Bachelor's thesis at the Lucerne School of Engineering and Architecture

Title	**Strategy for Urban eMobility Services for a Municipal Power Provider**
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Bachelor's degree program	**Bachelor in Energy Systems Engineering**
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Abstract German

Der Mobilitäts Sektor unterzieht sich zurzeit einem Wandel, welcher durch verändernde gesellschaftliche Verhaltensweisen, umweltorientierteres Denken der Bevölkerung, technologischen Fortschritten und politischen Instrumenten ausgelöst wurde. Die Elektromobilität gewinnt durch diese Veränderungen mehr und mehr an Bedeutung. Nebst der Automobilindustrie versuchen auch Energieversorgungsunternehmen eine zentrale Rolle in diesem eher jungen und unreifen Markt einzunehmen. Diese Bachelor Arbeit zielt darauf ab, eine Elektromobilitäts-Strategie und die darin beinhaltete Positionierung des Energieversorgungsunternehmens Elektra Sissach im schweizerischen Elektromobilitäts-Markt auszuarbeiten.

In einem ersten Schritt wurden makroökonomische Aspekte des schweizerischen Elektromobilitäts-Marktes, lokale Gegebenheiten in Sissach sowie die momentane geschäftliche Situation der Elektra Sissach analysiert. Basierend auf diesen Erkenntnissen wurden verschieden Geschäftsmöglichkeiten im Bereich der Elektromobilität erarbeitet. Mit Hilfe einer Multikriterien-Analyse wurden die attraktivsten und machbarsten Geschäftsmöglichkeiten anhand von verschieden gewichteten Kriterien ermittelt und in Form einer Elektromobilitäts-Strategie präsentiert.

Die Elektromobilitäts-Strategie sieht zum jetzigen Zeitpunkt eine Einführung eines Park & Charge Angebots vor. Der Sissacher Bevölkerung werden dadurch zwei öffentlich zugängliche und zentral gelegene Ladeparkplätze zur Verfügung gestellt. In einem nächsten Schritt wird auf einem der vorhandenen und mit Ladeinfrastruktur ausgestatteten Parkplätzen ein eCar Sharing angeboten. Zu einem späteren Zeitpunkt sollte die Einführung eines Tarif Anreiz Systems im Bereich der Elektromobilität unter den dann vorherrschenden Bedingungen geprüft werden.

Durch die vorgeschlagene Strategie positioniert sich die Elektra Sissach im lokalen Lade- sowie Car Sharing Markt, ohne dabei grössere Risiken einzugehen.

Abstract English

The mobility sector is currently undergoing a change, which has been triggered through transforming social behavior, more environmentally conscious thinking of the general public, technological advances and political instruments. Due to these developments, eMobility is becoming increasingly more important. In addition to the automotive industry, energy supply companies are trying to play a central role in this

emerging and immature market. This Bachelor Thesis aimed the development of an eMobility strategy and the corresponding positioning of the energy supply company Elektra Sissach in the Swiss eMobility market. In a first step, the macroeconomic aspects of the Swiss eMobility market, local conditions in Sissach and the current business situation of Elektra Sissach were analyzed. Based on the findings, various business options in the field of eMobility were developed. With the help of a Multi-criteria analysis, the most attractive and feasible business options were identified on the basis of differently weighted criteria and presented in the form of an eMobility strategy.
The eMobility strategy currently foresees the introduction of a Park & Charge offer. As a result, the community of Sissach will be provided with two publicly accessible and centrally located car charging spaces. In a further step, an eCar sharing service will be offered at one of the existing parking spaces equipped with charging infrastructure. At a later stage, the introduction of a tariff incentive system in the field of eMobility should be examined under the then prevailing conditions.
With the proposed eMobility strategy, Elektra Sissach can position itself in the local charging- and car-sharing market, without taking major risks.

Place, date Egolzwil, 06. June 2020

Bachelor Thesis

Strategy for Urban eMobility Services for a Municipal Power Provider

Flavio Hodel

Egolzwil, 06. June 2020

Lucerne University of Applied Science and Arts – School of Engineering and Architecture –
BSc Energy Systems Engineering

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Strategy for Urban eMobility Services for a Municipal Power Provider

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In einem ersten Schritt wurden makroökonomische Aspekte des schweizerischen Elektromobilitäts-Marktes, lokale Gegebenheiten in Sissach sowie die momentane geschäftliche Situation der Elektra Sissach analysiert. Basierend auf diesen Erkenntnissen wurden verschieden Geschäftsmöglichkeiten im Bereich der Elektromobilität erarbeitet. Mit Hilfe einer Multikriterien-Analyse wurden die attraktivsten und machbarsten Geschäftsmöglichkeiten anhand von verschieden gewichteten Kriterien ermittelt und in Form einer Elektromobilitäts-Strategie präsentiert.

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Durch die vorgeschlagene Strategie positioniert sich die Elektra Sissach im lokalen Lade- sowie Car Sharing Markt, ohne dabei grössere Risiken einzugehen.

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The mobility sector is currently undergoing a change, which has been triggered through transforming social behavior, more environmentally conscious thinking of the general public, technological advances and political instruments. Due to these developments, eMobility is becoming increasingly more important. In addition to the automotive industry, energy supply companies are trying to play a central role in this emerging and immature market. This Bachelor Thesis aimed the development of an eMobility strategy and the corresponding positioning of the energy supply company Elektra Sissach in the Swiss eMobility market.

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Table of Contents

List of Figures

List of Tables

List of Equations

Abbreviations and Acronyms

AC	Alternating Current
AEW	Aargauisches Elektrizitätswerk
AHP	Analytic Hierarchy Process
BAU	Business As Usual
BEV	Battery Electric Vehicle
BFE	Bundesamt für Energie
CHF	Swiss Francs
COM	Connected Mobility
DC	Direct Current
EBL	Genossenschaft Elektra Baselland
EFF	Efficiency
EM	Elektro-Material AG
EU	European Union
EVSE	Electric Vehicle Supply Equipment
FTTH	Fiber to the Home
HKN	Herkunftsnachweis
HSLU	Hochschule Luzern
HT	High Tariff
ICCB	In Cable Control Box
IWB	Industrielle Werke Basel
NT	Low Tariff
PHEV	Plug-in-Hybrid Electric Vehicle
PV	Photovoltaic
RCD	Residual Current Device
TCS	Touring Club Schweiz
WWZ	Wasserwerke Zug

1 Introduction

This thesis presents the development of an eMobility strategy as part of a new power grid strategy for Elektra Sissach and managing director Stephan Jurt. Dr. Achim Schneider, Senior Research Associate at the Competence Centre Energy Economics at HSLU, supervises this thesis and is part of the development team of the new power grid strategy. In this chapter, the subject of eMobility is first presented in the form of a background chapter. The background chapter presents the latest and most important developments in the field of eMobility in Switzerland. Furthermore, project aim and project objectives of this thesis are presented.

1.1 Background

The topic eMobility is currently widely discussed. Increasing populations, the possible phase out of fossil fuels, new governmental regulations and public pressure for more CO_2 friendly solutions has and will lead to changes in the mobility sector over the next few years. Furthermore, technological advances, decreasing battery prices and governmental incentives lead to an increasing demand in eVehicles in Switzerland as well as worldwide. This development is supported by Figure 1, which illustrates the number of registered e-passenger-cars from 1997 to 2019 in Switzerland. However, compared to the total number of registered passenger-cars in 2019, the share of e-passenger-cars amounts only to 4.22%. (Statista, 2019)

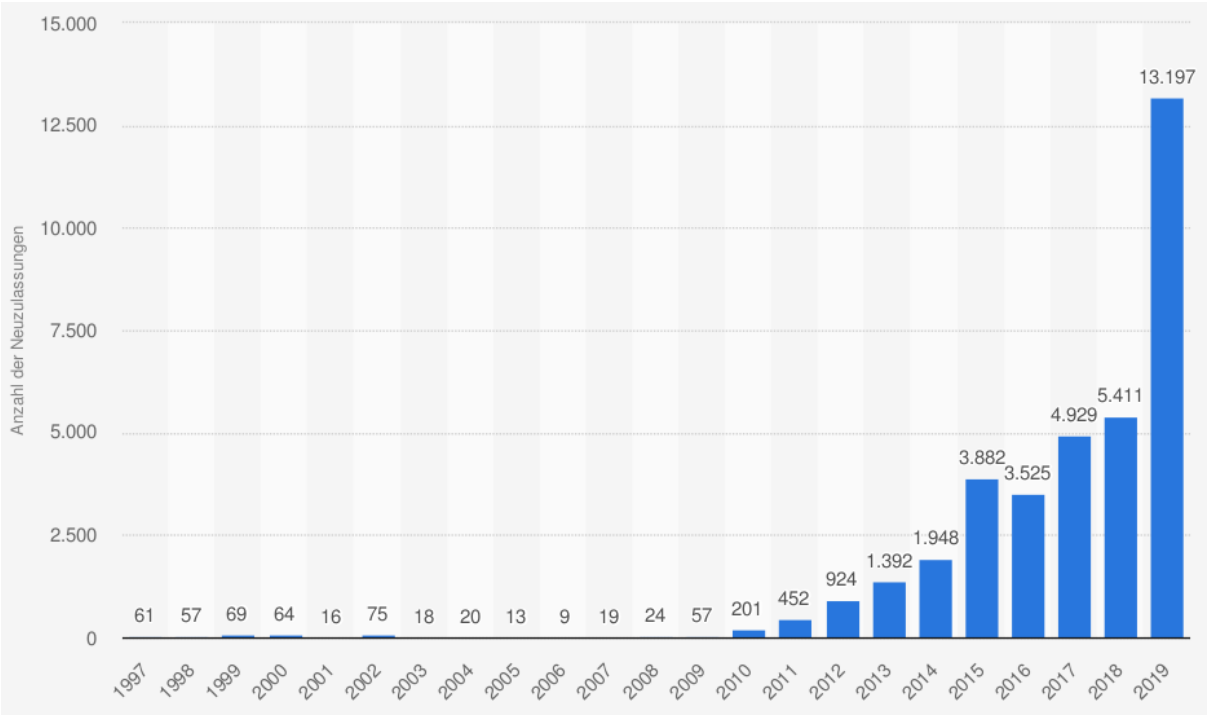

Figure 1: Number of registered e-passenger-cars from 1997 to 2019 in Switzerland
Source: (Statista, 2019)

Besides the increase in number of eVehicles, the parallel construction of charging infrastructure is booming. Charging stations are mainly built in residential buildings and workplaces, as 80% of the charging processes are executed at home or at the workplace (Volkswagen Schweiz, 2020). However, there is also a wider offering in public charging stations as fast or even super-

fast charging stations are more frequently built in areas such as supermarkets, railway stations, motorway service stations or gas stations. Figure 2 presents the development of public charging stations in Switzerland from 2012 to 2019. Within seven years, the offering of public charging stations was increased by a factor of approximately 15.

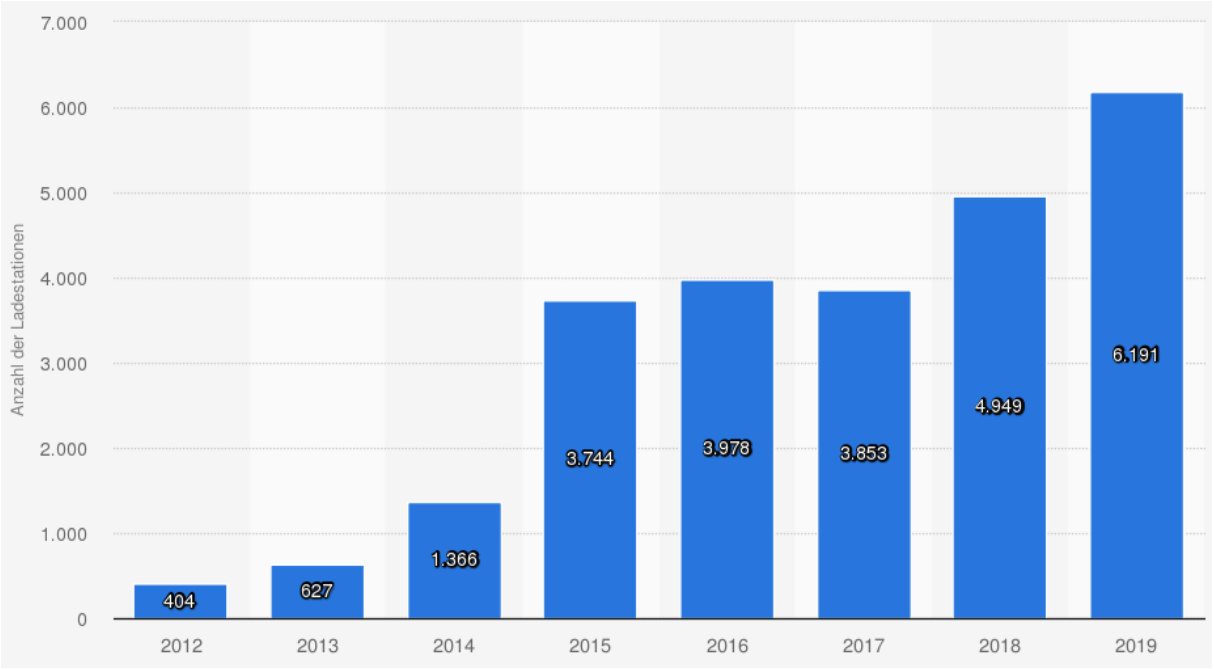

Figure 2: Number of public charging stations in Switzerland from 2012 to 2019
Source: (Statista, 2019)

Another essential aspect represents the "Roadmap Elektromobilität 2022" developed by the Swiss Federal Office for the Environment, Transportation, Energy and Communication (Departement für Umwelt, Verkehr, Energie und Kommunikation UVEK) in cooperation with 50 organisations and enterprises. The common goal is the promotion of eMobility in Switzerland. To fulfil the reduction of the CO_2-emission target value of 95 g/km (until now 130 g/km) by 2020, efficient and low-emission electric drives are desired to partly reshape the mobility sector. The share of new registered e-passenger-cars is aimed to be at 15% by 2022. The Swiss electricity mix consisting mostly of renewable energies and nuclear power, provides favourable conditions. (Eidgenössisches Departement für Umwelt Verkehr Energie und Kommunikation UVEK, 2018)

The "Roadmap Elektromobilität 2022" consists of three concrete measures,

- successful market development,
- optimal charging infrastructure and
- incentives & framework conditions.

The parties involved are active in different areas and work independently or in groups. Over the years, changes in the Roadmap are possible as it reflects a dynamic process.

1.2 Project Aim

The aim of this Bachelor Thesis is to answer the question.

“How should Elektra Sissach position itself regarding eMobility services in the urban area?”

As the Swiss mobility market is reshaping and especially technology, regulations & policies, public demands, local circumstances and business models are changing, the most suitable and viable strategy and position of Elektra Sissach in the Swiss eMobility market is sought-after. This is achieved by analysing the current eMobility market situation in Switzerland and addressing, evaluating and verifying different business options according to set criteria to present the most suitable eMobility strategy for Elektra Sissach.

1.3 Objectives

- Analysis of the current situation of the Swiss eMobility market regarding electric charging stations with focus on existing station types and local circumstances, current and future needs of the public and competitors in the area of Sissach.
- Analysis of current and future funding measures in the eMobility sector in Switzerland and the consequent significance for households or local energy providers like Elektra Sissach.
- Determine the best strategy regarding eMobility charging stations for Elektra Sissach in Switzerland by addressing, evaluating and verifying different business options according to set criteria.

2 Methodology

The Methodology chapter provides information on the data and methods / tools used in this thesis to achieve the set objectives and to fulfil the project aim. The used data and methods / tools are described, explained and justified and should give insight to the reader how the literature study was undertaken and processed. Following in Figure 3, structure and methods / tools used in this thesis are displayed.

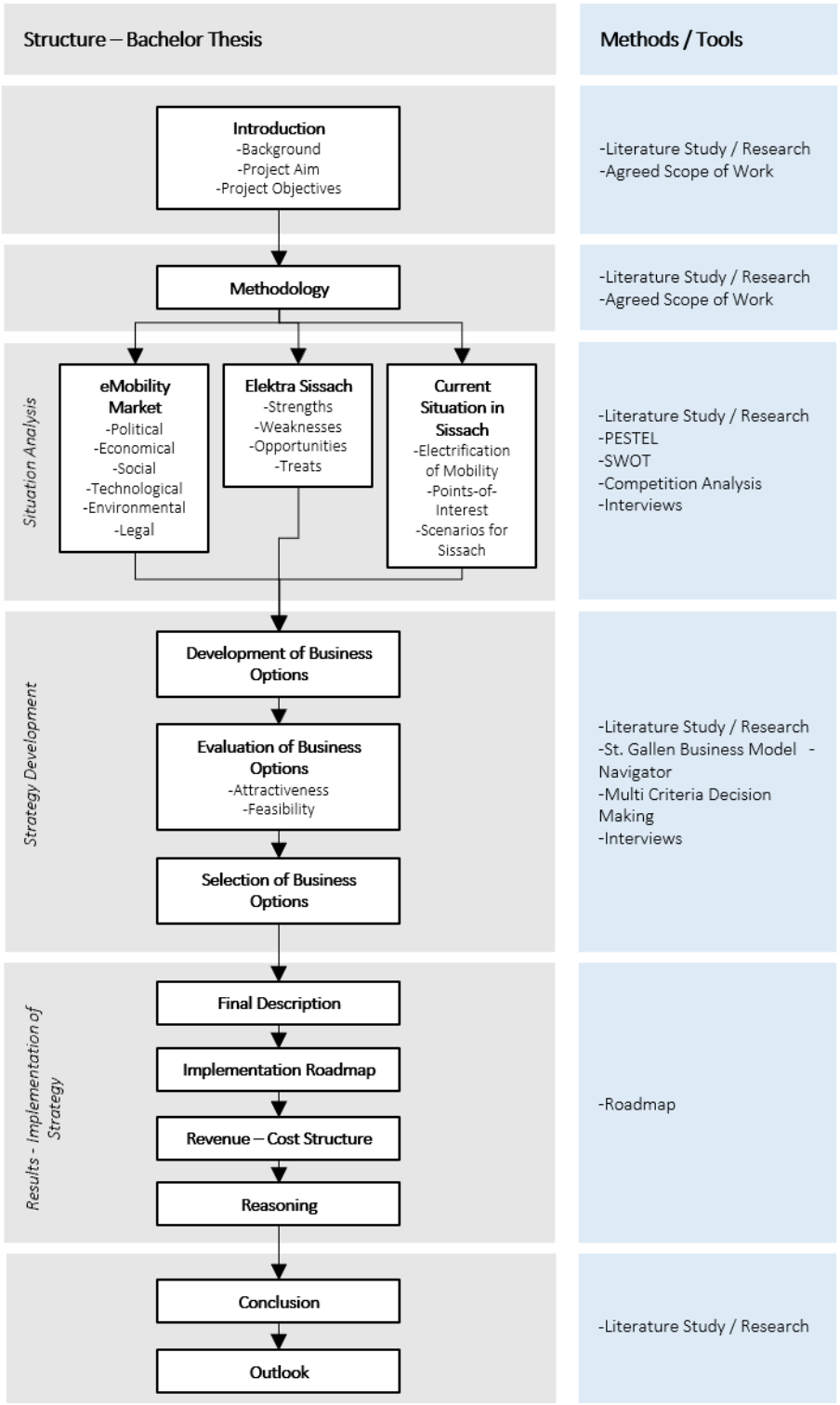

Figure 3: Overview structure and methods / tools used

The PESTEL, SWOT and competition analysis in addition with interviews are applied in order to execute the Situation Analysis. The Multi Criteria Decision Making is used to evaluate different business options for Elektra Sissach. In a next step, with the help of a roadmap, the most suitable and viable strategy is determined and presented. The study is closed with a conclusion and an outlook.

2.1 PESTEL Analysis

The PESTEL analysis is a framework / tool in strategic management to assess environmental factors and their direct or indirect influence on a company respectively on a business. PESTEL is an acronym and is composed of the first letter of each area of interest. (Theobald, n.d.)

- Political
- Economical
- Social
- Technological
- Environmental
- Legal

The PESTEL analysis was used in Chapter 3 Situation Analysis – eMobility Market. This framework enables to gain a complete overview of the current situation of the eMobility market in Switzerland. PESTEL assesses all the essential areas of interest and provides a solid basis for tasks in further chapters. Useful data was extracted through literature study from online sources and newspaper articles.

2.2 SWOT Analysis

The SWOT analysis is a framework / tool in the strategic management for the evaluation of Strengths, Weaknesses, Opportunities and Threats within a company, as displayed in Figure 4. To assess the internal environment, strengths and weaknesses are analysed. Those can be influenced directly by the management. The analysis and assessment of opportunities and threats belong to the external analysis of a company. External macro or micro-economic effects can be detected or anticipated by the management but not directly influenced. (Kotler et al., 2015)

In chapter 5 Situation Analysis – Elektra Sissach, the SWOT analysis was applied for Elektra Sissach to detect areas of strengths, weaknesses, opportunities and threats of the company. With the help of the SWOT framework, valuable insights were gained which were essential in determining the strategy and positioning of Elektra Sissach in the eMobility market.

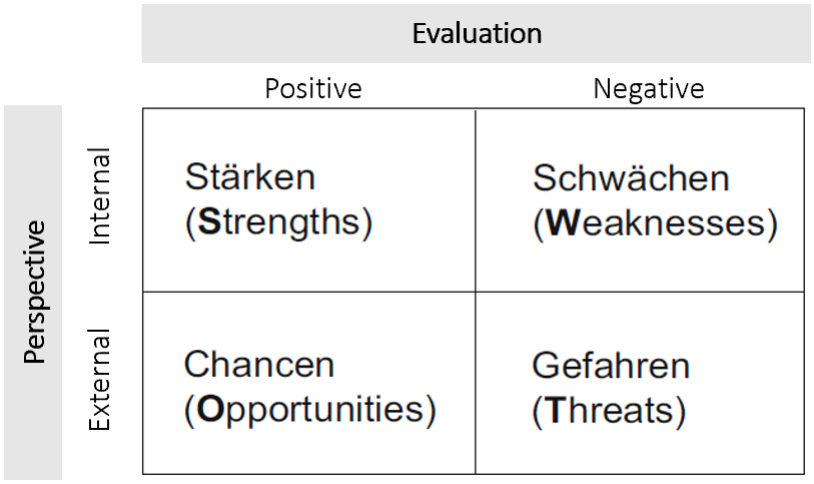

Figure 4: SWOT analysis
Source: adapted from (Billing & Schawel, 2018)

2.3 Competition Analysis

The competition analysis is a framework / tool to identify competitors by systematically gathering and evaluating specific information of certain companies. A determination is made between

- direct competitors,
- indirect competitors,
- potential competitors.

The focus of the competition analysis was to identify Elektra Sissach's direct, indirect and potential competitors as well as their existing business models and areas of operation in the eMobility market in Switzerland. Data was gathered through literature study mainly on the individual websites of the identified competitors. The competition analysis is executed to learn more about competitors and especially their business activities and their current position in the eMobility market. (WeBeatTheStreet, 2018)

2.4 Interviews

Interviews were executed to obtain further in-depth information on the topic of eMobility from three local eCar owners, the municipality of Sissach (Energy Commission Sissach), eMobility experts and from an external medium-sized energy provider. Different questionnaires about eMobility with around 10 to 15 questions were used for the different target groups. All of the interviews were conducted by telephone or skype except for one interview, which was conducted in written form due to a longer absence of the interviewed person. The interviews were conducted in German and then core statements were translated into English.

The majority of statements made by the respective parties can be seen in the Situation Analysis in the Social Description section. The information obtained was also used for further research. Furthermore, the statements made, and the insights gained by the respective persons were

valuable in developing business options and determining the strategy and future position of Elektra Sissach in the eMobility market. The questionnaires and the translated statements can be found in the appendix.

2.5 The St. Gallen Business Model Navigator

For the description of the business options for Elektra Sissach, the St. Gallen Business Model Navigator conceptualization was applied. Currently, different methods for the description of business options exist. The St. Gallen Business Model Navigator is a conceptualization based on four central dimensions as can be seen in Figure 5. The focus lies on the Who, the What, the How and the Value of a business option. Compared to other methods, the concept is simple however provides a clear picture of the selected business option architecture. (Gassmann et al., 2014)

This concept enabled the description of the five possible business options for Elektra Sissach by considering the four presented dimensions. The description of the possible business options provides a solid basis for the subsequent evaluation.

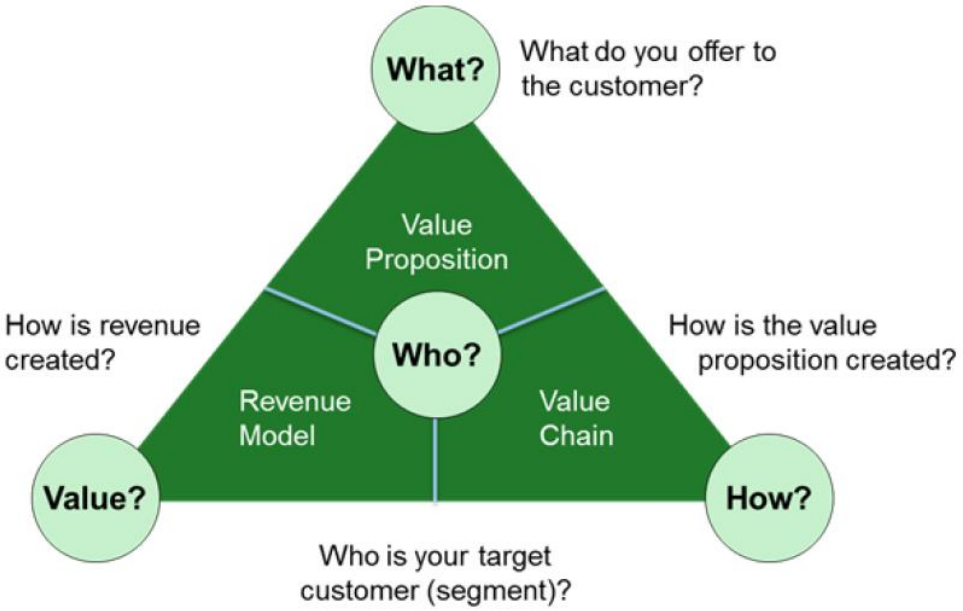

Figure 5: St. Gallen Business Model Navigator concept
Source: (Gassmann et al., 2014)

2.6 Multi Criteria Decision Making

The Multi Criteria Decision Making is a method for evaluating different options according to a set of weighted criteria. In a first step, a number of criteria are selected. The goal is to select as few as possible, but as many as required. In a further step, the different criteria are weighted according to the Analytic Hierarchy Process (AHP). The AHP, as displayed in Figure 6, is a pairwise comparison of the selected criteria. By comparing the criteria to each other, the expressions equal important (1), slightly more important (3), strongly more important (5) and very strongly more important (7) are assigned. For this thesis, a scale from 1 to 7 was used. Then, for each criteria and option, a score is assigned based on individuals scales. Furthermore, the scores are then multiplied with the corresponding weighting factors and summed up to a final score. (Rohrbach, 2019)

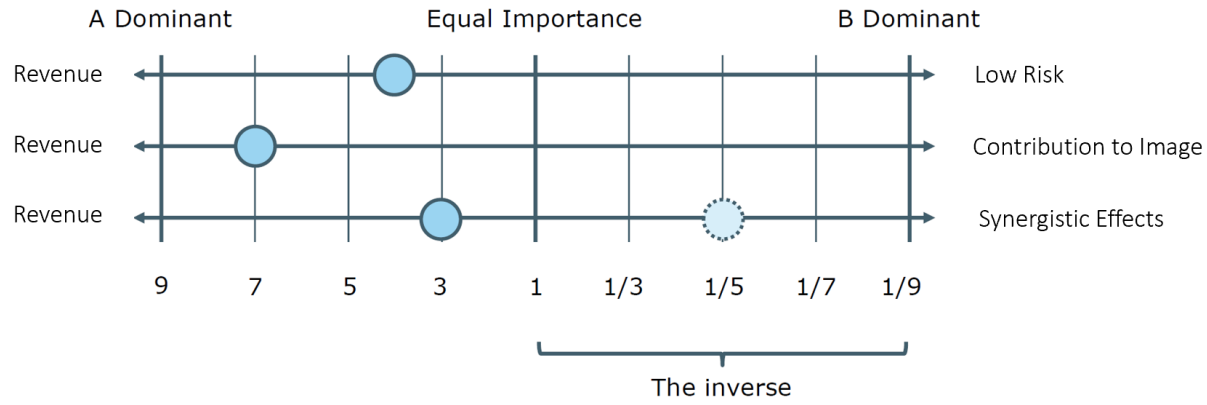

Figure 6: Analytic Hierarchy Process AHP
Source: adapted from (Rohrbach, 2019)

This method has been applied for the evaluation of the possible business options for Elektra Sissach. Eight criteria were selected and divided into two subgroups, attractiveness (revenue, risk, contribution to image and synergistic effects) and feasibility (costs, human resources, technological and realization time). The weighting factors were determined in cooperation with Mr. Stephan Jurt by applying the AHP method. The assigned scores are based on calculations, expert opinions, discussions and educated assumptions.

2.7 Roadmap

With the help of a roadmap, the chronological progression of the final strategy is presented. The selected business options including the necessary working steps of Elektra Sissach as well as of the external partners involved are displayed in Figure 7. On the horizontal axis, the time is represented in the form of now, soon and later and indicates at what point in time, a certain business option is implemented.

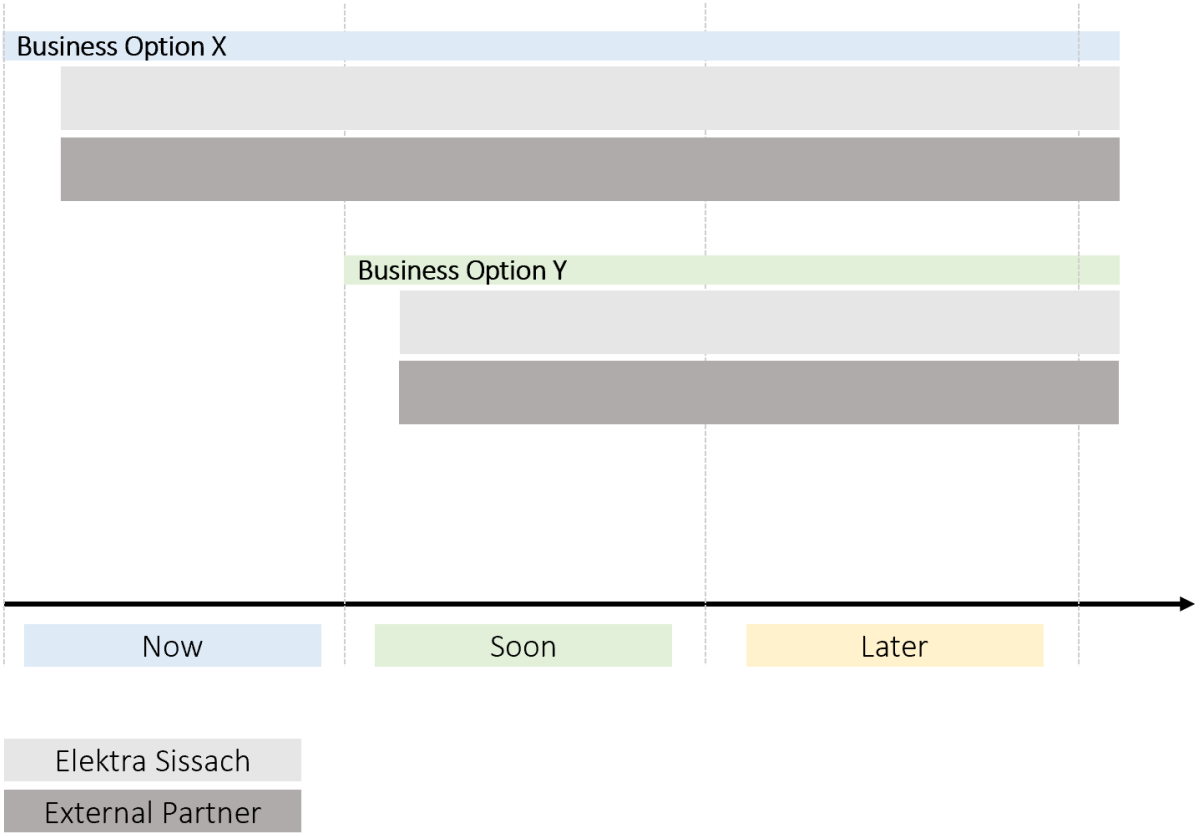

Figure 7: Roadmap example

3 Situation Analysis – eMobility Market

In this chapter, a PESTEL analysis of the eMobility market in Switzerland is presented.

3.1 Political Description

According to the online report "Politische Schwerpunkte 2019" by Swiss eMobility and other similar articles, there are already a few political measures in place to foster the eMobility technology in Switzerland in the coming years. The current dossier of 2018/19 consists of three main aspects, the CO_2 act, the E-Tax and the "Roadmap Elektromobilität 2022". (Swiss eMobility, 2020)

3.1.1 CO_2 Act

The current CO_2 act is undergoing a total revision to meet the requirements of the Paris Climate Convention. The first draft of the new CO_2 act was denied by the Swiss National Council and will be further revised by the Swiss Council of States. In the period from 2021 to 2030, the aim is to reduce the greenhouse gas emissions by 50% compared to 1990 whereas at least 30% are achieved nationally and 20% internationally. The measures are a combination of technological advances, stricter regulations and incentives for the building, transportation, industry and farming sectors. (Eidgenössisches Departement für Umwelt Verkehr Energie und Kommunikation UVEK, 2020)

3.1.2 E-Tax

Discussions are currently underway on the introduction of an E-Tax, which would require eVehicle owners to pay a contribution of around 500 Swiss francs (for a car of approximately 2 tons) per year for the use of roads. As of today, eVehicle owners are exempt from such a tax, unlike gasoline and diesel vehicle owners who are required to pay the mineral oil tax. According to the Federal Council, the E-Tax should only be introduced once the eMobility technology has established itself on the market, however, the E-Tax is expected to be introduced in 2022. (Tages Anzeiger, 2019)

3.1.3 Roadmap Elektromobilität 2022

As already described in the Introduction, the "Roadmap Elektromobilität 2022" developed by the Swiss Federal Office for the Environment, Transportation, Energy and Communication aims the promotion of eMobility in Switzerland. Around 50 external organizations and enterprises are actively working on the three agreed on measures such as

- successful market development,
- optimal charging infrastructure and
- incentives & framework conditions.

The CO_2-emission target value of 95 g/km (until now 130 g/km) by 2020 and a share of new registered e-passenger-cars of 15% by 2022 are aimed.

The Federal Council of Switzerland stated that there is no intention of making purchase premiums available for new eVehicles. However, the existing exemption from the mineral oil tax should be guaranteed for the foreseeable future. In addition, through pilot and demonstration projects and consulting on behalf of Energie Schweiz, eMobility is to be further promoted and supported within cantons and municipalities of Switzerland. Further measures can be expected in the future as a result of the ongoing development of the "Roadmap Elektromobilität 2022". (Eidgenössisches Departement für Umwelt Verkehr Energie und Kommunikation UVEK, 2018)

3.1.4 Funding Contributions

Funding contributions are granted on the national and cantonal level.

3.1.4.1 National Level

On the national level, eVehicles are exempted from the automobile tax at 4% of the vehicle value according to the policy R-68 Automobilsteuer. The savings are contributed to the car dealer, whether to transfer the savings to the car owner is their decision. (Eidgenössische Zollverwaltung EZV, 2019) For investments in the field of eMobility, small and medium-sized enterprises in Switzerland and Liechtenstein are rewarded with subsidies by the Swiss Climate Foundation. (Klimastiftung Schweiz, 2017)

3.1.4.2 Cantonal Level

In Sissach, belonging to the canton Basel-Landschaft, the motor vehicle taxes for passenger cars are calculated according to the total weight of a car. However, depending on the CO_2-emissions per kilometer, tax reductions (or tax surcharges) are granted (claimed). For a new passenger car, registered in the period from 2018-2020, the following tax reductions (or tax surcharges in case of not adhere to the target CO_2-emissions) are granted for the year of the new registration and the following three years. (Bundesamt für Energie BFE, 2020)

- 0 to 94 g CO_2 / kilometer CHF -300
- 95 to 104 g CO_2 / kilometer CHF -150
- 130 to 144 g CO_2 / kilometer CHF 75
- 145 to 159 g CO_2 / kilometer CHF 150
- Above 160 g CO_2 / kilometer CHF 300

3.2 Economical Description

This chapter covers economical aspects of the eMobility market in Switzerland. The automotive industry is currently undergoing a change. Environmental considerations play a role as well as uncertainties surrounding the future oil production. Around 50% of the world's oil reserves are located in unstable regions of the Middle East. In the long term, a significant increase of the oil price must therefore be expected. The above-mentioned reasons are therefore accelerating the shift towards eMobility, while reducing dependencies on the Middle East. (Strathmann, 2019) A large number of eMobility offers are already available from various companies in Switzerland. Possible competitors of Elektra Sissach in the field of eMobility are presented below. In a next step, existing business models of the previously identified competitors were examined.

3.2.1 Competition

The eMobility market is a fast-developing market with different players involved. Figure 8 displays the competition for Elektra Sissach in regard to eMobility services. In addition, core activities and future options are also considered when deciding between direct, indirect or potential competitors. Direct competitors operate in the same market and offer an identical product as Elektra Sissach does. For indirect competitors, the product offering in the same market is similar but not exactly the same. Potential competitors could potentially enter the eMobility market in the same region with an identical or similar product in the future and could develop into an indirect or direct competitor.

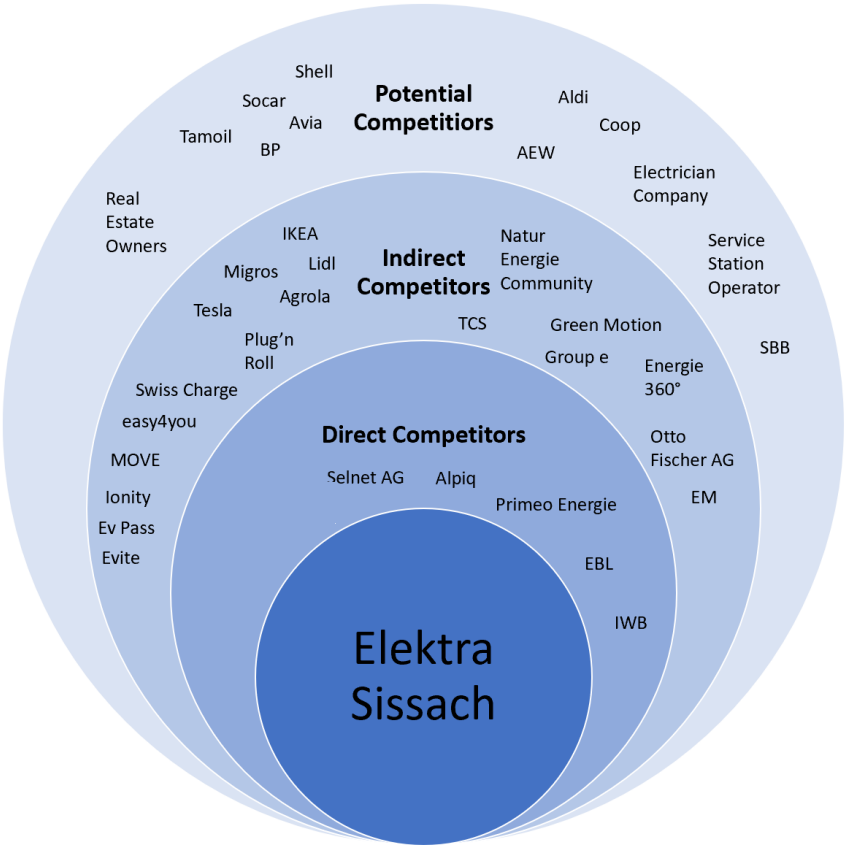

Figure 8: Competition Elektra Sissach in regard to eMobility

3.2.1.1 Direct Competitors

Direct competitors of Elektra Sissach regarding potential eMobility services are EBL, IWB, Alpiq, Primeo Energie and Selnet AG. The main business of the mentioned companies lies in the field of energy supply, more precisely in the operation and maintenance of electricity networks and its infrastructure, as Elektra Sissach in Sissach. As energy markets are changing and technology advances, new areas such as eMobility are becoming interesting for such companies. The companies mentioned already have a more or less extensive range of eMobility services in the Basel region.

3.2.1.2 Indirect Competitors

Indirect competitors have similar but not exactly the same business activities as Elektra Sissach. Since there are already various business areas in the field of eMobility, there are numerous opportunities for such companies. Indirect competitors can for example be operators of charging networks, sell eCars and charging stations, operate gasoline stations and sales shop. Such companies could develop into direct competitors and therefore it is necessary to know and understand their business activities.

3.2.1.3 Potential Competitors

Potential competitors are companies which are currently or in the future thinking about a possible entry into the eMobility market. This category includes various companies as well as private individuals with real estate, which could present a competing offer in the future. This could include charging offerings for eVehicles, installation and maintenance services or the consulting and sale of hardware and software products. Potential competitors and their future developments should be observed and noticed.

3.2.2 Existing Business Models

This chapter provides an overview of existing business models and areas of operation of companies, identified as potential, indirect or direct competitors in the eMobility market in the region of Sissach. The coloured boxes indicate areas of operation (indicated on the vertical and horizontal axes) of companies placed in a certain coloured box.

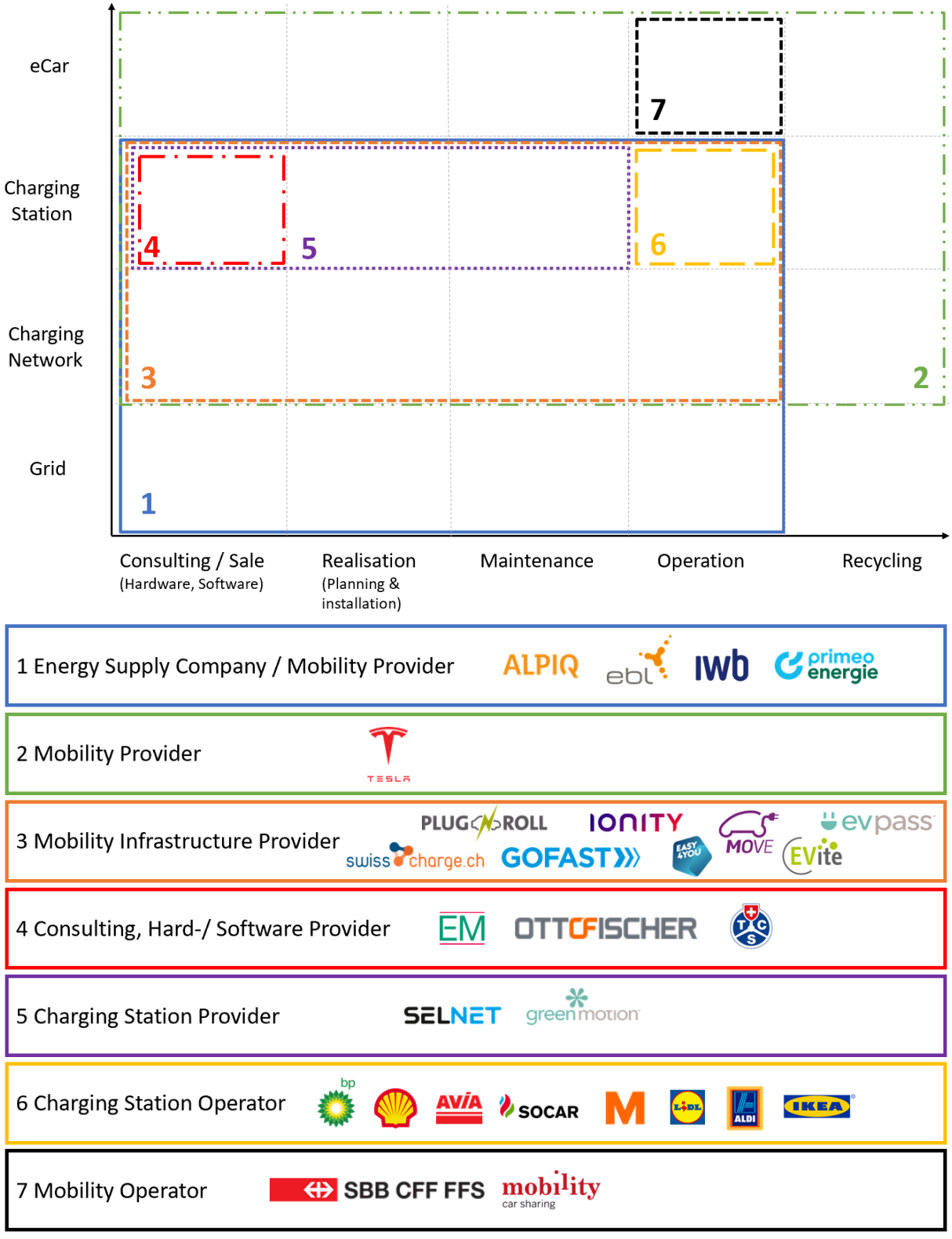

Figure 9: Existing business model in the region of Sissach

According to Figure 9, Tesla offers consulting, realization, maintenance, operation and recycling services in the area of charging networks, charging stations and eCars. It is important to know that overlaps within boxes are possible and moreover that Figure 9 presents a dynamic overview which can change within weeks or months due to new offerings and entrants in the eMobility market in Switzerland and especially in the region of Sissach.

3.2.2.1 Energy Supply Company / Mobility Provider

Energy Supply Company / Mobility Provider offer a variety of eMobility services besides their core business activities in the energy sector. The offering ranges from consulting services to sale and installation of hardware and software products. Furthermore, charging networks for public charging processes are provided for end consumers, as well as related services such as monitoring and billing. Often, a distinction is made between private and business customers, private or public and small- or large-scale solutions, that the needs of different customer groups can be satisfied to the same degree.

3.2.2.2 Mobility Provider

Mobility Provider have an almost identical offering such as the Energy Supply Company / Mobility Provider. Mobility Provider are not in possession of an electricity grid, but they offer partial services in the energy sector. They are specialized in offerings concerning consulting, selling of eCars, distributing charging stations, operating charging networks and more. Nowadays, certain Mobility Provider already operate factories where used eCar batteries are recycled and reused. There are currently not many Mobility Providers offering battery-recycling-services.

3.2.2.3 Mobility Infrastructure Provider

The offering of Mobility Infrastructure Provider consists of a well-established and structured charging network infrastructure, provided to end consumers. A charging network consists of several charging stations within a region, country. Often, end consumers are enabled to access charging networks abroad through the Mobility Infrastructure Provider, might it be on their own network or on a partner network. Mobility Infrastructure Provider often cooperate with other businesses to increase the range of their offerings.

3.2.2.4 Consulting, Hard-/ Software Provider

Consulting services are also provided from companies, which do not own a charging network infrastructure. The focus lies mainly on providing consulting services to end consumers which then as a result, lead to the selling of hard- and software products. Hardware products include private or public charging stations, plugs, adapters and transition cables. Software products for measuring and monitoring energy consumptions and charging behaviour of eVehicles are also common.

3.2.2.5 Charging Station Provider

Charging Station Provider have their focus in the area of consulting, installation and maintenance of charging stations. Often, partnerships are formed between Charging Station Operator and Mobility Infrastructure Provider.

3.2.2.6 Charging Station Operator

Charging Station Operator do mostly not offer consulting, installation or selling services. The business activities of Charging Station Operators lie in the area of the operation of charging stations, provided by an external company. Often, service station and supermarket operator take on the role of Charging Station Operators (e.g. service station operators such as BP, Shell, Socar, Avia, Tamoil or supermarket operators such as Migros, Aldi, Lidl, etc.).

3.2.2.7 Mobility Operator

Besides the acquisition of an own expensive eVehicle, the possibility of eMobility sharing services exist. Such business models provided by Mobility Operators enables customers to rent an eVehicle at the moment it is needed. Maintenance and insurance costs are often included in the renting price and are not of concern for customers. Often, eVehicles can be rented per hour or per day which makes the offering flexible and convenient. Certain Mobility Operators offer also rather new business model such as eMobility fleet management. The aim is the optimal and efficient use of eVehicles within a fleet.

3.2.2.8 Possible Future Business Model

Due to technological advances and the ongoing electrification of the automotive industry, new eMobility business models will arise in the future. Observing the eMobility market worldwide and specifically in Switzerland, leads to the realization that there exists a variety of different new business models. However, not all of them are applicable in the mass market yet. Following a few examples which could be of interest in the future. (GREAT, 2019)

- Battery exchange
- Battery recycling
- Inductive charging
- Advertisement on charging stations
- Vehicle to Grid (V2G)
- Mobility as a Service (MaaS)
- Electrical Road Systems
- Partnerships (combined business models)
- …

3.3 Social Description

In the social sector, trends show that mobility is facing a radical change. Mobility is still attached great importance in the future, but in a changed form. For younger generations, owning a car is of declining importance. High investment costs, difficult parking space situations in cities, loss of value and greater environmental awareness are increasingly leading to a "sharing economy". In addition, cars are not used on average 23 hours per day. The “sharing economy” creates more cost-effective and environmentally friendly intermodal mobility concepts. In times of these changes, eMobility will take on a more essential role. (Strathmann, 2019)

As for Switzerland, a medium-sized energy provider conducted a survey with about 800 participants in order to gain insights about people’s mindsets regarding energy and eMobility. The survey results revealed that just 4% of the participants already own BEV or PHEV. Furthermore, around 20% intend to purchase a BEV or PHEV when it comes to buying a new car. 33% would consider renting, 26% sharing a BEV or PHEV in the future. Interestingly to see, 49% of those surveyed would consider seeking advice from an energy provider when buying a BEV or PHEV. (External Medium-Sized Energy Provider, 2019)

In order to gain further insight about the current eMobility situation in Switzerland and especially in Sissach, three local eCar owners, the president of the Energy Commission of Sissach and an external medium-sized energy provider were interviewed on the topic of eMobility. Following, their thoughts and inputs are presented.

3.3.1 Three Local eCar Owners – Mr. Schaub, Mr. Löffel & Mr. Meier

Stephan Jurt, managing director of Elekra Sissach, suggested three people in the Sissach area who could be interviewed about eMobility. The persons mentioned already own eCars and are therefore familiar with the subject. Talks were held with Dieter Schaub, Daniel Löffel and Andreas Meier from Sissach.

The pioneering idea in the field of eMobility is lived by the three persons and it is important to them to contribute to the environment. Through the conversations it became obvious that there is a great incompatibility in the area of charging stations today. Different plugs, apps and billing tools make access to public charging stations difficult. A bad price-performance ratio often results from excessive tariffs at public charging stations. Furthermore, the charging infrastructure in Switzerland should be standardized and further expanded. For eVehicles, range, price and space conditions are the most frequently mentioned decision criteria.

It is observed that the population still has too little knowledge in the field of eMobility. Car sellers sometimes also do not have the necessary expertise to give competent advice. It would certainly make sense if energy providers took over some of these tasks (promotion, consulting, installation, maintenance etc.) and integrate them into their area of business activities. The three gentlemen surveyed also see opportunities in the future to create incentives in the area of tariffs or in the use of 2nd life car batteries in residential buildings for storage purposes.

3.3.2 Energy Commission Sissach – President Mr. Binggeli

According to Fredi Binggeli, president of the Energy Commission Sissach, there are currently no plans available for the promotion of eMobility services in Sissach. Currently the evaluation and testing of an electric wiper vehicle for the municipality takes place. Ahead of a decision, charging times, operation and maintenance costs must be analysed. In addition, individuals are advised to insert empty conduits in new constructions for future expansions in terms of eMobility charging stations. Furthermore, it is unknown if the label Energy City contains requirements regarding the promotion of eMobility services.

The municipality of Sissach is not in possession of an own charging infrastructure, however, refers to private companies which offer eMobility services. The Energy Commission notices interest in eMobility services from the general public but states that a certain price-performance ration must be given in order to gain interest. The feeling is, that the inhabitants of Sissach are well informed about the possibilities in the eMobility sector and that there is no need for further information. Furthermore, Mr. Binggeli stated that there are currently no incentives in places to promote eMobility in Sissach and did not rule out a future partnership with Elektra Sissach for example. A certain added value must be given. In these fast-developing times, it is also important that every citizen acts goal-oriented, it would be unfair to leave all responsibility to the state, canton or municipality.

3.3.3 External Medium-Sized Energy Provider

An external medium-sized Swiss energy provider recently conducted a survey in the field of energy and eMobility with about 800 participants. During a telephone conversation with an employee in the eMobility department, survey results and their impact on the daily business of the medium-sized energy provider were discussed.

The employee stated, that also due to the survey results, the company's activities in the field of charging station infrastructure for real estate administrations, commercial enterprises and municipalities are increasing. The company is confronted with real estate administrations, commercial enterprises and municipalities on a daily basis. However, the company is rarely directly confronted with private individuals. Furthermore, the company is mainly focused on selling and operating externally purchased hardware. External installers are in charge for the installation of the infrastructure as the company does not employ installers. Billing and monitoring are executed over a platform of a third-party.

Switzerland has a high proportion of rental housing and therefore the company is more and more focusing on tenants and their needs for charging infrastructure. Since there are frequent moves in this area, it is often not attractive to install a charging station for a limited time. Now there are possibilities to rent charging infrastructure over a certain period of time instead of making major investments. In case of a possible change of residence, the subscription can be cancelled. To increase the popularity of eMobility in Switzerland, a greater variety of eVehicles, higher financial incentives as well as a central office for the simple submission of funding contributions would be advantageous. In addition, an extension of the charging infrastructure

in public areas is inevitable. In Switzerland it is currently not yet possible to create incentives in tariffs as a suitable standard is not yet fully developed. However, this business model is already in place in Norway and could be applied in Switzerland in the near future.

3.4 Technical Description

In this chapter, the focus lies on technical aspects such as charging modes, charging capacities and charging times. In addition, Figure 10 displays the Gartner Hype Cycle for emerging technologies including electric vehicles and electric vehicle charging infrastructure.

According to Gartner, it provides a snapshot of the relative market promotion and perceived value of innovations. As can be seen, the Gartner Hype Cycle consists of five phases. The Innovation Trigger phase takes places when a breakthrough, product launch or public demonstration generates interest from the press and industry. A Peak of Inflated Expectations occurs when expectations for a specific innovation rise above the current reality of capabilities. Phase 3, Trough of Disillusionment, is a result of impatience and occurs if the adoption of a technology progresses slower-than-expected. The Slope of Enlightenment phase starts at the point where early adopters overcome initial hurdles and benefits become apparent. In the Plateau of Productivity phase, the technology is widely accepted, and the level of risk is reduced. Depending on technology, time periods of each phase can differ. (Gartner, 2019)

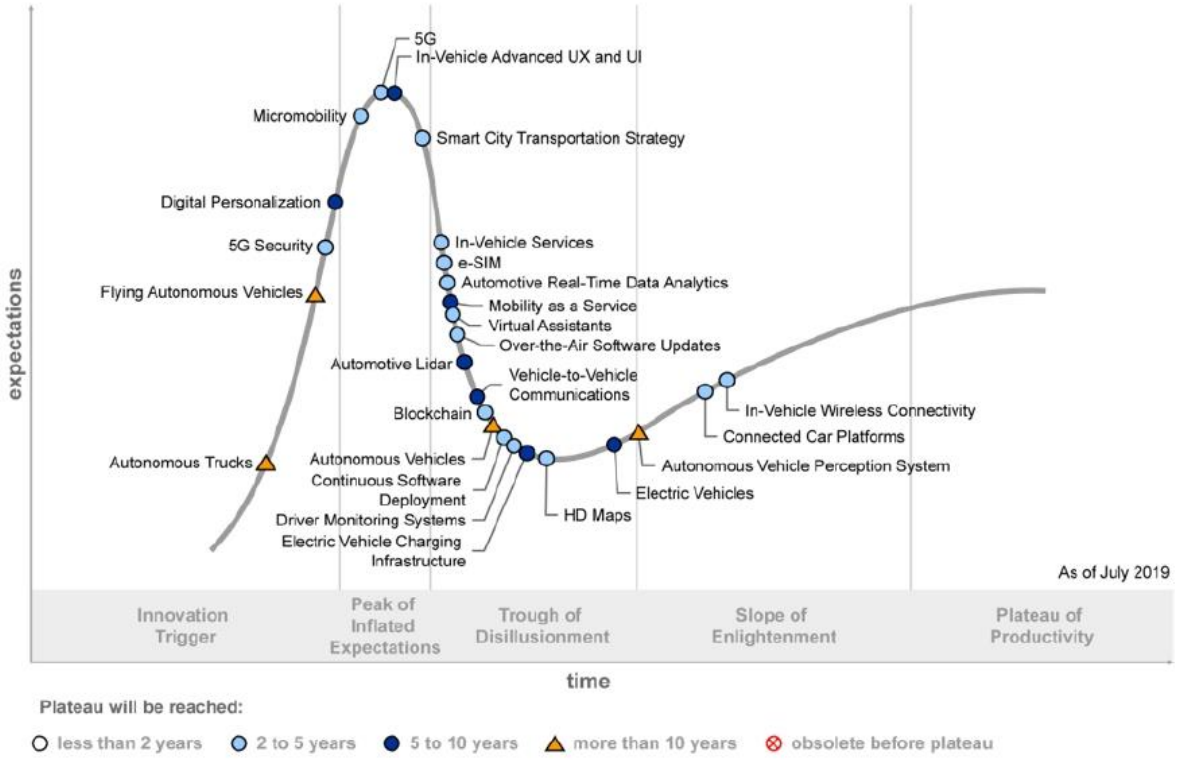

Figure 10: Gartner hype curve for connected vehicles and smart mobility
Source: (Gartner, 2019)

According to Figure 10, electric vehicle charging infrastructure and electric vehicles are in the Trough of Disillusionment phase. This current phase states, that technologies of electric vehicle charging infrastructure and electric vehicles progress slower-than-expected. However, in both cases the plateau of productivity will be reached in 5 to 10 years. In this phase, the technology is widely accepted, provides value and the risks are reduced by a great amount.

3.4.1 Charging Modes

As of today, the majority of charging is completed through conductive charging systems which means, that the transmission of energy is done by cable. However, research is ongoing in the field of inductive charging systems where the energy is transmitted by a magnetic field and therefore does not require a cable connection to the eVehicle anymore. This, as of today, little-known solution could gain relevance in the near future. According to the IEC-norm (IEC 61851), there are four different charging modes for the charging of eVehicles as displayed in Table 1. Following the four different modes are listed and explained in detail. A distinction is made between on-board charging (the conversion from AC to DC takes place on board-in the car) and off-board charging (the conversion from AC to DC takes place within the charging station). (Protoscar, 2019)

Table 1: Charging modes
Source: adapted from (Protoscar, 2019)

Mode 1	On-board charging process with standardized connectors at the grid side with a maximum current of 16 A per phase.
Mode 2	On-board charging process with standardized connectors at the grid side with a maximum current of 32 A per phase. In addition, the cable is equipped with a tool called In Cable Control Box (ICCB) which guarantees the safety measures throughout the charging process. The connection on the grid side must fulfil the requirement of a one or three phase outlet. The ICCB tool consists of a control function and a Residual Current Device (RCD). In Switzerland, the following two connection combinations are possible. a) Grid connection through a CEE connector 16 A (blue, one-phase) or 32 A (red, three-phase) per phase b) Grid connection through T13, T23 or Schuko connector 8 A (ICCB tool automatically limits the charging to 8 A according to connection-type and temperature)
Mode 3	On-board charging process with specialized connectors on the grid side with a maximum current of 32 A per phase. The charging process is executed by an Electric Vehicle Supply Equipment (EVSE) charging station.
Mode 4	Off-board charging process with direct current (DC) and special connectors. The charging process is executed by an EVSE charging station.

3.4.2 Charging Capacities

Besides different charging modes for eCars, different charging capacities exist which depend on the electrical power provided by the charging station and the ability of batteries to cope with a certain amount of electrical power. Following in Table 2, the six most common categories are listed. (Protoscar, 2019)

Table 2: Six categories of charging capacities
Source: adapted from (Protoscar, 2019)

Emergency / home charging	The electrical power amounts to at most 2 kW and results in a range of up to 10 km per charging hour.
Slow / normal charging	The electrical power ranges from 3.6 kW up to 11 kW and results in a range of 10-50 km per charging hour.
Accelerated charging	The electrical power typically amounts to 22 kW and results in a range of up to 100 km per charging hour.
Fast charging	The electrical power typically amounts to 50 kW and results in a range of up to 200 km per charging hour.
Superfast charging	The electrical power typically ranges from 120 to 150 kW and results in a range of up to 100 km per ten minutes.
Ultra-fast charging	The electrical power typically ranges from 250 to 350 kW and results in a range of up to 100 km per five minutes. However, for the 350 kW – charging process, a batterie designed for 1000 V is required which is rare until now.

3.4.3 Charging Time

Charging time depends on the energy to be charged and the nominal charging power of the charging station as can be seen in Equation 1. During a charging process, losses occur. Therefore, it is inevitable to add at least 20% of the calculated charging time additionally. As charging time cannot be generalized, Table 3 presents an example where charging time depends on either battery capacity or daily distance travelled. (Protoscar, 2019)

Equation 1: Charging time
Source: adapted from (Protoscar, 2019)

$$Charging\ time\ (h) = \frac{Energy\ to\ be\ charged\ (kWh)}{Nominal\ power\ of\ charging\ station\ (kW)}$$

Table 3: Charging times according to battery capacity or daily distance travelled
Source: adapted from (Protoscar, 2019)

Battery capacity in kWh	20	40	60	80	100
Charging time (h) of 3.6 kW	6.8	13.5	20.3	27	33.8
Charging time (h) of 11 kW	2.3	4.5	6.8	9.1	11.4
Daily distance travelled in km	20	50	80	100	200
Charging time (h) of 3.6 kW	1.1	2.9	4.6	5.7	11.5
Charging time (h) of 11 kW	0.4	1.0	1.5	1.9	3.9

3.5 Environmental Description

3.5.1 Ecological Tire Footprint

The Paul Scherrer Institute, in collaboration with the two researchers Brian Cox and Christian Bauer, conducted a large-scale study on the environmental impact of passenger cars with different drive systems. Five different drive systems, electric, fuel cells, natural gas, diesel and gasoline, were investigated and compared in terms of greenhouse gas emissions during production and operation. An "ecological tire footprint" has been defined for each drive system for the years 2018 and 2040. Greenhouse gas emissions are expressed in CO_2 (in grams) per kilometer driven. (Paul Scherrer Institut, 2020)

Table 4: Ecological tire footprint comparison
Source: adapted from (Paul Scherrer Institut, 2020)

	eCar	Fuel Cell	Natural Gas	Diesel	Gasoline
Total Production CO_2(g) / km	89.2	101.8	69.0	64.9	64.0
Total Fuel CO_2(g) / km	33.0	84.8	130.4	168.9	229.7
Total 2018 CO_2(g) / km	**122.2**	**186.6**	**199.4**	**233.8**	**293.7**
Total 2040 CO_2(g) / km	**101.4**	**155.3**	**132.4**	**166.7**	**194.8**

As displayed in Table 4, the eCar has the best ecological tire footprint mainly due to the low CO_2 emissions during operation. Compared to the eCars, the gasoline powered vehicles have lower CO_2 emissions during production but higher emissions during operation. Fuel cell powered vehicles have the second-best ecological tire footprint in 2018, followed by natural gas, diesel and gasoline. According to the forecast for 2040, emissions will be reduced for all types of drive systems.

3.5.2 Energy Label Passenger Cars

Due to the revision of the “Energieeffizienzverordnung (EnEV)” in 2019, a new energy label for passenger cars was invented. The amount of technical information on energy labels for passenger cars is reduced to shift the focus towards consumption, CO_2 emissions during operation as well as energy efficiency categories. The calculation method for the classification of the energy efficiency is still based on the primary energy gasoline equivalent and includes direct consumption and also the energy for the fuel or electricity generation. The energy label,

displayed in Figure 11, for passenger cars enables simple comparisons between different types of cars and should motivate people to move towards more efficient passenger cars.

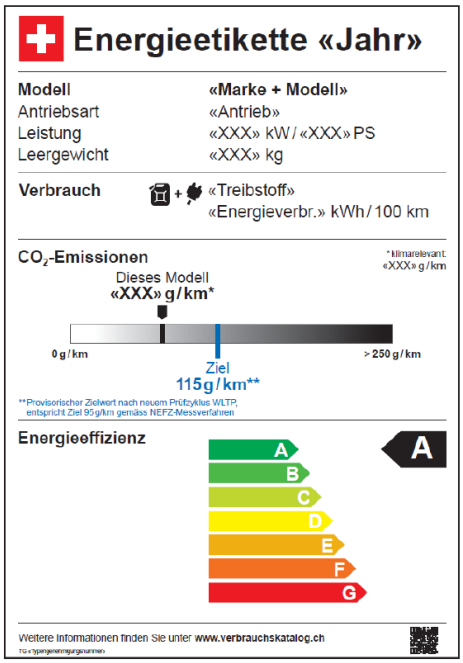

Figure 11: Energy label passenger cars
Source: (Bundesamt für Energie BFE, 2019)

3.6 Legal Description

The installation of a charging infrastructure must be reported to the energy supplier with an **installation notification**. Outdoor charging stations might require **building permits**. (Swiss eMobility, 2019)

Tenants need the consent of the landlord for the installation of a charging infrastructure, often these are administrations which must be contacted. Since the garages use "general" electricity, permission is also required for the use of electricity. The tenant bears the costs for the installation of a charging infrastructure. It is recommended to present a technical dossier of the charging infrastructure to the administration. (Swiss eMobility, 2017)

Condominium ownership must obtain consent for the installation of a charging infrastructure through the condominium ownership meeting (Stockwerkeigentümerversammlung). Often the development costs must be paid in full by the applicant. If another condominium ownership wants to install a charging infrastructure at a later date, initial costs can often be split. It is recommended to submit a technical dossier of the charging infrastructure to the condominium ownership meeting. (Swiss eMobility, 2017)

The **leaflet** Infrastructure for Electric Vehicles in Buildings **(draft prSIA 2060)**, prepared by the SIA, defines the framework conditions in the area of charging stations infrastructure. It serves the planning process and provides information on the questions to be clarified and should mainly lead to buildings being correctly equipped. (Schweizerischer Ingenieur und Architektenverein, 2019)

4 Situation Analysis - Current Situation in Sissach

This chapter provides information on the current situation in Sissach which includes data about the electrification of the Mobility sector in Sissach, points-of-interest and three possible future eMobility scenarios for Sissach.

4.1 Electrification of Mobility

The top half of Table 5 shows Sissach-specific data of passenger car new registrations with different drive systems in the years 2019, 2018 and 2016. In the bottom half, data of the static vehicle fleet from 2010 to 2019 in Sissach is presented. It can be seen in Table 5, that the numbers of gasoline-electric (all hybrid forms) and electric-passenger-cars were constantly increasing over the past years.

Table 5: New registrations and vehicle fleet Sissach
Source: adapted from (Bundesamt für Statistik BFS, 2020)

	Gasoline	Diesel	Gasoline-electric	Diesel-electric	**Electric**	Gas	Other	Total
New registrations (absolute)								
2019	146	52	16	2	**10**	1	0	227
2018	126	50	13	0	**3**	0	0	192
2016	117	80	12	0	**3**	1	0	213
Vehicle fleet (static)								
2019	2355	996	113	2	**36**	7	3	3512
2018	2357	955	97	3	**30**	6	3	3451
2016	2415	941	83	4	**15**	5	3	3466
2014	2412	861	57	6	**2**	4	0	3342
2012	2567	677	34	0	**0**	3	3	3284
2010	2640	526	19	0	**0**	3	1	3189

By considering all the different existing fuel types, the possible electrification potential in Sissach becomes visible. Furthermore, it allows an educated guess of the growth in new eVehicles and consequently the provision of the necessary charging infrastructure in Sissach in the near future.

4.2 Points-of-Interest

On the one hand the local conditions are considered to determine possible points of interest. Points of interest are described as locations at which Elektra Sissach could possibly implement eMobility services in the near future. Figure 12 partly displays the following points of interest.

- Service stations: BP, Avia, Station Hediger Automobile Ag, Tankstelle Nebiker
- Railway station Sissach
- Centrally located municipal parking spaces
- Supermarket parkings : Migros, Coop
- Motorway A2: Rastplatz Sonnenberg West, Mühlematt West

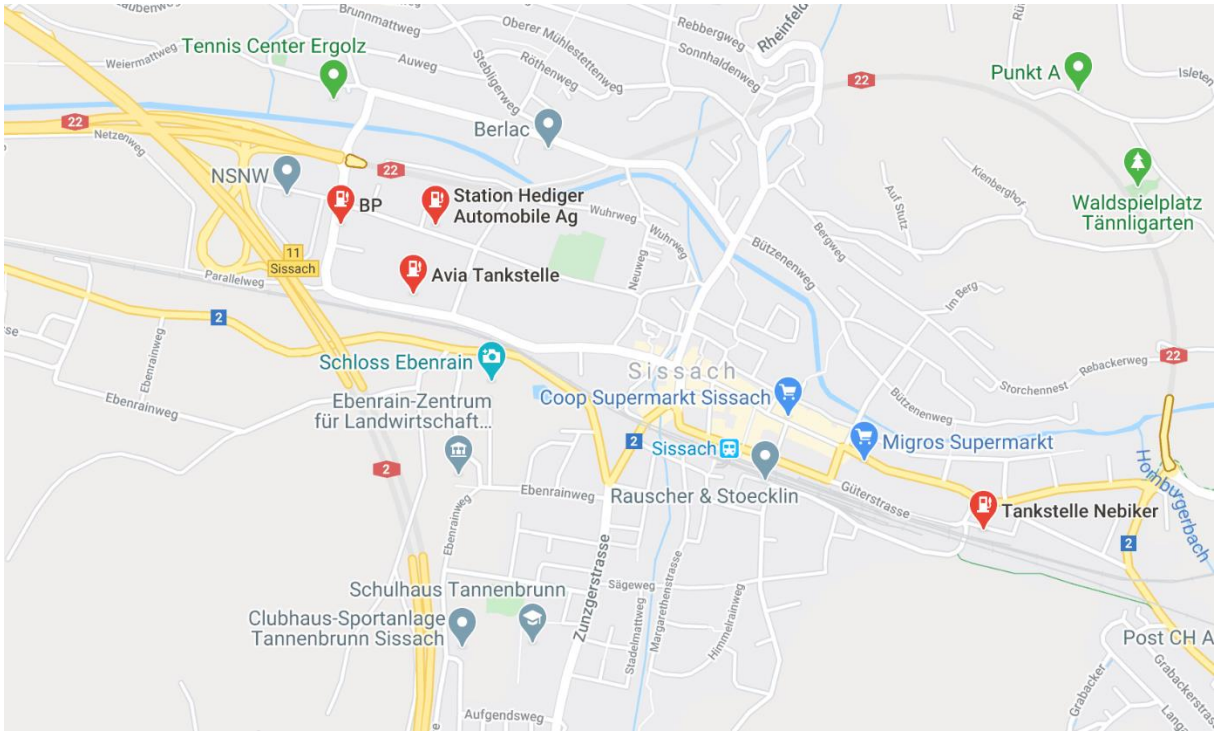

Figure 12: Points of interest Sissach
Source: (Google Maps, 2020)

As revealed by eMobility experts, a charging infrastructure (or other eMobility services) has to be centrally located in order to gain interest from the general public as the charging is often executed while doing another activity such as shopping, working or commuting. As a result, parking spaces near the railway station as well as centrally located municipal parking spaces are favoured for a possible eMobility services by Elektra Sissach.

4.3 Scenarios for Sissach

The EBP has published three different eMobility scenarios in its background report "Szenarien der Elektromobilität in der Schweiz - Update 2018". “BAU” is a trend scenario whereas “EFF” and “COM” are target scenarios. The occurrence of these scenarios depends on conditions, which are listed below. Furthermore, Sissach-specific output data, presented in Tables 6, 7 and 8, for the time span of 2020 to 2040 is presented in the area of PHEV and BEV new registrations, vehicle fleets as well as additional electricity demand (in MWh/a) and number of charging processes (in 1000) per year.

4.3.1 Business As Usual Scenario (BAU)

This scenario considers further tightening of emission regulations for new passenger cars. Switzerland adopts the EU regulations whit a new target value of 95 g CO_2/km in 2021. (EBP, 2018)

Table 6: Business As Usual scenario (BAU)
Source: adapted from (EBP, 2020b)

BAU	2020	2022	2024	2026	2028	2030	2032	2034	2036	2038	2040
New registrations (absolute)											
PHEV	3	4	5	7	9	11	13	15	17	19	20
BEV	11	14	21	28	36	44	54	63	73	83	92
Vehicle fleet (static)											
PHEV	5	12	24	39	58	81	108	136	166	197	227
BEV	15	47	92	153	231	326	435	559	693	835	983
Electricity demand in MWh/a, including losses											
Total	44	170	314	492	702	941	1200	1476	1772	2087	2408
Number of charging processes [in 1'000]											
Total	6	16	30	48	70	94	120	146	176	211	247

4.3.2 Efficiency Scenario (EFF)

Additional promotion and incentive instruments will be introduced for efficient vehicles in order to achieve the 2030 / 2035 targets of the Energy Strategy for road mobility. Technology-neutral promotion instruments (for very efficient internal combustion vehicles, for plug-in hybrids, for purely electric vehicles and for fuel cell and biofuel vehicles) are preferred. The total revision of the CO_2 Act for the period after 2020 pursues a further tightening of the CO_2 regulations for vehicles in the years 2025 and 2030 in line with the EU. The development of the charging infrastructure will be coordinated and its introduction in public road space will be facilitated. Furthermore, minimum requirements will be introduced for the fast-charging infrastructure. (EBP, 2018)

Table 7: Efficiency scenario (EFF)
Source: adapted from (EBP, 2020b)

EFF	2020	2022	2024	2026	2028	2030	2032	2034	2036	2038	2040
New registrations (absolute)											
PHEV	3	7	11	15	19	23	26	28	30	31	32
BEV	12	17	26	35	44	54	66	79	91	102	113
Vehicle fleet (static)											
PHEV	5	20	43	76	118	168	222	277	329	377	418
BEV	17	55	110	187	284	401	537	691	857	1033	1214
Electricity demand in MWh/a, including losses											
Total	48	209	422	690	1008	1367	1748	2144	2553	2970	3376
Number of charging processes [in 1'000]											
Total	6	19	37	61	89	120	151	182	217	258	299

4.3.3 Connected Mobility Scenario (COM)

For energy system considerations, electric cars are specifically promoted. Higher energy and mobility prices lead to changes in mobility behavior: Because longer distances are covered more by combining car and train, fewer long-distance passenger cars are needed. An increasing proportion of vehicle kilometers is covered by small electric vehicles. The total revision of the CO_2 Act for the period after 2020 pursues a significant tightening of CO_2 regulations for vehicles over the years 2025 and 2030 in line with the EU. (EBP, 2018)

Table 8: Connected Mobility scenario (COM)
Source: adapted from (EBP, 2020b)

COM	2020	2022	2024	2026	2028	2030	2032	2034	2036	2038	2040
New registrations (absolute)											
PHEV	5	14	22	31	40	49	55	56	56	54	51
BEV	14	21	33	47	60	74	90	108	124	139	151
Vehicle fleet (static)											
PHEV	7	35	83	151	240	347	464	575	670	745	796
BEV	19	65	136	239	372	532	717	929	1160	1402	1644
Electricity demand in MWh/a, including losses											
Total	54	271	593	1021	1543	2133	2749	3365	3969	4547	5059
Number of charging processes [in 1'000]											
Total	7	25	52	88	131	177	224	267	314	368	418

5 Situation Analysis – Elektra Sissach

Elektra Sissach is the local energy and telecommunication provider of Sissach. It is operated as a cooperative association and has around 15 employees. The local energy provider supplies around 4500 customers with electricity every year. In addition, there are 2400 broadband customers in the telecommunication sector. The forthcoming liberalisation of the electricity market and constant technological advances in the energy and telecommunications sectors are leading to changes in both markets. In order to meet future customer requirements in the areas of energy supply and broadband technology, Elektra Sissach is working, with the support of the Competence Centre Energy Economics at the Lucerne University of Applied Sciences and Arts, on a new strategy for the optimal positioning in both markets. (Schneider & Jurt, 2020)

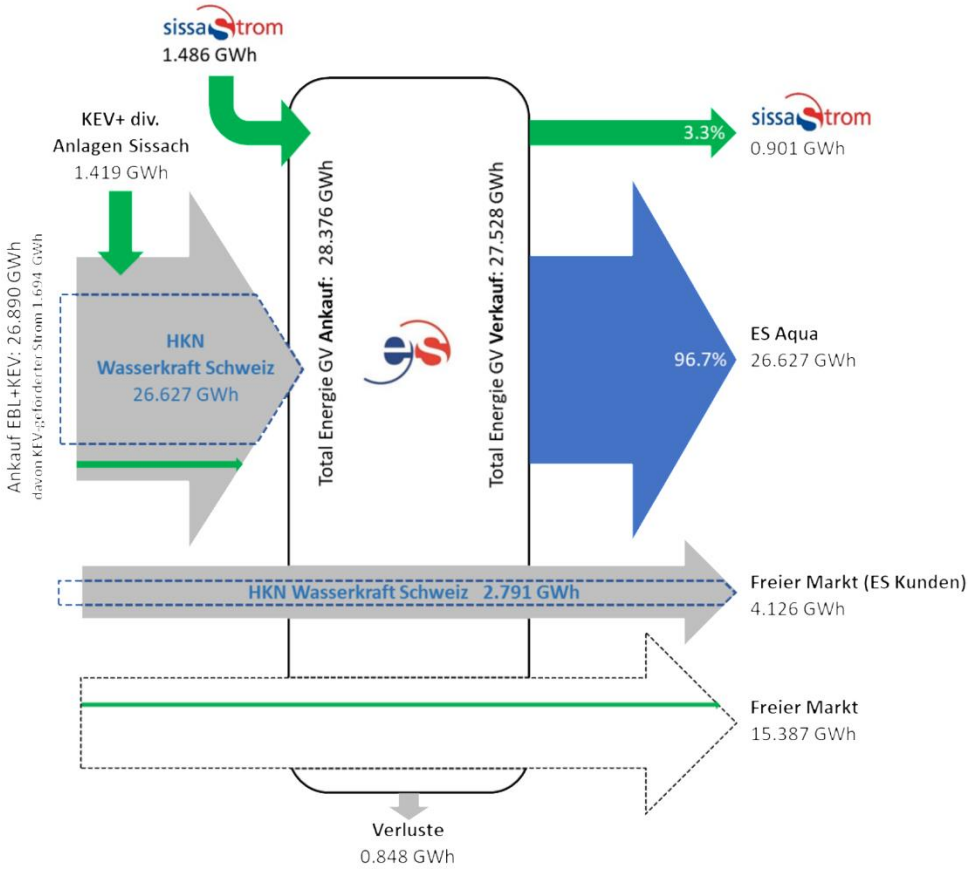

Figure 13: Energy flow in the grid of Elektra Sissach in 2019
Source: (Elektra Sissach, 2020)

As can be seen in Figure 13, Elektra Sissach sold 0.901 GWh of renewable sissastrom with a slightly higher Tariff (HT ≈ 22 Rp./kWh) in 2019, which represents only 61% of the generated sissastrom. Besides the sissastrom, 26.627 GWh of ES Aqua (HT ≈ 18 Rp./kWh), hydro power generated energy, were sold. The surplus of sissastrom is rather high and therefore, 40'000 kWh were sold in the form of HKN certificates in 2019. In addition, Elektra Sissach customers purchased 4.126 GWh on the open market. Another 15.387 GWh were purchased on the open market by non-Elektra Sissach customers, however they used the grid of Elektra Sissach. The losses accounted to 0.848 GWh in 2019. (Elektra Sissach, 2020)

5.1 SWOT Analysis

In this chapter a SWOT analysis is used to address the internal strengths and weaknesses of Elektra Sissach as well as opportunities and possible threats in regard to Elektra Sissachs business in the future.

Table 9: SWOT analysis Elektra Sissach

Strengths	Weaknesses
▪ Economically healthy financial situation ▪ Local anchoring in the region of Sissach ▪ Good reputation ▪ sissastrom	▪ Space conditions at site ▪ Marketing ▪ Customer relationship in regard to eMobility ▪ Rather reactive business approach in past years ▪ Digitalization of business activities ▪ Limited know-how
Opportunities	**Threats**
▪ eMobility (Charging stations, eCar sharing, consulting, …) ▪ SMART grid ▪ Dynamic tariffs ▪ Storage systems (2nd life batteries) ▪ Partnerships	▪ Lose connection to competition ▪ Future load management ▪ Data security ▪ Competitors ▪ Size of company ▪ Liberalization of electricity market

5.1.1 Strengths

The described strengths such as the economically healthy financial situation, the good reputation and their local anchoring in the society protrude. Furthermore, the renewable sissastrom indicates an environmental conscious approach by Elektra Sissach. The sissastrom can be further extended and promoted in the future as the trend towards more renewable energies will continue.

5.1.2 Weaknesses

Weaknesses are, space conditions at the site, marketing, customer relationship in regard to eMobility and a rather reactive business approach in the past years. Currently, the number of private charging stations in operation in Sissach is unknown for Elektra Sissach. Since energy consumption in the eMobility sector will rise steadily in the coming years, it is important for Elektra Sissach in the future to be aware of the number of possible charging processes and the associated required charging energy. In a more and more digitalised world, digitalization of business activities is necessary to a certain degree. Due to the rather small company size, the know-how for example in regard to eMobility, is limited until now.

5.1.3 Opportunities

There are various opportunities for Elektra Sissach in the currently changing energy environment. The surplus of sissastrom can be further pushed and utilised for example in the eMobility sector for the charging of eCars. Currently, discussions about the invention of SMART meters are held. SMART meters are the basis for a change towards a SMART grid and the possibility to a more flexible and stable grid. Furthermore, it supports the integration of new renewable energy sources as well as decentralized storage systems. (Ecoplan, 2015)

5.1.4 Threats

In the region of Basel, larger companies such as EBL or IWB are already active in the eMobility market. EBL is currently in the planning phase of the Swiss eMobility hub in Pratteln (BL), an innovation centre for eMobility equipped with 280 charging stations whereas 60 of them are superchargers. (Genossenschaft Elektra Baselland EBL, 2018) For Elektra Sissach, loosing connection to nearby competition can be regarded as a threat. Furthermore, it should also be noted that the current developments in the field of eMobility will soon lead to higher energy demands in Sissach and therefore to a more heavily loaded grid. The possible liberalization of the electricity market in Switzerland and new emerging competitors in the eMobility market are also seen as threats.

6 Strategy Development

This chapter contains the development, evaluation and selection of possible business options in regard to eMobility for Elektra Sissach. The following business options were determined based on the findings gained in the Situation Analysis.

6.1 Development of Business Options

During an online meeting in week 7 with Mr. Stephan Jurt and Dr. Achim Schneider, a discussion was held about the already developed business options for Elektra Sissach. During the virtual meeting it already became obvious, by considering the facts presented in the Situation Analysis, that certain business options for Elektra Sissach would not be further elaborated. Limited resources of the rather small company and the prevailing competition in certain fields in Sissach would impede a market entry in these areas. The discarded business options, followed by the remaining business options and their descriptions, are presented below.

6.1.1 Discarded Business Options

In Table 10, the seven discarded business options for Elektra Sissach are listed and described. The Reasoning column provides information on why these business options will not be elaborated on in more detail.

Table 10: Discarded business options

No.	Business Option	Description	Reasoning
1	Sale of hardware and software products	This business option would include the sale of charging stations, charging plugs, charging cables, monitoring software and billing tools.	In this field, prevailing competition, high effort, know-how and low margins makes an entry in this market unattractive for Elektra Sissach.
2	Maintenance services	This business option proposes the maintenance of charging infrastructure for external charging station operators.	Charging infrastructure and charging networks do not require a lot of maintenance.
3	Realization of private and public charging station	This business option would include the planning, installation, operation, sale and insurance of charging stations for private or public use.	Elektra Sissach does not employ electrical installers which are required for this business option. Furthermore, there are already other companies, in the region of Sissach, active in this field.
4	Acquisition of used car batteries	This business option proposes the purchase of used car batteries which could be integrated in the grid as storage systems or which could be sold at a later stage.	Aspects such as storing places, safety measures and know-how about battery technology makes this business option hardly realisable for Elektra Sissach.

5	PV systems in combination with charging station infrastructure	This business option proposes the entry into the Photovoltaic system market in combination with charging station infrastructure.	In Sissach, there are already other established companies offering the planning, installation and monitoring of PV systems.
6	Vehicle-to-Grid	This business option proposes the use of eCars as storage systems to store the excess energy during the day.	People would store energy only for themselves and it does not have a high influence on the electricity grid in Sissach according to Stephan Jurt.
7	eBike charging infrastructure	This business option proposes the installation and operation of charging infrastructure for eBikes at public places or the exchange of battery packs at a fixed location.	Charging of eBikes mostly takes place at home. A 230V outlet is sufficient for the charging. Furthermore, different eBikes – different charging plugs and cables which makes it challenging to set up public uniform charging stations.

6.1.2 Business Option 8: 2 Charging Stations at Company Site

Business option 8 proposes the operation of 2 charging stations at the site of Elektra Sissach for own usage, business clients, suppliers & agents and private individuals with eCars. The charging stations can be used free of charge during the day, during night-time the NT is used. As the site of Elektra Sissach is not centrally located, private individuals would rather make us of more centralized charging stations according to eMobility expert Remo Müller, CEO of allthisfuture. As a result, this business option can be seen as an additional services for the named parties. More information about the benefits for customers, creation of benefits and revenue can be found in Table 11.

Table 11: Business Option 8: 2 Charging Stations at Company Site

Dimension	Description
Who are the target customers?	▪ Business clients ▪ Suppliers & agents ▪ Private individuals
What is the benefit for the customer?	▪ Free charging during daytime with renewable sissastrom. ▪ Charging during night-time at low tariffs, no parking fees. ▪ Easy access through Elektra Sissach membership card. ▪ Investment costs for a private charging infrastructure can be reduced.
How is the benefit created?	▪ 2 Charging stations at the company site are made available free of charge during daytime, and at low tariffs during night-time, customers benefit also from free parking.
How does the company earn money?	▪ Sale of electricity during night-time ▪ Image boost ▪ Customer loyalty

For the consequent evaluation of business option 8, data from 2021 to 2025 of the eMobility scenario Efficiency (EFF) are considered. At Elektra Sissach's site, a share of 5% of the overall electricity demand for eMobility in Sissach is assumed. For the calculation of average costs per year, investment and operation costs within the 5-year period are taken into consideration. The average revenue per year results from the charging at night at a low ES Aqua tariff of approximately 0.134 Rp./kWh. A possible solution includes two 22kWh AC charging stations from zaptec, distributed by NovaVolt AG. A management tool for the monitoring of the charging stations is included according to Lukas Bucher, Project & Sales Manager at NovaVolt AG. During the day, sissastrom is used for the charging of eCars as far as possible whereas during the night, ES Aqua would be used. Further insights on calculations, tariffs and the evaluation of the remaining criteria can be gained in the Excel file "Evaluation Business Options Elektra Sissach".

6.1.3 Business Option 9: eMobility Consulting Services

Business option 9 proposes online or on site eMobility Consulting Services for private individuals, local companies or members of municipalities. According to the eMobility survey presented in the Social Description chapter, there is still a great amount of ignorance among the public in regard to eMobility services. Furthermore, 50% of the participants stated that they would make use of eMobility consulting services provided by the energy provider. The consulting could be done personally, through forms, information and application documents online on the website of Elektra Sissach or through the organization of events to promote eMobility in Sissach. For the implementation of a resulting project, a cooperation with an established company should be considered. More information about the benefits for customers, creation of benefits and revenue can be found in Table 12.

Table 12: Business Option 9: eMobility Consulting Services

Dimension	Description
Who are the target customers?	▪ Private individuals ▪ Local companies ▪ Municipalities
What is the benefit for the customer?	▪ Easy and free access to forms, information and application documents provided on the website. ▪ Competent advice from consultants avoids mistakes in the planning phase.
How is the benefit created?	▪ Forms, information and application documents are made available free of charge on the website. ▪ External or internal eMobility consultants operating at company site.
How does the company earn money?	▪ Image boost ▪ Customer loyalty ▪ Fee for consulting services

For the consequent evaluation of business option 9, data from 2021 to 2025 of the eMobility scenario Efficiency (EFF) are considered. For the consulting service at Elektra Sissach's site, the number of new registered PHEV and BEV in the future in Sissach are of interest. An assumption is made, that 75% of the individuals interested in buying an eCar in that period would make use of such a consulting service at Elektra Sissach. For the calculation of average costs per year, investment and operation costs within the 5-year period are taken into consideration. According to Remo Müller CEO of allthisfuture, the willingness-to-pay of individuals for consulting services are rather low. Therefore, a moderate fee of 100 CHF is incorporated for a consulting service of 2 hours. The internal costs of Elektra Sissach are assumed to be around 250 CHF per meeting. The development of know-how or the hiring of an external consultant to execute the consultancy as well as informing documents are included in these costs. In addition, around 3000 CHF a year are included for editing and updating the website. Further insights on calculations and the evaluation of the remaining criteria can be gained in the Excel file "Evaluation Business Options Elektra Sissach".

6.1.4 Business Option 10: Park & Charge

Business option 10 proposes the operation of a public charging station with two charging points for commuters, shoppers, workers and travellers at parkings of the municipality, supermarkets or train stations. For this business option, a central location is necessary to attract as many people as possible. Parking spaces at the train station in Sissach or central parking spaces of the municipality would do well. For the realization of this business option, a partnership with an established company in the charging market would be inevitable. By using sissastrom for the charging, the surplus could be reduced. Furthermore, people could be made aware of the renewable sissastrom through advertisement. More information about the benefits for customers, creation of benefits and revenue can be found in Table 13.

Table 13: Business Option 10: Park & Charge

Dimension	Description
Who are the target customers?	▪ Commuters ▪ Shoppers ▪ Workers ▪ Travellers
What is the benefit for the customer?	▪ Charged car after commute, shopping, work, travel. ▪ Longer charging times reduce the charging power and therefore the costs. ▪ The combination of parking and charging at the same time.
How is the benefit created?	▪ Frequently used parking spaces are equipped with a charging infrastructure to satisfy the needs of parking and charging at the same time.
How does the company earn money?	▪ Compensation Move ▪ Parking fee ▪ (Advertisements on charging stations)

For the consequent evaluation of business option 10, data from 2021 to 2025 of the eMobility scenario Efficiency (EFF) are considered. At a central location such as the parking spaces at the railway station in Sissach, a share of 5% of the overall electricity demand for eMobility in Sissach is assumed. For the implementation of this solution, a 22kWh AC charging station from zaptec with two charging points is integrated into the Move charging network. Due to this integration, Move-support for customers in case of problems is guaranteed. In addition, the consumption data can be exported either into the billing software (if compatible) of Elektra Sissach or separately into an excel file. These measures reduce the workload for Elektra Sissach. For the calculation of average costs per year, investment and operation costs within the 5-year period are taken into consideration. The average revenue per year results from a compensation per charged kWh of 0.33 CHF, paid by Move to Elektra Sissach. Further insights on calculations and the evaluation of the remaining criteria can be gained in the Excel file “Evaluation Business Options Elektra Sissach”.

6.1.5 Business Option 11: Tariff Incentive System for eMobility

Business option 11 proposes the introduction of a tariff incentive system for eMobility which would make charging eCars during the day more attractive to customers. Benefits are apparent for customers as lower tariffs lead to reduced electricity costs. For Elektra Sissach, the surplus of the renewable sissastrom could be reduced. However, a rollout of SMART meters is necessary to enable this service. A tariff incentive system could lead to reduced peak loads mainly at noon and in the evening. Monitoring of the grid leads to a more efficient use of the resources and as a result contributes to the reduction of grid costs. More information about the benefits for customers, creation of benefits and revenue can be found in Table 14.

Table 14: Business Option 11: Tariff Incentive System for eMobility

Dimension	Description
Who are the target customers?	▪ Real estate owners, administrations ▪ Private individuals ▪ Local companies ▪ Municipalities
What is the benefit for the customer?	▪ Lower tariffs – reduced electricity costs
How is the benefit created?	▪ Through a tariff incentive system, lower sissastrom tariffs for customers
How does the company earn money?	▪ Selling sissastrom with incentivized tariff instead of the lower ES Aqua tariff ▪ Power quality – image boost ▪ (Governmental subsidies)

For the consequent evaluation of business option 11, electricity consumption data from 2021 to 2025 of the eMobility scenario Efficiency (EFF) are considered. A share of 60% of the total eMobility electricity consumption in Sissach was assumed to be consumed from 08:00 and 11.00 as well as from 13:00 to 17:00 when creating a tariff incentive of 2 Rp./kWh. This measure leads to a reduction of the sissastrom surplus, which is normally sold at the lower ES Aqua tariff. With a tariff incentive of 2 Rp./kWh at the above-mentioned times in the eMobility sector, Elektra Sissach customers can use renewable sissastrom to recharge their electric vehicles at a reduced price. Elektra Sissach could also slightly increase its revenues as the incentivized sissastrom tariff (19.66 Rp./kWh) is about 2 Rp. higher than the ES Aqua tariff (17.91 Rp./kWh) normally used for the sale of the sissastrom surplus. For the calculation of average costs per year, data from the report “Smart Metering Roll Out – Kosten und Nutzen” are considered. The various costs are indicated per meter and were extrapolated to the total number of meters (2019) of Elektra Sissach. Further insights on calculations, tariffs and the evaluation of the remaining criteria can be gained in the Excel file “Evaluation Business Options Elektra Sissach”.

6.1.6 Business Option 12: eCar Sharing Partnership

Business option 12 proposes an eCar Sharing Partnership which enables inhabitants of Sissach, to rent an eCar in a cost-efficient and environmentally friendly way. By using renewable sissastrom for the charging of the eCar, the surplus of sissastrom could be reduced. For marketing and image reasons, the eCar could be equipped with well-designed Elektra Sissach advertisement. Furthermore, inquisitive people interested in buying an eCar could gather initial experience. For this option, a central location is essential as well. At the train station in Sissach, the carsharing operator mobility in cooperation with SBB is already active. However, this should not prevent Elektra Sissach from an entry in this market and the possibility of an attractive marketing opportunity. More information about the benefits for customers, creation of benefits and revenue can be found in Table 15.

Table 15: Business Option 12: eCar Sharing Partnership

Dimension	Description
Who are the target customers?	▪ Private individuals without an own car ▪ Environmental conscious individuals ▪ Commuters
What is the benefit for the customer?	▪ Lower expenditure on mobility ▪ No commitment, contract ▪ Contribution to the environment
How is the benefit created?	▪ A partnership with an eCar Sharing Provider enables customers access to an eCar and therefore to a cost-efficient and environmentally friendly mobility service.
How does the company earn money?	▪ Hourly / daily fees ▪ Image boost

For the consequent evaluation of business option 12, Mr. Rohs, Head of eMobility at AEW Energie AG, was contacted. AEW Energie AG in cooperation with E-Cargovia offer eCar Sharing services which are applicable for energy provider. An electric BMW i3 with a leasing contract of three years (12'000 CHF) is used as a base case for the calculations. A cautious assumption was made that the eCar sharing offering of Elektra Sissach will be used for an average of 3 hours a day, 200 days a year. Furthermore, it was assumed that on 40 days in the year, the duration of use is over 8 hours and counts as a full day. The hourly fee of 8 CHF and daily fee of 65 CHF are considered for the calculation of average revenue per year. For the calculation of average costs per year, investment and operation costs, such as leasing, hard- & software and electricity costs etc., within the 5-year period are taken into consideration. Further insights on calculations, tariffs and the evaluation of the remaining criteria can be gained in the Excel file "Evaluation Business Options Elektra Sissach".

6.2 Evaluation of Business Options

The evaluation of the five remaining business options is based on calculations, expert opinions, discussions and reasoned assumptions. Table 16 shows the operationalization of the evaluation criteria which is based on the excel file "Evaluation Business Options Elektra Sissach". The excel file contains calculations as well as justifications regarding the individual assigned scores. In Table 17, the assigned scores and their respective weighting factors are presented and summed up to a final score.

Table 16: Operationalization of evaluation criteria

Operationalization of Evaluation Criteria						
Criteria		**Business Option 8: 2 Charging Stations at Company Site**	**Business Option 9: eMobility Consulting Services**	**Business Option 10: Park & Charge**	**Business Option 11: Tariff Incentive System for eMobility**	**Business Option 12: eCar Sharing Partnership**
Attractiveness	Revenue in CHF	< 1'000 (1)	1'000 – 5'000 (2)	5'000 – 10'000 (3)	1'000 – 5'000 (2)	5'000 - 10'000 (3)
	Risk	High (2)	Moderate – High (2.3)	Moderate – High (2.7)	Moderate – High (2.3)	Low – Moderate (3.7)
	Contribution to Image	Moderate – High (3.3)	Moderate – High (3.8)	Moderate – High (3.8)	Moderate – High (3.5)	High (4)
	Synergistic Effects	2 (3)	2 (3)	2 (3)	3 (4)	3 (4)
Feasibility	Costs in CHF	1'000 – 5'000 (4)	5'000 – 10'000 (3)	5'000 – 10'000 (3)	10'000 – 20'000 (2)	5'000 – 10'000 (3)
	Human Resources	Medium workload (3)	Medium – High workload (2.3)	Small workload (4)	Medium workload (3,2)	No additional – Small workload (4.3)
	Technological	Normal to implement (4)	Normal – Hard to implement (3.7)	Normal to implement (4)	Challenging to implement (2)	Normal to implement (4)
	Realization Time	Low (4)	Low - Moderate (3.3)	Low (4)	Very High (1)	Low (4)

Table 17: Multi criteria decision making of business options for Elektra Sissach

Criteria		Weighting	Business Option 8: 2 Charging Stations at Company site		Business Option 9: eMobility Consulting Services		Business Option 10: Park & Charge		Business Option 11: Tariff Incentive System for eMobility		Business Option 12: eCar Sharing Partnership	
			Score	Acc. Score	Score	Acc. Score	Score	Acc. Score	Score	Acc. Score	Score	Acc. Score
Attractiveness	Revenue	0.06	1.0	0.06	2.0	0.11	3.0	0.17	2.0	0.11	3.0	0.17
	Risk	0.33	2.0	0.67	2.3	0.78	2.7	0.89	2.3	0.78	3.7	1.22
	Contribution to Image	0.31	3.3	0.99	3.8	1.14	3.8	1.14	3.5	1.07	4.0	1.22
	Synergistic Effects	0.31	3.0	0.92	3.0	0.92	3.0	0.92	4.0	1.22	4.0	1.22
	Final Score			**2.63**		**2.95**		**3.12**		**3.18**		**3.83**
Feasibility	Costs	0.3	4.0	1.19	3.0	0.89	3.0	0.89	2.0	0.59	3.0	0.89
	Human Resources	0.42	3.0	1.26	2.3	0.98	4.0	1.68	3.2	1.35	4.3	1.82
	Technological	0.23	4.0	0.92	3.7	0.84	4.0	0.92	2.0	0.46	4.0	0.92
	Realization Time	0.05	4.0	0.21	3.3	0.18	4.0	0.21	1.0	0.05	4.0	0.21
	Final Score			**3.58**		**2.89**		**3.70**		**2.45**		**3.84**
Total Score				**6.21**		**5.84**		**6.82**		**5.63**		**7.68**

6.3 Selection of Business Options

The final scores of the criteria subgroup's attractiveness and feasibility were incorporated into a matrix as can be seen in Figure 14.

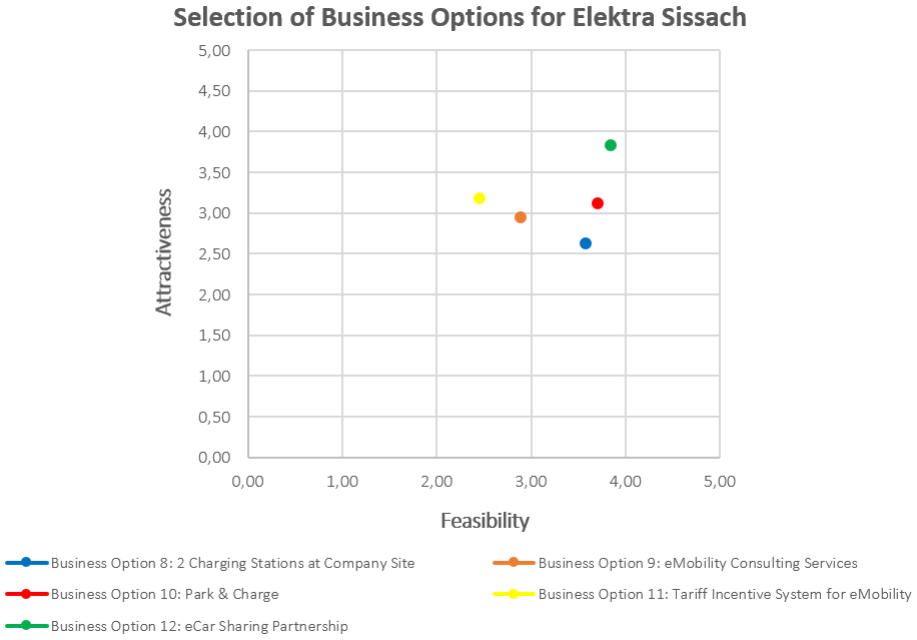

Figure 14: Selection of business options for Elektra Sissach

By considering Figure 14 and the individual awarded total scores in Table 17, it can be seen that Business Option 10: Park & Charge and Business Option 12: eCar Sharing Partnership are the most appropriate solutions under the prevailing circumstances.

The execution of a sensitivity analysis, in which the attractiveness and feasibility criteria were given uniform weightings of 0.25, showed that the Business Options 10: Park & Charge (Total Score: 6.85) and the Business Option 12: eCar-Sharing Partnership (7.5) continue to have the highest total scores. Business Option 11: Tariff Incentive System for eMobility achieved a lower total score (5.01) under the new weighting factors as the long implementation time as well as the complex technology are of more consequence. Furthermore, the sensitivity analysis revealed that Business Option 8: 2 Charging Stations at Company site (6.06) achieved a lower total score under the changed conditions. The total score of Business Option 9: eMobility Consulting services (5.85) remained constant.

In an online meeting at the end of May, the evaluation as well as the subsequent selection of the business options were discussed and verified with Mr. Stephan Jurt, managing director of Elektra Sissach.

7 Results - Implementation of eMobility Strategy

This chapter contains the implementation of the eMobility strategy for Elektra Sissach. The final description chapter provides information on how the selected business options are incorporated into an eMobility strategy. The implementation roadmap, illustrated in Figure 15, shows the chronological progression of the chosen strategy, including the necessary working steps of Elektra Sissach as well as of the external partners involved. In addition, the revenue – cost structure section provides information on the financial aspects of the recommended eMobility strategy. The subsequent Discussion (Reasoning) section states the reasons for the chosen strategy.

7.1 Final Description

The main objective of the strategy is to gain know-how and experience in the field of eMobility during the next years. At this stage (Now), the strategy foresees that two centrally located parking spaces (at Sissach railway station or municipal parking spaces) will be equipped with a charging infrastructure. Elektra Sissach is responsible for providing the two parking spaces as well as the required electricity (sissastrom, as far as possible). In addition, Elektra Sissach is responsible for marketing the newly created offering and its benefits to possible customers. External partners such as NovaVolt AG and Move are in charge for the procurement and installation of the charging station and its integration into the Move charging network.

At a later stage (Soon), an eCar sharing service will be introduced at one of the two previously with charging infrastructure equipped parking spaces. The existing charging infrastructure will continue to be available for public charging, as well as for the eCar Sharing. A BMW i3, with all the necessary services such as billing, insurance, support etc., is being used from the companies AEW / E-Cargovia. Elektra Sissach continues to provide the necessary charging infrastructure as well as the required electricity (sissastrom, as far as possible) for the charging. Furthermore, the organization of an opening event as well as the labelling of the BMW i3 belong to Elektra Sissachs marketing tasks.

At an even later stage (Later), the idea of Business Option 11: Tariff Incentive System for eMobility should be revisited. As of today, the necessary infrastructure (Smart Grid) in the supply area of Elektra Sissach is not in place and therefore makes the implementation of a tariff incentive system for eMobility impossible.

7.2 Implementation Roadmap

The implementation roadmap shows the chronological progression of the recommended eMobility strategy for Elektra Sissach. On the horizontal axis, the time is displayed in the form of now, soon and later. The light grey boxes indicate the scope of duties of Elektra Sissach, whereas the dark grey boxes provide information on duties of external partners. The two red stars, placed above the business options 10 and 12, mark the approximate start of operation of each business option. The yellow hatched box does not represent the introduction of Business Option 11 but recommends its consideration under the circumstances existing at that time.

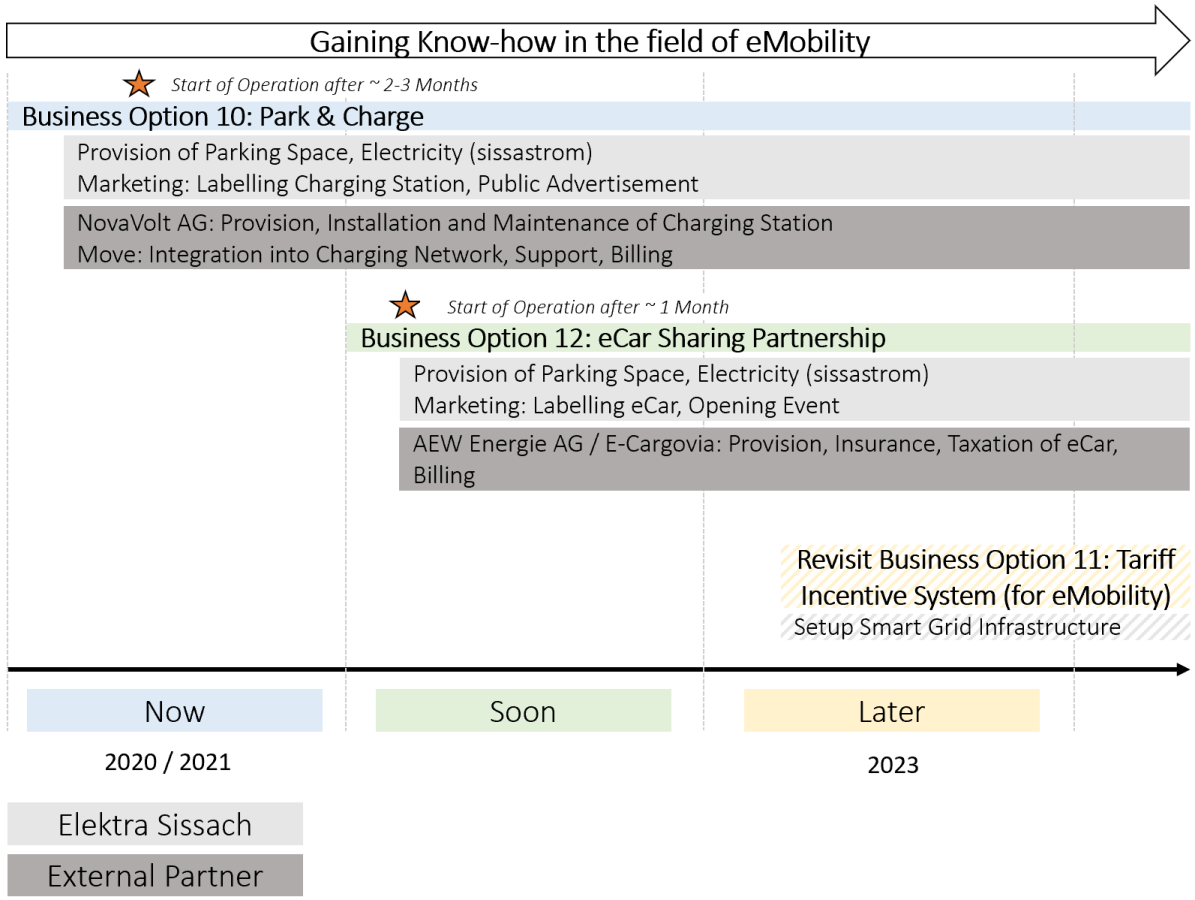

Figure 15: Implementation roadmap eMobility Strategy

7.3 Revenue – Cost Structure

This chapter presents the revenues and costs of the proposed eMobility Strategy. For the calculation of revenues for the Park & Charge option, the amount of charged energy described in the Business Option section (data according to the EFF scenario) is used. For the eCar Sharing option, the assumed operating hours of the eCar are offset against the E-Cargovia tariffs. The costs result from the one-off investment costs of the charging infrastructure and the resulting annual operating costs such as the integration into the Move network, electricity consumption, parking fees and eCar leasing. In Figure 16, it can be seen that losses are made in the first two years. In the years 2023 to 2025, profits are finally generated. However, over the 5-year period, a loss of approximately 1000 CHF is generated.

Business Option 10: Park & Charge					
Revenue in CHF	**2021**	**2022**	**2023**	**2024**	**2025**
Payment Move	2016	3445	5093	6960	9057
Parking Fee	208	356	526	719	936
Total	**2224**	**3801**	**5619**	**7679**	**9993**
Cost in CHF					
Charging Infrastructure incl. Inst.	3500	0	0	0	0
Additional Charging Point	100	100	100	100	100
Integration Move Network	250	250	250	250	250
Sissastrom (daytime)	596	1 018	1 505	2 056	2 676
Es Aqua (nighttime)	98	167	247	337	439
Parking Spaces	4800	4800	2400	2400	2400
Total	**9343**	**6335**	**4502**	**5144**	**5865**
Business Option 12: eCar Sharing Partnership					
Revenue in CHF	**2021**	**2022**	**2023**	**2024**	**2025**
Payment "Hours"		4800	4800	4800	4800
Payment "Days"		2600	2600	2600	2600
Total		**7400**	**7400**	**7400**	**7400**
Cost in CHF					
Leasing BMW i3		4000	4000	4000	4000
Sissastrom (daytime)		783	783	783	783
Parking Space		2400	2400	2400	2400
Total		**7183**	**7183**	**7183**	**7183**
Profit in CHF	**-7119**	**-2317**	**1334**	**2752**	**4345**
Total Profit in CHF (2021 - 2025)					**-1005**

Figure 16: Revenue - cost structure eMobility strategy

As a remark, marketing and advertisement costs as well as costs for any additional power lines for the provision of the charging infrastructure are not included in the revenue – cost structure presented in Figure 16.

7.4 Discussion (Reasoning)

There are a variety of good reasons to implement the presented eMobility strategy, despite a slight financial loss over the five-year period. The proposed entry into eMobility will enable Elektra Sissach to gain initial valuable experience in this emerging and future-oriented field. In addition, new knowledge can be acquired, and useful contacts can be made in the future. An entry at this point in time puts Elektra Sissach in a favourable position, as there are currently no concrete plans in the area of eMobility on the part of the municipality of Sissach, as stated by Fredi Binggeli – president of the energy commission.

The two business options selected by the multi criteria evaluation, Park & Charge and eCar Sharing, have relatively short implementation times, which can be seen as an advantage. In addition, it is possible to offer both options at a central location, which is essential according to eMobility expert Remo Müller. If available, renewable sissastrom can be used to operate the charging infrastructure. These measures contribute in part to reducing the surplus of sissastrom. A step-by-step entry into eMobility makes it possible to identify changes in the eMobility market and to minimise the associated risks.

By implementing the eMobility Strategy, at least two areas identified as weaknesses in the Swot analysis can be improved. On the one hand, the Park & Charge and eCar Sharing options can be used for targeted marketing of sissastrom. A creative labelling of the eCar offers Elektra Sissach a platform to present themselves to the general public as an innovative, future-oriented and environmentally conscious energy company. An opening event at the introduction of the eCar Sharing allows customer relations to be maintained. Interested and curious people can be introduced to the advantages of electric cars powered by renewable energy. In addition, test drives with the eCar will enable the general public to gain first experiences in the field of eMobility. At the same time the event can be used to present new offerings and services in regard to the new FTTH network.

Entering the eMobility market at this point in time enables Elektra Sissach to acquire the know-how needed in the future. According to eMobility expert Remo Müller, it is currently difficult to achieve sustainable profits in the field of eMobility. However, it is essential to position and prepare oneself cleverly, as electromobility will play an even more important role in the field of mobility in the future.

8 Conclusion

The mobility sector is currently undergoing a change, which has been triggered through transforming social behavior, more environmentally conscious thinking of the general public, technological advances and political instruments. Due to these developments, eMobility is becoming increasingly more important. In addition to the automotive industry, energy supply companies are trying to play a central role in this emerging and immature market. This thesis aimed the development of an eMobility strategy and the corresponding positioning of the energy supply company Elektra Sissach in the Swiss eMobility market.

The presented eMobility strategy enables Elektra Sissach to gain initial valuable experience in the field of eMobility, facilitates the reduction of the sissastrom surplus and proposes new marketing possibilities. From a technological perspective, eMobility is currently in a phase, where the adaption of the technology progresses slower-than-expected. Different suppliers, products and services in regard to eMobility currently make standardized solutions difficult. From an economic perspective, generation of large sustainable profits in this emerging and immature market proves to be difficult for small-scale companies at this stage, as revealed by different eMobility experts as well as presented in the revenue-cost structure section (generating a loss of ≈ 1000 CHF from 2021-2025). Nevertheless, Elektra Sissach has now the opportunity to position itself in the local charging- and car-sharing-market and to gain the much-needed knowledge in a future-oriented market. Within 5-10 years, the eMobility technology is expected to be widely accepted, the level of risk to be reduced and the generation of sustainable profits conceivable.

The implementation of the eMobility strategy proposes new marketing opportunities for Elektra Sissach in form of Elektra Sissach advertisement for example on the charging infrastructure and on the eCar. The central location of the Park & Charge- and eCar-sharing-service will enable the general public to be made aware of the innovative and environmentally conscious developments of Elektra Sissach. As the various conducted conversations revealed, the majority of the general public is still ignorant about eMobility and its advantages such as the available financial contributions on the national as well as on the cantonal level. The general public can be gradually introduced to eMobility, for example by enabling test drives at an opening event. At the same time, the advantages of using renewable sissastrom and innovations in the newly planned FTTH network can be promoted / presented.

Since the evaluation of the created business options and the consequent development of the eMobility strategy is based on data from the eMobility scenario “Efficiency”, developed by EBP, there are certain limitations in regard to the accuracy of the predictions (energy consumption of eMobility in Sissach) made. It should also be noted that the various prices and tariffs used for the calculation of revenues and costs might vary over time. Furthermore, it remains unknown on what degree uncontrollable impacts, such as the current Covid-19 virus, affect (car) sharing services in the future.

9 Outlook

This outlook chapter presents aspects of notable future developments in regard to eMobility in the region of Basel as well as nationwide, which could be of relevance for Elektra Sissach.

Starting in 2021, Baselland Transport AG (BLT) will launch a pilot project involving the deployment of five electric buses on line 37 in the city of Basel. According to Philipp Glogg, Head of Vehicles at BLT, this test phase is intended to provide information on the potential of this alternative drive system. As of today, the electric buses will be charged with renewable energy sources at two locations. If the pilot project proves to be successful, an expansion of electric busses on other lines in the region of Basel is conceivable. Depending on the region, a possible expansion of this operation could be of interest for Elektra Sissach. One possible solution would be to use renewable sissastrom for charging the electric buses. By placing Elektra Sissach specific advertisements on the busses, people could be made more aware of the product sissastrom. (BLT Baselland Transport AG, 2019)

The EBP is currently supporting a local bus company, partially operating in mountainous regions, in switching to low-emission, electric buses. The energy supply of the required charging infrastructure will be coordinated with the local energy supply company. In the future, Elektra Sissach could be confronted with similar issues. (EBP, 2020a)

IWB in cooperation with Fritz Meyer AG are reviewing the production of hydrogen at the power plant Birsfelden. The produced hydrogen could be either used for the transport and automotive sector as well as in the industry as a raw material. The offering of Fritz Meyer AG, operator of approximately 100 service station, provides an alternative to the eMobility technology which should be observed. (punkt4 info, 2020)

In addition, decreasing battery prices, enhancements in the eCar- as well as in the charging-technology (inductive charging, ultra-fast charging) are expected in the future. Furthermore, a greater variety of electric vehicles on the market will lead to price reductions and therefore to more attractive offerings for customers. The development of Smart Grids can facilitate the integration of electric vehicles into the grid as storage systems and can contribute to a continued reliable energy supply.

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Appendix A: Interviews

Questions regarding eMobility to three eCar owners of Sissach

(executed in German and core statements translated to English)

- Wie wurden Sie auf die E-Mobilität aufmerksam und was waren Beweggründe für den Kauf eines E-Fahrzeuges?
- Aufgrund welcher Kriterien haben Sie ihr E-Fahrzeug ausgesucht? (Preis, Reichweite, Design, Marke)
- Auf was beruht die Anschaffung eines E-Fahrzeuges bei Ihnen? (Beitrag zur Umwelt, Benzinkosten sind zu hoch, Pionier-Gedanken, …)
- Wie lange besitzen Sie bereits ein E-Fahrzeug?
- Besitzen Sie mehrere E-Fahrzeuge, wenn ja wie viele?
- Bei welchen Instanzen haben Sie sich erkundigt betreffen E-Mobilität vor dem Kauf Ihres E-Fahrzeuges?
- Sind Sie zufrieden mit Ihrem E-Fahrzeug? Was könnte Ihrer Meinung nach besser sein betreffend E-Fahrzeug?
- Wie sehen bei Ihnen die Ladevorgänge Ihres E-Fahrzeuges aus? (Zu Hause, in der Öffentlichkeit, kurze oder lange Ladevorgänge, zu welcher Zeit?)
- Wie sehen bei Ihnen Ladevorgänge an öffentlichen Ladestationen aus? (Beim Einkaufen, beim Kaffee-Trinken, auf Raststätten, …) Wie lange dauern diese bei Ihnen im Durchschnitt?
- Besitzen Sie eine eigene PV-Anlage zu Hause welche Strom für Ihr E-Fahrzeug liefert?
- Was würden Sie sich wünschen betreffend E-Mobilität in der Schweiz? (Bessere öffentliche Ladeinfrastruktur, mehr Anreize seitens Bund und Kanton, …)
- Sehen Sie eine Dringlichkeit das der lokale Energiebetreiber, in diesem Falle die Elektra Sissach, sich bemüht das Thema E-Mobilität in der Gemeinde attraktiver zu machen / zu promoten.
- Welche Angebote seitens Elektra Sissach wären für Sie wünschenswert / würden Sie nutzen?
- Würden Sie bei einem passenden Angebot ein E-Fahrzeug auch mieten oder leasen oder bevorzugen Sie das E-Fahrzeug zu kaufen?

Daniel Löffel (Owner of Nikodemus Broki in Sissach, eCar: Tesla Model S)

09.03.2020 – phone conversation

- "… fascination eMobility was a reason for buying an eCar…"
- "…eager to contribute to the environment, sustainability is important…"
- "…support the pioneering idea and set a good example for others…"
- "…due to interest in eMobility, know-how was acquired through online magazines and literature…"
- "…range of eCar is a decisive factor…"
- "…massive expansion of the charging infrastructure in Switzerland is necessary…"
- "…mostly using Superchargers from Tesla in the public, otherwise the charging takes place at home with a conventional 230V socket."
- "…the standardization of plugs, operation and billing are essential…"
- "…as an "Energie Stadt", Sissach should consider, offering public charging stations at the train station, service stations…"
- "…people need to be made aware of this technology and its advantages…"

- "…in places where the cars just stand around, there is great potential…"

Dieter Schaub (Owner of Schaub Medien AG in Sissach, eCar: Opel Ampera)

03.03.2020 – phone conversation

- "… been dealing with the topic of eMobility for a long time…"
- "… eCars were too expensive for a long time because of the complex technology…"
- "… price, range and space conditions are decisive factors…"
- "…contribution to the environment is a reason, combustion engines are inefficient, electric engines have high efficiencies…"
- "…acquired knowledge through internet research and through discussions with colleagues…"
- "…eCar used 90% for short distances…"
- "…where 70-80% of charging is done at home…"
- "…reasonable price-performance ratio must be created through standardization of charging services…"
- "…standardization of the charging grid as for the electricity grid, energy provider should be in charge for charging stations…"
- "…a SMART-Grid is advantageous, incentives can be created in terms of tariffs…"
- "…leasing or sharing of eCars are possibilities to consider…"
- "…concerns regarding batteries after 8-10 years of lifetime, 2nd life batteries could be used in houses as storage systems…"

Andreas Meier (Owner of Axova AG in Sissach, eCars: Renault Zoe, Tesla Model S & X)

02.03.2020 – phone conversation

- "…the reference to eMobility is related to the profession, the distribution of solar systems…"
- "…the electricity produced by the own PV system (7 kW) can be ideally used to charge eCars, otherwise sissastrom is used…"
- "…it is important in today's world to make a contribution to the environment, and driving an eCar is great fun…"
- "…as the vehicles are used for business purposes, space conditions are decisive…"
- "…due to the professional skills, no external consulting was needed when purchasing the eCar…"
- "…the eVehicles are reliable and satisfactory, ranges and charging infrastructure in Switzerland could be improved…"
- "…the company (Axova AG) has two own charging stations which are used daily, the employees make use of superchargers when they are on the road…"
- "…the charging behavior differs, often charging is done during the day when the employees are working…"
- "…funding measures are not a decision criterion but would certainly be welcomed and appreciated…"
- "…there is a great deal of ignorance among the population on the subject of eMobility, classic car sellers often lack expertise in the field of eCars…"
- "…through the sale of PV systems, we are often contacted by customers when it comes to the purchase of an eCar…"

- "…energy suppliers are a good contact and could take over this task and provide consulting services…"
- "…eCars require little maintenance, there is no need to spend money on petrol and the money can be used for the slightly more expensive renewable electricity…"

Questions regarding eMobility to Fredi Binggeli – President of Energy Commission Sissach

(executed in German and core statements translated to English)

- Gibt es Pläne seitens Gemeinde Sissach bezüglich der Förderung von E-Mobilität in naher Zukunft? Wenn ja, von welchem Zeithorizont sprechen wir? Ist eine Mobilität's Strategie vorhanden?
- Beinhaltet das Label Energie Stadt auch konkrete Bedingungen, welche an den E-Mobilitätssektor geknüpft sind?
- Besitzt die Gemeinde Sissach eine eigene Ladeinfrastruktur (Ladestationen) oder werden private Ladestationen der Öffentlichkeit zugänglich gemacht?
- Besitzt die Gemeinde Sissach E-Fahrzeuge in Ihrem Fuhrpark (Gemeindearbeiterfahrzeuge, etc.)?
- Ist Interesse bezüglich E-Mobilität bei der Sissacher Bevölkerung vorhanden?
- Erkundigen sich öffentliche Personen bei Ihnen (Energie Kommission), wenn es um das Thema E-Mobilität geht?
- Wird die Gemeinde Sissach E-Mobilität Service einsetzen, um Lärmbelastungen oder CO_2 Emissionen in der Gemeinde zu verringern?
- Wie viele Personen besitzen E-Fahrzeuge in der Gemeinde Sissach?
- Besitzen Sie Angaben zum Ladeverhalten von E-Fahrzeugen der Sissacher Bevölkerung?
- Werden die öffentlichen Ladestationen von der Bevölkerung geschätzt und genutzt?
- Welches Businessmodel wird genutzt bei öffentlichen Ladestationen in Sissach?
- Gibt es Anreize (Beiträge, Steuersenkungen, …) seitens Gemeinde Sissach (oder seitens Energiekommission) für Private, Hauseigentümer oder Unternehmen, im Bereich E-Mobilität (Ladeinfrastruktur) zu investieren? Wenn ja welche und wieviel?
- Bei der Beschaffung von Elektrizität, wird die zunehmende E-Mobilität mit eingerechnet oder sind diese Anteile bisher gering?
- Wäre es hilfreich, einen Partner wie zum Beispiel die Elektra Sissach an der Seite zu haben, welche bei Fragen rund um die E-Mobilität assistieren könnte?
- Falls ja, welche Aufgaben sollte / könnte die Elektra Sissach zukünftig übernehmen im Bereich E-Mobilität?
- Wäre es interessant für die Gemeinde Sissach Ladestationen für E-Fahrzeuge anzuschaffen, welche durch die Elektra Sissach betrieben werden, wie z.B. die Strassenlampen?

Fredi Binggeli (President Energy Commission Sissach)

09.03.2020 – written communication

- "…no, the local authority currently has no plans to promote eMobility. Therefore, no strategy has been defined. We recommend that builders of garages, parkings and similar buildings undergoing renovation at least insert empty conduits to make it easier to equip them with charging stations. Otherwise we leave the construction to private investors. We do not want to give away parking spaces "only" for charging stations…"
- "…it is currently unknown whether the Energy City label contains concrete conditions for eMobility…"
- "…the municipality Sissach currently has no charging stations. Private companies, which also rent appropriate vehicles, offer these services…"
- "…we are currently evaluating a wiper vehicle. Open questions are, what is the time required for a loading process? The vehicle should have the shortest possible maintenance times. Furthermore, any operating costs must be analyzed…"
- "…in principle, the population of Sissach has an interest in eMobility, but not at any price…"
- "…sometimes, the population inquires with us when it comes to the topic eMobility. The population is quite well informed and does not want additional information…"
- "…measures to reduce noise levels and CO2 emission are applied in the new construction sector and also in the renovation sector (e.g. new heating systems) but currently eMobility is not considered…"
- "…for eBikes, battery exchange (get e fully charged battery for an empty battery) could be an option as a business model…"
- "…currently, there are no incentives available by the municipality of Sissach for investments in eMobility sector…"
- "…having Elektra Sissach as a possible eMobility partner depends also on the possible added value delivered…"
- "…the strategy adopted becomes more challenging as the time goes by. A large number of voters are unaware of the need to act in a goal-oriented manner. The citizen has voted and must take responsibility. Leaving everything to the state, canton or municipality would be unfair…"

Questions regarding eMobility to an external medium-sized Energy Provider

(executed in German and core statements translated to English)

- Welche Erkenntnisse haben Sie aus der gemachten Umfrage gewonnen?
- Wurden aufgrund dieser Daten bei Ihnen neue Angebote erstellt / neu Geschäftsbereiche eröffnet?
- Welche Geschäftsmodelle könnten für Sie und andere Stromanbieter interessant sein?
- Sollten Stromanbieter vermehrt auch Beratungen im Bereich der eMobility anbieten aufgrund Ihrer Umfrageresultaten?
- Der Wunsch nach eFahrzeugen besteht gemäss Umfrage – sind finanzielle Faktoren hauptsächliche Barrieren?
- Denken Sie, dass so eine Tracking App zu einem geringeren Stromverbrauch führen würde?
- Gibt es Ihres Wissens bereits Stromanbieter in dieser Region welche Anreize bei den Tarifen eingeführt haben?
- Das Wissen über die Existenz und Höhe der Förderbeiträge, in diesem Fall für die Installation einer Solaranlage, sind gemäss den Umfrageresultaten bei mehr als 50% nicht vorhanden. Wie sieht es bei diesem Thema im Bereich der eMobility aus?
- Nach dem Studieren der gesamten Umfrage, was sollte Ihrer Meinung nach in der Schweiz geschehen bezüglich eMobility?

External medium-sized Energy Supplier (Employee in the mobility sector)

25.03.2020 – phone conversation

- "…also due to the survey results, we are now increasingly active in the field of charging infrastructure for real estate administrations, commercial enterprises and municipalities…"
- "…we are confronted with real estate administrations and communities on an almost daily basis and rarely directly with private individuals…"
- "…at the moment, the business models without great risks are applied, as we do not have our own installers, the installations are carried out by external companies. Externally purchased hardware is sold and operated, including infrastructure management services such as billing and monitoring…"
- "…often apartments are rented in Switzerland, so it is often difficult for tenants to have an own charging infrastructure. In addition to the purchase of charging infrastructure, renting these services, to meet the needs of tenants, is possible…"
- "…financial factors as well as the currently small variety of eVehicles are possible barriers, in addition to the small financial incentives in Switzerland…"
- "…there is currently no central office for the simple submission of funding contributions. The number and amount of contributions varies from canton to canton…"
- "…the monitoring of energy consumption by an app usually only works for a short period of time, after a certain time the stimulus decreases. According to a study, the savings potential through tracking is only about 1-2%..."
- "…in Switzerland it is currently not yet possible to create incentives in tariffs as a suitable standard is not yet fully developed. In Norway, dynamic control is already possible…"
- "…financial contributions, a high density of charging stations and a varied and affordable range of eVehicles could give the eMobility in Switzerland a boost in the future…"

Questions regarding eMobility to Remo Müller – eMobility expert and CEO of allthisfuture (Innovation lab of WWZ)

(executed in German and core statements translated to English)

Option 8: Ladestationen bei der Geschäftsstelle der Elektra Sissach

- Wie attraktiv ist Option 8 für Privat Personen Ihrer Meinung nach? (keine unmittelbaren Einkaufsmöglichkeiten oder Aktivitäten möglich in der Umgebung)
- Sollte ein reduzierter Tarif verwendet werden oder sollte das Laden gratis sein und hauptsächlich als «Werbung» dienen?
- Wie hoch sollte die Ladeleistung der Ladestationen auf dem Firmengelände sein?

Option 9: Beratung Elektromobilität (Online durch Informationsbroschüren etc. / Persönlich)

- Macht es Ihrer Meinung nach Sinn, dass EVU's Beratungen im Bereich der Elektromobilität anbieten?
- Was gilt es bei der Beratung speziell zu beachten für EVU's?
- Wäre eine Partnerschaft mit einer etablierten Firma im Bereich der Elektromobilität sinnvoll / zwingend für eine kompetente Beratung?
- Wie effizient und sinnvoll ist eine online «Beratung», basierend auf Dokumenten (Informationen, Formulare etc.) auf der Website der Elektra Sissach?

Option 10: Park & Charge (Öffentliche Parkplätze mit Ladestationen betreiben)

- Welche Standorte eignen sich am besten für ein solches Angebot? (Bahnhof, Einkaufszentrum, Gemeindeparkplätze etc.)
- Gibt es Ladeinfrastruktur Anbieter welche das Betreiben der Ladestationen einem Dritten (in diesem Fall die Elektra Sissach) überlassen?
- Wie attraktiv ist eine solche Lösung für den Drittanbieter? (Aufwand – Ertrag)

Option 11: Einführung Tarif Anreiz System (Überschuss sissastrom zum Laden von E-Fahrzeugen verwenden)

- Wie hoch müssten die Tarif Anreize sein damit es für Kunden attraktiv ist?
- Wie reagieren Kunden auf ein solches Angebot?
- Wie könnte der Verkauf von sissastrom weiter gepusht werden im Bezug zur Elektromobilität?

Option 12: eCar Sharing Partnerschaft

- Gemäss Ihrer Einschätzung, macht ein eCar Sharing Angebot Sinn in einer Gemeinde mit rund 6700 Einwohnern?
- Sollte das Angebot von Elektro Fahrzeugen aus verschiedenen Modellen bestehen oder sollte ein Fahrzeugtyp verwendet werden?
- Wie attraktiv ist eine eCar Sharing Partnerschaft für ein EVU? (nur zu Werbezwecken oder lässt sich damit etwas verdienen?)

Aufgrund Ihrer Erfahrung und Einschätzung, gibt es weitere Anmerkungen, Vorschläge oder Hinweise zu lohnenden Geschäftsmodellen im Bereich der Elektromobilität für eher kleinere EVU's, wie die Elektra Sissach?

Remo Müller (eMobility expert and CEO of allthisfuture)

01.05.2020 – Skype meeting

Option 8: Ladestationen bei der Geschäftsstelle der Elektra Sissach

- "…such an option can be seen as a goodwill action or can be used for marketing reasons…"
- " …the attractiveness of the location of the charging infrastructure has to be given…"
- "… if the business option will be used for marketing reasons – the implementation does make sense. However, generating profits is currently difficult in this field…"

Option 9: Beratung Elektromobilität (Online durch Informationsbroschüren etc. / Persönlich)

- "…an eMobility consulting service does make sense, as there is still a great amount of ignorance among individuals …"
- "…sale of know-how is rather difficult, could make sense as an additional service for customers to increase customer loyalty…"
- "…gaining of know-how and experience takes time and cannot be underestimated…"
- "…as an energy provider, the know-how in regard to eMobility is necessary for future tasks such as connection requests and how to handle the increase in power due to eMobility…"

Option 10: Park & Charge (Öffentliche Parkplätze mit Ladestationen betreiben)

- "…this option does make sense if used in regard to Elektra Sissach's marketing, generating profits requires a large-scale charging infrastructure…"
- "…the case of public charging is not ideal; a lot of companies just want to be part of the change in the mobility sector and gaining initial experience…"
- "…there is a variety of companies offering charging infrastructure as well as services in regard to eMobility…"

Option 11: Einführung Tarif Anreiz System (Überschuss sissastrom zum Laden von E-Fahrzeugen verwenden)

- "…such as system is rather difficult to understand for customers…"
- "…the complexity of the tariff incentive system makes an implementation difficult…"
- "…the degree of use of such a system remains unknown; some people would definitely use it – others do not care about a tariff reduction of 2 Rp./kWh…"
- "…one should not expect too much of such a tariff incentive system for eMobility…"

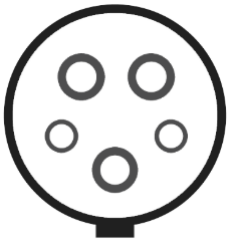
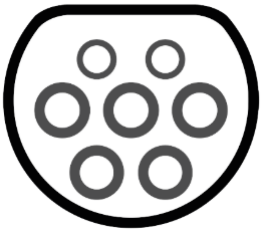
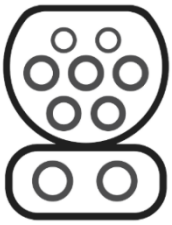
Option 12: eCar Sharing Partnerschaft

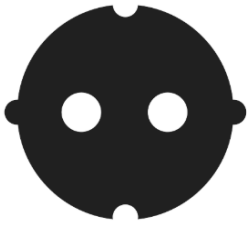
- "…rather difficult to generate a sustainable profit over the time, it can also be seen as a marketing case to promote eMobility…"
- "…such an option could enable individuals to gain initial experience in the field of eMobility…"
- "…an option could be to cooperate with a local car garage or other companies interested in such an offering…"

Appendix B: Charging Connectors

In Switzerland, there are five charging connectors which are relevant. A distinction is made between slow- and fast charging. For slow charging processes, which are mainly executed at home, conventional T13 / T23 or CEE 16 A outlets are used. For fast charging processes however, the following five connectors are used. Each connector does have different properties and therefore the designated operation area differs. For each connector presented in Table 18, current type, maximum charge power and maximum current are listed.

Table 18: Appendix B: Charging connectors
Source: adapted from (The Mobility House, 2018)

Type 1 AC 7,4 kW / 32 A (230V, one-phase)	
Type 2 AC 43 kW / 63 A (400 V, three-phase)	
CCS (Combination Charging System) AC and DC 50 kW / 125 A (400 V, three-phase)	
CHAdeMO DC 150 kW / 250 A	
Tesla Supercharger DC 250 kW	

Domestic Socket T13 / T23 AC 2.3 kW / 10 A 3.7 kW / 16 A	
CEE 16 / 32 Plug AC 3.7 kW / 16 A (CEE 16 / 230 V, one-phase) 11 kW / 26 A (CEE 16 / 400 V, three-phase) 22 kW / 32 A (CEE 32 / 400 V, three-phase)