although this does not apply to fast chargers. (Bjerkan et al., 2016)

Norwegian experience also exhibits the noteworthy tendency for purchasing BEVs even without a comprehensive fast-charging network, which has sparked discussion about the chicken-and-egg situation of these two factors. For example, neighboring Denmark is a home to quite well-developed charging infrastructure network, although the local BEV sales are stagnant, and the pace may be worsened after weaker tax incentives in the course of a car purchase. The implication is that other incentives weigh more than a charging network alone (Lorentzen et al., 2017; Haugneland et al., 2017). Norwegian BEV users favor the tax breaks at the time of purchase and other economic incentives. Lorenzen et al. (2017) argue that it is not an exceptional trait of these users since BEV purchases are more economically viable thanks to these incentives, as vital as the tax breaks at the time of purchase for BEV development. Lorenzen et al. also remind that Norway is moving towards a mass market adoption of BEVs. The shift evidently requires a large-scale fast charging network as new user groups are preparing to shift to BEVs, and as an increasing number of BEV owners are not relying on conventional cars as a backup measure anymore.

Certain Norwegian incentives can be adopted fairly straightforward by other countries whereas others would need to be adjusted to other circumstances. The financial incentives, including exemption from purchase tax, VAT and 80% of the registration tax, are rather strong incentives in light of high vehicle taxation in Norway. For countries adopting lower vehicle taxation, the direct adoption of such incentive will not yield the similar price competitiveness compared to ICE vehicles (Bjerkan et al., 2016). A variety of countries have, or have had still direct subsidies for EV purchases, for instance, France, India, Japan, the Netherlands, Spain and United States (IEA, 2013). The incentives in these countries in overall remain weaker in empowering EV price competitiveness than in Norway. (Bjerkan et al., 2016)

The Norwegian case of road tolling is not very special. Costs of passage and extensiveness of road tolling systems are comparable to many other countries. EV

exemption from road tolling could become revenue-neutral by increasing prices for ICE vehicles in stages representing past revenue loss from the free passage of EVs, which is a principle applicable to free parking and ferry passage, although the latter is barely relevant in the day-to-day mobility of European citizens aside from Norway. (Bjerkan et al., 2016)

For bus lane accesses, a free incentive can be applied as part of a market introduction package in smaller and medium-size cities wherever until the number of EVs reaches the limit of obstruction for public transport. 70000 vehicles on Norwegian roads have enforced the bus lane access for EVs with at least one passenger only on one road. (Bjerkan et al., 2016).

Prices and Long-term policies

The two national charging operators in Norway, Fortum Charge & Drive, and Grønn Kontakt have a payment model for fast charging in which the customers pay for a minute of charging, notwithstanding the amount of kWh the car receives. 50 kW fast charging starts at NOK 2,50/minute, which roughly results in a kWh price of NOK 3-5 depending on the actual charging speed. BEV users at home pay approximately NOK 1 per kWh with all taxes and fees included, casting no doubts at fast charging being comparatively costlier. A lot of users prefer payment per kWh due to the substantially differing, state-dependent charging effect, battery temperature, and the onboard charger of various BEV models. (Lorentzen et al., 2017)

Payment per kWh increase the risk of queues since the BEV owner will not have an incentive to relocate the car if the charging process is slow. Dynamic effect distribution between chargers would incite the adoption of the payment model comprising a combination of time and kWh, in the vein of taxi rates with a combination of time and km. Charging operators, governmental funding agencies and the Norwegian EV Association have actively informed the current BEV user community about the costs of fast charging, given the fact that a premium has to be paid for the fast charging service. The monthly cost for charging remains low as long

as most of the charging happens at home. The eve of more efficient fast charging will motivate charging stations to offer different charging speeds with varying pricing structures. The costumer, on the basis of their needs at any time, could choose the most suitable offer and pay for it accordingly. (Lorentzen et al., 2017)

Differing charging speeds may indeed give birth to new markets since certain groups people might be in a hurry, while others might stop for instance for a meal in the course of charging. The user perspective proves to be essential, although charging services are facing tremendous challenges to achieve user access and payment for fast-charging. The BEV owner has to adapt to different charging standards, discover charging stations with different map services, and pay for charging with different payment systems, including charging tags, SMS and/or mobile apps. Conventional payment methods akin to a credit card or cash have not been an option to a greater degree. The Norwegian EV Association, ever since 2015, has offered a universal charging tag to all of their members, which can be registered with a majority of the charging operators for simpler access and payment for charging services, although with an individual invoice per each operator. Such payment model has gained popularity thanks to a step-by-step quick guide being provided to each new user for explaining the registration and usage of the charging tag. According to the latest Norwegian EV Association member survey (The Norwegian EV Association, 2018), the charging tag is the most important service that the association provides for their members, of which 57% use it. The remaining group of people not using it motivate their decision by covering their need for charging at home or at work. (Lorentzen et al., 2017)

Lorentzen et al. (Lorentzen et al., 2017) also highly value the paid service model of the fast charging during the development of a large scale fast charging network. The cost of fast charging installations and fast charging conveniences should be communicated to the BEV users to sustain an understanding of the price models. In addition, the low cost charging at home or at work should be the backbone solution for EV users, allowing the occasional use of more expensive fast charging services

and preserving the low total cost of ownership compared to conventional vehicles. Authors have also deduced that no instrumentality exists for having a single, national payment system or roaming solution, since operators are improving their own systems, a universal charging tag was introduced, the app-based solutions experience rapid development, and the user experience, in particular, is safeguarded in case of a customer-friendly drop in the system for payment. (Lorentzen et al., 2017)

Cases of Finland and Sweden are discussed more widely in the Appendix section of this report.

5. Scenario Planning

We have identified some major trends and uncertainties related to the company. By identifying the underlying trends that affect the company business, we can construct feasible scenarios that provide a rough description of the possible future environments for the company. Our scope is mainly Finland, even though for scenario planning we have also observed the EV situation in Norway to comprehend the current development of a society taking active steps to increase the share of EVs of the whole automobile market.

5.1 Key trends

1 - Urbanization: There is a global trend of urbanization: the population in most of the countries tend to emigrate to the largest cities, thus contributing to the higher density of population. Density is a causality for certain, more precise trends we have also identified. (The Economist, 2012)

2 - Increasing taxation on fossil fuels: Finland already has some of the highest taxes on fuels in the world for private car owners. The tax situation may change at all in the near future. Such trait does not only equate the best means of collecting taxes, but also the best means of disincentivizing non-environmental friendly habits akin to private motoring. This could be an economic incentive for a consumer to purchase an EV, although not as effective when it is solely applied. (The Economist, 2010)

3 - Greener policies: Finland has been implementing greener policies over the years. These include subsidized public transportation, “green lanes” on highways, and heavier taxation on fossil fuels. A possibility of limitations to private motoring in the capital city of Helsinki has been moderately discussed as of lately. Other cities, such as Stockholm, are planning to ban diesel-powered cars from the city centers. This could be a practical incentive to purchase an EV.

4 - Diminishing car ownership rate: Less of the young population feel the need to own a car in urban areas. Their transportation needs are satisfied by public mass transportation. This effect is reinforced further by the urbanization trend, which affects the company as the end user is often a private car owner. (Elina Brandt, 2017)

5 - Increasing share of EVs of total automobile market: The aforementioned trends have in our vision a combined effect of increasing the share of EVs of the total automobile market. The effect is due to punitive taxation and policies (current and upcoming), which incentivize people to purchase EVs, even if they otherwise consider it undesirable over ICE car.

5.2 Key Uncertainties

1 - Ownership mentality change: Related to the fourth trend in the previous segment. As people become less incentivized to own a car, it might become natural to use various car-sharing services as needed.

2 - Major policies boosting public transportation: In Finland, the public transportation is already heavily subsidized. This model enjoys widespread support, as no serious suggestions have been provided to reduce the subsidies to the public transportation companies. Subsidies may increase in the near future in light of current transportation policies.

3 - EV acceptance: Most people value the maximum range of petrol engine over ecology of an electric one in a vehicle. Preferences originate from the culture of having summer cottages often hundreds of kilometers away. Furthermore, a large part of the country is sparsely populated and sometimes very low temperatures may test the durability of automotive batteries.

4 - Company able to adjust: Sometimes the technological development takes huge leaps and the rules of the technological and market development are changed in an instant. Parkkisähkö technology might be proprietary, a new standard or anything in

between. It is therefore uncertain how well our case company can adjust to the situation the new technology creates.

5 - A technological breakthrough: A more clearly defined uncertainty would be, as a case in point, the reduced charging time of the present technology. Cars could be consequently charged in a similar fashion as petrol car tanks are filled with gas. It is a major factor in the company success and is selected as one of the two base uncertainties for our scenario planning.

6 - Subsidies for EVs: Although there are no real subsidies for EV purchasers at the moment, it is highly likely that such subsidies will be realized in near future. As a fairly quick decision to be considered, we may deduce that it might be possible in the scope of ten years, especially if the economic situation undergoes improvement. This report considers this as the second of two major uncertainties.

5.3 Initial scenarios

1 - Norway's way

- Subsidies for electric vehicles for private owners
- No further public transportation subsidies
- No major breakthroughs related to charging speed or battery capacity

This is the best scenario for the company. People are encouraged to purchase EVs, although they also require charging for a long period of time while they are parked (i.e. at home and at work.). Such habit will lead to increased demand for the modules since they are one of the least intrusive solutions.

2 - Slow course

- No major subsidies
- No major breakthroughs

In this scenario, the market will take its own course. Trends are on the company side That is, private corporations shift towards eco-friendly employee benefits in the form of EVs, there will be a naturally increasing demand for the company services. In

addition, the lack of technological breakthroughs motivates the company service as a viable solution to the ‘range issue’.

3 - Electric vehicle boom

- Major subsidies
- Major breakthrough
- No further public transportation subsidies
- High ownership mentality

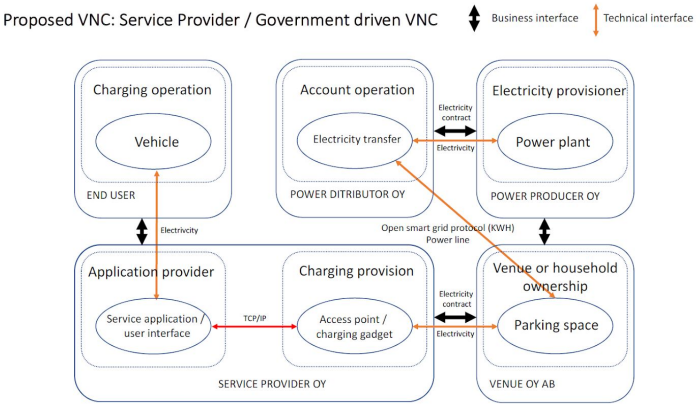
This scenario could be somewhat manageable. While there are fast charging opportunities available, shareholders, real estate investors, and housing cooperatives would still purchase the modules sold by the company for their long-term parking needs. Fast charging would be initially available in public, mid to short-term parking lots such as supermarkets and malls. Depending on the capacity of charging, gas stations can be also included. The market share for the modules would be smaller, although the increase in absolute numbers would be a compensating factor.

4 - Musk’s way

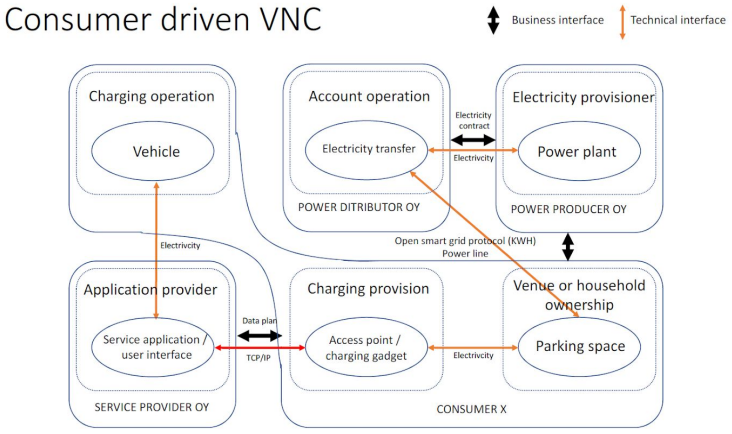
- A major technological breakthrough increasing both capacity and charging time
- No subsidies for electric vehicles
- The company cannot utilize the new technology

A technological breakthrough is achieved, rendering EVs relatively fast to charge and increasing their capacity, while subsidies for EVs are very little to none. The market share of EVs starts to grow as they are seen as a viable option for ICE vehicles. Neither shareholders nor real estate managers would have a need for charging modules as they would instead charge their cars at designated charging stations. Nevertheless, the technology utilized to achieve the fast charging rates would probably be out of reach for the company. Slowly increasing number of EVs would be insignificant to the company with its current business model.

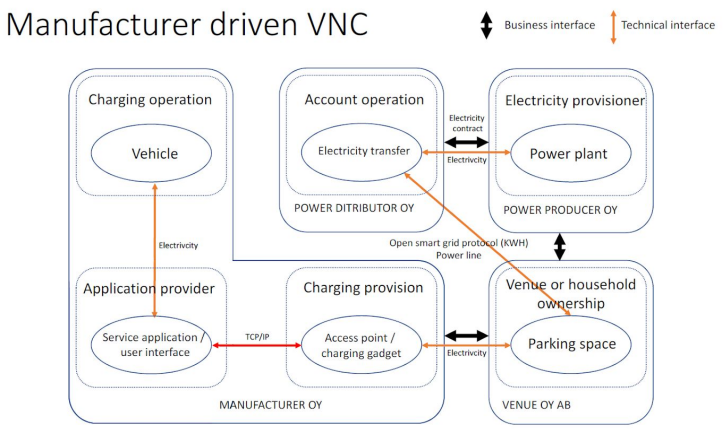
6. Value Network Configurations



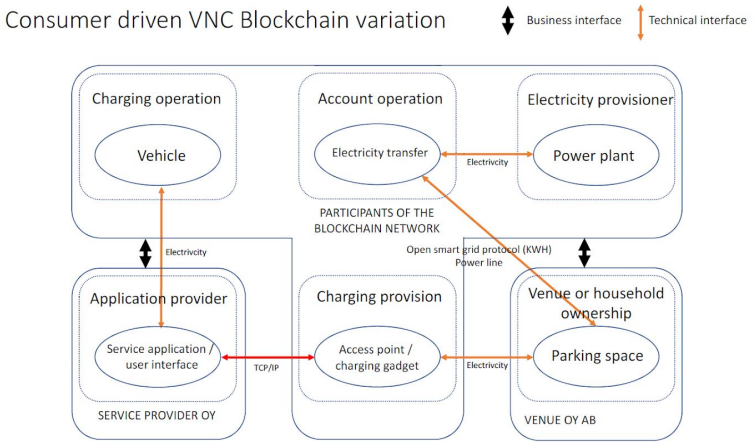
The most feasible VNC for Parkkisähkö is their current VNC. The service provider controls the manufacturing process of the charging device and the production of the application. The government is providing major subsidies for electric vehicle owners, increasing the penetration of electric vehicles in the market.



In the case of a consumer-driven market, the consumer may visit any major store and purchase a charging station. The price would be low and competition among manufacturers high. The remaining factor for companies such as Parkkisähkö is the application. The scenario would incite very intense competition, that is not the desired outcome.



In the case of manufacturer driven VNC, we assume a technological breakthrough for adversaries, enabling them to manufacture and produce the vehicle, the charging device, and the application. Parkkisähkö would cease to exist at this point.



Parkkisähkö is not necessitated to develop a distributed ledger of its own since certain factors (according to Nikander) are absent, such as the lack of trust and shared (distributed) database between multiple parties. In case the company requires a tracking system, a proprietary database would be suitable, since proprietary databases usually include a bundle of support services and training provided by the vendor, or Parkkisähkö and their suppliers in this case. However, an existing DLT solution could

benefit the existing chargers by Parkkisähkö. These applications could comprise for instance a certain kind of peer-to-peer economy platforms.

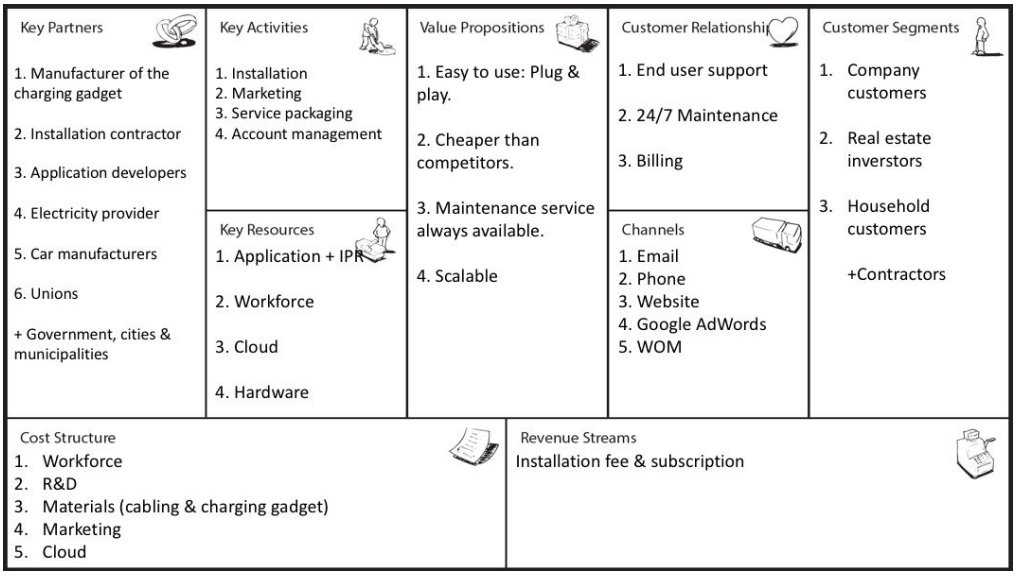
One suitable instance would be the platform for residents to purchase and sell electricity to one another. In particular, residents decide to invest in energy production of their own, most likely in solar panels, and to sell the excess energy thereafter. The excess energy is currently sold back to the main grid, compensated to the resident with below-market price payment. Instead of the current model, residents could sell the energy to their neighbors and track this resource with a DLT platform. A purchaser would consequently receive cheaper electricity and seller, on the other hand, would receive a better return on investment.

Parkkisähkö could involve the integration of this system into their own charging setup. Benefits would include the possibility to charge vehicles with cheap energy while being sold, thus optimizing the cost and benefit of charging. Parkkisähkö chargers could also act as nodes in the DLT platform, providing an additional incentive for residents to purchase them. They would act as an interface to the electricity trading platform.

Another topic of interest would be cryptocurrencies. In spite of no major profits provided in the short term, it could provide users a possibility to pay for the energy with other means than regular currency. The only prospective benefit might entail just slightly higher customer satisfaction, although the long-term benefits may include earlier entry to machine-to-machine (M2M) markets and accommodating expertise. Other potential use cases could involve an autonomous vehicle conducting own charging and handling payments afterward. The vehicle would drop off the passenger and locate the nearest charging station thereafter, pay for own charging, and then disengage from the charger to vacate the spot for another vehicle and wait for the passenger to return. However, this case is hypothetical and demanding in terms of technological development not otherwise controlled by the company.

7. Business Model Canvas

Breaking down the business model canvas helps different sides to comprehend the business of Parkkisähkö and the links that constitute this framework.



Customer Segments: Who are the customers? What do they think, see, feel, and do?

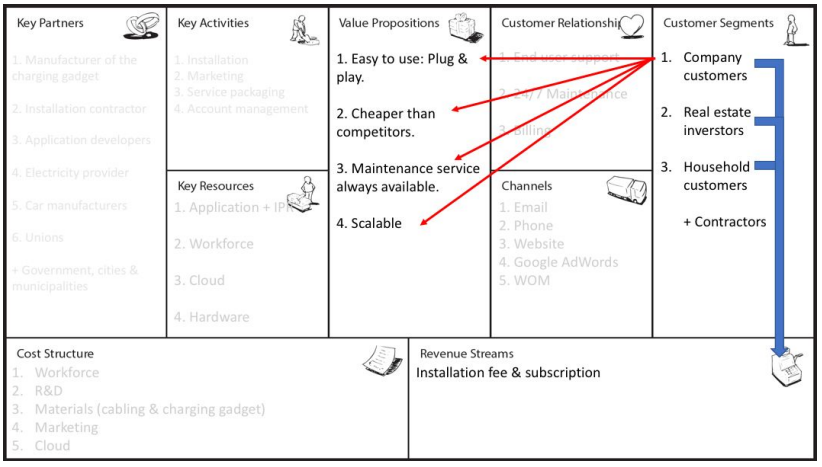
Parkkisähkö has a single-sided market, where the customer segment is effectively similar: All of the customers require similar kind of service. However, the segment can be further divided into following subgroups: Company customers, household customers, and real estate investors. Each of these subgroups demands the same service: Easy and affordable electric charging in their parking lot. In addition, an extra subgroup is also involved, although not as an actual customer segment. Contractors are the subgroup of various people, promoting the products and services of Parkkisähkö. Promoters are the important actors in improving the business, although they also require attention and marketing communications. Hence they have to be included in business model canvas in spite of not being the end customers. Out of the various segments, the company customer is evidently the most crucial one. In order to fully comprehend the segment, the following personas are used to describe the subgroups:

A typical company customer is located in the metropolitan area, in a fixed office building with parking lots. Company customer wants to participate in economical transportation, therefore facilitating electric vehicle leasing for their employees. Company customer would want to support the EV users by ordering a charging service from Parkkisähkö. End-users of the service need charging over the course of their workday. Company customer appreciates a scalable system, that is updated and maintained as an outsourced service.

A typical household customer is also a resident of the metropolitan area. With short distances to work and other facilities, the wealthy customer has decided to purchase an EV. Small parking lot enables Parkkisähkö solution to be installed, and the household customer may use the service the most during the night time. Household customer appreciates the affordable and reliable charging system.

Real estate investors see Parkkisähkö as one of their assets, when they rent out or resale their properties. Having ecological features in the property, such as electric vehicle charging stations, the investors position their properties in more valuable markets. Real estate investors appreciate the convertible and scalable charging system.

Value Propositions: Which of the customer needs are being fulfilled? What is unique about your value proposition? What is Parkkisähkö doing that actually incites a customer to purchase the service?



Ease of use: Parkkisähkö provides charging solutions that do not require any skills to use or maintain. They will be installed for the customer and the usage is very straightforward. Applicable connectors match with the majority of the electric vehicle models. Monitoring, the billing, and the usage are conducted within the application.

Cheaper than competitors: Currently Parkkisähkö provides effectively inexpensive solutions in comparison to the competitor services. Including the effort and maintenance in the long period charging systems, which they provide, the service model of Parkkisähkö frees the customer from various tasks and external costs.

Maintenance: As a service, the maintenance and user support are always available. The support is promised to be available 24/7 via email or mobile phone in case of problem scenarios. The value proposition of such kind is especially important in case there are multiple charging stations in the same parking lot.

Scalable: Being able to increase and decrease the amount of charging stations easily is an effective feature, especially for customers whose demand for electric vehicle charging changes. Especially company customers can expand their electric vehicle charging spots effortlessly.

Channels include the entities Parkkisähkö uses to communicate its value propositions to various segments. Email is the most important, although not the most accurate, direct, and the imminent channel in the daily communication tool. As such,

Parkkisähkö also has an active phone service to manage the urgent matters. The website, Google AdWords and word of mouth are common channels for marketing purposes, and for receiving attention from the customers. For achieving business abroad, all of the communications should also be at least in English. Even in Finland having multiple languages utilized in the channels is an advantage distinguishing Parkkisähkö from the competitors.

Connecting the topics in key partners, key activities, and key resources helps to understand the crucial activities Parkkisähkö can conduct by itself and outsourcing opportunities. Manufacturing the gadgets might be worthwhile with minimal quantities, although as Parkkisähkö is growing, outsourcing the production will increase their margins. However, new modifications are slower to be implemented, and Parkkisähkö has less control over the overall quality of the supply, therefore rendering outsourcing intents ineffective at the moment. Having installation contractors as key partners implies that the marketing and communication are conducted partially with them. Having close relationships with the contractors enables Parkkisähkö to promote their service through another channel, and similarly, the contractors are part of the business as they install the gadgets. Application developers are a part of the service packaging and account management activities, as from the end-user point of view the application is a part of the charging service aside of the physical charging gadget. Similarly, the user experience relies considerably on the user experience of the application and the gadget interaction. The installation process, manufacturing the gadget, and the workforce required to develop the service also form the major part of the cost structure. Since the installation requires human labor, savings are less likely by labor cuts. Instead, savings are possible, for instance, in the production, and in marketing. With an advertising agency, Parkkisähkö would gain external knowledge and skills from the current effective ways to market their service.

As proposed, Parkkisähkö could enhance their business by starting negotiations with cities. Cities provide parking lots and have close relations with largest actors.

Cooperation with cities would bring EVs more visibility and increase the amount of EV charging stations.

8. Conclusions: Proposals

Parkkisähkö should outsource production: The production costs of the charging device should be derived as low as possible to direct scarce resources for expanding the company activities in a drastic, or even in an aggressive fashion.

Aggressive lobbying for EVs in general to allow more accessibility and inexpensiveness: One of the main factors and the prime uncertainties in the future is EV penetration. In case Parkkisähkö is unable to generate a more positive outlook on EVs, or in case the market leans towards other options, Parkkisähkö will be left with little to nothing to act upon. By lobbying EVs for people, they will also gain a better image and a stronger brand. People want to be considered important as regulations are extensively applied to non-green companies and practices.

Be prepared for new upcoming regulation: This is more of a mental, yet crucial note to consider. However, companies tend to forget the simplest tasks and notes to perform and track. By anticipating anything they are likely to be more adaptive. Being able to market the product and the service as regulation compliant improves the perceived quality of service in the eyes of a client.

Begin cooperation with car manufacturers for campaigns: another good measure to prevent an undesirable outcome in the future is to assess the outcome. In this situation, in case a company can have a breakthrough disrupting the market, healthy working relationships with car manufacturers are strongly advised.

Uplift the brand to a whole new level: The outlook of the charging post (charging station) is unreasonably unpleasant to the eye. A simple change in design or a choice of different designs targeted at end customers is a good means of attracting new customers and attention.

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Feedback for the course

- Workload: Workload is evenly divided, however, it was fairly confusing sometimes to figure out what the expectations of the presentations are. This was already improved during the course, but still as it is a school course, the more emphasized goals and methods are, the better is the learning process. The guidance for the different methods were lackluster and too much was left for our own decision. Most of the groups did deductions that later were shown to be not wanted.

- Schedule of the course: This course could be shorter, so that the learning is not forgotten by the time reports are due.

- Methodology: Great methodologies, however, all of them are ambiguous and the teachers should probably focus in what the groups are doing right than just over particularly tell what is wrong? This comes down to guidance for the methods beforehand.

- Further improvements: Companies should probably be informed about the course methodologies and course content to some extent, so that they would understand what the students are after. Now they think we are going to do a grand consultation when in reality it is quite limited.

Appendix

Given the brief description of the past and the present of Norwegian EV and charging technology and its development, we will refer to Muhonen (2016) and their study with regards to the case-by-case comparison of EV incentives and charging infrastructures across the Nordic. A few years have passed since their work on this topic, and with that respect, we will note if there were any changes affecting our observations within that timespan.

Comparison: Finland and Sweden

According to the European Alternative Fuels Observatory (EAFO, 2018) EV charging positions (Figure 1) in Finland consist of 706 type 2 positions, 70 type-2AC positions, 62 CHAdeMO positions, 71 CCS positions and 38 Tesla Supercharger positions. All of these altogether amount to 7 EVs per charging position.

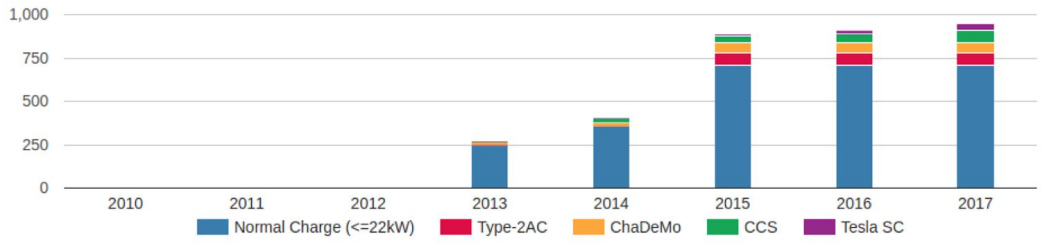

Figure 1: Total number of EV charging positions in Finland (EAFO, 2018)

There are no incentives in Finland so far with regards to electric vehicles since they are subjected to a propulsion tax that concerns non-gasoline vehicles in Finland as the taxation on ICE vehicles relates to the amount of greenhouse gas produced. Since electric vehicles do not produce tailpipe emissions, the propulsion tax compensates the cost (Trafi, 2018)

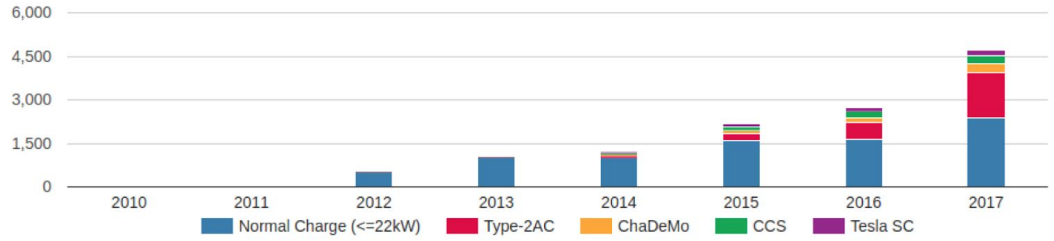

Figure 2: Total number of EV charging positions in Sweden (EAFO, 2018)

According to the European Alternative Fuels Observatory (EAFO, 2018), there are currently 4733 EV charging positions (Figure 2) in Sweden. These charging positions consist of 2363 type 2 positions, 1589 type-2AC positions, 295 CHAdeMO positions, 286 CCS positions and 200 Tesla Supercharger positions. All of these altogether amount to 11 EVs per charging position. The dispersion of electric vehicle charging stations in Sweden can be observed from Figure 3. Infrastructure for electric vehicle charging stations is lacking in the northern areas, even though other areas of Sweden are well-covered by the current electric vehicle charging station infrastructure.

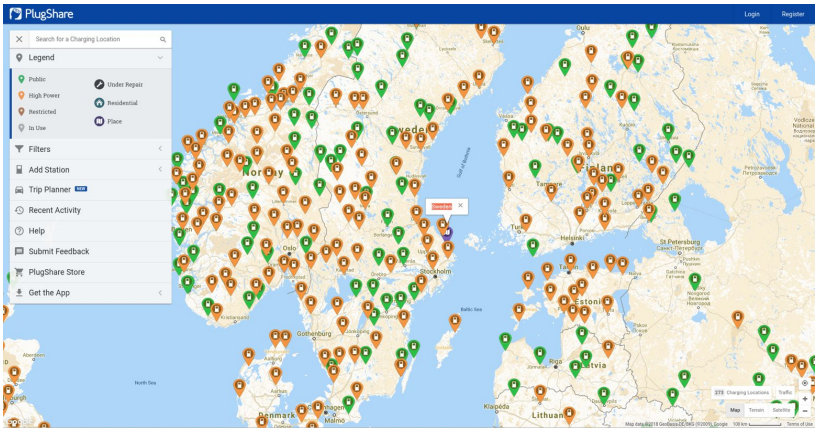

Figure 3: Plugshare map visualizing the dispersion of EV charging positions in Sweden as of now. We may notice certain gaps around more specific areas such as the northernmost yet the coverage in the southernmost, especially urban areas caters EV users the most compared to similarly urban areas in Finland. Source: https://www.plugshare.com/.

Sweden, akin to Finland, does not have large incentive programs devoted to electric vehicle purchases, although the latest development as evident from the map, shows

that they are gradually adhering to the example of their western neighbors. Harryson et al. (2015) list certain incentives that were implemented with that respect, which include an exemption from yearly circulation tax for five years, as well as a rebate for so-called “super green cars” in the amount of 40,000 SEK per vehicle.

As was showcased previously, Finland has the fewest electric vehicles and charging stations compared to its neighbors Sweden and particularly Norway. Sweden is in the middle with a few incentives regarding electric vehicle purchases, and Norway, thanks to its amount of incentives and user benefits, has the largest fleet of electric vehicles and the largest charging infrastructure. Harryson et al. (2015) have noticed that the incentive program in Norway indeed had a significant effect on the technology adoption of electric vehicles and expansion of the accommodating charging station infrastructure. Since Finland has no well-defined incentives in terms of the total cost of ownership (TCO) of electric vehicles, the infrastructure reflects the aforesaid reality. For Norway, the reduction of TCO leveraged the stimulation of electric vehicle uptake levels. Harryson et al. (2015) argue that the best option for neighboring countries is to have the incentive offerings of Norway as a prospective blueprint for drastic improvements of the EV uptake, while yet also considering both the large incentives and the tax revenues.