

# FACILITATING THE NEXT MARKET FOR ELECTRIC VEHICLES: INCREASE ADOPTION WITH USER CENTERED SERVICES

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# Facilitating the next market for electric vehicles: increase adoption with user centered services

By

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 **Eneco**

# EXECUTIVE SUMMARY

This report is the result of a graduation project at the TU Delft, Faculty of Industrial Design Engineering. The assignment was commissioned by Eneco Group, with the aim to increase the adoption of the electric car among private consumers.

## Problem definition

Over past decades, the electric car has received an increasing amount of interest. Especially for environmental reasons, the electric car is considered a promising alternative for the conventional fuel car. Currently, business consumers are the main users of the electric car. However, with the advantages of the electric car becoming clearer, the adoption among consumers is predicted to rise. Eneco E-Mobility has chosen to invest in electric mobility and has developed into a significant party in the market of electric car charge services. Eneco E-Mobility wants to prepare for the upcoming consumer market by creating user centered services that stimulate adoption of the electric car. This is the origin of this graduation project. The aim is to help Eneco to get an understanding of the consumer perspective on electric cars and to develop a service that stimulates adoption among private consumers.

To do so, the project was divided in three stages. The first stage gave insight in the challenges of the electric car market, consisting of a company analysis, a market analysis, a trend analysis and extensive qualitative consumer research. In the second stage, the insights of the first stage were combined into a design direction. The third and last phase developed the design further, presenting the service in form and function, with distribution channels, a business model and a promotion strategy. Below, the results are summarised.

## Vision on solution

The first part of the design brief was an understanding of the consumer needs. Interviews with eleven potential consumers led to the development of three Purchase Drivers: profiles that represent the main purchase motivators for electric cars among consumers. The prominent reasons can be divided in three categories: environmental, financial and technological. The Purchase Drivers show the relationship between the reason to purchase an electric car and additional services consumers would be interested in. Accordingly, the Drivers summarise the most important consumer

needs in a comprehensive manner, giving Eneco E-Mobility the understanding they wished for. The Drivers can be directly applied in product development and marketing communication: they should all be considered to make sure the widest range of consumers is addressed. With the Purchase Drivers, Eneco can make sure their offer is relevant and fits the prominent motives of their consumers.

Apart from the understanding of consumer needs presented in the Drivers, the research shows that two main issues play a role in the consideration for an electric car. One: consumers fear the range is not enough to let them enjoy their car as they are used to. Two: consumers see potential advantages the electric car may have, the environmental, financial and technical factors that were presented in the Purchase Drivers, but there is no way to specify the extent of these benefits for their situation. The available information on electric car purchase remains very general, leaving consumers unaware of the exact financial, environmental or technological gain. The combination of the unknown impact of the range and the haziness of the benefits impedes the purchase decision of the consumers. It makes them stick to the familiar fuel-powered car. The two factors are both linked to the compatibility of the electric car: the extent to which consumers can estimate what an electric car means for their life. Roger's theory states an improvement in compatibility significantly stimulates adoption of an innovation, in this case, electric cars (Rogers, 2010). A focus on those issues is also perfectly in line with the strategy of Eneco E-Mobility, that searches the answer to needs of consumers.

Thus, to accelerate the adoption of electric cars, the emerging market needs a powerful tool that helps consumers to assess the effect of the range on their mobility and the extent of the sustainability and cost gains. These consumers can be found where they already inform themselves on electric cars: car dealers and lease companies. Altogether, the design direction is formulated in the following positioning statement:

*Eneco E-Mobility will offer a transparent pre-sale tool that gives a personal overview of the benefits and costs of the electric car for their lease and car dealing partners. To do so, the service analyses the car use of the consumer to give insight in nearby charge facilities and the impact of the range on their mobility. Simultaneously, the service provides an overview of the savings in costs and for the environment and a sneak peek at future innovations.*

## Solution

The service materializes in an online platform called EV Inzicht (see Figure 1). Consumers insert information about their car and car use: type of ownership, distances they drive, et cetera. This data is then processed to a personal overview specifying the impact of an electric car for four topics: impact, finances, sustainability and technology. The impact shows the implications of the electric car for the routes of the consumer, with the effect on travel time and the location of chargers. The financial overview presents a breakeven point and return on investment (see Figure 2). The environmental overview determines CO<sub>2</sub> emission savings and lastly, the technologic overview presents innovations Eneco works on. Al together, this overview specifies the costs and benefits of the electric car for the consumer's personal situation. This enables a balanced decision that fits their personal motives. The tool is honest by using data from practice, like the actual range, and transparent by citing sources for the information.

EV Inzicht answers perfectly to the request of Eneco E-Mobility. It enables them to improve the information flow towards the consumer, emphasizing the benefits of the electric car. The consumer oriented strategy is continued by the incorporation of the Purchase Drivers, addressing the most important consumer needs.

The service gives Eneco E-Mobility the opportunity to collect data about their potential consumer base, enabling tailored marketing campaigns. Since a collaboration with the distribution channels is already in place, it allows Eneco E-Mobility to strengthen the relationship with their partners, showing that electric car sales are considered a mutual responsibility. A close relationship with their partners fortifies Eneco's market position relative to competitors. Simultaneously, the business model makes sure that EV Inzicht either leads to increased profit from the sale to the partners or from new leads for charge station installation. Most importantly, EV Inzicht promotes electric driving, accelerating the adoption of the electric car and thereby enlarging the potential consumer base of Eneco E-Mobility.

In conclusion, the Purchase Drivers provide an understanding of the relation between purchase motivation and consumer needs. The Drivers help Eneco E-Mobility to address the motives of the widest consumer base, ensuring relevance of their offer. The developed service, EV Inzicht, simplifies the purchase process of the electric car, aiding consumers' purchase decision with the incorporation of individual needs. This stimulates the sale of the electric car, enlarging Eneco E-Mobility's consumer base and boosting their sales.

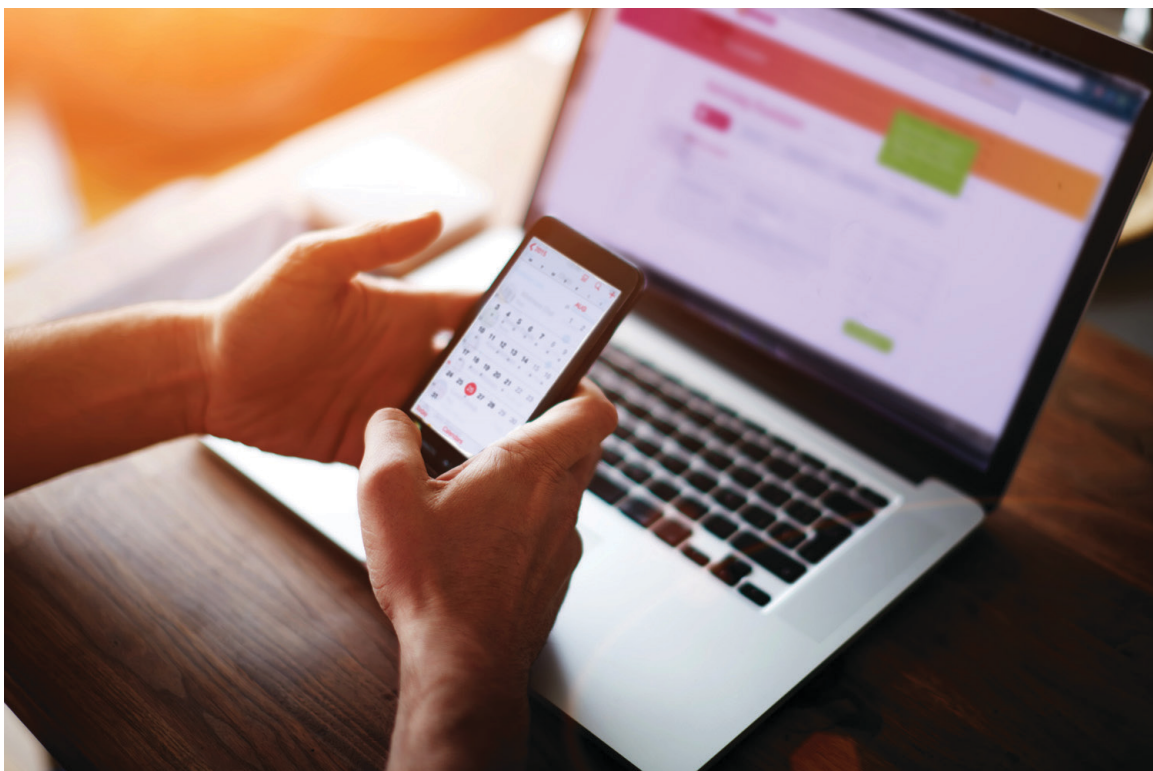
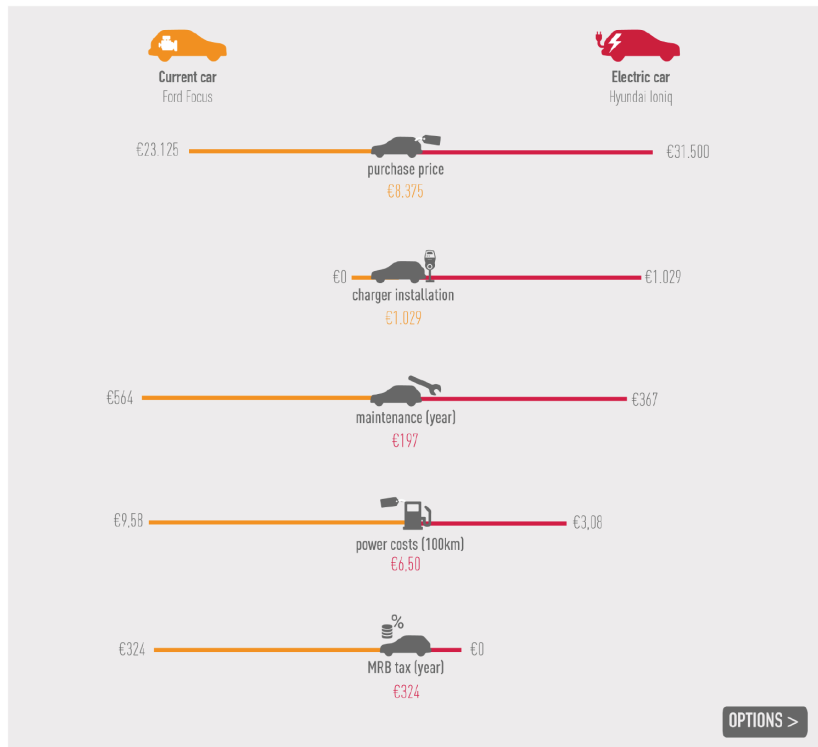


Figure 1: *Impression of interaction with EV Inzicht*

## EV match

- Impact on mobility
- Costs**
- Sustainability
- Innovation



### Investment

Purchase price	€8,375
Charger installation	€1,029
<b>Total investment</b>	<b>€9,404</b>

### Savings (yearly)

Power	€1,003
MRB tax savings	€324
Maintenance	€197
<b>Total savings (yearly)</b>	<b>€1,524</b>

Breakeven reached after **6,2** years

Savings over total ownership **€1.266**

GO TO SUSTAINABILITY >

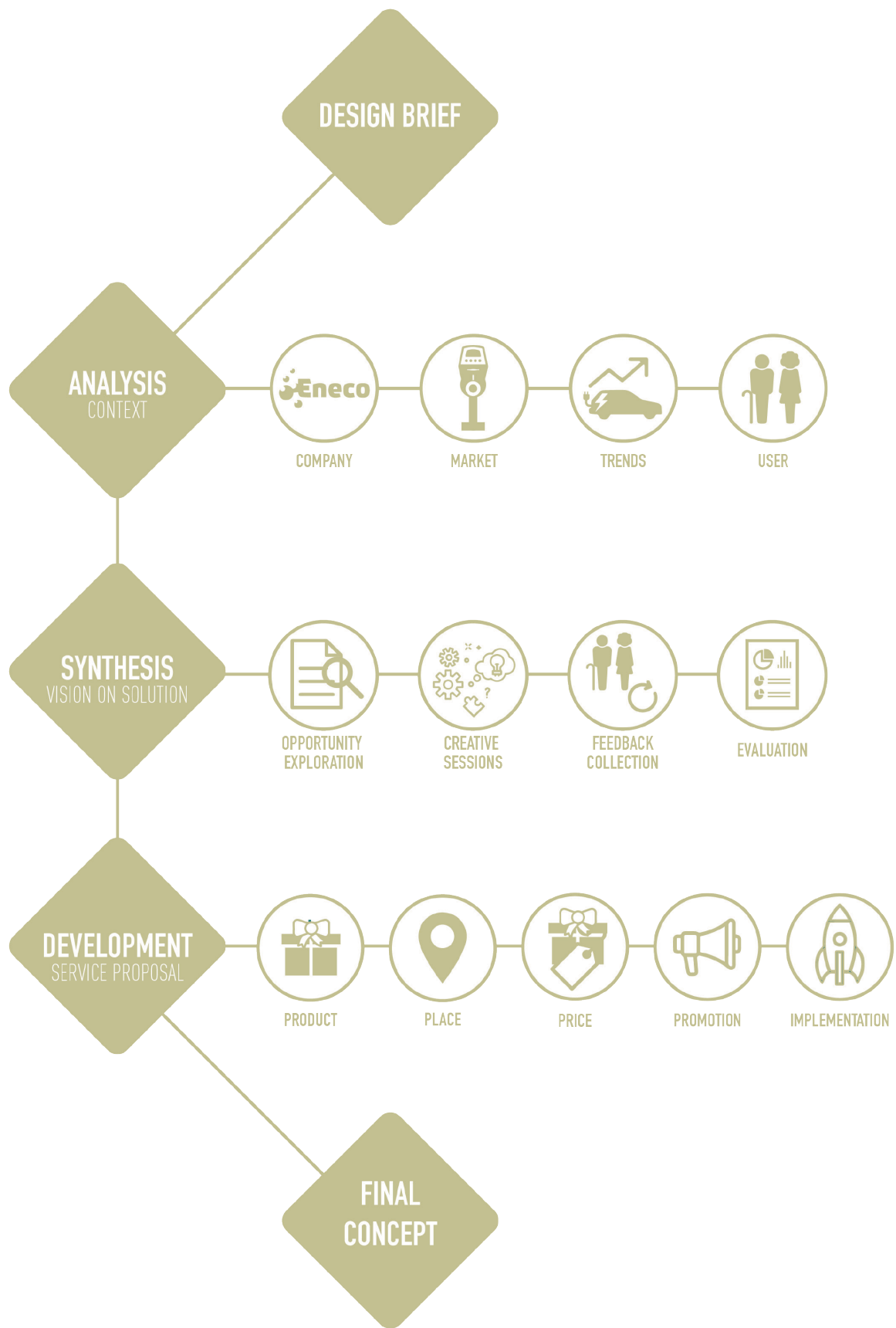
Figure 2: Sneak preview: finances overview page





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# INTRODUCTION

Every day, six million cars flood the Dutch road network, transferring people from A to B. Every day, those six million cars emit 85 million kg CO<sub>2</sub>. All together, the transport sector is responsible for 14% of the Dutch CO<sub>2</sub> emissions (CBS, 2015). The greenhouse gas CO<sub>2</sub> has been proven to increase health risks, contribute to climate change and deteriorate air quality (Stanford University, 2008). Because of this, the Dutch government has presented measures to reduce the impact of car emissions (Autoblog, 2015; Nu.nl, 2012).

The electric car is proposed as an interesting alternative for the polluting internal combustion engine (ICE). When powered by renewable energy, the electric car emits 54% less CO<sub>2</sub> well to wheel<sup>1</sup> (van Gijlswijk, Koornneef, van Essen & Aarnink, 2014). The Dutch government has acknowledged this by introducing incentives that stimulate electric car purchase (Kamp, 2016a; Kamp, 2016b).

Holding a key position between suppliers and users of renewable energy, Eneco Group has recognized itself as an important party in this revolution. The company chose E-Mobility as one of the innovation areas and has since then developed to a substantial party in the market of electric car services. They now provide charge stations and charge services for the evolving electric car market.

Currently, business customers<sup>2</sup> are the most prominent users of electric vehicles. Though, now the infrastructure for electric cars gets more established, the offer for electric cars is more versatile and the advantages become clearer, the adoption of electric cars by private consumers is predicted to rise.

Eneco wants to prepare for this shift, developing user-centered charge services to facilitate the adoption of electric cars by private owners. However, they do not know who to target, nor what barriers the future drivers expect concerning electric driving. The company lacks knowledge about the needs and wants of this consumer market.

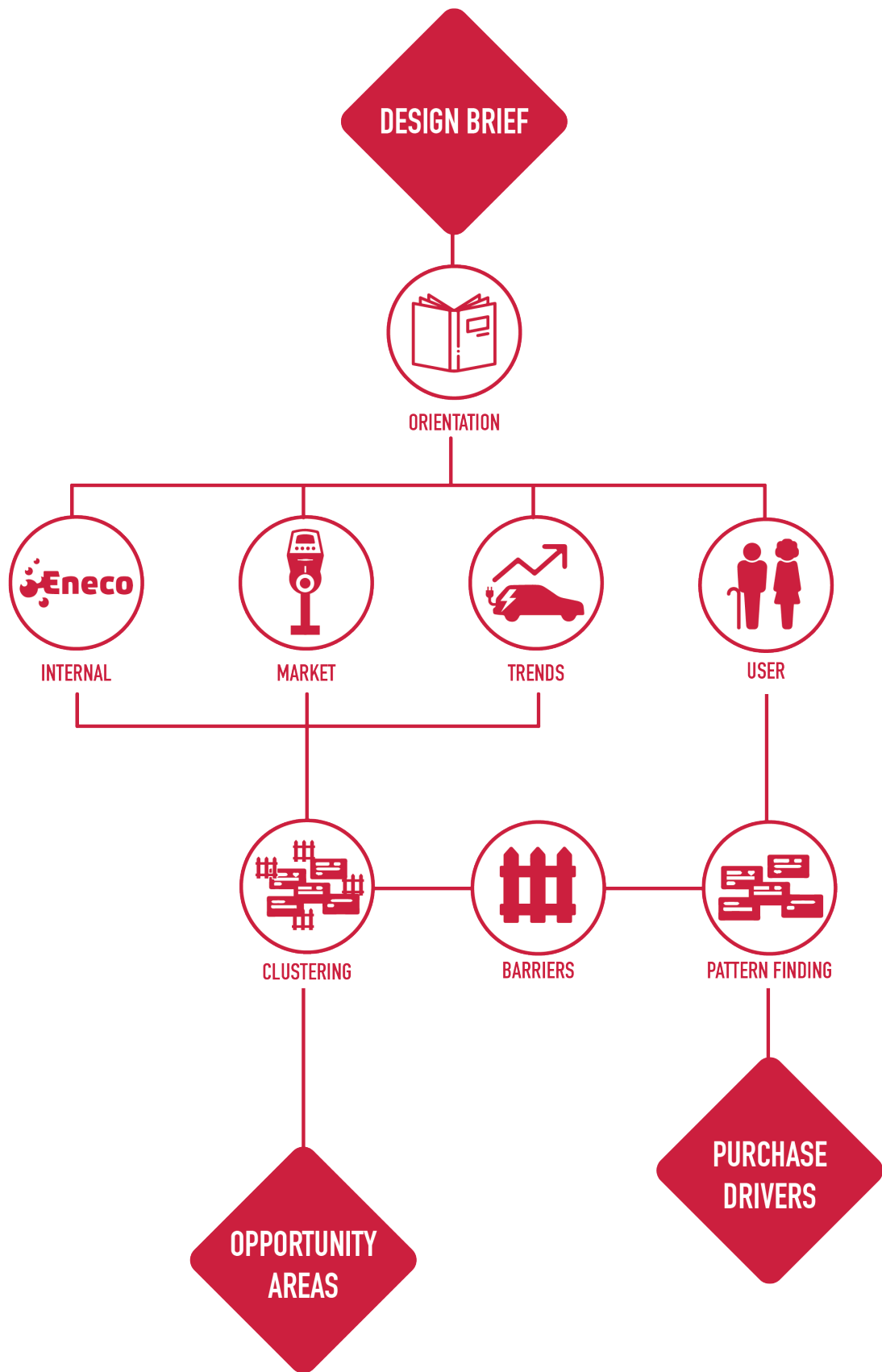
This report documents a graduation project for Eneco E-Mobility. The aim of this project is to help Eneco to get an understanding of the consumer perspective on electric cars and to develop a relevant service for private consumers that stimulates adoption. The project distinguishes three research questions:

1. *What does the current field of electric charging look like and what are opportunities from user perspective?*
2. *What patterns in consumer needs can be distinguished and how can they be answered to?*
3. *With what service can Eneco add value for the consumer market?*

The structure of the report concurs with the approach of the project, which is shown in the visual on the left. Just like the project, the report is split in three parts: Context, Vision On Solution and Service Proposal. The first chapter, Context, presents the analysis phase with background information on electric driving, the company, the market and trends. It also covers the consumer perspective that originates from qualitative research executed for this project. In the second chapter, Vision On Solution, the insights of the first chapter are combined in a positioning statement: a vision that provides a direction for the service. The last chapter, the Service Proposal, shows the further development. It presents the service, covering the product, place, price, promotion and a strategy for implementation. Following the three parts of the report, the research questions are answered and evaluated in the conclusion, discussion and reflection.

<sup>1</sup> Well to wheel refers to lifecycle of a car from raw materials to its disposal at the end of its use. Well to wheel calculations consider all the cycles in their analysis.

<sup>2</sup> notice the difference between customer and consumer. Customer indicates business clients, that uses the service in name of their company. Consumer, on the other hand, refers to clients who call on the services for private use.



# CONTEXT

In order to develop a service, it is important to understand the current context of the service. The figure on the left presents the approach to this analysis phase. After a short introduction in the topic, an internal analysis will evaluate the goals and capabilities of Eneco. Then, the current market is evaluated and an overview of trends is given. Since the aim of the project is to lower the threshold for electric cars, it is crucial to know the consumer perspective. Their opinion about electric vehicles and the barriers they foresee helps to understand what helps most to fasten adoption. Patterns in consumer needs will be combined in Purchase Drivers, summarising needs. In the next chapter, the insights of these areas will be combined into a vision on the solution.

This chapter provides an introduction in electric cars, an overview of the company, the current market, developments and the user perspective.



# 1.1 ELECTRIC DRIVING

In order to understand and judge the content of this report, background information is required about electric cars and charging. Since this report is written to be consulted by anyone, this section gives a short overview of electric driving.

## 'Electric vehicles'

Electric vehicles come in many shapes and forms. Golf carts, trains and segways are examples of vehicles that are often powered by electricity. Electric cars, too, can be divided in four categories: hybrid (HEV), plug-in hybrid (PHEV), Range Extender (E-REV) and battery electric (BEV).

Figure 3 gives an overview of the main characteristics of all electric cars and their power sources. The hybrids and range extender use a combination of an internal combustion engine (ICE) and an electromotor to run the car. The ICE is the main power source for the hybrid, but it also has a small electromotor that is powered by the energy regenerated from braking. The main power source for the plug-in hybrid is the electromotor: the distance that can be driven with the electromotor is dependent on the size of the battery (often around 30 kilometres), when the battery runs out,

the ICE takes over (McEachern, 2012). The Range Extender uses only the electromotor to drive, but it also has an ICE, which is used to recharge the battery for long distances. The full-electric vehicle only uses an electromotor and is completely dependent on the grid for power. The (driving) range of the battery electric vehicle is mostly dependent on the size of the battery and is around 200 km on average. Appendices A1, A2 and A3 provide more elaborate information about the energy use and the history of the electric car.

The project is executed for Eneco, an energy company providing charging services for electric cars. Since the HEV cannot be charged, it is out of scope of the project. In this report, 'electric vehicle' (and 'electric car') refers to PHEV, E-REV and BEV.

## Electric vehicles in the Netherlands

The Netherlands has approximately 7.8 million owned cars (CBS, 2016a). In 2015, 44.150 of these cars were electric, which has increased to 86.200 (1,1%) in 2016 (CBS, 2016b). In 2015, 449.000 new cars were sold in the Netherlands (CBS, 2016c), of which 60.000 were electric (13,3%) (CBS, 2016d). Both these numbers show a growing interest in the electric car.

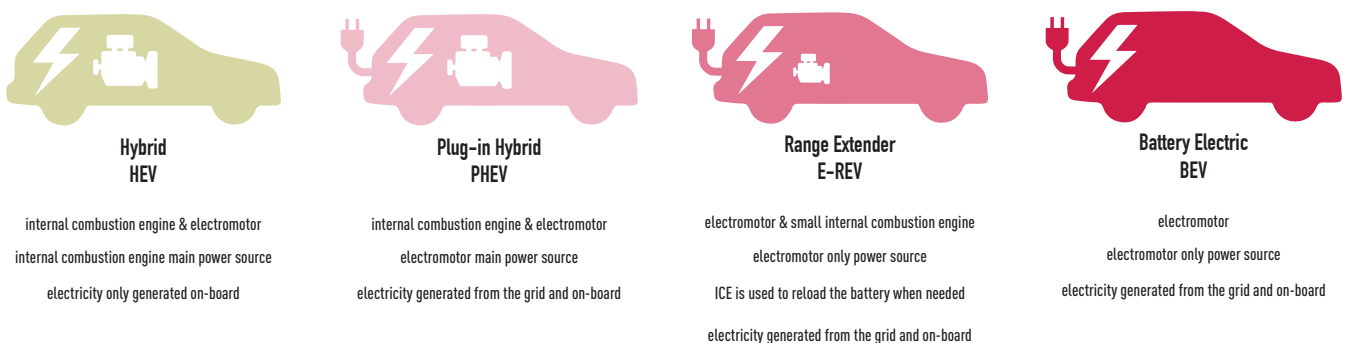


Figure 3: Different types of electric vehicles

## Charging

The batteries of PHEV, E-REV and BEV cars need to be charged. Three locations can be distinguished for charging: public locations, for example at petrol stations; semi-public locations, for example at work; and private locations, for example at a private driveway. To charge at (semi-)public locations, a cable is required to plug in the car and a card is to identify the payer at the charger. Multiple cables are available for different power outlets, but most chargers are accessible with a standardised plug. Information about the location and availability of the chargers is most often found through websites or apps.

In charging, four stakeholders can be distinguished (see Figure 4): a user, a card provider, a charge point operator and a charge point owner. The user desires to charge his/her car at the charge station. The card provider owns the card and enables identification of the consumer at the charge station, similar to an OV-chipcard, by tapping the station. The cards are often provided by the same party that sells charge points, like Eneco E-Mobility. The card system is standardised and can be used at nearly all charge points. The third stakeholder is the charge point operator, for example Eneco E-Mobility, who makes sure the charge station stays up and running. They are also responsible for invoices to the identified consumer and payment to the charge point owner. The charge point owner is the fourth and last stakeholder. It can, for example, be a municipality or a hospitality. Sometimes the charge point operator is the owner of the charger. The last three stakeholders all take a margin of the price the consumer pays.

Charge stations can be divided in roughly four speed levels (see Figure 5). The slowest way of charging, in a regular socket, takes up to 20 hours. The fastest way of charging, at a fast charger, takes around 20 minutes. Chargers with power over 22 kW often require power grid reinforcements.

Apart from the power the source provides, the charge time is dependent on multiple factors: the capability of the car, the capacity of the battery, remaining energy and weather conditions. Unfortunately, not all cars are capable of fast charging, though most newly introduced cars are. The less remaining energy in the battery and the higher the battery capacity, the longer it takes to charge. Cold weather, too, prolongs the charge time. Lastly, the first 80% of the battery is known to charge relatively fast, while the last 20% goes slow. Appendix A4 gives more information about the details on charging time.

To summarise, in this report, PHEV, E-REV and BEV are named 'electric cars'. At this point, only 1,1% of the Dutch car fleet is electric. Car charging can be done in various places in which four stakeholders are involved: the consumer, card provider, charge point operator and the location owner. The charging speed is influenced by many factors, but especially by the power of the source. These facts will help to understand the further content of the report, for example, the offer of the company.



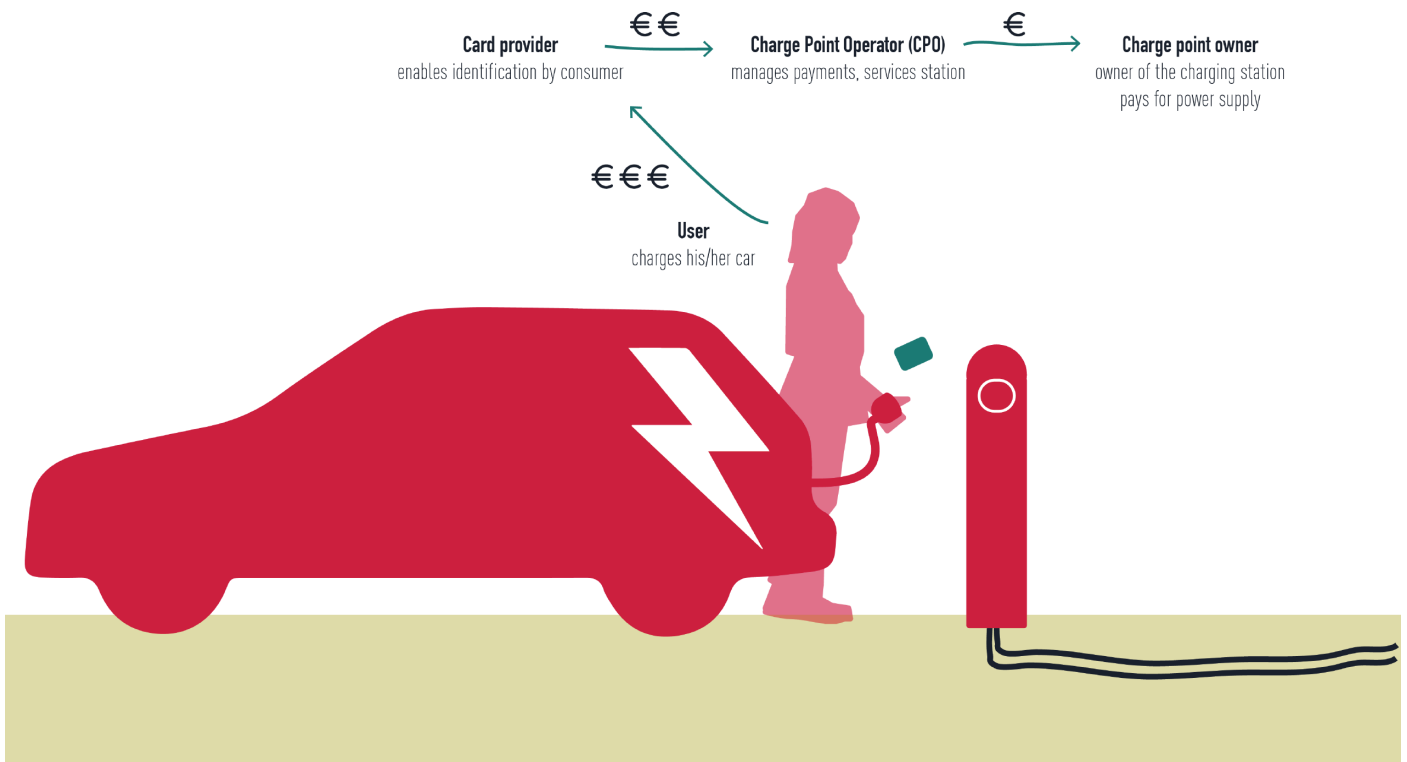


Figure 4: Stakeholders for charging









				
	<b>230V Socket Charging</b>	<b>Regular Charging Station</b>	<b>Accelerated Charging Station</b>	<b>Fast Charging Station</b>
	2,3 kW	3,7 to 11 kW	11 to 22 kW	42 to 120 kW
	12 to 20 hours	4 to 10 hours	2 to 4 hours	0,5 to 2 hours
	accessible anywhere	at work, home or public spaces	at work, public spaces or near motorways	next to motorways
	innumerable	17.000 (increasing rapidly)	9.000 (increasing rapidly)	600 (increasing rapidly)

Figure 5: Types of chargers

01:57

tijd (mm:ss)

0,70

energie (kWh)

90

batterij (%)

ID:  
NALLEGO000716

[www.watkostladen.nl](http://www.watkostladen.nl)



Probl  
Bel All

## 1.2 ENECO E-MOBILITY

Eneco E-Mobility is an investment area of the bigger corporate (and more commonly known) Eneco Group. This section will explore the capabilities, strategy and aim of the company. It will do so by first introducing the Eneco Group, followed by the strategy and structure of E-Mobility. The information in this chapter has been retrieved from multiple sources, including conversations with employees and strategy documents.

### Eneco Group

Eneco is an international company founded in 1995 with as core business the distribution of energy from suppliers to users. Since then, they have grown to serve the Dutch, British, German, French and Belgian market with their energy services and employ over 2.500 employees (Eneco, n.d.-a).

Up until recently, Eneco employed the traditional strategy of purchasing, distributing and selling electricity. However, there is an increasing need for renewable energy that is produced locally (ECN, Energie-Nederland & Netbeheer Nederland, 2016). This local production diminishes the need for a traditional energy company that distributes energy from elsewhere. Because of this, Eneco introduced a strategy switch to ensure profitability in the long run. Since 2011, Eneco is the leading example of big energy corporates on the road to sustainability (Pieters, Honig, Schmid, 2016). The company invested in multiple innovation areas with a focus on sustainability. Services like Toon, the smart thermostat, and the Zonnehub, a service to provide solar panels for those without a suitable roof, are good examples. These services are the embodiment of Eneco's strategy towards a reduced human footprint (Eneco, n.d.-b).

In order to create focus for the investment areas, Eneco introduced a 'group structure' for their company (Eneco, n.d.-a). This means the company has split up in eight separate brands, each focussing on a separate market or product (see Figure 6). The brands are connected by the strategy of the overarching "Eneco Group". At the moment, Eneco E-Mobility is not yet recognized as a sub-brand, as shown in the figure, but they are structured as such. Therefore, it is analysed as a separate brand in the group.

The group structure gives the brands room to decide on their own budget and strategic moves. Still, the brands are supported by the resources of the bigger corporate. On the other hand, the brands themselves should account for fixed costs on housing or legal advice. It also forces the brands to create their own brand awareness.

Eneco Group chose to invest in E-Mobility because of a combination of opportunities. For one, Eneco Group is in a unique position that bridges the suppliers and users of renewable energy. Also, the group has the possibility to supplement the e-mobility services with the smart home services Eneco already offers. Eneco Group believes these investments are best done now, since the developing market of electric cars allows them to learn and put those lessons to purpose when the majority arrives.

The company structure has consequences for the development of a service. The service needs to respond to both the strategy of Eneco E-Mobility and the sustainable strategy of Eneco Group. Service proposals will be judged by the higher management of the group too, restricting Eneco E-Mobility in their freedom of decision. Simultaneously, higher initial investments are possible, because Eneco Group can support E-Mobility with resources.



Figure 6: Eneco group structure

## Eneco E-Mobility

Eneco E-Mobility is the department dedicated to electric car charge services. This section will evaluate their mission, vision and strategy (Figure 7) and product portfolio. The combination of a vision, mission and strategy gives a long-term aim for the company to work towards, while the product portfolio gives an overview of the current focus of the company.

### Mission

Eneco E-Mobility offers charge equipment and complementary services to the business to business (B2B) and business to consumer (B2C) market for electric vehicles that require plug charging. All charge stations are powered by 100% renewable energy (Eneco Hollandse Wind), to guarantee their users to drive independent of fossil fuels. Their mission is "to accelerate happiness in E-Mobility".

### Vision

Eneco E-Mobility envisions the electric car a part of the smart home, with renewable energy as the cornerstone. They want to make this transformation together with the user by getting to know their individual needs. As a part of this, Eneco E-Mobility works towards "mobility as a service". They want to provide the user with a complete mobility package, a combination of car lease, car sharing and car charging.

To be able to offer those services in the future, Eneco E-Mobility wants to enlarge their market by accelerating the adoption of the electric car with user centered charge services. They want to serve the B2C market with tailored services for different consumer groups.

On a more concrete level, Eneco E-Mobility aims to expand their current offer for Lease, Automotive and Business customers throughout Europe in the coming years.

### Strategy

Until recently, Eneco E-Mobility classified itself as a smart follower of the market. Learning from others, they improved the services for Lease, Automotive and Business incrementally with a strong focus on the needs of the customers their competitors had missed.

Nowadays, this smart follower strategy is slowly turning around. Especially in the consumer market, Eneco E-Mobility is taking the lead. They invests in research of the consumer market to develop tailored propositions for energy, mobility and charging. This project, too, is a step Eneco E-Mobility takes to get more familiar with the consumer market.

In order to create focus, Eneco E-Mobility has not developed services for public charging. They regard this market as niche and therefore not promising enough. Instead, the company focuses in the internationalisation of their current services.

The to be designed service should contribute to the mission of the company. In their strategy, future services are directed towards packages for energy, mobility and charging. The electric car can also be seen as a part of smart home solutions. Public charging hardware is out of scope, but charge services to improve the on the go experience is a possibility. For Eneco E-Mobility, consumer relationship and consumer focus are vital requirements for the service.

### Product portfolio

Now, Eneco E-Mobility's main focus is services for B2B customers. They distinguish three client groups: Lease, Automotive and Business.

In Figure 8, the main services per group are summarised. Eneco E-Mobility consults in charge station installation: they give advice on reinforcement of the grid to reach the best charge speed. Furthermore, after sale, they offer the customer services to manage their charge points and billing.

Specifically for the charge equipment, E-Mobility offers charge services for the B2B market (see Figure 9) with a lease construction. Instead of a high investment, the customer pays a fixed amount per year for a defined period. The charge stations offered are 11 or 22 kW (Eneco, n.d.-c).

Eneco E-Mobility also provides charging services for consumers. Though, this group is still very small. The three charge points offered are shown in Figure 10 (Eneco, n.d.-d).

What can be concluded from the product portfolio is that Eneco E-Mobility's offer is still focussed on the B2B market. Currently, their main business is the sale of hardware charge stations and charge cards, with few additional services for consumers. Their care for the customers is translated to extensive consultation in the purchase of charge stations, installation and after-sale services tailored to the needs of their B2B customers.

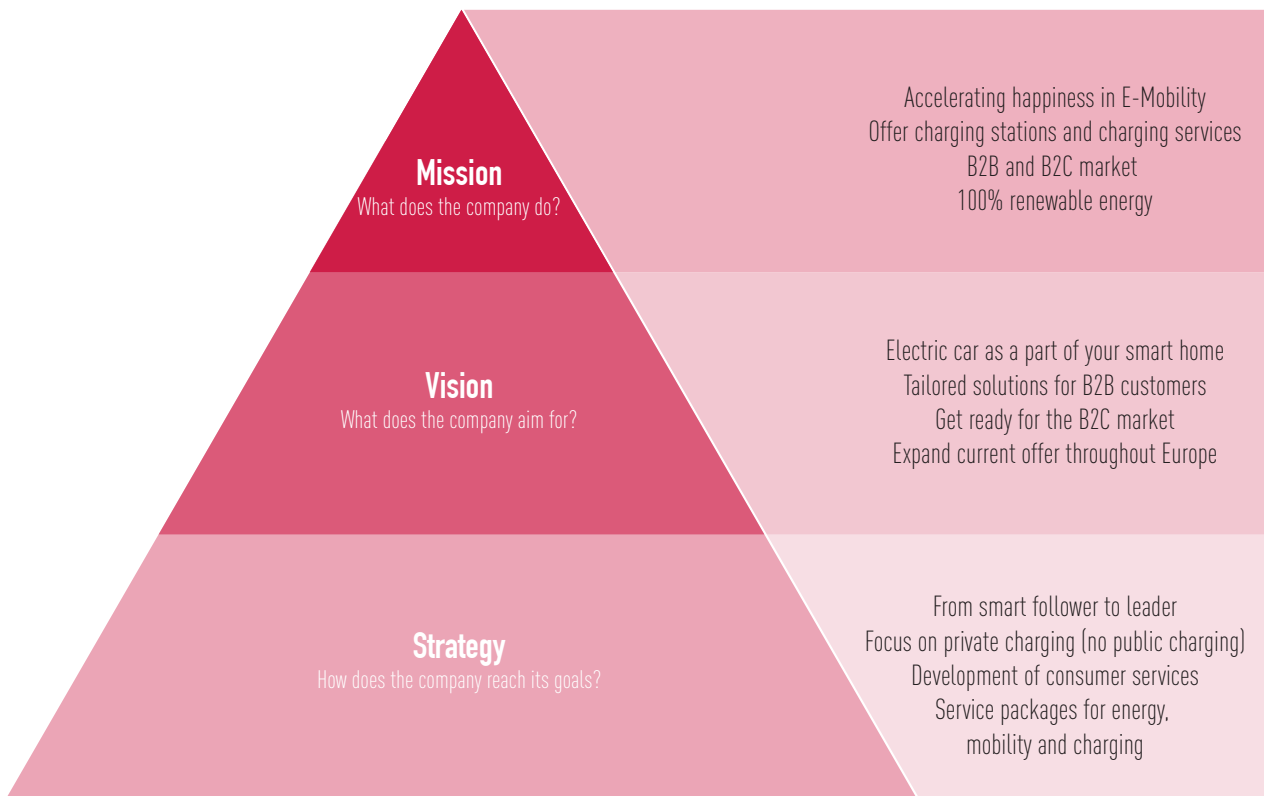


Figure 7: Mission, vision and strategy of Eneco E-Mobility

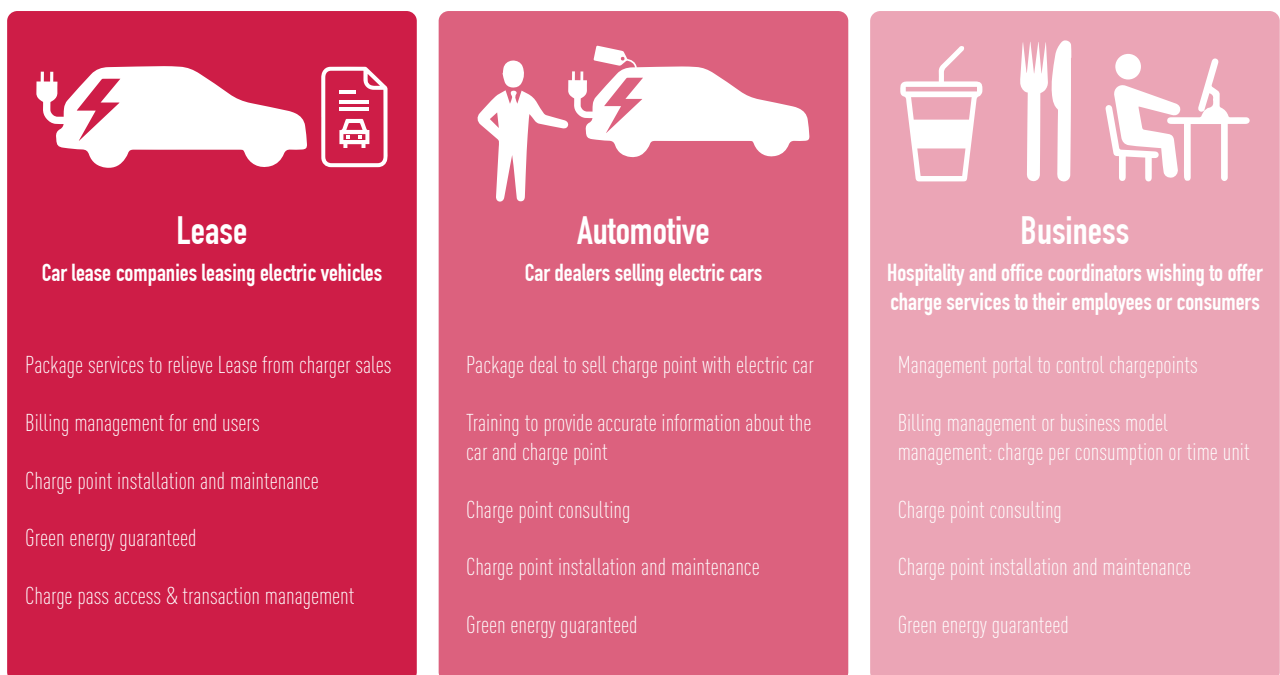


Figure 8: Product portfolio of Eneco E-Mobility



### ICU Eve

- ✓ Dubbel laadpunt met lcd-display
- ✓ Verkrijgbaar als wand- of paalmodel
- ✓ CE en DEKRA (voorheen KEMA) gecertificeerd
- ✓ Kleur voorkant: wit, kleur achterkant: grijs
- ✓ Afmetingen: 59 cm x 34 cm (HxB)
- ✓ Vermogen: 3.7 kW (1x16A), 11 kW (3x16A) of 22W (3x32A)

**Vanaf €1.900 excl. BTW**



### EV-Box BusinessLine

- ✓ Intelligente statusindicator
- ✓ Dubbel laadpunt als paalmodel
- ✓ Kleur: wit, blauw, groen, donkergroen, lichtgrijs en donkergrijs
- ✓ Afmetingen: 60 cm x 25 cm (HxB)
- ✓ Vermogen: 3.7 kW (1x16A), 11 kW (3x16A), 7.4 kW (1x32A), 22W (3x32A)

**Vanaf €1.970 excl. BTW**

Figure 9: Offer for companies (Eneco, n.d.-c)



### ICU Compact

- ✓ Laadpunt is geschikt voor verrekenen
- ✓ Wand- of paalmodel, met contactdoos of vaste kabel
- ✓ DEKRA (voorheen KEMA) gecertificeerd
- ✓ Kleur: wit
- ✓ Afmeting: 33 x 20 cm (HxB)
- ✓ In verschillende vermogens leverbaar

**Vanaf € 775 excl. BTW**

€ 938 incl. BTW



### ICU Eve Mini

- ✓ Laadpunt is geschikt voor verrekenen
- ✓ Wand- of paalmodel, met contactdoos en display of vaste kabel zonder display
- ✓ Kleur: wit
- ✓ Afmeting: 37 x 24 cm (HxB)
- ✓ In verschillende vermogens leverbaar

**Vanaf €850 excl. BTW**

Vanaf €1.029 incl. BTW



### EV-Box HomeLine

- ✓ Laadpunt is geschikt voor verrekenen
- ✓ Wand- of paalmodel, met contactdoos of vaste kabel
- ✓ Kleur: wit, groen, lichtgrijs en donkergrijs
- ✓ Afmeting: 49 x 31 cm (HxB)
- ✓ In verschillende vermogens leverbaar

**Vanaf €850 excl. BTW**

Vanaf €1.029 incl. BTW

Figure 10: Offer for consumers (Eneco, n.d.-d)

## Department structure

Eneco E-Mobility has 20 FTE (see Figure 11), which are divided in three departments: a strategic department, Eneco Elektrisch Laden and a Belgium department. The task division between the departments is relatively simple: the strategic department seeks new opportunities, Eneco Elektrisch Laden coordinates the products that are already introduced and the Belgium department concentrates on expanding the business abroad.

The relatively small taskforce for product development fits their strategy as smart follower, focussing on incremental innovation. Eneco E-Mobility has a lot of FTE dedicated to the customer (customer support and account management). This allows them to provide extra service: they assist customers with tailored advice to implement this new, unfamiliar technology.

## Jedlix

Apart from the Eneco E-Mobility strategy on (smart) charging services, Eneco Group has other projects on car charging. Recently, Jedlix was introduced as a new brand in the Eneco Group. Jedlix offers smart car charging for home use. The user sets a time when

the car should be fully charged. The time to fully charge the battery is often shorter than the time set by the user, which gives Jedlix a margin to minimise the costs of charging. Due to fluctuating offer and demand, the electricity prices vary. The software of Jedlix aims to charge the car when the price is lowest, while pausing the charging process when the price is higher. This results in an average saving of €0,02 per kWh.

In summary, the company analysis has highlighted a company with the flexibility of a start-up, with access to the resources of a corporate. The department structure enables a customer focus while concentrating on incremental product development. Eneco E-Mobility wants to work towards complete package services for energy, mobility and charging and has a strong desire to deliver both customer and consumer sustainable, tailored services. The current offer is very much focussed on the B2B market, in which attention is paid to the wishes of each customer group.

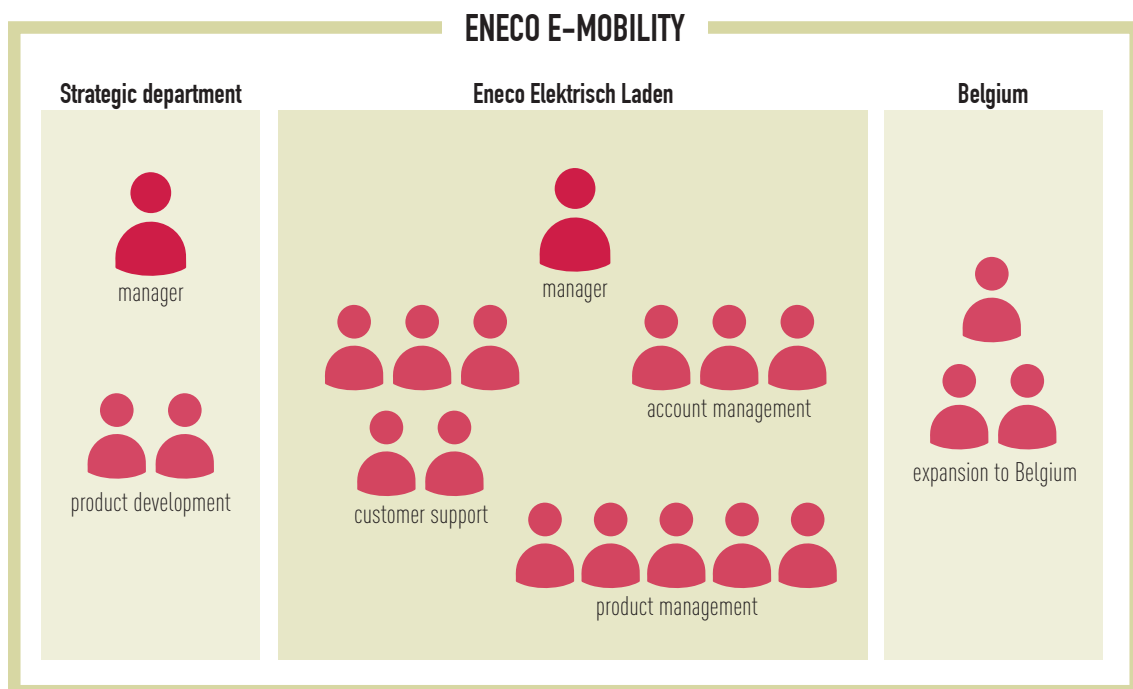


Figure 11: Department Eneco E-Mobility





# 1.3 MARKET OF EV SERVICES

The market for electric cars has been developing quickly for a couple of years now. Already, a range of products and services for electric cars are offered by different operators. An overview of the competitors and the offer is necessary to reveal areas for differentiation and untapped markets. This also helps to understand developments in the market and gain insight in the movements of competitors. Thus, an overview is provided of the charge infrastructure and different operators and existing services for electric cars in the Netherlands.

## Overview

The charge infrastructure in the Netherlands is moving at a rapid pace. The growth since 2010 is visualised in Figure 12.

In 2016, 6.000 charge stations were installed: this is an increase of 16 stations per day. In 2016, the European Alternative Fuel Observatory reported the availability of 17.165 regular, 9.877 accelerated and 612 fast public charge stations in the Netherlands (European Commission, 2016). On top of this, the RVO (2017) estimates another 72.000 private charge points.

## Competitive field

The charge stations mentioned above are coordinated by multiple operators like Eneco E-Mobility, offering charge equipment, card services and information on the infrastructure. Consequently, they battle for market share in the developing market for electric vehicles. By analysing their strategies, Eneco E-Mobility can improve – or differentiate from – their offer.

The competitive field in Figure 13 (Oplaadpunten.nl, n.d.; Oplaadpalen.nl, n.d.; Kassa, 2016) gives an overview of the operators of public charging equipment. Even though Eneco E-Mobility does not offer public charge services (and is therefore not shown in the overview), the field of public charge stations gives a good estimate of the competition.

The figure gives an overview of the most important players in the Dutch market, their core business (colour), their market (vertical

axis), the power their charge stations deliver (horizontal axis) and the amount of chargers they employ in the Netherlands (size of the circle). The numbers must only be seen as an indication, since they change quickly.

In Appendix A5, the most important characteristics of each operator are summarised. The operators all compete in the same market, employing diverse strategies in the battle for market share:

- **Accessibility.** Most chargers are accessible with a charging card, provided by any operator. However, some operators employ a more exclusive strategy. The Tesla Superchargers can only be used by Tesla vehicles. Fastned too, requires registration in order to charge.
- **Payment.** Some require a monthly fee with additional payment per kW, while others offer an all-in membership. The New Motion allows their consumers to switch between different memberships. The costs of charging differ per operator.
- **Energy source.** Fastned and Allego guarantee energy from renewable sources. Other operators leave this decision to the owner of the charge station, allowing green and grey energy.
- **Core business or side service.** For some providers, like Ecotap and NewMotion, car charging is their core business, while Nuon and MisterGreen offer a range of services, including car charging.

All these aspects influence the choices of the operators for their charge services and possible responses to moves of competitors.

Though offering similar services, some competitors are less of a threat for Eneco E-Mobility's market share. Tesla, Ecotap, Fastned and MrGreen differentiate by offering fast chargers: a different service at a different location. Though it is interesting to watch their moves, they are not likely to be a threat to Eneco E-Mobility's market. Furthermore, Allego focusses on public charge stations, an area that Eneco E-Mobility deliberately cast aside. Lastly, EVnet.NL seems to be a foundation and is therefore less commercially oriented.

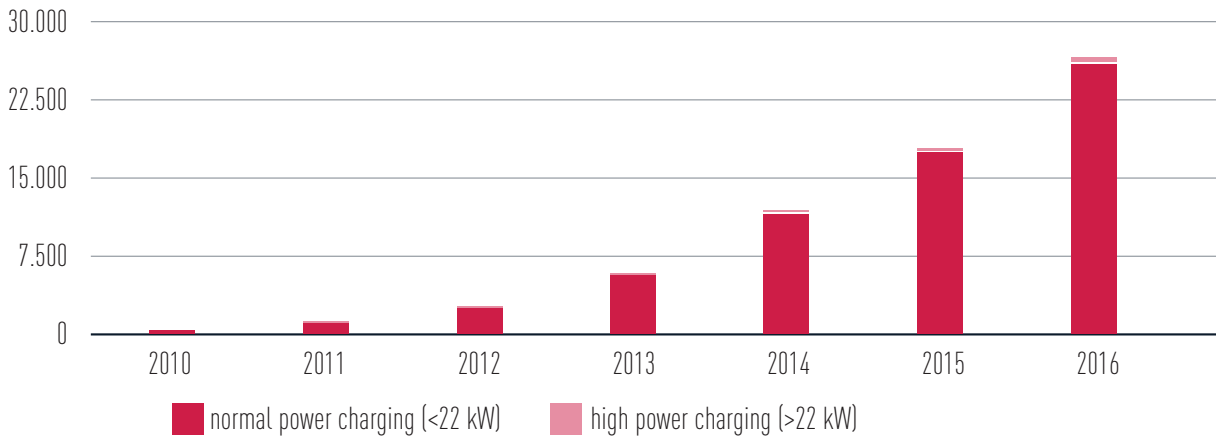


Figure 12: Growth charger network

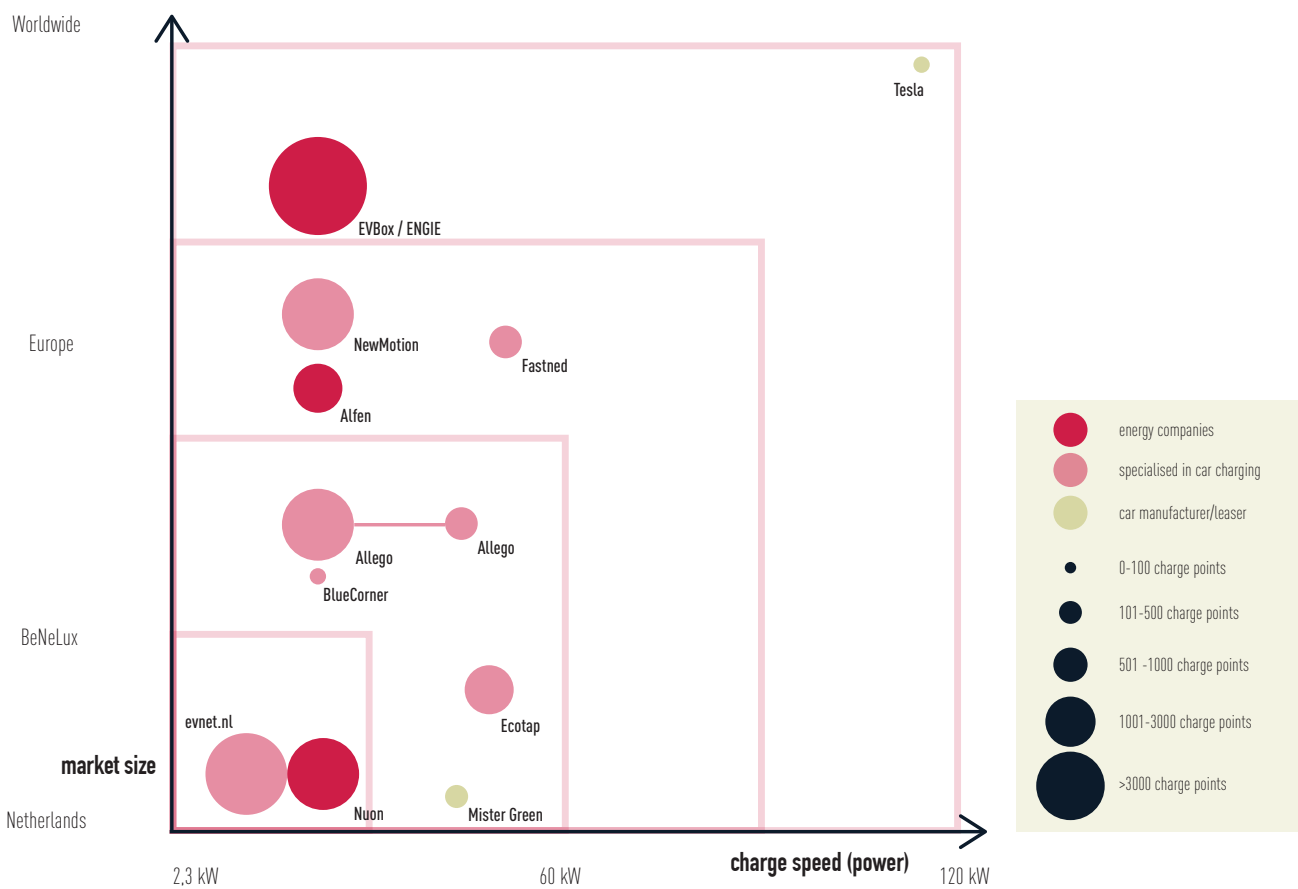


Figure 13: Competitive field

On the other hand, some competitors are important to pay attention to. EVBox (ENGIE), NewMotion, Alfen ICU and Nuon all offer similar charge services in a similar market. Car charging is the core business of NewMotion and Alfen ICU. Probably, they will respond fiercely to innovations that may harm their business (Chen, 1996). Their aim will be to grow fast, with a focus on new product development. Eneco E-Mobility views The New Motion as market leader in the current customer and lease segment, which makes them even more interesting to watch. Nuon and ENGIE (who recently bought EV Box; ENGIE, 2017) are both energy corporates, just like Eneco Group. They offer similar services in a much broader range than only charging. Just like Eneco Group, ENGIE employs a sustainable strategy. ENGIE's Dutch market share is smaller than Eneco's and their operation is not as green yet (Pieters et al, 2016), but they share similar goals. Nuon is also smaller than Eneco, both in Europe and the Netherlands. Though Nuon claims to focus on sustainability, their operations prove differently (Pieters et al, 2016).

In conclusion, Nuon, EVBox (ENGIE), NewMotion and Alfen ICU are the most important competitors to take into account. NewMotion and Alfen ICU will probably be the first with new innovations and are therefore interesting to watch. Eneco E-Mobility can learn from their moves and improve their offer. Because of their bigger market, NewMotion, Alfen ICU and EVBox (ENGIE) will defend the Dutch market less fiercely, but they should not be forgotten. Of all competitors, Nuon and EVBox (ENGIE) are likely to employ a similar strategy and share most of the market with Eneco E-Mobility. This makes it important to formulate a clear differentiation strategy.

## Additional services

Apart from the operators that facilitate the charging process with hardware, a range of phone applications and websites exist to make the electric car journey even easier. An overview of these services is necessary to identify the gaps in the market. The available offer at this moment can be categorised in monitoring, charger location finding, smart charging, anti-sticking and information services.

### Monitoring

The monitoring apps are mainly provided by the car manufacturers themselves, for example for the Nissan Leaf and BMW-I (Figure 14). The user can keep track of the charging process and the real time range. Also, the app enables pre-heating of the car while charging, to spare battery capacity.

A similar type of monitoring is also offered by charge station operators. These apps give insight in charge history and billing.

### Charger finding

The greater part of the existing apps and websites help EV drivers to plan their journey towards charge stations. All of these apps give information on the location of charge stations, and some also publish information on price, nearby facilities, charge speed or compatible plugs. This information is often also incorporated in the car navigation system. Examples are oplaadpunten.nl, The New Motion app or Charge Now (Figure 16). Tesla provides its drivers with an overview of the Tesla Superchargers. This Tesla app is among the few that allow route planning: automatically incorporating charge stops.

### Smart charging

Smart charging can be defined as planned charging: instead of just charging while the car is plugged in, a intelligent schedule is used. The purpose of this schedule is different per service: it often saves the user money or reduces peaks in energy demand.

Smart charging is offered in different services. Allego, for example, offers smart charging for companies and at public charge points. As explained in the internal analysis, Eneco E-Mobility's sister brand Jedlix also offers smart charging services. Another variant of smart charging provides users with rewards when they charge off-peak.

### Anti-sticking

A problem that frustrates EV users are electric cars that occupy a charger when they are fully charged. Multiple parties have jumped at this opportunity to solve the frustration. Nuon and Tesla, for

example, fine these EV users by requiring a minimal payment of 1 kW per hour (€0,30-0,80). Another solution are apps like 'Social Charging' (Figure 15) and 'EV Ping' that facilitate communication between EV-users. Through the app, owners of charging cars can be asked to move their car when it is fully charged. A downside of this app is that it only works for members that are registered in the database.

### Information

Next to the services mentioned above, a lot of information about electric cars can be found online. There are websites that help to calculate the costs of an electric car in comparison to a conventional car. This information is very general and based on a few variables. Also, plenty of websites give information about charging, blog about EV experiences or evaluate the sustainable gain. Phone apps, too, update on EV information or help to choose the right electric car for you (Sierra Club, n.d.).



Figure 14: Nissan Leaf & BMW-i app to monitor the car

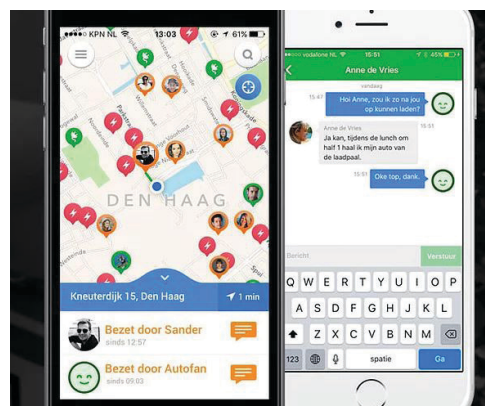


Figure 15: Social Charging applications



Figure 16: Platform to find a charger

In summary, apps help EV users to remotely monitor their car. Plenty of apps exist that show charge stations nearby, but only few of them enable route planning. Furthermore, smart charging and anti-sticking are opportunities that spiked product development. A lot of information about electric cars can be found online, though this remains very general. For Eneco E-Mobility, it is interesting to decide whether they want to expand or improve on the current offer.





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# 1.4 DEVELOPMENTS

Especially in a relatively new domain like electric cars, innovation and developments shape consumer choices, behaviour and needs. Therefore, the trends considered relevant for the service development for Eneco E-Mobility. In order to get a broad overview, technological, social, economic, political, demographic and environmental trends are considered. Since politics (Egbue & Long, 2012; Sierzchula, Bakker, Maat, & van Wee, 2014) and technology (Graham-Rowe, Gardner, Abraham, Skippon, Dittmar, Hutchins, & Stannard, 2011; Lane & Potter, 2007; Ewing & Sarigöllü, 2000) have a significant influence on the adoption of the electric car, these areas received special attention.

Figure 17 gives an overview of the most important developments that might impact the market for electric cars. A description of the developments and analysis of the trends can be found in Appendix A6.

The to be developed service has to be implemented in the coming one to two years, when not all developments will be fully evolved. Therefore, the service should be developed for the present context, while prepared for the developments to come. Based on the trends mentioned above, the following can be concluded:

## There is a shared interest for the electric car

The economic and political climate both show positive developments that will support the adoption of the electric car. The dropping EV and battery price (Cuijpers, Staats, Bakker, Hoekstra, 2016; Ernst

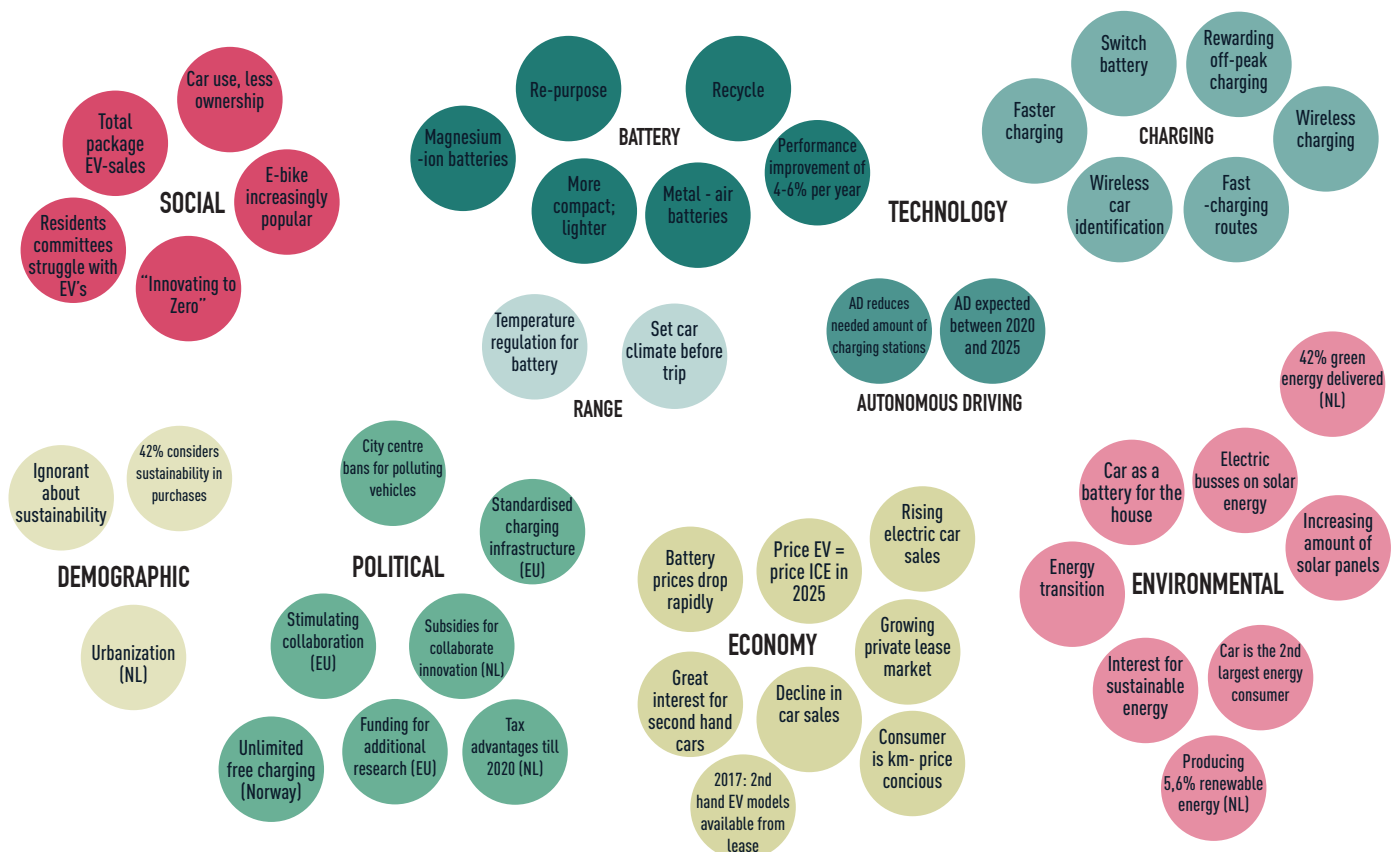


Figure 17: Trends and developments

& Young, 2012; Verbeek, Bolech, van Gijlswijk, Spreen, 2015) are beneficial for the EV market, confirmed by the increase in sales (Cuijpers et al, 2016). The political climate, too, shows the widespread interest for the EV. The amount of research requests to explore the impact of the technology shows that EV's are considered promising (European Commission, n.d.). On top of this, both the Dutch and the EU government have funding to stimulate collaboration and innovation in this field (Kamp, 2016a; Kamp, 2016b; European Commission, n.d.), and regulation is introduced to limit pollution from vehicles (Nu.nl, 2012; Autoblog.nl, 2015). EV sales are stimulated with multiple tax advantages, that will remain until at least 2020 (Rijksoverheid, 2015). Lastly, the demographic trends show urbanisation (CBS, 2016e). This might increase the desire for clean cars in the city centre and reduce the need for long-distance travel; both positively impacting the electric car. In short: Eneco E-Mobility has chosen a promising market to invest in, which is likely to remain attractive for the coming years.

### **Environmental benefits**

While consumers have an increased interest for sustainability (MVO Nederland, 2014), they are in the dark on choosing one sustainable alternative over another (Hensley, Knupfer & Krieger, 2011; Lane & Potter, 2007; MVO Nederland, 2014). This underlines the importance to inform the consumer about the environmental impact of electric cars. Since sustainability is an important benefit and an considerable purchase motivator of the electric car Eneco E-Mobility does well to reduce this environmental impact even more by offering renewable energy. It is also an opportunity to provide environmentally friendly charging equipment with low impact or sustainable package deals.

### **Second hand and lease EV's**

The trends show where the next EV driver can be found. The first electric cars that were used for lease will soon be available on the second hand market. Also, private lease is a promising opportunity for the electric car (Rabobank, 2016), as it tackles the high purchase price. In these two domains, potential electric drivers can be found. Eneco E-Mobility can remember this for marketing purposes.

### **Resident committees and EV's**

Resident committees struggle with requests for electric car chargers. The material is new to them: they do not know what the effect of the charger is on the power grid, or who can best cover the expenses. To aid resident committees in this process, the municipality of Amsterdam drew up a document to support both residents and resident committees with this situation (Appartement&Eigenaar, 2014; Nederland VVE.nl, 2014).

In summary, Eneco seems to have chosen well by investing in electric mobility. The economic and political climate both show positive developments that will support the adoption of the electric car. The interest for sustainable products is growing, but consumers seem to need support to make an informed choice. It is interesting to utilize the sustainable benefit of electric cars. The trends indicate domains for potential new consumers, which are interesting collaboration partners for Eneco E-Mobility. Lastly, resident committees seem to struggle with the installation of chargers, a potentially interesting finding for Eneco.





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wake-  
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range

# 1.5 USER RESEARCH

Even though a lot of consumers are curious about electric cars (Graham-Rowe et al, 2011; VER, 2017), there has not been a big increase in adoption among consumers. The adoption of electric cars can be seen as a socio-technical system: technological development is a requirement, but the social acceptance of consumers is just as vital (Egbue & Long, 2012). Even if the technological possibilities are endless, adoption will stagnate if the consumer does not see the benefit. Next to the previous sections, that gave an overview of the current context concerning electric car charging, research into consumer needs is important to fasten sales of electric cars to enlarge the potential market of Eneco E-Mobility.

In general, new innovations have a hard time being adopted by the greater public. Humans are creatures of habit and do not easily change their behaviour. Most innovations take years to get significant market share (Rogers, 2010). Rogers (2010) distinguished five factors that influence the speed of this adoption:

- the relative advantage of the innovation; how easy it is for consumers to understand the benefit;
- compatibility; how easy consumers can determine how the innovation fits in their lives;
- complexity; how hard it is to understand the innovation;
- trialability; how easy it is to experiment with the innovation;
- observability; how easy it is to see the benefits the innovation brings to other consumers.

Research into the consumer perspective on these factors helps to understand what stimulates the adoption of the electric car.

The complexity of electric cars is relatively low, but the compatibility, trialability and observability seem to be more difficult. Even though the government strives to improve the relative advantage by financial incentives (Rijksoverheid, 2015), the conventional combustion cars outperform the electric cars on the available models, purchase price and range. In order to drive electric, consumers have to compromise on these issues with environmental friendliness as the main benefit. This is not enough for most consumers, who only intend to switch to electric vehicles if it outperforms the cars already available on the market (Graham-Rowe et al, 2011; Lane & Potter, 2007; Ewing & Sarigöllü,

2000). Additional research can clarify what holds consumers back. Better insight in their perspective on the disadvantages will help to understand how adoption can be accelerated.

The general barriers to electric car adoption are high purchase costs, limited battery range and long recharging times (Egbue & Long, 2012; Sierzchula et al, 2014; Graham-Rowe et al, 2011; Lane & Potter, 2007). Specifically on the charging, it was mentioned that consumers 'reluctantly break their journeys' to charge or are forced to search transport alternatives because their car is charging. Waiting for the car to be charged feels like 'dead time' and the infrastructure is undeveloped (Graham-Rowe et al, 2011). These arguments seem to be the most important, but their relative importance and interdependence is still vague. Few research is done after the motives to purchase an electric car and expectations of the charge infrastructure.

The literature also proposes a profile for the probable early adopter of the electric car among consumers. Considering the significant environmental benefit of the electric car, the future consumer is likely to be environmentally conscious (Egbue & Long, 2012; Bamberg, 2013; Moons & de Pelsmacker, 2012; Diamond, 2009; Hidrue, Parsons, Kempton, & Gardner, 2011). Furthermore, the consumer is expected to have a high income (Lane & Potter, 2007; Diamond, 2009) and to be highly educated (Moons & de Pelsmacker, 2012; Lane & Potter, 2007; Hidrue et al, 2011). Because of the limited range, electric cars are also viewed as a promising option for a second car (Klößner, Nayum, & Mehmetoglu, 2013; Ernst & Young, 2012; Schuitema, Anable, Skippon, & Kinnear, 2013). Lastly, because the electric car is at a financial advantage in costs per km, car commuters are proposed as a promising target group (Cuijpers et al, 2016). For Eneco E-Mobility, it is interesting to check this profile in the Dutch market, holding it against demographic information to allow targeting.

Additional research in the relation between needs and demographic data and attitude towards the charging infrastructure create value for Eneco. It is worthwhile to explore the consumer groups more extensively to discover relations between group characteristics and perceived barriers in electric car purchase. This helps Eneco to expand their current offer with relevant services and to improve the communication towards their potential market. Though the infrastructure is mentioned as a bottleneck in other research, the insights on the expectations of- and experiences with – the infrastructure are limited. Knowledge on specific needs of consumer groups and the consumer perspective on the infrastructure will help to decide what service does most to stimulate adoption. This research aims to get insight in the different needs of consumers and the bottlenecks and opportunities in the purchase of the electric car. Since the services of Eneco E-Mobility are now mainly centered around charging, the focus will lie on the energy supply of the car.

## Method

Qualitative interviews are expected to give the best understanding of the consumer perspective on the purchase of the electric car. This section describes the recruitment of participants, the procedure and the analysis.

### Participants

Participants were recruited on the following criteria:

- A spread in potential EV drivers and EV drivers
- Focussing on early adopters, including also early majority
- Spread in household situation
- Among EV-drivers, a spread in public and private chargers and type of car

These four criteria were expected to enhance the results. First, both EV users (4 participants) and potential EV users (7 participants) were recruited for the research. This was done to make sure the identified barriers were substantiated by legitimate problems. Second, because of the short-term implementation of the service and the fact that electric cars are not yet widely adopted by consumers, early adopters and early majority were considered most interesting (Rogers, 2010). Third, Eneco E-Mobility wants insights spread per user group that allow them to develop specific services

for different consumers. Therefore, participants are spread in household situation (DINKY's, Families and Empty Nesters, of which a definition can be found in Appendix A7) and age. Fourth and lastly, EV drivers using different chargers were expected to have different experiences.

Participants were recruited in three ways: through a LinkedIn call, flyer dispersion and personal network. In total, eleven interviews were conducted with ten males and one female (see Table 1). Figure 18 summarises the spread in household and driver/potential driver. Each black dot represents an interview. Figure 19 gives an indication of the stage in the adoption curve the participants were in.

### Procedure

Semi-structured interviews were used to retrieve the information from both potential EV drivers and EV drivers. The approaches differed slightly for the two groups: the focus lie on expectations for potential EV drivers and on experiences for EV drivers (see Appendix A8). After a pilot, the setup was extended by adding category probes to aid the participant (see Dutch topic guides in Appendix A9).

Interviews were always conducted face to face. The interviews were recorded on audio tapes. Beforehand, a consent form (Appendix A10) was sent to the participant with information about the purpose of the research and use of the data. At the interview, the interviewer introduced the interview by summarising the purpose of the interview and aim of the project. The participant was asked to sign the consent form. Then, the interview started. In general, the interview lasted 55 minutes.

#### *General transportation*

Participants were asked how they travelled to the location of the interview as an introduction to the topic. They were led to talk about the general modes of transport they used and the reasons to choose one mode over another.

#### *Use of the car*

The participants were led to tell about the overall use of the car. Participants were asked to explain the characteristics of the rides in terms of distances, company et cetera. This topic was used to get an understanding of the differences in car use of the participants. It was also used to gauge the required charge flexibility.

#### *Electric car considerations*

Next, participants (both EV drivers and potential EV drivers) were asked about the considerations to buy an electric car. The participants were first invited to come up with suggestions themselves, but were probed with categories when these dried up.

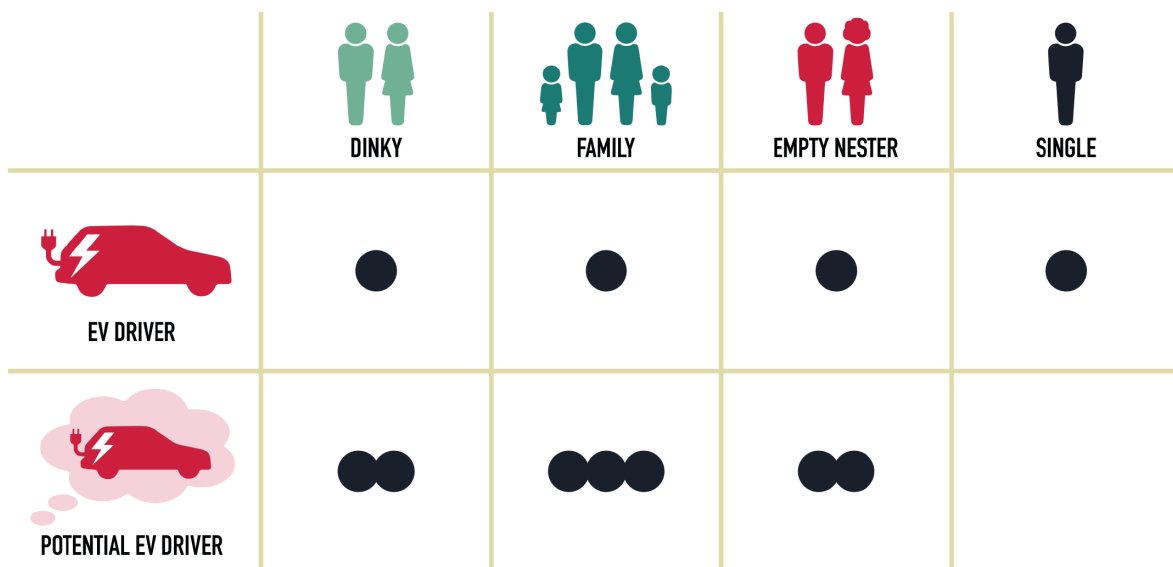


Figure 18: Devision of participants in EV-driver / potential EV driver and household



Figure 19: Devision of participants in EV interest (DINKY's are light green; family are dark green and empty nesters are red)

#	Gender	Age	Household situation	Driving/Interested	Car Type	Charging station
1	male	30	DINKY	Interested (5)		
2	male	31	DINKY	Driving	BEV - BMW i3	Public
3	male	31	Family	Interested (4)		
4	male	34	DINKY	Interested (7)	BEV - Tesla model S	
5	male	34	Family	Driving	PHEV - BMW 225XE	Public
6	male	42	Family	Interested (5)		
7	male	42	Family	Interested (6)		
8	female	46	Single	Driving	BEV - Renault Kangoo	Public& Private
9	male	53	Empty nester	Interested (7)	BEV - Opel Ampera	
10	male	59	Empty nester	Driving	BEV - Mercedes Benz	Private
11	male	59	Empty nester	Interested (4)		

Table 1: Characteristics of participants

The categories were financial, environmental, social, technical and ease of use. This gave insight in the importance of the charging process among the other considerations.

#### *Expectations of / experiences with charging*

When charging was mentioned, this topic was further explored. The EV drivers were asked about their experiences with the charging infrastructure, while the potential EV drivers were asked about their expectations. Participants were probed to come up with services that could make charging easier and were asked about what they found important in car charging. This part aimed at exploring the needs and wants in car charging, that might give opportunities for service development.

#### *Future way of charging*

Finally, the participants were asked to jump ahead a few years, to consider their ideal way of charging. Both the far and close future were explored. Also, participants were asked to mention their ideal way of charging without being realistic. This gave insight in the most important downsides they expect now. It clarifies what users value in car charging and what is considered user friendly.

The interview was closed off by the explanation of further steps. Participants were given a small gift to thank them for participation.

### **Stimuli**

A stimulus (see Figure 20 and Appendix A11) was used as a conversation tool during the 'considerations of an electric car' topic.

This element is inspired by the context mapping method, as also described in the Delft Design Guide (van Boeijen, Daalhuizen, Zijlstra & van der Schoor, 2013). The interviewer wrote the arguments on stickers and asked the participant to paste them on a target. The closer to the middle, the more important the arguments on the stickers were. This stimulus was used to get insight in the relative importance of the arguments. It also functioned as an extra probe, to let the participant reconsider the arguments and add missing arguments.

### **Analysis**

In order to get a complete and accurate overview of the results, multiple steps were taken in the analysis. First, notes were taken during the interview to highlight the most important statements. These notes were digitalised first. Second, the recording of the interview was listened to a second time, to complement the notes with quotes and additional statements. These notes were then translated and transferred to colour-coded circles (see Figure 21). The colours were used to distinguish the different household groups: DINKY's (light-green), families (dark-green) and empty-nesters (red). The circles of EV-drivers were marked with a golden outline. High density circles were used for statements that were emphasized strongly by the participant or mentioned multiple times during the interview. Other statements were placed in low density circles.

The circles with different colours and outlines were all printed and mixed. Then, they were clustered per topic: statements about costs

#### **OVERWEGINGEN IN DE AANSCHAF VAN EEN ELEKTRISCHE AUTO**

Wat speelt er mee in de koop van een elektrische auto? Wat waren de argumenten voor- en de argumenten tegen?  
Schrijf ze op en plak ze op de cirkels. Hoe dichtter bij het midden, hoe belangrijker de argumenten zijn.

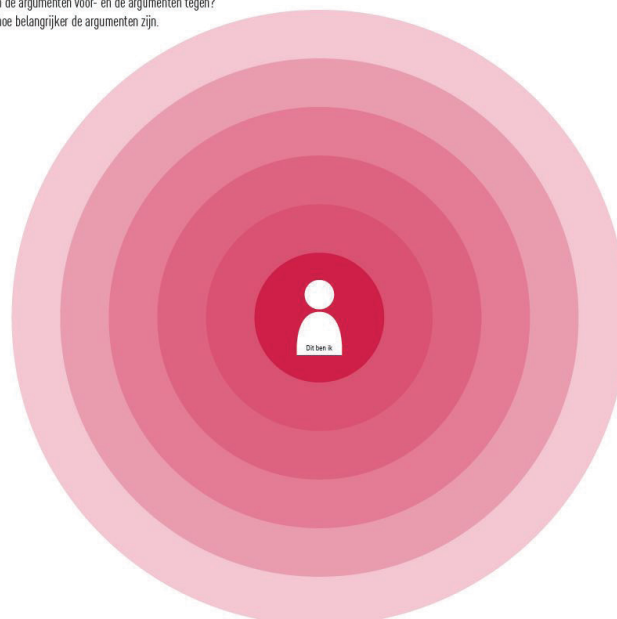


Figure 20: Stimulus material

or sustainability were grouped and relations were made visible. The clusters and sub-clusters were named. Because of the colour-codes, it became evident what topics were stakeholder-specific and what topics were shared by all stakeholders.

## Results

This result section gives an overview of all topics covered in the interviews. They will be sorted in themes. The themes are 'car ownership', 'car purchase', 'benefits stimulating electric car purchase', 'obstacles for electric car purchase', 'expectations of the charging infrastructure', 'experiences with charging infrastructure', 'information for public charging' and 'future developments'. In Appendix A12, the results of the analysis are explained in more detail.

### Car ownership

Participants owned a car for several reasons. Most participants value a car for flexibility and freedom to travel wherever and whenever they want. The car is mainly used for travels outside the city and valued because it brings door to door transport. The car is often faster than other modes of transport, like the bicycle or public transport. The car is also thought to be cheaper and more comfortable than public transport. Some participants would rather go by public transport for environmental reasons, but consider the travel time too inconvenient. Most participants see their car as an essential possession.

*"Een auto brengt mij vrijheid omdat ik sneller, op een moment dat ik dat wil, ergens heen kan." (EV owner, DINKY)*

### Car purchase

Considerations vary widely in the purchase of a car, both for conventional and electric cars. Some participants want their car to be pretty, while others view it as an utensil. Participants that own a second car have other considerations than users with one car. Users with one car need a car fulfilling the needs of all purposes, while users with two cars often distinguish between a smaller 'shopping car' and a bigger 'family car'. The purchase method also influences the choice between an electric or a conventional car. Buying a car brings insecure factors like residual value and battery degradation. Car lease reduces this risk. Lease is also considered positive in respect to the fast improving range: after a short time, the car can be switched for a better one. Though, the lease options are often restricted by the offer of the lease company.

Most participants want EV purchase to be stimulated. They want the lease companies to offer multiple models to choose from and big companies to stimulate their employees to drive electric. Participants said it is important that municipalities are quick to install chargers and that the government maintains the tax advantages. It was considered the responsibility of the influential stakeholders.

*"Het is heel belangrijk dat de gemeente flexibel omgaat met de vraag. Gemeenten moeten laadpalen stimuleren." (EV owner, DINKY)*

Another result for car ownership originated in the participant recruitment. A spread in gender was aimed for, but the man was continuously referred to as 'in charge of the car purchase process'. Only one of the eleven interviewees was female and she was single.

### Benefits stimulating electric car purchase

The interest the participants have for the electric car can be split in four factors. First, sustainability is an important perceived benefit: electric cars are thought to reduce the impact of transport on the environment. Second, some participants expect financial advantages of the electric car. Third, some participants are attracted by the newness and innovativeness of the technology. Fourth and final, some participants consider an electric car for the fit with their work. The participants mentioned combinations of the four benefits as a reason to consider electric cars.

#### Sustainability

Eight participants designate sustainability as the most important reason to consider an electric car. They like that the cars do not emit greenhouse gasses and value the independence of fossil fuels. They find it important that the whole package of the electric car is sustainable and therefore consider to buy solar panels together with the car. Those participants often like to keep track of the energy consumption of the car and see it as a challenge to drive as efficient as possible. They see global warming as a significant problem and often consider sustainability in other parts of their lives too, for example in their choice of work.

The other three participants find the sustainability of electric cars a nice to have. They are not sure whether EV's are truly more sustainable or think their choices do not matter in the process of stopping global warming.

*"Als ik een elektrische auto koop zal ik mezelf verplichten om zonnepanelen op het dak te leggen." (Potential EV owner, Empty Nester)*

*“Ik denk ook dat we onszelf over tien jaar voor gek verklaren, dat we zolang de lucht die we inademen hebben vergiftigd met uitlaatgassen van auto’s.” (Potential EV owner, Family)*

*“Milieu was niet een primaire overweging, maar het was wel een extra nice to have.” (Potential EV owner, DINKY)*

#### Costs

Costs are another important consideration in the purchase of an electric car. Some participants think the electric car will be cheaper than the petrol car. They value the lower costs per km and the tax advantages. They want a complete picture of the costs before purchase. They plan to research this themselves, but often had not yet got around to it. The weight of the cost consideration differs per participant. Some would always choose the cheaper option: costs are decisive. Others will not consider costs at all or are willing to pay extra for the sustainable alternative.

*“Maar als per saldo het misschien niet eens zo heel veel goedkoper is waarom zou je dan al die concessies gaan doen.” (Potential EV owner, Family)*

#### Technology

The technology of the electric car is another purchase motivator. The participants who value technology like to try something new. The new technology is considered attractive and the car feels gadget-like. The cars are believed to be ‘future-proof’, because they are often sold with autonomous driving software. Those technology-enthusiastic participants are often excited about the silent engine with fast acceleration. They also look forward to new innovations like vehicle-to-grid. The participants consider hybrid cars as a semi-solution that shames the real technology. They see themselves as pioneers of the revolution towards a new way of transport.

*“Ik vind de auto’s hele mooie techniek.” (Potential EV owner, DINKY)*

*“Leuk, iets nieuws, altijd uitproberen. Een Gadget-achtig gevoel.” (EV owner, DINKY)*

#### Fit with work

The last important motivator participants mention for purchase is the fit between the car and their work. Sustainable entrepreneurs want to have a sustainable car, to give the right example. The progressive electric car is seen as a way to make an appropriate impression on their contacts. Apart from the entrepreneurs, environmentalists also want to give the right example to others.

*“Omdat ik bij een bedrijf werk in duurzame elektriciteit vind ik dat ik ook die kant op moet bewegen.” (EV owner, Family)*

#### Other

Next to these four benefits, two less important reasons were mentioned. The silent engine is considered advantageous and some participants like that they do not have to refuel again.

### Obstacles for electric car purchase

Apart from the reasons to choose an electric car over a conventional car, there are also obstacles in electric car purchase. The range and knowledge gaps are the most important reasons consumers refrain from purchase and there are also a few factors of minor importance.

#### Range

The limited range of the electric car is mentioned often as a drawback. Participants fear the range will restrict them, limit their flexibility or negatively influence their driving comfort. Most participants want the range to be significantly higher before they consider purchase. Observed innovation in current car batteries makes them want to wait for better models. The range makes the participants choose a plug-in hybrid over a full electric car. Along the same line, participants find the electric car unsuitable for holidays. Most participants also link the range to the speed of public chargers: if charging goes fast enough, the range will be less of an issue. The range is less important for the owners of two cars, who are willing to swap one of their cars for an electric car.

*“Voor elektrische auto’s is de actieradius niet voldoende om een volwaardig alternatief te vormen voor een brandstofauto.” (Potential EV owner, DINKY)*

#### Knowledge gaps

Participants mentioned multiple uncertain or unknown factors, which makes them hesitant for purchase. They wonder whether electric cars are truly sustainable or fear quick battery degradation. They often do not know how charging works or what costs are related to electric cars. The range of the electric car is frequently estimated too optimistic. Some participants are aware of their knowledge gaps. They either intend to find answers before purchase or consider the uncertainty a drawback of the electric car. Other participants are unaware or intend to fill the gaps on the fly.

#### Other

Apart from the range and the knowledge gaps, other considerations make participants choose a conventional car over an electric car. Participants mention the available models on the market







are limited. The purchase price is high and the residual value is unknown. Also, electric cars are thought to “miss the cool factor”. The charge time is too long and the possibilities to charge are too restricted and undeveloped. For residents of apartment complexes, it is difficult to get a charger since the residents committee has little experience with electric cars. Because electric cars are still very new, participants regard them less trustworthy.

### Expectations of charging infrastructure

Participants were asked about their expectations of the charging infrastructure. Most participants do not know how an electric car should be charged. When invited to speculate, they expect to mainly charge at home, at a private charger. Most participants prefer private chargers, because that guarantees an available charger. Some know public chargers near their home and intend to charge there at night. The choice between public and private chargers is also influenced by the costs: consumers have to pay for private chargers, while public chargers are often provided for free by the municipality.

*“In de stad kun je waarschijnlijk ook je eigen laadpaal installeren, of een kabel door de brievenbus. Ik weet niet hoe dat werkt.” (Potential EV Owner, Empty Nester)*

Apart from charging at home, participants expect to use public chargers if they need to. Especially on the go, faster chargers are preferred over ‘normal’ chargers. Participants do not want to wait for their car to charge and consider half an hour the maximum charge time. Participants familiar with the fast charge network intend to use primarily those chargers.

Prospective users expect (and require) the infrastructure to be sufficient for the demand. They highly value the reliability of the network and expect operators to take this responsibility. Some participants are very optimistic about the infrastructure, while others predict problems finding available chargers. The last group fears unavailable chargers due to late maintenance, fully charged cars that occupy charge spots or parking pressure.

### Experiences with charging infrastructure

The participants who owned an electric car were asked about their experiences with the charging infrastructure. The majority of the EV drivers state that the infrastructure is not good enough at the moment. Charging the car is a hassle that costs time and frustration. The participants blame this on the undeveloped infrastructure and lack of accurate information (see ‘info on public charging’). Chargers are often down, hard to find and fully charged cars occupy the charge spots.

*“Het is relatief veel gedoe ten opzichte van een normale auto. Maar dat is het per saldo wel waard.” (EV Owner, Empty Nester)*

*“De infrastructuur is gewoon niet goed genoeg.” (EV owner, Single)*

Trips by car have to be planned carefully. EV drivers have to make sure charging is possible at the destination by checking if the charger is accessible and working. The EV drivers who can fast-charge their car feel the safety of that back-up option. They admit they have to plan their journeys better, but do not experience this as a problem. The users that cannot fast-charge experience planning as frustrating and stressful.

*“Ik moet autoritten beter plannen, maar dat is geen drempel om niet te gaan.” (EV owner, DINKY)*

The EV drivers suggest multiple solutions for their frustrations. They highly value accurate information, a better charging infrastructure and better servicing. Also, they like to solve the full-car occupation by contacting other EV users or the possibility to reserve chargers. The EV users themselves are willing to take on a flexible approach to their car parking to contribute to the fully-charged car occupation problem.

*“Bovendien sta ik daar het hele weekend een laadplek bezet te houden. Ik wil de sleutel ergens droppen: verplaats hem maar als hij vol is.” (EV owner, Empty Nester)*

Even though they are not happy with the infrastructure, the EV owners will not go back to a gasoline car. The principles that stimulated them to buy an electric car are too strong. One EV owner said: “I feel guilty when I drive a petrol car.” Also, the EV owners are very pleased with the electric way of driving. They find the cars very comfortable to drive.

### Info on public charging

Information on public charge stations is provided, to inform drivers about places to charge. The participants were asked how they prefer to receive this information and what would influence the choice between chargers.

#### Communication of the charge information

Information on the public infrastructure is expected to be found in an app or a navigation system. The participants want the system to be intuitive, so they do not have to think about where to charge. Therefore, the participants stress the importance of ‘availability’ information in the app. In this context, the availability refers to

the possibility to charge when needed. Participants want to know real-time whether the charger is vacant, working and accessible. They clearly state that they do not want to search for an available charger, which will take extra time and essential range.

*“Je wilt meteen naar de goede laadpaal toe kunnen rijden, zonder zelf te hoeven kijken naar de beschikbaarheid.” (Potential EV owner, Family)*

*“Als je de hele tijd moet zoeken naar een plekje is dat wel vervelend.” (Potential EV owner, DINKY)*

#### *Choice between chargers*

Participants will choose between the available chargers based on distance to destination, costs, energy source and charging speed. This information should be provided by the information platform.

In the choice for a charger, the pragmatic distance to destination is considered most important. In general, time is seen as an important benefit of the car and this should not be lost in the travel from the charger to the final destination. The distance to the charger also determines whether the car remains its advantage of door to door transport.

*“Afstand is het meest belangrijk in de keus voor een laadpaal; omdat dat tijd kost.” (Potential EV owner, DINKY)*

Next to the distance, the costs of charging are a consideration. Some participants heard the costs are not clear at the moment, while most highly value cost transparency. Costs will influence the charger choice of most participants, while others do not look at the costs at all.

The energy source of the charger is important for the participants that value sustainability. To benefit from the environmental advantage of the electric car, the energy should be renewable. This is more important to them than the costs of the charger. Some participants mentioned they inquired after the energy source of charge stations, but this was hard to come by.

Lastly, for public charging, participants value the charge speed. Participants will choose fast chargers over slow ones. They prefer to charge their car in the time they are doing something else, so they can leave with a full battery.

*“Dat is een afweging tussen gemak en prijs: net zoals tankstations.” (EV owner, DINKY)*

#### *Experiences with the provided information*

The previous considerations are mentioned by potential EV drivers, current EV drivers have experienced the services as they are now. The current EV drivers make clear it is hard to find accurate information about the infrastructure. The information is often outdated, inaccurate or incorrect. Locations of chargers are stated wrong and chargers are hard to find. The EV drivers emphasize they are dependent on the information. Especially the owners of cars that cannot fast charge need to plan their journeys towards chargers. The EV drivers base their choices on the information about the infrastructure, which is often incorrect. This leaves them with an empty car battery, without a way to charge. They said the accuracy of the information is more important than the information itself. If the information is incorrect, it would be better if it was not offered at all.

*“Ik heb door schade en schande ontdekt dat die informatie niet klopt. En dat ik er niet op kan vertrouwen en dat ik driedubbele checks moet doen en dat het dan nog mis kan gaan. En dat vind ik heel vervelend.” (EV owner, Single)*

*“Ik verwacht niet per sé ergens informatie te vinden, maar als je informatie biedt, zorg dan dat die accuraat is. Biedt het anders niet.” (EV owner, Single)*

#### **Future innovations**

Participants were asked to predict the future of car charging. They forecasted the developments for the charging infrastructure and the influence of future innovations like smart and wireless charging.

#### *Charging infrastructure*

Participants expect (and hope) that the charging infrastructure will be expanded fast. They think charging will go faster. Some indicate an interest in battery swapping. Participants want the recognition of the car by the charge station to be automatic, for example with a chip in the plug.

*“Over het netwerk: hoe meer hoe beter hoe sneller hoe beter. Ik denk dat dat voor veel mensen een remmende factor is.” (Potential EV owner, DINKY)*

#### *Smart charging*

Smart charging and vehicle-to-grid are often mentioned technologies. Participants like the potential to store renewable energy from solar panels in their car. One person sees the technology as a secondary work advantage: to charge the car at work and use the energy at home. Smart charging systems are

seen as positive developments, but participants emphasize the consequence of smart charging for their schedule should be clear. Also, the schedule should function without interference of the user.

#### *Wireless charging*

Next to smart charging, wireless charging is often mentioned. Wireless charging is seen as an advantage when it is faster than plug charging. Also, charging while driving is seen as an ideal situation. However, participants consider this a future vision, because they see this is expensive and complicated.

#### *Other*

When asked what services they want in the future, one participant wants the full battery as a service ("I don't want to charge, I want a full battery"). In EV purchase, the consumers want package deals: when they buy an EV, they want to buy a charge station with it, and possibly also solar panels or whatever else they might need. Also, the consumers would like advice on battery treatment, to make the most out of the battery lifetime.

## Conclusion

The results help to understand how consumers perceive electric cars and uncover use preferences and needs. In conclusion, the following can be said about barriers, opportunities and consumer groups in EV purchase (Figure 22).

### Barriers

From the interviews, four barriers can be identified in electric car purchase: the range, the charging infrastructure, requesting a charger and knowledge gaps.

#### *Range*

From the interviews, it becomes clear that a car is owned because of the convenience it brings. Being always available, the car offers a flexible way of transport adjusted to your schedule. Simultaneously, electric cars provide a range that is significantly smaller than that of the conventional car. Because of the shorter range, the use of the car requires a consideration of the range and charge possibilities at the destination (Graham-Rowe et al, 2011). This, in combination with the long recharging times, makes the car significantly less flexible. Participants considered this as an important barrier in electric car purchase, as also found by other research (Egbue & Long, 2012; Sierzchula et al, 2014).

#### *Charging infrastructure*

The short range is partly solvable with a widespread, fast and

reliable public charging infrastructure (Ernst&Young, 2012; Cuijpers et al, 2016). However, the current infrastructure is no advocate for the electric car. On the contrary, EV users are disappointed by the current charging facilities (also found by Graham-Rowe et al, 2011), an experience that is also spread through word of mouth. Consumers that will buy an electric car now, are likely to be disappointed too. If operators can improve (the information about) the charging infrastructure, it will contribute significantly to the success of electric cars.

#### *Requesting a charge facility*

When an electric car is bought, it is important to have a charging facility nearby. Consumers who use a semi-private car park, for example in apartment complexes, foresee problems in the request of a charger. The decision is not only theirs, it concerns the other residents too. The electric car is new material, with consequences unfamiliar to residents committees. This will result in a tiresome process for the consumer, putting some of them off.

#### *Knowledge gaps*

Lastly, consumers lack knowledge about the electric car. Consumers are unaware of the costs of an EV compared to the conventional car, have a hard time assessing the environmental impact and do not know how charging works. Participants fear that the infrastructure is not developed enough. They are unaware of chargers in their direct surroundings. They consider the electric car unproven and are afraid of the value degradation of the car. Often, the consumers were aware of the factors that were important to them, for example sustainability or costs, but were in the dark in the other domains. The knowledge gaps are confirmed by other research (Lane & Potter, 2007; Hensley et al, 2011; Graham-Rowe et al, 2011). Because of this lack of knowledge, consumers have a hard time estimating what an electric car means for their mobility. In combination with the short range, this makes them hesitant for purchase.

### Opportunities

On the other hand, opportunities are found to stimulate electric car purchase.

#### *Drivers for purchase*

As also found in literature (Egbue & Long, 2012; Bamberg, 2013; Moons & de Pelsmacker, 2012; Diamond, 2009; Hidrue et al, 2011), sustainability is a very important motivator pro-purchase of the electric car. Independence of fossil fuels, no emission and global warming are important reasons to consider electric car purchase. Furthermore, financial factors are stimulating: consumers suspect electric cars to be cheaper than conventional cars, which makes



Figure 22: Barriers & opportunities in ev purchase



**DINKY**



**FAMILY**



**EMPTY NESTER**

**SUSTAINABILITY AS NICE TO HAVE**

"Sustainability was no primary consideration, but it is an extra nice to have."

**GO BY PLANE**

"Electric cars are not suited for holidays. I think we would faster go by plane."

**OWN TWO CARS**

"We need a second car for flexibility."

**HIGH EXPECTATIONS OF INFRA**

"Your car navigation system automatically displays all the charge stations and you can see how much range you have left. How hard can it be?"

**STIMULATE ELECTRIC CARS**

"I would be annoyed if the tax would rise to 22%. It is important to stimulate electric driving."

**CONSIDER PHEV FOR RANGE**

"For me, the range is a reason to consider a plug-in hybrid."

**NEED A BIG CAR**

"It is important to have a car that fits our whole family including luggage."

**SUSTAINABILITY IS IMPORTANT**

"An important advantage of electric cars is that they drive emission-free and are independent of fossil fuels."

**RENEWABLE ENERGY IS MUST-HAVE**

"I will buy solar panels with the car. That is a package deal for me."

Figure 23: Overlap between households

them consider purchase (Graham-Rowe et al, 2011; Lane & Potter, 2007; Ewing & Sarigöllü, 2000). The last motivator is the technology: the innovativeness of the electric car appeals strongly to some participants. They look forward to further developments and like to pioneer in this revolution (also proposed by Egbue & Long, 2012; Lane & Potter, 2007). These perceived main benefits of the electric car offer opportunities for product development and can be emphasised to stimulate adoption.

#### *Electric car lease*

Another opportunity is electric car lease. Car leasers return their car at the end of the contract and pay a fixed price per month. Apart from entrepreneurs, a lot of consumers use a lease car through their work while still being responsible for a great part of the costs. Car lease is a very accessible, low-risk way to get familiar with the electric car. Without uncertainties like battery degradation and residual value, the electric car is less scary. In the first years towards the adoption of the majority, EV lease is a great way to attain a proof of concept.

### **Consumers**

The aim of the research was to find needs that match to specific consumer groups. For this purpose, participants varied in household situation. In the analysis, the households were colour coded to enable pattern identification.

A few relations between need and household were found (see Figure 23). The fact that so few patterns were found between consumer groups indicates that car purchase considerations are very personal. They are dependent on various factors that all differ per individual. This stresses the need for tailored products and services Eneco already plans to develop. It also makes patterns in purchase considerations valuable: this makes it possible to predict consumer needs.

Much stronger than the consumer groups, the purchase motivation has interesting links to their attitude towards use and additional services. This means that, as mentioned at opportunities above, sustainability, costs and technology can be used to increase the benefit of electric cars. It seems that most consumers consider electric car purchase for two out of those three reasons. The benefit gives information about other services consumers might be interested in, in the use of electric cars.

In summary, barriers, opportunities and patterns in needs were found. Four barriers in purchase can be distinguished. The range that might restrict the flexibility of the car, the undeveloped network that might make it hard to charge, the request for a charger in shared car parks is complicated by the residents committee and lastly, knowledge gaps, leave consumers a lot of guesswork for what the electric car means to their lifestyle. Fortunately, there are also opportunities. Consumers see advantages of the electric car that motivate purchase: electric cars are sustainable, cheaper and innovative. These benefits can be exploited to stimulate purchase. Also, electric car lease is an opportunity, as it reduces the risk for the consumer. Among consumers, only few relations were found between household groups, but the perceived benefits did show relationships with other needs.

## **Discussion**

The research has resulted in insights in the user perspective on the electric car. This section will explain how the discovered barriers, opportunities and attitude relations are used for service development.

### **Service development**

The research has resulted in barriers and opportunities to improve the perception and experience of electric car use. Some barriers reveal conditions Eneco E-Mobility has to work with, such as the range of the car. This range and the negative experiences with the infrastructure might be somewhat stronger than with recently introduced cars, since not all electric drivers were able to fast-charge. Other barriers show disadvantages that offer an opportunity for improvement, like the education of the consumer. The opportunities present possible approaches towards service development. The barriers as well as the opportunities give Eneco E-Mobility possibilities to create value for consumers with commercial services. The conclusions of the research will therefore be the foundation of the to be developed service.

### **Purchase Drivers**

On top of this, the insight in different consumer groups helps to understand relations between consumer needs. From the results, three groups were created, each based on an important purchase

driver. The purchase drivers are represented by the following groups: environmental savers, technology enthusiasts and cost balancers.

Since the recruited participants either owned an EV or planned on buying one, the group represented the early adopters and early majority. The Purchase Drivers can thus only be applied to these groups.

Empty nesters and families are often found in the 'environmental saver' group. Sustainability is the main motivation to buy a car. Users in this group often want to purchase solar panels together with the car. The energy for the battery should be green. Environmental savers are often flexible in transport choice and are willing to go by public transport or to hire a car for holidays. A car is seen as a functional object and they are indifferent to the new technology or way of driving. For them, it is important that the whole package is sustainable. All services to get insight in the impact of the car as well as services that make the car more sustainable, are interesting for them.

The 'technology enthusiasts' like technology and innovation and buy the car to try something new. They do not consider a PHEV, but only want a car fully powered by an electromotor. Technology enthusiasts look forward to the new technologies that the car will bring, like autonomous driving or vehicle-to-grid. They want their car and equipment to be future proof and expect a seamless driving experience, facilitated by the technology.

The last group is 'cost balancer'. Money is a consideration for most consumers, though it differs between lease drivers and car buyers. Because there was no clear definition of a business driver, lease drivers were also included in the participants. For lease drivers, finances are an important consideration, but it differs per lease contract to what extent the driver is responsible for the costs. What costs are important in car ownership is therefore still unclear. However, both lease drivers and non-lease drivers are part of this group; their decisions mainly dependent on financial incentives. Cost balancing consumers will choose a cheap provider and charger. They dislike obscure pricing. Participants valuing finances want insight in the total costs of ownership and like solar panels and vehicle to grid for their financial advantages. They like the monthly cost overview as a confirmation of the money they save.

The Purchase Drivers are no tool for market segmentation, but a tool to enhance the relationship in needs of consumers. No consumer will be the archetype of a Driver. More likely, all consumers will consider all drivers, but find some more important than others.

Upon consultation, the participants indicated a strong relation with one or two drivers. A third one was of less importance. The Drivers should be considered supplemental, not exclusive.

In product development, each of these Drivers should be considered and accommodated for, to make sure every type of consumer is reached. The Purchase Driver can be the starting point for the development of tailored products and services, as it will be for the service developed in this project.

This research extended the understanding of the consumer perspective on electric cars. It confirmed and reinforced findings of other research with results of the Dutch market. The current knowledge is broadened with insight in the relationship between electric car purchase and additional needs for electric car use and charging. The understanding of car charging is expanded, revealing problems consumers foresee and the solutions they envision. Lastly, the research has increased the understanding of the consumer attitude towards sustainability. It discloses which compromises consumers are willing to make for their lifestyle and which values are not negotiable. The understanding is a starting point for designers and marketers to serve the consumers according to their needs.

To summarize, patterns were found between the main purchase motivation and consumer needs. The findings were translated to Purchase Drivers: profiles that show the relationship between the reason to purchase an electric car and additional services consumers would be interested in. Three profiles are created. 'Environmental Saver', buying a car for sustainability reasons and seeking for ways to reduce impact even more. 'Technology Enthusiast', keen on trying something new and enthusiastic about any innovation related to electric cars. And lastly, 'Cost Balancer', interested in the electric car for financial reasons, striving to confirm this assumption. The Drivers are complementary: consumers in the early adopter and early majority group are likely to value two of the three Drivers. The Purchase Drivers can be used for product development and marketing purposes.



## ENVIRONMENTAL SAVER

highly educated, high income, families & empty nesters



"It is important to do something to stop climate change. EV's contribute to a cleaner environment and help to reduce our dependence on fossil fuels."

### VALUES



Environmental savers believe that everyone should contribute to a better world. For them, it is important to aim for a sustainable lifestyle. Their environmentally conscious behaviour manifests in multiple aspects of their life, for example in their work or purchase behaviour.

### ATTITUDES



Environmental savers are ok with paying a little more for the sustainable electric car. They are flexible in mobility: they could just as well choose for the public transport and might hire a car for holidays. For them, a car is a functional object. As long as it gets them from A to B, they don't care about the technology or way of driving.

### DESIRES



The environmental savers will want to finish the lifecycle of their current car before they buy an EV. They like to produce renewable energy to power their car, for example with solar panels. For them, it is important to have insight in the impact on the environment. They like to track the energy consumption of the car, which they might also use to convince others to start driving electric.

## TECHNOLOGY ENTHUSIAST

highly educated, high income, dinky's & empty nesters



"The electric car is a great piece of engineering. I like to be part of this revolution towards a new way of transport."

### VALUES



Technology enthusiasts have a heart for car technology and innovation. They follow new developments in the car industry with interest and keep themselves up to date with trends. They prefer to experience car innovations first-hand.

### ATTITUDES



Technology enthusiast consumers would buy an electric car for the technology, somewhat as a gadget. They like the new way of driving: silent and with fast acceleration. Plug-in hybrids are viewed as a semi-solution that shames the real technology. Sustainability is no important consideration in the purchase and is seen as a nice to have.

### DESIRES



Technology enthusiasts want their car and equipment to be future proof. They look forward to the new possibilities that come with innovation and don't want to stay stuck with old material. Fast and smart charging is right up their alley. They want the technology to provide a seamless driving experience. Electric driving is something to stimulate.

## COST BALANCER

highly educated, high income, dinky's & families



"If the total package is not cheaper, why would you compromise so much on your driving comfort...?"

### VALUES



The cost balancer's do not want unnecessary expenses. The costs are an important factor in their car purchases. Cost balancer's will carefully compare costs and benefits of a new car. They are willing to accept less driving comfort, but only if this saves them money in the long run.

### ATTITUDES



The economic advantages make the electric car attractive for cost balancer's. They consider a car a functional object, no status symbol. The costs will be decisive for the purchase. Sustainability can be a factor, as long as the costs remain reasonable. Costs will also be considered when choosing a charger or operator.

### DESIRES



Transparent pricing is of high importance for cost balancer's. A complete overview of the costs, including maintenance and residual value, is a must before purchase. They like to have a monthly overview of charging costs as a confirmation of the money they saved. Cost balancing consumers can be interested in smart charging or solar panels for the economical benefits it may bring.



**EV STATION**  
I think home charging is important for EVs. It's convenient and saves money. I would like to see more public charging stations.

**WILL BE BETTER**  
I think EVs will be better in the future. They are cleaner and more efficient. I hope they become more affordable.

**TAKE IT EASY TO GET A CHARGE**  
I think it's important to have easy access to charging stations. It should be convenient and quick. I hope there are more charging options.

**CHARGE TO GO**  
I think it's important to have charging stations in public places. It's convenient and saves time. I hope there are more charging options.

**RECHARGE AT HOME**  
I think it's important to have charging stations at home. It's convenient and saves money. I hope there are more charging options.

**TWO CARS**  
I think it's important to have charging stations for two cars. It's convenient and saves time. I hope there are more charging options.

**EV QUALITY**  
I think it's important to have high-quality EVs. They should be reliable and efficient. I hope there are more options.


**DRIVE WHERE**  
I think it's important to have charging stations in public places. It's convenient and saves time. I hope there are more charging options.

**DRIVE**  
I think it's important to have charging stations in public places. It's convenient and saves time. I hope there are more charging options.

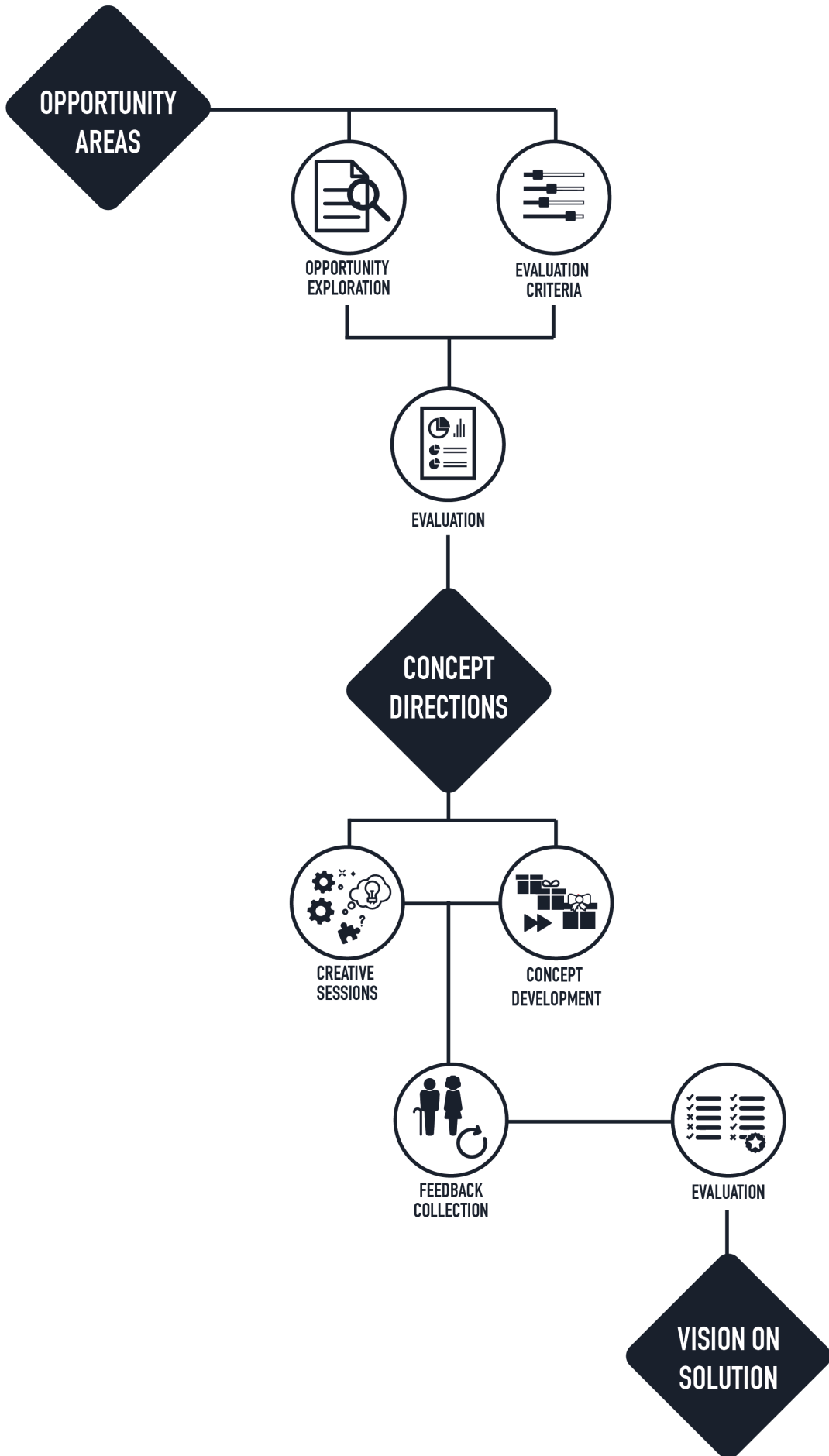
**CHARGE AT HOME**  
I think it's important to have charging stations at home. It's convenient and saves money. I hope there are more charging options.

**CHARGE AT HOME**  
I think it's important to have charging stations at home. It's convenient and saves money. I hope there are more charging options.

# VISION ON SOLUTION



The first chapter gave an overview of the current situation from multiple perspectives. These insights now need to be combined into a vision on the solution: a conclusion for the current situation with a direction for the service. This is done in this chapter, *Vision On Solution*. The chapter starts with a description of the ideation phase, explaining what steps are taken to translate the insights to a design vision. Next, three concept directions are described, proposing potential solutions. Lastly, an overall conclusion determines what direction is most viable and formulates the aim of the service in a positioning statement.



## 2.1 IDEATION

In order to combine the insights from the analysis into a design vision, an ideation phase is set up. This phase consists of iterative cycles, resulting in a positioning statement for the concept. The process uses multiple diverging and converging steps, exploring directions before selecting the most fruitful ones. A schematic overview of this phase is presented in the figure on the left.

The barriers described in the user research led to seven opportunity areas described in Appendices A13 and A14. Those opportunity areas are first ideas for propositions that resolve a barrier. For example, one opportunity was car sharing among those interested in the electric car and owners of an electric car. This provided the owners of the electric car with a comfortable holiday car, while the interested consumer could try the electric car for a longer period to see whether they liked it. The opportunity areas were explored further by searching additional information to verify initial assumptions. To illustrate, the car sharing was discussed with environmentally conscious family members and the interest for car sharing was evaluated by checking the participant numbers of car sharing platforms.

Simultaneously, eleven evaluation criteria helped to determine the most promising areas. Eneco highly values the individual needs of consumers and wishes to lower the barrier to electric cars. This resulted in the criteria 'barrier solving' and 'value for user'. Second, it is important that the service fits Eneco E-Mobility's product portfolio and generates profit. Therefore, the service is evaluated on 'strategy match' and 'commercial value'. Thirdly, by distinguishing from the current offer, the relative advantage of the service becomes clear. Thus, it is important that the service is 'distinctive'. It is also important that the service is substantiated by the research, which resulted in the criteria 'research support'. The areas were also evaluated by the five factors of the theory of Rogers (2010), as explained on page 35.

Next, the concepts were evaluated with the criteria above to bring them down from seven to three. To give an example, the car sharing scored low on value for user, the strategy match and distinctiveness. It was not received with much interest and the percentage of consumers interested in car sharing is very low

(2%). Also, the service does not fit with the current offer of Eneco E-Mobility. Because of this, the opportunity was eliminated. In Appendix B15, the detailed evaluation can be found for this and the other opportunity areas.

A creative session was organised to develop three concepts further. The creative session was held with four industrial design students from the different master directions (Integrative Product Design, Design for Interaction and Strategic Product Design). In two and a half hours, each concept was divided in five sub problems which were brainstormed upon. The confrontation with fresh eyes delivered new perspectives on the concepts, which were used to develop them further. Eventually, the concepts were defined by a target group, a main benefit and a product shape. All three were described in an advertisement, presented in section 2.2 (also Appendix B16).

Consumer opinions were necessary to determine which of the concepts scored highest on 'barrier solving' and 'value for user'. A survey was set up and spread among potential electric car owners. The recruited participants were all highly educated, had a high income and owned a conventional car. The selected participants belonged to the 'early majority'/'late majority' group. Because this group has not yet considered electric car purchase, their input was considered most insightful.

The survey gave a broader perspective on the perceived drawbacks of the electric car, the importance of these barriers and interest for the concepts (for the complete overview of the survey, see Appendices B17 and B18). The results confirmed that the range is the most important barrier of the electric car. Also, participants are unaware of the exact range and do not know where charging facilities in their surroundings are located. The requests for a charger and the public charging infrastructure were considered less important barriers. The survey has also given insight in the value of the concepts: they were all judged fairly positive.

With the input of the survey, the concepts were evaluated once again. This, in combination with the other results of the ideation phase, resulted in an overall conclusion of the analysis- and ideation phase of the report and a design direction in section 2.3.

## 2.2 THE THREE CONCEPTS

The explanation of the ideation phase in section 2.1 mentioned three concept directions that were considered and evaluated a survey. Here, the origin and essence of the concepts is described. Figure 24 shows three images that were used to communicate the concepts to participants of the survey.

### 1: EV-Match Assessment ('Maat')

One of the most important drawbacks of the electric car is the range. Users are afraid of being restricted in their mobility, while flexibility is seen as the most important advantage of a car. However, in this fear, consumers focus on the few times they drive longer distances than 200 km. It is likely that the electric car suffices fine for the greater part of their trips. Simultaneously, many consumers are unaware of the possibility to fast charge, expanding the range unlimitedly. It is impossible for users to assess the extent to which they have to compromise on their flexibility.

"Maat (English translation: 'Mate') is an app that analyses your car use to calculate what the impact of an electric car would be on your mobility. Maat can tell you what percentage of your travel you could do without public charging which trips do need charging on the go and which chargers you can use. Furthermore, because Maat has such precise data on your car use, it can tell you your exact savings: both financial savings and environmental savings."

Maat helps users to find out whether an electric car would be interesting for them. By telling how much consumers can save, it provides awareness and stimulus towards electric cars. By being based on real data, the information is more trustworthy and probable to convince users. Most importantly, Maat helps to lower the most important barrier in the adoption of electric cars, by giving more insight in the impact of the range.

### 2: Resident Committee Charger Consult

In the Netherlands, everyone with a bought house is part of a Resident Committee (RC). This means that when they want to change something on the shared property, like the installation of a charger, they need to deliberate with the committee.

RC's are found to have a lot of doubts on charger installation, for example about the impact on the power grid. This delays the charger installation and causes hassle for the resident.

With its expertise, Eneco E-Mobility assist the RC with the charger request. By getting themselves familiar with the organisation of the RC and the most frequently asked questions, they can guide the EV owner in the purchase of a charger.

By facilitating the request for a charger, Eneco E-Mobility relieves the consumer of a frustrating, time consuming task. The service fits their strategy perfectly, because they already consult for charge point installations. Their expertise will speed up the process and thus creates value for the user.

### 3: Public Charging with User Feedback

Some participants expressed worries about finding available chargers. The EV owners confirmed these worries: info about the location of chargers is often wrong, chargers are broken or turn out to be private. These experiences are no advocate for EV driving.

This is an opportunity to incorporate 'user feedback' in the apps that provide information on the charging infrastructure. Users can adjust the information according to their experiences, thereby continuously checking and improving the information. Giving feedback in the app could be rewarded by discount on charging or extra functionalities like charger reservations.

The application also leaves room for Eneco E-Mobility to include a 'consumer profile' in the application, in which users can find their charging history and billing.

The application with user feedback makes use of the potential of its users. This will make sure the offered information is checked and therefore saves users time and frustration. The feedback function is, together with the current offer, a unique feature and distinguishes Eneco E-Mobility from competition. The app brings a seamless charging experience one step closer and, with this positive word of mouth, stimulates consumers to switch to electric driving.

A choice between these concepts is made in the overall conclusion.



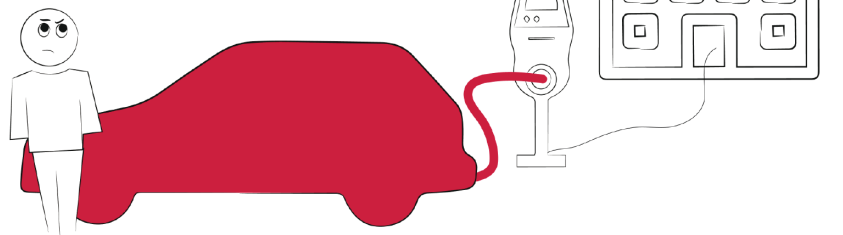
**KAN IK DEZELFDE  
DINGEN BLIJVEN DOEN MET  
EEN ELEKTRISCHE AUTO**

**Elektrisch rijden. Iets voor jou? Test het met Maat.**

- Ontdek welke afstanden je echt rijdt door je autogebruik te volgen
- Ontvang advies over elektrisch rijden en opladen op basis van jouw autogebruik
- Bereken jouw besparing op je kosten en voor het milieu

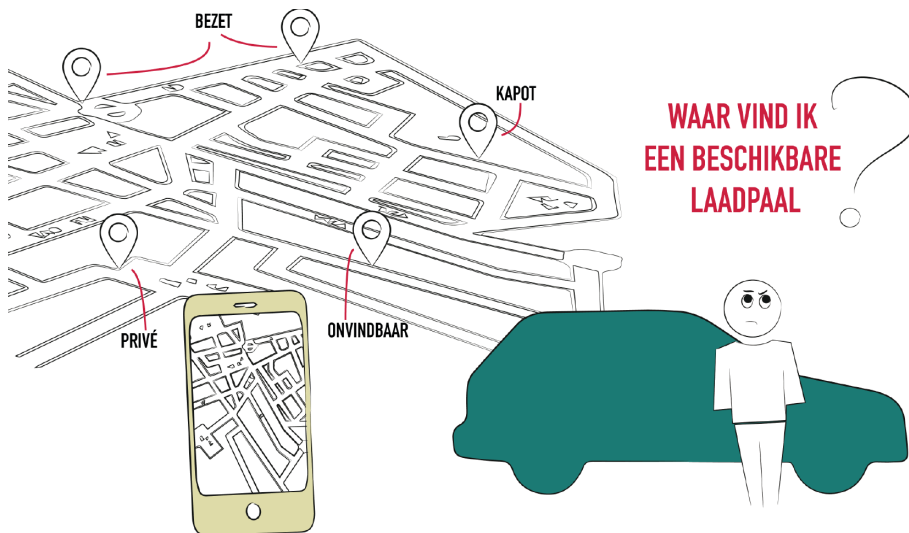


**KAN IK EEN LAADPAAL  
AANVRAGEN VOOR DE  
PARKEERPLAATS VAN MIJN  
APPARTEMENTENCOMPLEX**



**Een laadpaal aanvragen voor een gedeelde parkeerplaats. Wij regelen het voor je.**

De installatie van een laadpunt op een gedeelde parkeerplaats brengt vragen met zich mee over de belasting van het netwerk, stroomverbruik en de kosten. Wij weten wat er speelt binnen de Vereniging van Eigenaren en helpen je met je aanvraag. We bieden advies op maat en snelle installatie, zodat jij snel met een volle batterij op weg kunt.



**WAAR VIND IK  
EEN BESCHIKBARE  
LAADPAAL**

**ChargeBuddy. De app met up-to-date informatie over de laadinfrastructuur.**

- Laadinfo met locatie, prijs, laadsnelheid en stroomsoort
- Accurate informatie door middel van user feedback
- Verbeter de gegevens met jouw ervaringen



Figure 24: The three concepts

## 2.3 OVERALL CONCLUSION

The analysis in the previous chapters give a good grasp on the current situation, which is necessary to evaluate the three design directions. Here, a conclusion is drawn for the current situation and a direction is chosen for the service (see also Appendix B19).

Eneco Group has invested in the electric car as part of their strategy to become the leading company in the energy transition towards a sustainable society. An important aim of Eneco E-Mobility is to stimulate consumers to purchase the environmentally friendly electric car, enlarging their market. At this moment, consumers show an increasing interest for sustainable products and the government has set their eyes on the electric car as a sustainable way of transport. Financial incentives are offered as a stimulant until at least 2020, which is found to have a positive effect on the purchase numbers. The interest in sustainability creates a promising setting for the electric car, which can be taken advantage of by Eneco E-Mobility.

Simultaneously, the strategy of Eneco E-Mobility shows a clear desire to focus on the client. Their products and services show consideration of individual B2B customer needs and their department is organised to provide additional after sale services. Being the first of their competitors, Eneco E-Mobility wants to expand this same user-centered approach to the emerging private market.

When reviewing the current market, most services around electric cars are universal. Competitors provide information about public chargers or enable communication between electric drivers, services that can be used by anyone. Websites provide plenty of information about electric cars, to aid consumers in their car purchase decision, but the information remains general. Though test drives are pre-sale tools that engage the consumer personally, it only gives a brief insight. There is no service that helps consumers to get reliable, personal advice to their car purchase decision.

The range of the electric car is frequently mentioned as a barrier for purchase. The other barriers that were the inspiration for the other concepts were significant issues, but diminish in comparison with the barrier of the range. Consumers buy a car to be flexible and they fear the range will restrict them. Simultaneously, consumers are

unaware of the exact range and the charging infrastructure, which makes it hard to estimate to what extent they have to compromise on their flexibility. Since there is no way to test the range for their car use, it is impossible to verify their assumptions. Consumers choose for the safe, familiar ICE car, because there is no service to contradict their concerns about the range.

At the same time, the research shows that consumers are often in the dark about the exact benefits of the electric car. They anticipate advantages in costs and sustainability, but do not know whether these assumptions are true. There is no easy tool to measure the individual gains for each customer. Because the benefits are so intangible, it is hard to use them to convince consumers.

In summary, the service should contribute to the strategy of Eneco Group by stimulating consumers to buy the electric car, mainly for sustainability reasons. The societal setting promises stimulus for the electric car, which underlines the importance of fast implementation. Consideration of individual consumer needs is crucial to align the service with the strength of Eneco E-Mobility, something that is even more important because of the lack of personal services in the current market. The range is an important drawback which makes consumers tend to the conventional car. Also, the advantages of the electric car are too vague to convince consumers. A promising way to increase adoption is to focus on the transparency of the range and the benefits.



## Design direction

The predicted leap in electric car purchase by consumers has yet to occur. The research shows that two main issues play a role in the consideration for an electric car. One: consumers fear the range is not enough to let them enjoy their car as they are used to. Two: the potential of the advantages of the electric car has not materialised yet, because the extent of these benefits is ambiguous and there are no services to specify them. The combination of the unknown impact of the range and the haziness of the benefits impedes the purchase decision of the consumers.

Compatibility is one of the five factors in Rogers' theory to influence the adoption of innovation (Rogers, 2010). The two aspects above, range impact and benefit extent, are both linked to the compatibility. They help the consumer to assess how the electric car fits with what they are used to and what benefit it brings. Because the range and benefit extent affect compatibility, a tool that affects them significantly stimulates the adoption of electric cars.

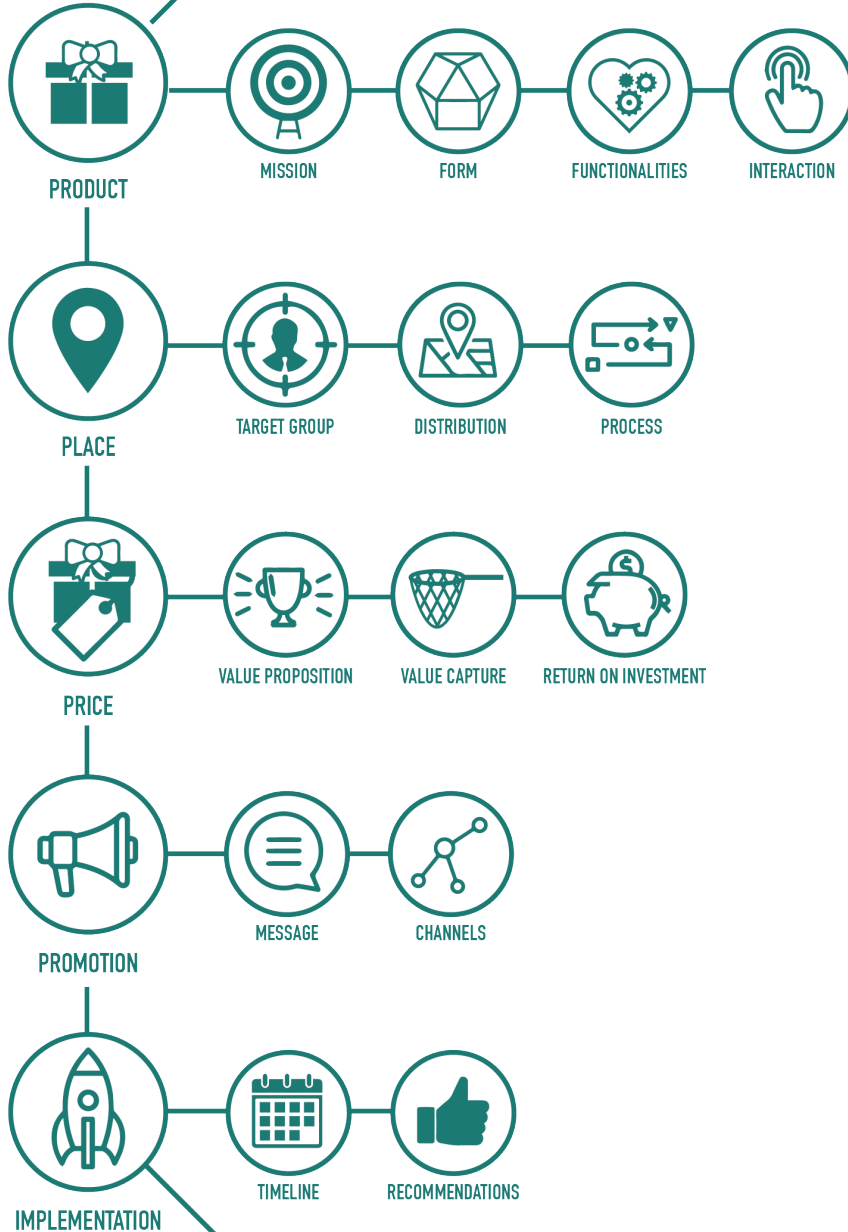
To accelerate the adoption of electric cars, the emerging market needs a service to help consumers assess the impact of the range and the extent of the benefits. It should specify the advantages of the Purchase Drivers, sustainability, costs and technology. The service is most convincing and trustworthy if it is based on the mobility habits of consumers. The tool should give insight in the match between the range and the consumers car use. The personal data can also be used to inform about chargers at frequent destinations. Altogether, the service will help consumers to understand what an electric car means for their mobility. By specifying the costs and benefits of the electric car, consumers can make a balanced purchase decision that fits their motives.

Eneco E-Mobility might not seem the most logical party to introduce a pre-sale service, but they are for several reasons. When considering car purchase, consumers often visit car dealers to inform themselves. However, the analysis shows car dealers lack knowledge of electric cars: they are unable to inform consumers

accurately about the implications of electric driving. Eneco E-Mobility keeps close relationships with the car dealers, as they represent a crucial distribution channel for their charging equipment. Eneco can use the knowledge they have about electric cars and charging to help their partners with the car sales. This way, the service helps Eneco E-Mobility to improve the information flow towards consumers, while strengthening the relationship with their partners.

*Eneco E-Mobility will offer a transparent pre-sale tool that gives a personal overview of the benefits and costs of the electric car for their lease and car dealing partners. To do so, the service analyses the car use of the consumer to give insight in nearby charge facilities and the impact of the range on their mobility. Simultaneously, the service provides an overview of the savings in costs and for the environment and a sneak peek of future innovations.*

VISION ON SOLUTION



FINAL CONCEPT

# SERVICE PROPOSAL

The project is structured in three phases. The context chapter presented different perspectives on the current electric car market, which gave an understanding of the status quo. These insights were then combined into a design direction in the second chapter. This final chapter, the Service Proposal, is structured like the figure on the left. It presents the service<sup>3</sup> with an implementation strategy, following the 4P-model of Kotler & Zaltman (1971, see also van Boeijen et al, 2013). It starts with Product, defining the mission, form and functionalities of the service and presenting the interaction. Then, the Place section defines the target group and decides on distribution channels. Price presents the value proposition with a strategy to capture this value. It also calculates the return on investment. Promotion explains the message and the channels to announce the service. Lastly, the implementation section plans a strategy towards implementation and gives recommendations.

<sup>3</sup> As the title of the chapter suggests, the presented service is a proposal. The service is detailed to best insight, but it is not yet finalised. Assumptions need to be verified with the stakeholders in further development.



## EV Inzicht



My dashboard

EV Inzicht

Additional information

Back to dashboard user

### EV match



#### Make your selection

Ownership type

Choose ownership

Planned ownership duration

Choose duration

# 3.1 PRODUCT

The service was defined in a positioning statement on page 57. It gives a clear idea on what the service should do, but it is left open how the service should achieve this. This section of the report resolves this by explaining the mission, form, functionalities and interaction of the service.

## Mission

The mission formulates the goal of the service and explains the essence of how this is achieved.

At this moment, consumers are hesitant to purchase an electric car, because the impact on their life is indistinct. To get around this, the service has two goals. One, to ease the worries of the consumer about the range of the electric car. Two, to specify the advantages of the electric car in relation to the Purchase Drivers: financially, environmentally and technically. By making the costs and benefits very explicit, it aids the consumer to make a substantiated choice in the purchase of an electric car.

The benefits and costs are specified by comparing the current car use of the consumer with the properties of the electric car. By analysing the distances, destinations, prices and CO<sub>2</sub> emissions, the impact of an electric car can be calculated for the specific case of this consumer. Because it is based on the consumer's lifestyle, the information is relevant and trustworthy.

## Form & namegiving

The tool materializes in an online platform, which ensures accessibility from any location. Also, a computer based tool gives access to online databases and enables processing of multiple sources of data.

When it comes to a name, it is beneficial to let the purpose of the tool shine through. This makes it easier for consumers to understand what it is about. The tool is meant to give insight in the compatibility of the electric car. It is also important that the name represents the electric car somehow. The name has to fit the portfolio of Eneco Group, which is characterised by simple,

straightforward names. Thus, the tool will be presented as

*EV Inzicht - Wat een elektrische auto voor je doet*  
(*EV Insight - What an electric car does for you*)

## Operation

EV Inzicht's functionalities can be split in three parts: a route check, an EV Match and additional information (see Figure 25). The options may still sound vague, but will get clear with the presentation of the interface.

### Route check

The route check allows the user to see the impact of the electric car on one route. It gives insight in the influence of the range and shows chargers at departure location, along the route and the destination. Also, it shows the average cost savings and environmental savings. Figure 26 gives an overview of the input and output of the route check. The route check is meant as a teaser for the EV Match.

### EV Match

The EV Match is a more extensive analysis that takes longer to complete. The consumer inserts data about his current car, future car, ownership and the use of the car (see Figure 27). Because the user might be new to the domain of electric cars, it is also an option to let the database choose the EV most similar to the old car, or a car that best fits their car use. Then, EV Inzicht presents a detailed report with four topics:

#### *Impact on mobility*

This section shows the impact of the electric car on any route the user drives. It presents the impact on travel time and shows chargers at departure, along the route and at the destination. Also, it calculates what percentage of routes requires charging on the go and to what extent home charging is sufficient.

#### *Costs*

The cost section gives an overview of the finances of the electric car. It compares purchase price, the costs per km, maintenance and taxes. With an overview of the investment and yearly savings, it presents the breakeven point: the moment when the user reaches




<b>ROUTE CHECK</b>		Give a quick overview of what the tool does Tease users to try the EV-use match
<b>EV-USE MATCH</b>		Insight in the impact of an EV on their life Ease worries about the range of the EV Specify the advantages in costs, sustainability and technology
<b>ADDITIONAL INFORMATION</b>		Inform the consumer about the EV Answer frequently asked questions

Figure 25: Functionalities & purpose of EV Inzicht

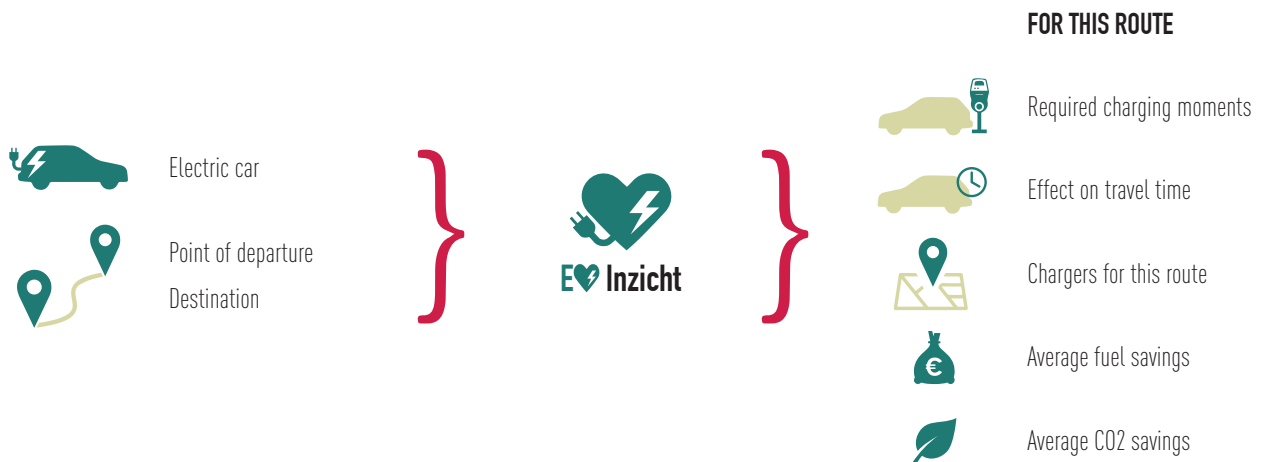


Figure 26: Input & output of Route Check

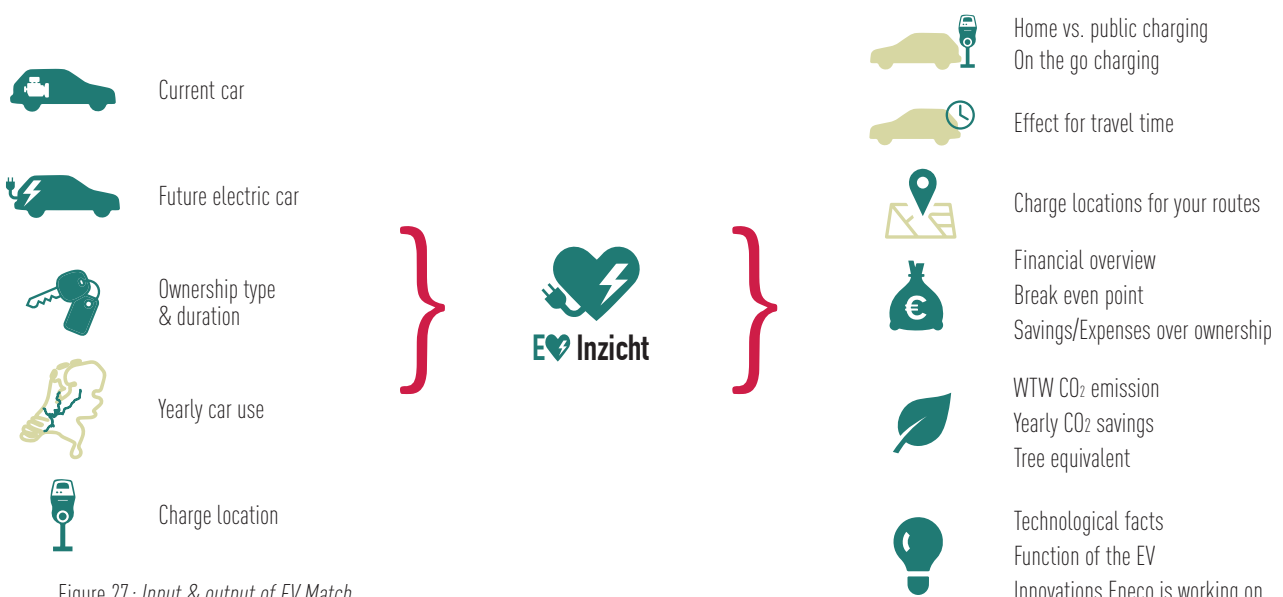


Figure 27: Input & output of EV Match

return on investment. Lastly, because the planned duration of ownership is known, the tool can tell how much money is saved (or lost) in the total ownership.

### *Sustainability*

To let the consumers evaluate the environmental impact of the car, an overview of the greenhouse gas emission is given as well. An overview of the Well-To-Wheel CO<sub>2</sub> emission is presented, separated for the production, powered by green and grey energy. With the consumers' yearly driving habits, the saved CO<sub>2</sub> emission is calculated and translated into an equivalent of trees to make it more insightful.

### *Innovation*

The technology enthusiasts can be enticed by facts about the technology and innovations Eneco is working on. Therefore, the innovation section will have a movie about the operation of the electric car and a movie about innovations Eneco invests in.

Altogether, this report should inform the consumer about what an electric car means for their life. It presents insight from enough perspectives to allow the consumer to make a founded choice in the purchase of an electric car.

## **Additional information**

The last function of EV Inzicht is 'additional information'. This leaves room for frequently asked questions, information on battery degradation, safety, charging, etcetera, answering to knowledge gaps of consumers. This section is added to make sure EV Inzicht presents all the information a consumer needs to decide on electric car purchase.

The three functionalities of EV Inzicht complement each other to give the information necessary to make a purchase decision for the electric car.

## **Data collection**

EV Match requires data on the use of the car to make its calculations. Therefore, the consumer is asked to manually insert his or her car use of an average year. Compared to other ways of data collection, for example with a GPS tracker or a mobile app, manual insertion is relatively quick. GPS trackers and apps need time to track the average car use (e.g. a month) and the threshold is higher because consumers need to order or download the tool. Also, GPS tracking causes privacy issues. Manual insertion may require some time to get a proper overview of your car routine, but it leaves the consumer free on what to insert and it computes the data immediately. It is

also an incentive for the consumer: the better the inserted data, the better the overview.

Even with this incentive, the overview the consumer inserts will not be a hundred percent accurate. The EV Match will aim for the reasonable level of accuracy sufficient to provide a convincing overview.

## **After sales**

The overview the consumer sees is quite extensive, and therefore not easy to grasp at once. He or she might want to review the information again later. Therefore, the overview can be downloaded in a PDF report. Also, a personal link will be provided to access the interactive mobility map (shown on the next pages).

Since electric cars are such a new domain, developments go fast. Having completed the tool once, consumers are not likely to visit the platform again a year later, even though the situation might be completely different. Long(er) range car introductions and the charger installations make conclusions from a few months earlier obsolete. Therefore, users are stimulated to stay updated on developments that concern them personally with email notifications. This ensures consumers that opted against the electric car are not put off longer than necessary.

## Interface

The next pages are used to walk through the route check and the EV Match of EV Inzicht.

### Route check

The route check can be compared with Google Maps route planning. The user inserts a point of departure, a destination and an electric car he wants to know more about. Then, an overview appears of the route. The effect on travel time, public charging and chargers for this route are shown. Also, the average cost savings and emission savings are stated.

*The header shown in the figure on the right is always visible. It is left out of the other screenshots to emphasize the changing content.*

## Route check

Curious how an electric car influences your most-driven route? Or are you leaving and do you want to check the last updates on the way to your destination? The route check gives a quick insight in the necessity of charging, the costs of the route and emission savings.

### Select your route

From	<input type="text" value="Point of departure"/>
To	<input type="text" value="Destination"/>
Electric car	<input data-bbox="810 1832 1040 1868" type="text" value="Select electric car"/>

GO >





## Route check

From	<input type="text" value="Buitenbaan, Heerenveen"/>
To	<input type="text" value="Rietzangerlaan, Den Haag"/>
Electric car	<input type="text" value="BMW i3"/>

[GO >](#)

## Route details

<b>BUITENBAAN, HEERENVEEN – RIETZANGERLAAN, DEN HAAG</b>		
<b>190 km</b>		
Effect on travel time:	<b>no effect</b>	<a href="#">view</a>
Charging on the go:	<b>not necessary</b> (3 fast chargers available)	<a href="#">view</a>
Charging at departure location:	<b>required</b> (8 chargers available)	<a href="#">view</a>
Charging at destination:	<b>required</b> (15 chargers available)	<a href="#">view</a>
Route cost savings:	<b>€14,25</b>	
CO2 emission savings:	<b>28,5 kg</b>	



The route check shows the impact of an electric car on one route. The EV-use match evaluates all your car use and compares it with the electric car to calculate your return on investment and yearly savings. Curious?

[GO TO EV USE MATCH >](#)

## EV Match

The second function of EV Inzicht is more elaborate. The EV Match has four steps for data insertion: car, car ownership, car use and a data check. Once these are completed, the results are shown in four pages; one for each category (impact, costs, sustainability and innovation). The pages contain interactive elements, to present more information in one image.

The interface is presented on the following pages. An imaginary case is set up to provide data for the example. The case is made as realistic as possible: the fictional person drives 17.000 kilometres per year, including a holiday in Italy.

*The two screenshots on these pages allow the user to insert data on their car. They choose their current car as comparison material, define whether they lease or buy the car and choose the duration of the ownership in years. The user also chooses to either install a charger or use a public one. Power is cheaper at a private charger, providing the user with a stimulus towards the installation of an (Eneco) charger.*

## EV match

The electric car is different from the cars we are used to. They do not emit greenhouse gasses, have a shorter range and though they require a higher investment, they are cheaper per km. Though most consumers are familiar with the differences, the impact of these differences on their lifestyle remains vague. EV Inzicht gives insight in what an electric car means for you: your driving habits, your finances, environmental impact. Also, it tells what innovations you may expect in the future.

Curious? Give it a try!

\*mind you, the tool requires you to fill in your car use, it may take a moment!



### Make your selection

Current car	<input type="text" value="Select your car"/>
Potential electric car of your choice	<input type="text" value="Choose most similar"/>
Install a charger at home	<input type="text" value="Select your choice"/>

**NEXT TO CAR OWNERSHIP >**

# EV Inzicht



Route check

EV match

Additional information

Back to Elektrisch Laden

## EV match



### Make your selection

Ownership type	<input type="text" value="Choose ownership"/>
Planned ownership duration	<input type="text" value="Choose duration"/>

**NEXT TO CAR USE >**

## EV match



### Make your selection

<b>Home</b>	Location	<input type="text"/>	
<b>Work</b>	Location	<input type="text"/>	
	Frequency	1 time <input type="text"/> per week <input type="text"/>	<a href="#">Add another location</a>
<b>Family</b>	Location	<input type="text"/>	
	Frequency	1 time <input type="text"/> per week <input type="text"/>	<a href="#">Add another location</a>
<b>Shopping</b>	Location	<input type="text"/>	
	Frequency	1 time <input type="text"/> per week <input type="text"/>	<a href="#">Add another location</a>
<b>Leisure</b>	Location	<input type="text"/>	
	Frequency	1 time <input type="text"/> per week <input type="text"/>	<a href="#">Add another location</a>
<b>Other</b>	Location	<input type="text"/>	
	Frequency	1 time <input type="text"/> per week <input type="text"/>	<a href="#">Add another location</a>

[CHECK DATA >](#)

The third step of the process lets the user insert their car use. Multiple categories are shown to aid the memory. Per category, multiple destinations can be chosen.

## EV match



### Check your input

<b>Current car:</b>	Ford Focus
<b>Electric car:</b>	Hyundai Ioniq
<b>Charger installation:</b>	Home charger
<b>Type of ownership:</b>	Buy
<b>Ownership duration:</b>	7 years
<b>Home location:</b>	Lieftinckplaats, Rotterdam
<b>Destinations:</b>	Work; 4 times per week; Burgemeester de Raadsingel, Dordrecht Work; 1 time per week; Rembrandtstraat, Zwijndrecht Family; 1 time per month; Meester Kesterweg, Ridderkerk Family; 4 times per year; Hanensteeg, Kampen Family; 1 time per year; Koggenland, Purmerend Shopping; 2 times per week; Grote Beer, Rotterdam Shopping; 1 time per month; Akkerweg, Moerkapelle Leisure; 4 times per year; Haagweg, Monster Leisure; 1 time per year; Bosbesstraat, Wouwse Plantage Leisure; 1 time per year; Via Senna, Florence, Italy

GO >

*This screen summarises all inserted data in one overview. The user can check the data and compute it to his personal overview when it is correct.*

# EV match

Impact on mobility

Costs

Sustainability

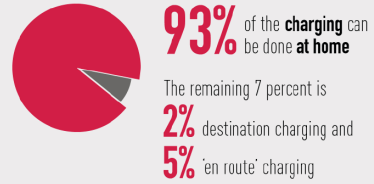
Innovation

## Travel time



[VIEW ROUTES >](#)

## Charging



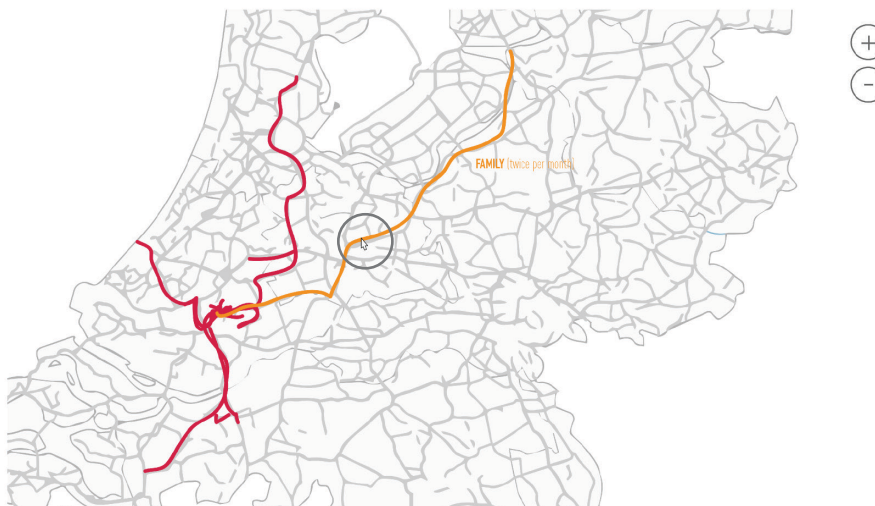
[VIEW ROUTES >](#)

1



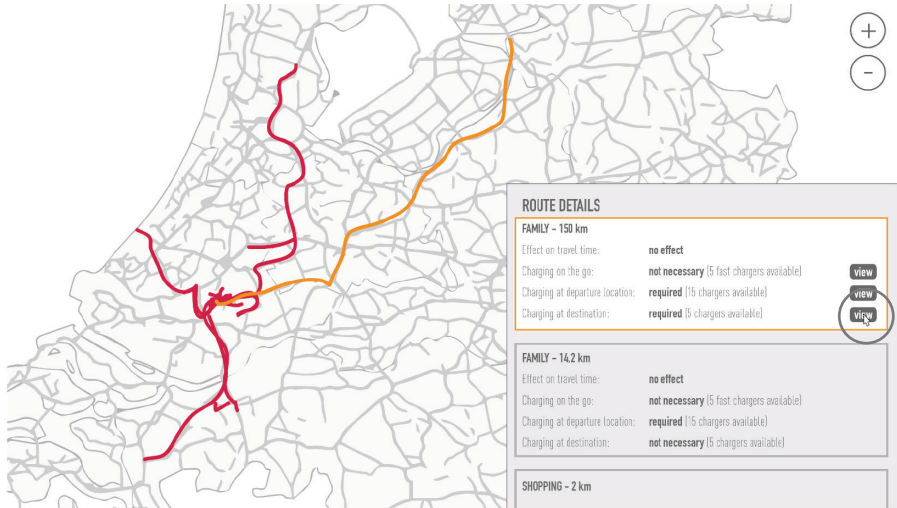
[SEE COST OVERVIEW >](#)

2



This page shows the impact on mobility. The map visualises all the routes the user inserted. By clicking on a route, the interactive map gives additional information about travel time and chargers (follow the circled pointer in the images).

3



4

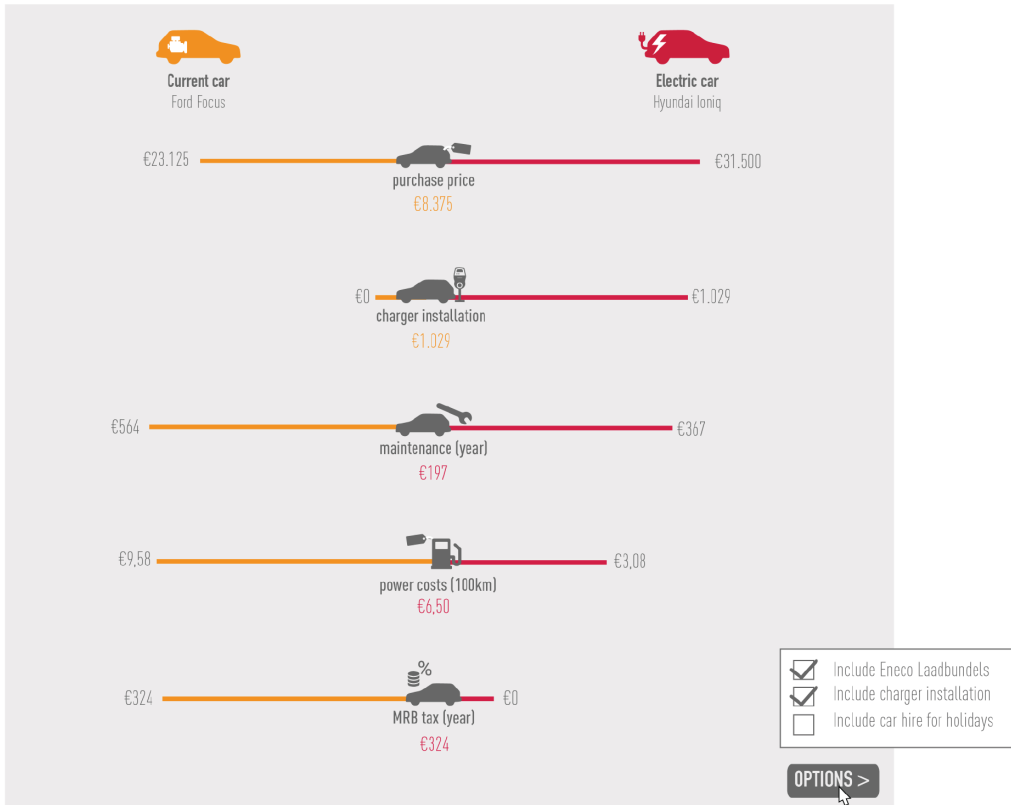


5



# EV match

- Impact on mobility
- Costs**
- Sustainability
- Innovation



## Investment

Purchase price	€8.375
Charger installation	€1.029
<b>Total investment</b>	<b>€9.404</b>

## Savings (yearly)

Power	€1.003
MRB tax savings	€324
Maintenance	€197
<b>Total savings (yearly)</b>	<b>€1.524</b>

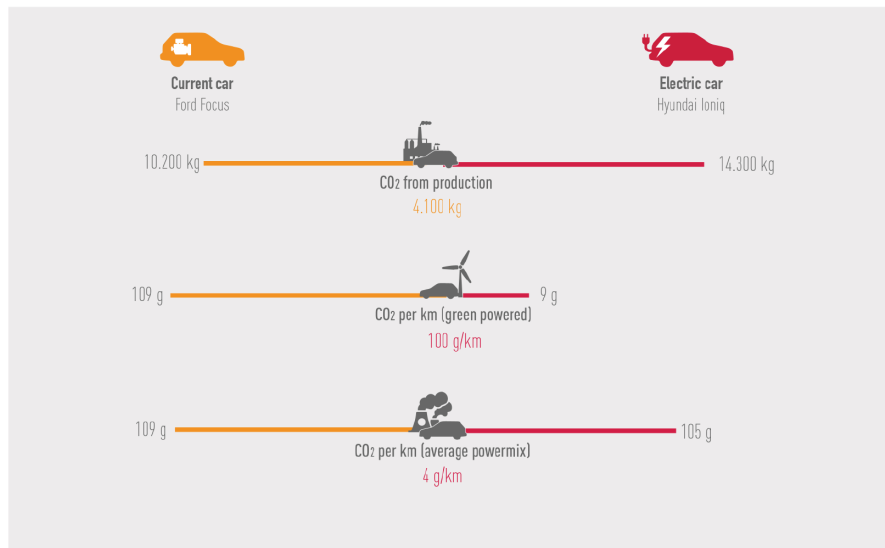
Breakeven reached after **6.2** years

Savings over total ownership **€1.266**

[GO TO SUSTAINABILITY >](#)



## EV match



**Powered by green current...**

You have compensated for production after **2,1** years

You will **save 1.788 kg CO<sub>2</sub>** per year

This is the equivalent of **82 trees** absorbing CO<sub>2</sub> for **one year**

If **half of the Dutch drivers** would save this much, it would be a **forest** of the size of **the Netherlands**

[GO TO INNOVATION >](#)

The screenshot on the left shows the cost overview, comparing multiple financial facts for the current car and the new electric car. Consumers can adjust the information for, for example, second hand cars. At the bottom, this is summarised into a breakeven point and return on investment.

The screen above informs the user on the sustainability. It evaluates the emission from production and driving, for green and grey energy. The production incorporates the emission of the battery, as it was seen as a bottleneck by some participants. Based on the yearly car use, the savings are calculated and translated to a tree equivalent.

# EV match

Impact on mobility

Costs

Sustainability

Innovation

## Innovation

Electric cars **accelerate** linearly, which makes their acceleration **faster than ICE cars** in high gears.

Because of this linear power, all electric cars have **automatic transmission**.

Electric cars are better suited for **autonomous driving** because their engines are already electrified.

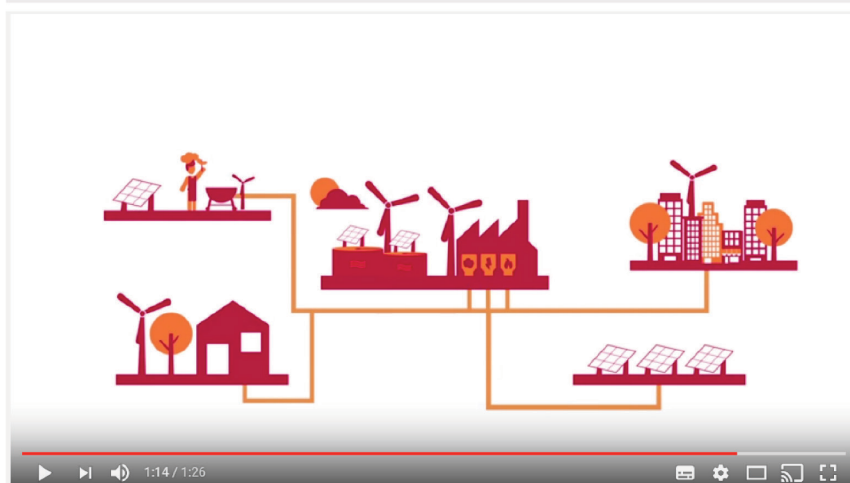
## Technology of the electric car

The inductionmotor of the electric car and internal combustion engine of the ordinary car are different pieces of engineering. This movie introduces the technology of the electric car and explains the advantages of the simpler, more efficient inductionmotor.



## Vehicle to grid & smart charging

Another potential purpose for the electric car lies in vehicle to grid and smart charging. These technologies are considered promising for the storage of renewable energy and balancing the electricity grid. This video explains how.



[DOWNLOAD PERSONAL OVERVIEW >](#)

## Principles

To ensure trustworthiness, a few choices are made on how the tool informs consumers. This section dives into honesty, transparency and the use of the Purchase Drivers.

Since Eneco E-Mobility benefits from the sale of electric cars, consumers might think the tool is biased. To prevent this, a basic principle of EV Inzicht is to inform the consumer in a honest manner. The service is thought to be most effective when informing the consumer with facts, rather than with fairy tales. To give an example, the service will incorporate the actual range of the electric car, rather than the advertised range. Also, it will communicate fairly about the influence of weather conditions (see Figure 28). No advice on electric car purchase will be given: an overview of implications is presented, so the consumer can decide whether the benefits outweigh the costs for them.

Another principle of EV Inzicht, also to evoke trust, is transparency. To enhance the reliability, the origin of the information should be clear for the consumer. Therefore, data sources and calculation formulas are stated in the tool (see Figure 29).

Lastly, EV Inzicht uses the Purchase Drivers developed in the user

research to specify the advantages of the electric car. As mentioned before, costs, sustainability and innovation are topics upon which the tool elaborates. These make sure that the most important purchase motivations are incorporated, to excite the consumer for the advantages.

In short, the service aims to ease worries about the range and specify the financial, environmental and technical advantages. It is named EV Inzicht and materializes in an online platform where consumers can insert the facts and figures of their car use. The tool offers a route check, to quickly check the effects on one route. The main functionality of the tool is the EV Match. This function analyses the car use and gives a personal overview for four themes. An overview of the consumers' routes with the effect on travel time and the location of chargers. A financial overview with a breakeven point and return on investment. An environmental overview with CO2 emission savings and, lastly, a technologic overview presenting innovations Eneco works on. Since developments go fast, users can stay updated by subscribing for email notifications. The tool is honest by using data from practice and transparent by citing sources.

### Route details



Figure 28: Honest range information

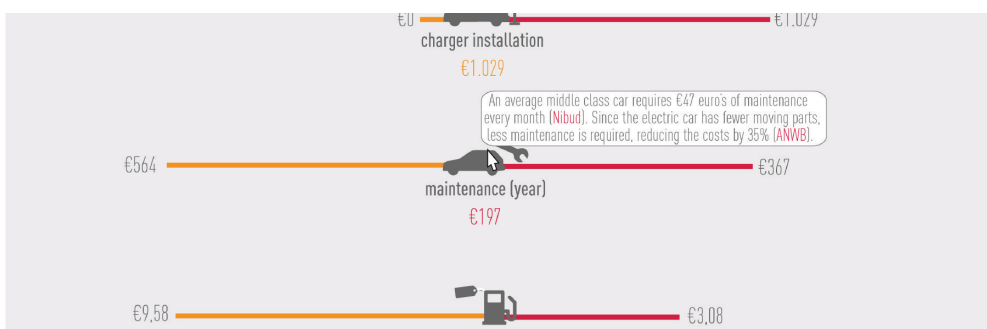


Figure 29: Transparency of sources in the costs section

Pon Dealer



## 3.2 PLACE

Now the service is defined in functionalities, look and feel, this section presents the ideas on the distribution of the service. The target group for the service is defined and the locations where the user interacts with the service, the distribution channels, are presented.

### Target group

EV Inzicht aids consumers with their electric car purchase decision, so the tool is meant for consumers who consider to purchase an electric car. There are two challenges in reaching this group. The first is that the group is still very small, and the second is that the characteristics of this group are unknown. This makes it very hard to setup an efficient marketing campaign: the unknown characteristics make it complicated to choose the right channels and targeting the mass is expensive, something that does not make sense in such an immature market. For now, EV Inzicht is distributed through sales channels of electric cars. When the consumer group is bigger, direct promotion towards consumers is worthwhile (more about this in section 3.4).

Already, Eneco E-Mobility partners with lease companies and car dealers to distribute their charge equipment. These same channels can be used to reach consumers with the tool (see Figure 30). Two routes are distinguished: one from Eneco E-Mobility to lease companies, through their customers (e.g. corporates like KPN or ING) to consumers, and one to car dealers to their consumers.

### Distribution channels

The description of the target group above results in three distribution channels: car dealers, lease companies and the customers of the lease companies. They will use EV Inzicht, consisting of both the route check and the EV Match. While the route check is mainly meant to tease consumers to do the more extensive analysis, the EV Match requires a time investment from the user. It is important that the distribution channels create the right setting and expectation to enhance the results of the tool. Lease companies and car dealers know best how to reach their clients, and therefore, they will decide how to use EV Inzicht. Below, the recommended procedure is presented.

### Car dealers

Car dealers should be divided in two types of stakeholders. First, there is a dealer group or brand representative, for example Pon or Hyundai. This is a strategic office that determines the long term vision of the brand and sets targets for the dealers. Second, there are the car dealers themselves. They are often franchisers that do not necessarily practice the details of the strategy of their representative brand. They care about selling cars and reaching targets. The strategic office of Pon or Hyundai may care about the adoption of the electric car, but that does not guarantee the car dealer does too (Baan, D., personal communication, 20 July 2017). This means both stakeholders will employ EV Inzicht differently (see Figure 31).

If the strategic office agrees to use the tool, it can recommend EV Inzicht to its representative dealers. They can promote the tool at the webpage on their electric offer and refer to their dealers, or choose to allow consumers to use the tool online.

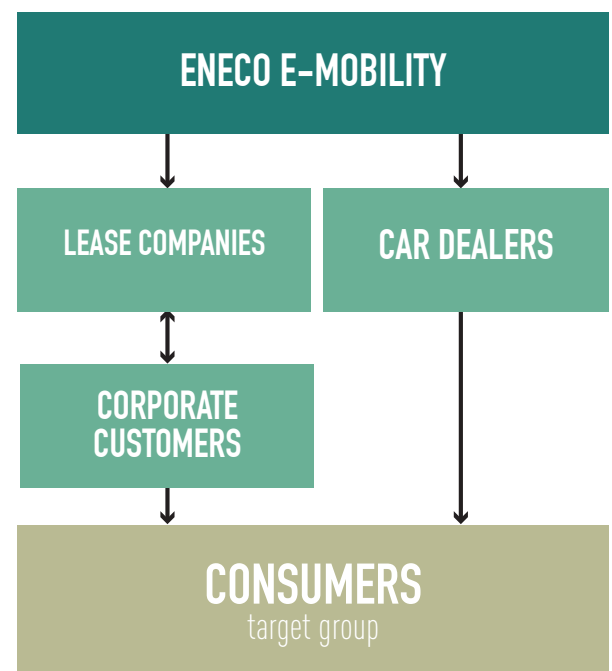


Figure 30: Channels to reach consumers

If a dealer chooses to use EV Inzicht, it can be offered to consumers in store. When consumers show interest in an electric car, car dealers can use the route check to convey the principle and peak their curiosity for EV Match. EV Match can be used directly in store, but it is recommended to do this by distributing an access code when consumers express their interest online or in store. This gives a feeling of exclusivity and brings an official edge to the tool, which communicates to consumers that the tool demands an investment.

### **Lease companies**

Lease companies help their customers with mobility solutions. Multiple organisations have set 'green mobility targets': goals to reduce the environmental impact of their fleet. For lease companies, EV Inzicht is an excellent way to help customers with this challenge. Especially since electric cars are well suited for lease, because consumers consider them risky. In Figure 32, the ideal customer journey is presented from lease company to their corporate customers. Lease companies can offer the EV Match to companies as an extra service. This can be done in their current promotion channels and when companies approach them with an ambition to electrify their fleet. The journey is continued in Figure 33, where the journey from corporate to employee is visualised.

### **Companies (through lease)**

Companies that seek to electrify their fleet often prefer to do this bottom-up, rather than forcing their employees to drive electric vehicles. Lease companies are their partners in mobility solutions, so they are likely to turn to them with this challenge. In Figure 33, the employee journey is visualised, continuing Figure 32. When an employee nears the end of his or her lease contract, the company can ask the employee to use the EV Match. It presents the perfect way to naturally stimulate the consideration of electric vehicles.

Since most of the channels above are examples of indirect distribution, Eneco E-Mobility has limited influence on the implementation of the tool. Lease companies and car dealers can put the tool to purpose the way they like, which influences the impression of the consumers. It is therefore even more important to pay attention to the aspects Eneco E-Mobility can influence, such as the online environment. Next to the easy interface and attractive data visualisation that were already presented in the previous section, the introduction of the tool should manage expectations of the time investment. When users take the tool too lightly, they might get frustrated when it takes too long, downgrading the results and potentially creating an unfavourable brand impression of Eneco. Also, to make sure the results are easy to review, the tool should be only accessible on desktops, laptops or tablets. To

enhance the trustworthiness of the tool, it should have a neutral appearance, without advertisements of certain car types. The follow-up updates on the consumers profile and the downloaded report will be coordinated by Eneco, allowing them to control the information flow towards consumers.

In summary, Eneco E-Mobility develops EV Inzicht for consumers who want to purchase an electric car. Since these are hard to reach, lease companies and car dealers Eneco already collaborates with will be used as distribution channel. The partners can use EV Inzicht to their best insight. Eneco, on the other hand, will take care of the experience of the online platform. It is important that the platform manages expectations on time investment and restricts accessibility to tablets, laptops and desktops.



Figure 31: Consumer journey through car dealers



Figure 32: Corporate journey through lease companies

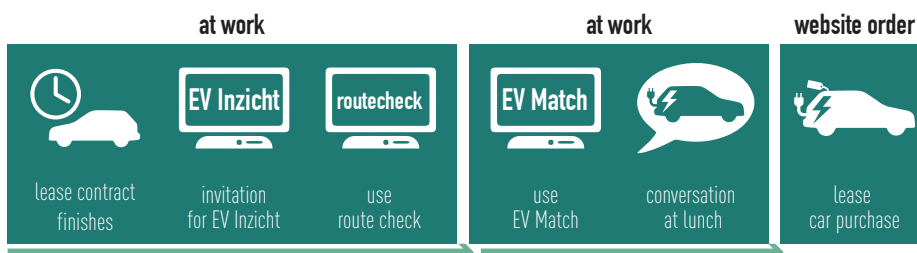


Figure 33: Employee journey through corporates (through lease)



**Eneco**





# 3.3 PRICE

In order to be worth the investment, EV Inzicht needs to create value for Eneco E-Mobility. This section will go into the value proposition of the service, explaining what value is created for who. Then, the value capture will be covered: this will explain how this value is turned into profit. Lastly, the expected investment, market size and revenue is calculated.

## Value proposition

Four types of stakeholders can be distinguished: consumers, car dealers and lease companies, corporate clients of lease companies and Eneco. Figure 34 summarises the value proposition for the stakeholders.

### Consumers

EV Inzicht gives consumers a complete overview of the information they need to make a purchase decision on the electric car. The information is based on their personal car use, which makes it relevant, accurate and trustworthy. EV Inzicht helps consumers to make a balanced decision, to ensure they choose a car that fulfils their needs and fits their personal motives.

### Car dealers & lease companies

For car dealers and lease companies, EV Inzicht brings an extra

service to offer to their clients. With the tool, they can inform consumers appropriately, resulting in increased sales and consumer satisfaction. EV Inzicht assists to distinguish from competition and promotes sustainable mobility.

### Companies (through lease):

Many companies search for ways to stimulate electric driving among employees. EV Inzicht helps companies to arouse the discussion about electric driving by making the implications explicit. It makes employees consider an electric car and stimulates a bottom-up movement in a natural manner.

### Eneco

EV Inzicht gives Eneco the opportunity improve the information flow towards the consumer. It brings Eneco E-Mobility closer to the consumer, which concurs with one of the goals of the coming years. The tool enables Eneco E-Mobility to collect data about their future market, which can be used for marketing purposes. The service pays attention to individual consumer needs by incorporating the purchase driver and thus links to one of the core values of Eneco E-Mobility. The service contributes to the strategy of Eneco by lowering the threshold for electric car purchase for consumers and enlarging their potential consumer base.










CONSUMERS	CAR DEALERS & LEASE COMPANIES	COMPANIES (THROUGH LEASE)	ENECO E-MOBILITY
 relevant information	 consumer satisfaction	 stimulate electric car consideration	 enlarge market
 the right car	 differentiate from competition	 arouse electric car debate	 consumer data
 pursue their values	 increased sales	 naturally accelerate adoption	 strengthen partner relationship

Figure 34: Value proposition for the three stakeholders

By providing their partners with the pre-sale tool, Eneco E-Mobility reinforces the partnership. The proposal shows they want to help their partners and see electric car sales as a mutual responsibility. Through their partners, the service will result in increased revenue, either by growing sales from charge stations, or by payment of the partners (see section 'cost price').

## Value capture

The value proposition identified the gain of the different stakeholders. In order to prove worth of investment, this gain of EV Inzicht has to translate into profit. Here, it is determined which stakeholder pays for the service and sets the price.

### Value flow

The value flow determines who pays for the service. Consumers will consider the tool a marketing instrument, since the service is used to stimulate consumers to purchase a product. As also found in the survey, consumers expect it to be free of charge. If Eneco E-Mobility distributes it freely, it is impossible to reach return on investment. Partners would not pay for something that is freely accessible for any consumer. When the tool is limitedly distributed to car dealers and lease companies, it is a way to improve their service and increase sales. Therefore, the investment is likely to pay off for the partners. Though lease companies and car dealers

will need to be consulted to verify their interest, it will be assumed they pay Eneco E-Mobility for the use of the service.

Figure 35 shows the value flow for EV Inzicht. Eneco E-Mobility is shown on the left and the consumer, the target group, on the right. Two value flows are shown, one for lease companies and one for car dealers. The partners will pay Eneco E-Mobility a yearly fee to use the tool. For the car dealers, this is a fee for each dealer that uses the tool or a combined fee for all. For the lease companies, it is a fee per client they sell the tool to or a combined fee for unlimited distribution.

### Cost price

The price of the tool is determined by consulting the offer of competitors. A similar tool is offered by Emodz, that helps car dealers to find the right car match for their consumers, based on smart calculations (Slimme Mobiliteit, n.d.). This tool is offered for €1.200 per year per dealer. In order to compete with this proposition, the price of EV Inzicht is in consultation with Eneco set at €400 per year per dealer.

Since the partners are also distribution channels for charge stations, EV Inzicht may result in an increase of charge station sales. This benefits Eneco E-Mobility directly and will be stimulated. If a partner sells ten charge stations per year, the tool is free of charge.

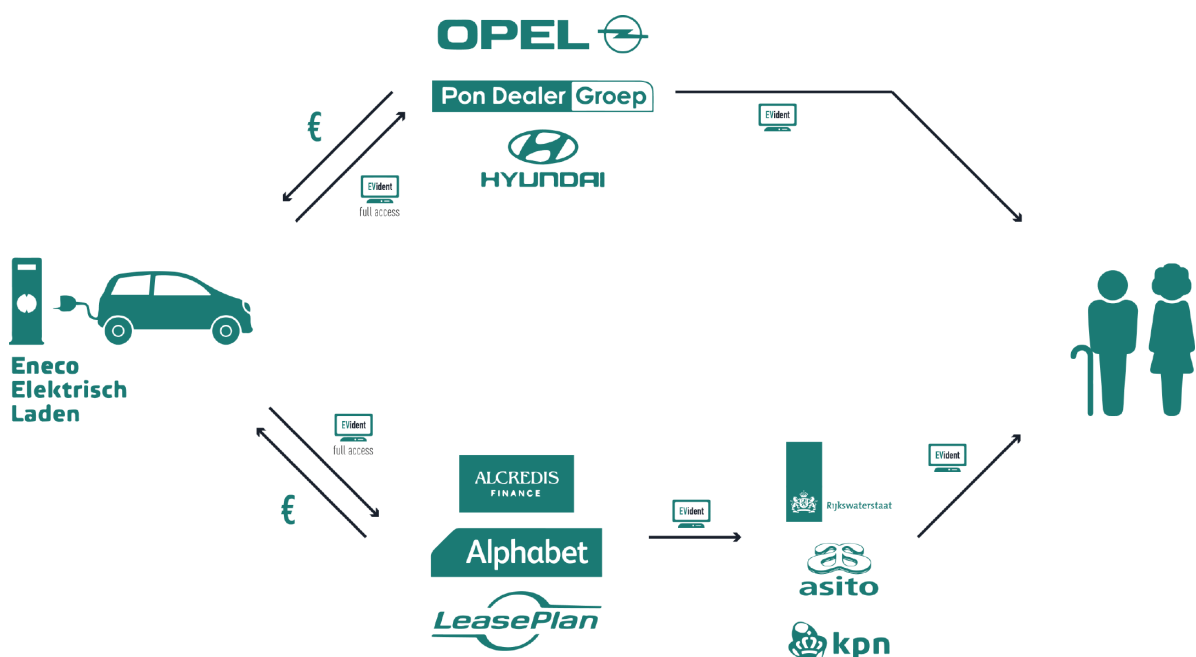


Figure 35: Value flow from Eneco E-Mobility to target group

## Return on investment

Now the value flow and cost price are set, a preliminary calculation can be done on the investment, revenue and profit.

### Investment

The required investment in EV Inzicht can be split into two categories: development and sales. The costs were estimated in consultation with a software developer at Eneco (Pieter Noorman, personal communication, 7 July 2017). An overview of the different costs is shown in Table 2.

The development mostly concerns the online platform. This exist of a frontend: an interface upon which the consumer interacts with the platform, and a backend: the behind-the-scenes programme that retrieves information from databases and processes the calculations. Because the backend needs to be compatible with multiple sources, this is the most expensive to develop. An employee needs to coordinate the development process, resulting in budget for FTE.

The sale costs consists of the time Eneco E-Mobility needs to invest to promote the tool. The exact actions will be covered in promotion, but now it comes down to 0,4 FTE.

In total, the estimated investment comes down to €92.500. After this investment, a yearly budget is required to employ someone

to keep the tool up and running. This is estimated at 0,1 FTE throughout the year: €6.000.

### Market size

Because the distribution channels are acknowledged partners of Eneco E-Mobility, the market size can be determined.

Pon Dealer Group, Hyundai and Opel are examples of Eneco E-Mobility's potential car dealing partners. Pon is a representative of multiple car brands, among others Volkswagen and Audi, altogether, Pon represents 100 car dealers who sell electric cars. Hyundai and Opel both coordinate around 100 car dealers. The new car market is therefore 300 car dealers.

Then, Eneco E-Mobility keeps partnerships with multiple lease companies, like Alphabet, Alcredis and LeasePlan. Each of these companies have thousands of customer organisations. To keep it simple, the deal is arranged per lease company client while the total remains below 200. When it reaches 200 or above, the price will stay fixed at 200 clients.

A potential future market is the second hand car dealers, which is still relatively small. Because it is no official partner of Eneco E-Mobility yet, it is left out of the calculation. In the coming years, this market will be increasingly attractive. Therefore, it is incorporated in the market implementation planning (section 3.5).

Subject	Amount	Duration	Costs per unit	Total costs
<b>Development</b>				
Frontend				€10.000
Backend				€40.000
Coordination	1 FTE	6 months	€ 5.000	€30.000
<b>Sales &amp; promotion</b>				
Information leaflets	2.000 pcs		€ 0,25	€ 500
Ambassadors	0,4 FTE	6 months	€ 5.000	€ 12.000
<b>Total investment</b>				<b>€ 92.500</b>

Table 2: Required investment for EV Inzicht (Pieter Noorman, personal communication, 7 July 2017)

## Revenue

Since the success of the tool is hard to predict, three scenarios for the first year are taken into account. The revenue and profit of those scenarios is calculated in Table 3. The increase in sales of charge stations and charge cards is left out of the calculation. Apart from the fact that these sales are dependent on multiple factors and therefore hard to predict, the profit margin of Eneco E-Mobility is competitively sensitive information and thus unknown. However, these indirect profits should be determined to decide whether EV Inzicht is worth the investment.

Scenario 1 is a 'fail' scenario. Here, only 5 percent of the market purchases the tool. Eventually, this results in a revenue of € 17.700. With an investment of €92.500, this results in a loss of almost €74.800.

Scenario 2 is a 'moderate success' scenario. The tool is sold to 30% of Eneco's partners. Altogether, this results in a revenue of €106.200 and a profit of €13.700.

Scenario 3 is the last 'success' scenario. 60% of the market buys the service. This generates €212.400 revenue and €119.900 profit.

Because Eneco E-Mobility already collaborates with the partners and has developed multiple propositions in co-creation, the partners are likely to be amenable for the tool. When Eneco E-Mobility is willing to make adjustments for their partners, the tool can be shaped to both their liking. These expectations for joined development ensure

the tool will be received with interest. Because of this, and because the second hand market is not taken into account yet, an outcome that approaches scenario 2 seems plausible. Thus, moneywise, the tool is expected to deliver Eneco E-Mobility approximately €15.000 of profit in the first year. The profit is predicted to be much higher from increased sales of charge stations and charge cards.

The calculations are done for the first year. In consequent years, the costs are much lower, while the sales presumably increase. With EV Inzicht, Eneco E-Mobility can attract new partners, increasing both their distribution market and the market for EV Inzicht. With the revenue dependent many unknown factors, estimates are left to experts, but EV Inzicht is likely get increasingly attractive.

In summary, the tool creates value for consumers, lease companies and car dealers and Eneco E-Mobility. It helps consumers to find the right car for them. Lease companies and car dealers can deliver extra service to their consumers, increasing sales and consumer satisfaction. It helps Eneco E-Mobility to strengthen the relationship with their partners, support electric car sales and collect data on their future market. The tool will be sold to car dealers and lease companies, who pay a fixed fee per year. The price is competitor based and set at €400,- per year. EV Inzicht requires an investment of €92.000 and the tool alone is estimated to result in a revenue of approximately €15.000.

Brand	Market size	Scenario 1 (5%)	Scenario 2 (30%)	Scenario 3 (60%)
<b>Car sales</b>				
Pon	100	€ 2.000	€ 12.000	€ 24.000
Hyundai	95	€ 1.900	€ 11.400	€ 22.800
Opel	90	€ 1.800	€ 10.800	€ 21.600
<b>Car Lease</b>				
Alphabet	200	€ 4.000	€ 24.000	€ 48.000
LeasePlan	200	€ 4.000	€ 24.000	€ 48.000
Alcredis	200	€ 4.000	€ 24.000	€ 48.000
<b>Total</b>	<b>885</b>	<b>€ 17.700</b>	<b>€ 106.200</b>	<b>€ 212.400</b>
<b>Return on investment</b>		<b>-€ 74.800</b>	<b>€ 13.700</b>	<b>€ 119.900</b>

Table 3: Revenue and profit for three scenarios



MAX.  
30 MIN.



## 3.4 PROMOTION

The previous sections presented car dealers and lease companies as distribution channels. However, those parties can only be used if they are willing to offer the service to their clients. In this section, the promotion strategy is unfolded, covering the message and the channels. Altogether, the promotion should make sure the distribution channels are aware of EV Inzicht and convinced of the value.

EV Inzicht will be actively promoted towards the partners, since they deliver the return on investment. The promotion towards consumers will be passive from Eneco E-Mobility, though the partners will be encouraged to promote it actively. The three identified distribution channels in section 3.2 are also the target group for the promotion: car dealers, lease companies and companies (through lease).

### Message

The promotion strategy has to achieve two things: inform the stakeholders of the possibility of EV Inzicht and to convince them of the value. Since the value of the EV Inzicht is different for every partner, this is the core of every message. The paragraphs below are examples of promotional text towards the stakeholders.

#### *Car dealer:*

EV Inzicht helps to make consumers understand the benefits of an electric car. Thus, it helps to sell the more expensive, more difficult car models and achieve targets. EV Inzicht is an extra service to offer your consumers: a way to distinguish yourself from competition. EV Inzicht will increase sales and result in higher consumer satisfaction.

#### *Lease company:*

As a lease company, it is your mission to assist companies with their mobility challenges. Nowadays, an increasing amount of companies wants to electrify their fleet for environmental and financial reasons. With EV Inzicht, you continue to serve your customers in the transition towards electric transport. EV Inzicht helps to make your lease company future proof.

#### *Companies (through lease):*

As a company, you may search for ways to stimulate electric driving among employees. EV Inzicht is designed to provoke thoughts on electric driving by making the implications explicit. By arousing the discussion about electric driving, EV Inzicht stimulates a natural bottom-up movement from your employees.

To make the partners understand the value of EV Inzicht, showing the screens and interaction with the tool is considered crucial. This translates the abstract terms to something tangible. This is therefore also part of the message.

### Channels

Promotion can be done through a wide range of channels. It is important to choose the channels that fit the target group. Also, the AIDA principle should be taken into account. This theory suggests to lead the target group through the stages 'awareness', 'interest', 'desire' and 'action' to market your product (Engel, Blackwell & Miniard, 1995). In this case, sale meetings, leaflets and a demo are channels considered most appropriate.

### Sale meetings

In order to define the details of their partnership, employees of Eneco E-Mobility have sale meetings with their partners. Especially with the bigger partners, meetings are set on a regular basis. If Eneco has a new proposition to share, these meetings are used to present and discuss the offer. The propositions are shaped together: the partners can suggest changes to tailor it to the needs of their clients.

For EV Inzicht too, those meetings will be used to promote and improve the proposition. The partner can test and evaluate the tool and suggest adjustments. In co-creation with the partner, the service will be shaped to a viable proposal. This channel is expected to address all four stages of the AIDA model, though it is only suitable for big clients.

### Leaflets

To make sure the essence of the story sticks with the partner, a leaflet will be developed to distribute (see Figure 36, Figure 37 and

Figure 38). The leaflet will contain the basics of EV Inzicht and refer to the demo. The leaflet can be emailed to smaller partners and spread at business fairs, connected to Eneco E-Mobility's current promotional activities. The lease companies will receive a digital and hard-copy leaflet for their customers, to enable them to spread the story. The leaflets will mainly be used for the first two stages of AIDA: awareness and interest.

## Demo

To turn 'awareness' and 'interest' into 'desire' and 'action', a demo is used to explain the full extent of the tool. As it makes the abstract claims tangible, a demo conveys the value of EV Inzicht best. Instead of focussing on 'what' and 'why', a demo shows 'how' EV Inzicht helps. The demo will be available in two versions: lease and buy. It shows the simplicity and straightforwardness, demonstrating the easy interaction. The detailing of the overview, with the impact, finances, environment and technology, should convince the partners of the effect of EV Inzicht and the value it brings for consumers. The partners will be able to order EV Inzicht through the demo page.

## Promotion towards consumers

The place section explained the difficulty with promotion towards consumers in this first stage of adoption. Though, since the market is predicted to grow, this target group should not be forgotten. In the coming years, there will be a stage when the market is interesting enough for direct promotion towards consumers. When this happens, the promotion strategy should be adjusted accordingly.

At this point, Eneco E-Mobility could offer the tool freely to consumers. This is likely to have a negative impact on the arrangement for EV Inzicht with their partners, who will not be willing to pay anymore. This decision should not be taken lightly. The promotion towards consumers increases awareness of Eneco E-Mobility's charge services among consumers and acknowledges them as a party that informs honestly about electric cars.

EV Inzicht can be promoted through the owners of their charge cards, using them as ambassadors. In the newsletter, clients will be invited to challenge family and friends to use EV Inzicht. Being electric drivers themselves, a great deal of them will be happy to spread the word. Other promoters of electric driving, for example 'Vereniging Elektrische Rijders', can also be asked to spread the tool among their followers, increasing awareness. Together, this will contribute to the accelerating adoption among consumers.

To summarise, a promotion strategy is developed to inform partners about the functionalities and value of EV Inzicht. The value differs per stakeholder and therefore, different versions of the materials are developed for each stakeholder. Different channels are used for promotion and the AIDA model distinguishes the goal of the methods. Sales meetings touch on all four stages, leaflets create 'awareness' and 'interest' and a demo is developed to spark 'desire' and 'action'. At a later stage, promotion towards consumers will be interesting to increase awareness of Eneco E-Mobility and stimulate adoption in the potential market.





## Help consumers to understand the benefits of an electric car

Do you want to increase your sales by offering an additional service to your consumers? Do you want to make your consumers understand the benefits of electric driving? EV Inzicht helps you to inform your consumers convincingly on the advantages of the electric car.

Use EV Inzicht for  
**€ 400**  
per year

EV Inzicht analyses the current car use of your consumer, which results in an online overview of the implications of car charging and the savings for the environment and in costs. The information is visualised in a transparent, engaging manner to help your consumer weigh the benefits and costs of the electric car.

As a car dealer, you offer an extra service to consumers to stand out from competition and increase your sales.

Do you want EV Inzicht for free? When you sell 10 Eneco charge stations per year, EV Inzicht is free of charge.

More information on EV Inzicht or order it directly?  
A demo can be found at [www.eneco.nl/evinzicht](http://www.eneco.nl/evinzicht)

### Advantages

- sell the difficult, expensive models
- increase your sales
- offer an extra service for consumers
- attract consumers to your showroom
- differentiate from competition

Tax fees are not included in the price

Welcome to the new world.  
**Eneco**

Figure 36: leaflets for car dealers



## Assist companies to electrify their fleet

An increasing amount of companies want to electrify their fleet. As a lease company, you are their partner to support them in this aim. How do you stimulate employees to start driving electric? EV Inzicht makes the implications of electric driving insightful and creates a bottom-up movement at the organisation of customers.

Use EV Inzicht for  
**€ 400**  
per customer

EV Inzicht analyses the current car use of the staff of your client, which results in a personal overview of the implications of car charging and the savings for the environment and in costs. The information is visualised online in a transparent, engaging manner to stimulate employees to consider the benefits and costs of the electric car.

As a lease company, you stay up to date and offer your customers a solution for their mobility challenges.

Do you want EV Inzicht for free? When bring 10 leads for charge stations per year, EV Inzicht is free of charge.

More information on EV Inzicht or order it directly?  
A demo can be found at [www.eneco.nl/evinzicht](http://www.eneco.nl/evinzicht)

### Advantages

- assist your customers in mobility challenges
- differentiate from competition
- keep your lease company future-proof
- stimulate electric driving

Tax fees are not included in the price

Welcome to the new world.  
**Eneco**

## Stimulate employees to consider an electric car

Do you want to make the transformation to electric transport? Would you like your employees to consider an electric car without forcing them? EV Inzicht makes the implications of electric driving insightful and creates a bottom-up movement in your organisation.

Ask for the possibilities at your lease partner

EV Inzicht analyses the current car use of your employees, which results in a personal overview of the implications of car charging and the savings for the environment and in costs. The information is visualised online in a transparent, engaging manner to stimulate employees to consider the benefits and costs of the electric car.

This way, the discussion about electric driving is spread through your organisation in a natural manner.

Do you want EV Inzicht for free? When bring 10 leads for charge stations per year, EV Inzicht is free of charge.

More information on EV Inzicht or order it directly?  
A demo can be found at [www.eneco.nl/evinzicht](http://www.eneco.nl/evinzicht)

### Advantages

- electrify your fleet bottom-up
- stimulate debate about electric driving naturally
- help your employees choose a car that fits their motives
- keep your company future-proof
- promote electric driving

Welcome to the new world.  
**Eneco**

Figure 37: leaflets for lease companies

Figure 38: leaflets for companies (through lease)



Eneco

# 3.5 IMPLEMENTATION

The service is now defined in form and function, it has distribution channels, a business model and a promotion strategy. Altogether, EV Inzicht is ready for development. To make the transition from graduation project to practice as smooth as possible, it is necessary to provide Eneco E-Mobility with an approach for implementation. This section therefore presents a timeline with suggested steps to take towards market introduction. Also, recommendations are provided for further use of the outcome of this project.

## Timeline

Figure 39 presents a timeline until market introduction. In the timeline, three types of actions are distinguished: development, partners and distribution channel. The development steps concern the materialisation of the service; programming, testing, developing the layout, et cetera. Steps in the partner category make sure the interest of the stakeholders (lease, car dealers and corporates) is taken into account. These actions also involve scouting and

attracting new partners. The last category, distribution channels, presents the market introduction of the service at the partners.

As shown in the timeline, the first year is defined by the realisation of the service. In collaboration with Eneco E-Mobility's most important partners, EV Inzicht will be developed in iterative cycles. Once the tool is finished, it will be rolled out in the market. The key partners first, followed by the other partners en possibly new partners.

On the background of the timeline, the adoption curve is shown. It gives an indication of the size of the consumer market at the different steps. This curve is also influenced by political or market developments, for example the announcement that a car manufacturer chooses to go all-electric. These developments and their consequences are hard to predict, so the curve must only be seen as an indication. At a certain point in the adoption curve, Eneco Group may decide it is worth the investment to target consumers directly. This, too, is shown in the timeline.

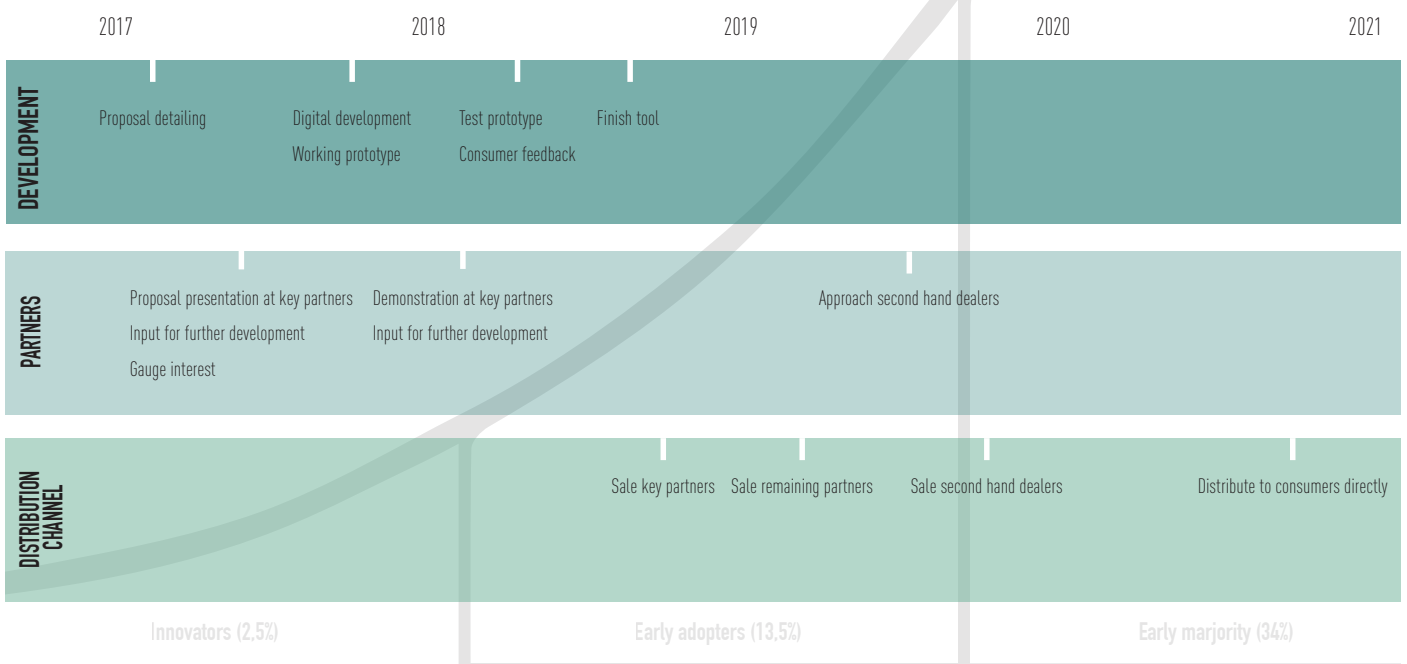


Figure 39: Timeline from project to market introduction

## Recommendations

If Eneco E-Mobility decides to pursue the direction proposed in this report, a few things should be taken into account. Therefore, suggestions are given to enhance the value of the project and to preserve the strengths of EV Inzicht in further development.

### General

Eneco E-Mobility's strategy pays specific attention to the consumer. A clear desire is stated to discover unmet consumer needs and understand their motivations. In this project, a significant amount of time was spent on qualitative research. It holds audio files of interviews with consumers, provides a cluster of shared opinions and gives a wide range of consumer attitudes towards the electric car and charging. Apart from the service presented in this report, it can be the inspiration of many other propositions. Eneco E-Mobility should make sure the results of the research are put to purpose. It would be a shame if the information ends up in a dusty drawer.

### Purchase drivers

The user research has, among other things, resulted in three preliminary Purchase Drivers. However, since the research they originate from is qualitative, it would be sensible to verify the Drivers with quantitative research. This might produce other perspectives on the electric car purchase and show the purchase drivers in a different light. On top of this, it might reveal relationships between demographic data and attitude towards the electric car that were invisible in the qualitative research. That type of information is of high value for marketing purposes.

The Purchase Drivers show the main motivations of consumers to purchase an electric car. When verified, this knowledge can be utilized for marketing and product development purposes. They help to make sure the important arguments are taken into account, to address a bigger consumer group.

### EV Inzicht

For the tool, recommendations can be done for the content, co-creation with partners and growth strategy.

#### *Tool content*

To better aid the consumer in the electric car purchase, EV Inzicht can be extended with multiple options. For example, the service could incorporate a new fuel car in the comparison. This gives a better idea of the differences, since a new car might already be more fuel efficient and thus cheaper to drive. Other options that can be considered are influence of trailers as extra load on the range

or additional information about charging abroad. All these aspects address doubts of consumers and will make the overview of EV Inzicht more complete.

Currently, a national communication standard for charge stations is under development that enables real time monitoring of charger availability. This, too, can be inserted in the app, informing consumers how often and at what time a charger is occupied.

Another aspect interesting to consider is the data Eneco might want to collect about potential consumers. Users of the tool now insert data about their car use, but some demographic information about gender and age are very valuable for marketing purposes. At that point, it is important to consider the (feeling of) privacy of consumers and benefit of the data.

Though the recommendations above improve the accuracy of the tool, Eneco E-Mobility should be careful not to overshoot the purpose of the service. One of the strengths of EV Inzicht is to provide a clear and fairly complete overview in a small amount of steps. Adding too much steps or information will overwhelm and confuse the consumer, while doing nothing to improve adoption. For each added feature, the benefits and the implications for EV Inzicht should be carefully weighted.

#### *Co-creation with partners*

The co-creation with lease companies and car dealers is likely to present challenges that endanger the independence of the EV Inzicht. The partners might wish to limit the tool to the cars they offer. It makes sense for them to favour their business, but benefitting the partner's offer is likely to threaten the trust of consumers. The fact that the tool incorporates cars of all brands, communicates clearly about its sources and is offered by a (relatively) neutral party like Eneco enhances the reliability. For the consumer to value the outcome, this reliability should be guarded.

#### *Growth*

Next to the Dutch market, it is interesting to evaluate the use for such a tool in other countries as well. EV Inzicht could hitchhike on the current expansion activities, since Eneco E-Mobility is already expanding their services to other markets. With the electric car at such an early stage, other countries are likely to struggle with similar problems. The investment in the development of the tool are even more justified with the potential of the markets abroad.

To summarize, a timeline to implementation was drawn up, distinguishing time to co-create with partners to develop the tool, seek collaboration with new partners and distribute EV Inzicht through those partners. Eventually, Eneco E-Mobility might decide to turn directly to consumers. Eneco E-Mobility is recommended to cherish the outcomes of the qualitative research and verify the purchase drivers with quantitative research. Also, recommendations are done to improve the performance of the tool while protecting its value for consumers. Eneco E-Mobility is warned to guard the independence of the tool and recommended to evaluate the possibility of expansion abroad.



# CONCLUSION

Over the past years, interest in the electric car has steadily increased. While the market is now mainly dominated by business users, a rise in adoption by private consumers is predicted. The strategy of Eneco E-Mobility is characterised by a focus on individual user needs. To pursue the same strategy, Eneco E-Mobility wants to prepare for the private consumers by getting an understanding of their needs in electric car services. The aim of this assignment was to provide insight in the consumer perspective on electric cars and to develop a service that accelerates adoption by private consumers.

The consumer research led to the development of three Purchase Drivers. These profiles show the relationship between the perceived benefit of the electric car and additional services those consumers would be interested in. The three Drivers highlight the advantages consumers value most: financial benefits ('Cost Balancer'), technological benefits ('Technology Enthusiast') or environmental benefits ('Environmental Saver').

The Drivers summarise the most important consumer needs in a comprehensive manner, providing Eneco E-Mobility with the understanding they wished for. The Drivers can be directly applied in product development and marketing communication: the three motivations should be considered to make sure the widest range of consumers is addressed. With the Purchase Drivers, Eneco E-Mobility can make sure their offer is relevant and fits the motives of their consumers.

Apart from the Purchase Drivers, a service is proposed to accelerate adoption among consumers. Because the consumer market is at such an early stage, the promotion of the electric car is just as important as the promotion of Eneco E-Mobility's own charging services. Therefore, the service focusses on reducing the uncertainties and highlighting the advantages of the electric car. EV Inzicht specifies the implications of the electric car for the individual situation of the consumer, focussing on the relevant information by the incorporation of the Purchase Drivers. EV Inzicht makes the advantages and disadvantages of the electric car tangible, enabling consumers to weigh their personal motives against the implications of electric car purchase.

EV Inzicht answers perfectly to the request of Eneco E-Mobility. It enables them to improve the information flow towards the consumer, simplifying the purchase process of the electric car. The consumer oriented strategy is continued by the incorporation of the Purchase Drivers, addressing the most important consumer needs. The service gives Eneco E-Mobility the opportunity to collect data about their potential consumer base, aiding tailored marketing campaigns. Since a collaboration with the distribution channels is already in place, it allows Eneco E-Mobility to strengthen the relationship with their partners while helping to attract new ones. This fortifies Eneco's market position relative to competitors. Simultaneously, the business model makes sure that EV Inzicht leads to increased profit from the sale to the partners and from increased sales for charge stations and charge cards. EV Inzicht accelerates the adoption of the electric car with a focus on individual consumer needs, thereby enlarging the potential consumer base of Eneco E-Mobility and ensuring profitability in the long run.

In conclusion, the Purchase Drivers summarise the relation between benefits of the electric car and additional services. They help Eneco E-Mobility to focus on the aspects of the electric car consumers value most. If Eneco utilises these benefits, they appeal to the consumers' convictions. The use of the Purchase Drivers ensures that consumers relate to the brand image of Eneco, stimulating consumer loyalty in the long run (Kressmann, Sirgy, Herrmann, Huber, Huber, & Lee, 2006).

EV Inzicht specifies the effects of an electric car for the lifestyle of the consumer, which enables them to decide whether the benefits outweigh the costs. EV Inzicht facilitates the societal debate by removing the haziness around electric cars, which in turn accelerates adoption in a natural manner. This expands the market of Eneco E-Mobility, presenting an immaculate consumer base ready to purchase their products.





# DISCUSSION

This report presents a solution for a design brief formulated by Eneco E-Mobility. This section assesses the quality of the solution. It evaluates to what extent the proposed solution fits the brief and highlights the points of improvement.

## General improvements

This report documents extensive qualitative research that gives deep insight in consumer motives. Apart from the service developed in this project, it could inspire multiple other propositions. Unfortunately, when one is realistic, the report is more likely to end up in a dusty digital folder on a hard drive. It would be interesting to think of a way to transfer the information in such way that the results of the research remain alive and inspiring the daily decisions of Eneco E-Mobility.

## Improvements for the purchase drivers

When Eneco E-Mobility asked to find patterns among users, they wanted a model that enabled market segmentation. This model would allow them to target specific consumer groups with tailored services. The qualitative research set up for this project did not support such segmentation. Much larger participant groups are required to find trends that can be used for market segmentation. The relations found in this research are not mutually exclusive and collectively exhaustive (MECE). The Purchase Drivers are a good start, but they do not answer exactly to Eneco's assignment.

Along the same line, it would be interesting to verify the purchase drivers of this report with quantitative research. This makes them stronger and enables confident use in product development.

## Improvements for the tool

The service is designed to accelerate adoption in the immature market of electric cars, which is its biggest strength and at the same time its limitation. The pre-sale tool does not fit in their client propositions. It is not the start of a new product category that can be extended in the future. The purpose of the tool is to develop the immature market: it might get redundant when the

majority has arrived.

In the accessibility of the tool, the impact and the viability of the business model had to be weighed carefully. Consumers have been thinking about an electric car before they arrange a test drive. It would be nice to reach consumers earlier in the process to enhance the impact of the tool. This means the tool should be widely available. At the same time, this makes an appropriate revenue from the tool impossible: companies would not pay for something that is freely accessible for consumers. Though the current business model results in profit for Eneco, it reduces the accessibility of the tool.

The data the tool uses to inform consumers about chargers was found to be inaccurate earlier in the project. Though the information about chargers might comfort consumers, they will be disappointed when they find out the data was unreliable. Unfortunately, the improvement of the data was out of the scope of the project. Nevertheless, the information services around public chargers remains a problem that needs to be tackled.

To summarise, a few things can be improved. It would be great to find a way to transfer the research data in such a way that it enhances the product development process and can be used later. The purchase drivers might be a little general for Eneco's liking and should be verified by quantitative research. The tool is limited to the immature stage of the electric car market and does not fit Eneco's product portfolio. It would be better to reach consumers earlier in the purchase process, but disturbs the business model. Lastly, the information on the public infrastructure is something that still needs to be resolved.



# REFLECTION

Next to the quality of the end result, the process of the project is evaluated. In this reflection, the approach of the assignment is reviewed to determine what can be done differently next time. The addressed topics are project management, approach, user research, efficiency and collaboration with Eneco.

## Project management

In contrast to other courses in the master, the graduation project has a very open setup. Instead of deciding on the approach in consultation with coaches, the student is expected to take decisions on its own and justify these afterwards. Because this type of guidance is different, I struggled to understand what was expected of me. I found myself seeking for confirmation of my coaches and felt the urge to update them about what I was doing, so they knew that I was doing well. It took me a while to start trusting myself in the project, but then I enjoyed the freedom to take my own decisions.

Once I had started to take the lead, I got more confident with the project. I took the time to weigh important decisions and made sure I could argument my choices. I like that my coaches challenged me to do so by asking me to clarify decisions. I appreciate the efficiency compared to groupwork, because less time is lost in discussions. My graduation project has made me realise I enjoy working on my own.

## Approach

In retrospect, the methods I chose in my project were too stereotypical. The approach I took in this project, with internal and external analysis, user research, ideation and the marketing mix, was almost an autopilot decision. This originates in the method-focussed IDE programme at the TU Delft. Students are taught to take on a structured (standardised) approach to any project. For me, this approach has taken such a rigid position in my mind that the methodology becomes almost too solid. Now, I think the project would have benefitted from extra time to decide what approach was best for this project.

An example of this automated approach is the trend analysis. To me, the trend analysis always feels a bit random. You google a few terms, find some developments and try to select the relevant ones. But how to decide what trends are relevant is always a bit ambiguous. Often, you do not know which trends are relevant until later in the project. Next time, I think it is better to do a quick trend search to know what big developments are out there and wait with a more detailed search until the focus of the project is clear.

In general, I tend to choose the safe approaches that I am familiar with, so I feel very comfortable in the standardised TU Delft method. I often need an external force to challenge me to try something new and extreme. Once I do try new things, I enjoy experimenting with- and learning from them. In this project, I could have challenged myself to apply things outside my comfort zone, which would have contributed to my learning experience.

## Research

Along the same lines, I think the methodology for the user research would have benefitted from an extra moment of deliberation. As also mentioned in the discussion, the Purchase Drivers do not answer completely to the question Eneco had. I think a different research method would have been more appropriate for that part of the design brief. At the same time, I think the service did benefit from the qualitative method I chose and another approach would have taken too long. I do not consider this methodology wrong, I just blame myself for not taking more time to think about what methodology was best for the design brief.

Another aspect that should have been clearer at the start of my user research, was the profile of the participant. Now, the definition of 'consumer' was somewhat vague, which resulted in a relatively high percentage of lease-participants. This changed the attitude towards financial decisions significantly and made the results less relevant for Eneco. Another decision for the recruitment was to look for participants that were considering electric car purchase. The consequence was that all participants planned on buying an electric car: they hardly experienced any barriers for purchase. In retrospect, it would have been interesting to include more people that were unsure about electric car purchase. This would have emphasized real

barriers more clearly. On the other hand, participants far from EV purchase often have little to say about the charging infrastructure, because it is unfamiliar to them. A clear definition of the 'business' and 'private' user would have improved the view on their different perspectives on electric cars.

## Efficiency

One of my personal strengths is my ability to manage time. I have a strong urge to stick to the planning, I can work hard and take decisions efficiently. Also, I have a good sense of when something is appropriately developed. Anything can always be better, but to me, there is a point when the improvement in quality does not justify the time investment any more. These characteristics allow me to work efficiently and effectively, producing work from good quality in a relatively short time.

As always, this strength also has a downside. My tendency to focus on the result sometimes makes me think that 'a' decision is better than 'the best' decision. This is what makes me forget to take a step back to reconsider an approach. For example, the market analysis is based on the data on public chargers that is freely available. Though this does give a fair overview of what happens in the market, I could have reconsidered this approach when I realised Eneco does not offer public charge stations. Another way might have resulted in more relevant insights. Another example is the ideation phase. I recently realised the solution to a problem is only as good as the problem statement. In order to develop the best ideas, it is important to pay attention to each sub step. Personally, I skip over this too easily, focussed on choosing an idea rather than spending too much time considering different alternatives. It would benefit the result if I would spend more time to consider whether the preliminary result is good enough to move on.

This desire to stick to schedule also makes me struggle to use my time optimally. I often stress out two weeks before my deadline, ending up with free days to spare that could have been spend on improving the content further. I need more practise to find the optimal point to finish in time with the highest quality.

## Collaboration with Eneco

The impact of the project would have benefitted from a closer collaboration with Eneco from the start of the project. Since the company could not offer me an intern position, I was coached by an employee who visited me at the university. Later in the project, this employee left the company and was replaced by someone else.

This replacement was allowed to invite me at the office. From that point on, the contact with the company changed drastically. The department was much more engaged, which helped to improve the service towards a feasible proposition. At this point, they also identified flaws in my internal analysis. If the department had been engaged from the start, the results of the user research would inspire the staff earlier and the final result would fit better with their consequent steps.

All together, I am happy how the project turned out. It took a while to realise that I could take the lead, but then I very much enjoyed it. It also made me realise that project management is one of my strengths. Something that I need to realise in further projects, is that taking a step back and reconsidering an approach supports the aim of the project. Experimenting with different methods and exploring side paths is no loss of time, but an investment for the quality. I still need to find the optimal combination of a focus on the result and the freedom to explore.





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