Strategic Market Entry For Energy Aggregator Firms In The Netherlands

A qualitative study exploring potential business strategies and business models and their viability for aggregators in the Netherlands

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Strategic Market Entry For Energy Aggregator Firms In The Netherlands

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Preface

This document represents my thesis as part of the Master of Science in Management of Technology from the TU Delft. The thesis is titled: “Strategic Market Entry For Energy Aggregator Firms In The Netherlands”. With this thesis, my education at the faculty of Technology, Policy, and Management comes to an end. However, before my time as a student ends, I will move on to my next objective which is completing my thesis for the MSc. Mechanical Engineering.

First of all, I would like to thank my family and friends for supporting me throughout my study.
I would also like to express my gratitude to S. Swaen for being my external supervisor; making me familiar with the company and guiding me with my thesis work. Additionally, I would like to thank my professor dr. J.A. Annema for his guidance and feedback during my thesis project as my first supervisor, as well as my second supervising professor prof. dr. C.P. van Beers for his feedback at the kick-off meeting and greenlight meeting.

Furthermore, I would like to thank the people that I worked with during my time at Accenture for their contribution and assistance. I would also like to express my gratitude to the people that took part in my interviews. I appreciate the time and effort they took for these interviews very much, and their perspectives were very valuable for the thesis.

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Executive Summary

A profound change is occurring in the energy systems of member states of the European Union with the ambition to decarbonize the energy systems (European Parliament and the Council, 2019a). The Netherlands as one of these member states also experiences these changes. The Netherlands is experiencing significant growth in energy production from renewables and this growth requires flexibility solutions to balance demand and supply of electricity (CBS, 2021) (Autoriteit Consument & Markt, 2019). Aggregators are firms that collect flexibility and offer this flexibility to other actors in the energy system. The European Union describes aggregators in the "Clean Energy for all Europeans package" as actors with the important role to provide this flexibility and addresses that member states such as the Netherlands should enable and stimulate aggregators to operate (European Parliament and the Council, 2019a).

In literature, it is described that there are multiple actors in the Dutch energy system that can fulfil the role of an aggregator, as well as the possibility that exists for independent aggregators on the market. Aggregatorship is still in an early phase and thus faces several technical and regulatory challenges such as the aggregator's role being yet undefined in the Dutch Electricity law (Dutch Council of State, 1988)(Autoriteit Consument & Markt, 2019) (de Vries & Poplavskaya, 2020). Furthermore, it is not yet described in scientific literature which strategies could be used to enter the Dutch energy market as an aggregator firm and which possibilities exist to do business as an aggregator in the Dutch energy market.
This study, therefore, focuses on the exploration of business strategies and business models for firms entering the Dutch energy market as an aggregator. The main research question that the study aims to answer is formulated as follows:
"How could a firm design its business strategy and business model when entering the Dutch energy market as an aggregator?"

To answer this research question, a number of sub-research questions have been formulated and addressed. The study used a qualitative research approach with primary data collection, which are interviews with experts that have been held. The choice of a qualitative research approach over a quantitative approach is based on the fact that the study aimed to gain an understanding of the context of the collected data, which would not be sufficiently present in collected quantitative data. The interviews as part of the study are semi-structured and used the view of experts to gain more insight into components that are essential for an aggregator's business strategy and business model. These interviews gave the researcher a better understanding of the context, thus not only collecting certain data but also gaining an understanding of why the data is that way and how it relates to other findings.

Interviews have been held with experts in the field of aggregation. A total of ten interviews have been held with technology consulting managers, strategy managers, a professor, financial manager, management consultant and trade organization member, a flexibility expert at an energy supplier, and a co-founder of an aggregator firm. These interviewees have been selected for their expertise on aggregatorship, which means it was required that each interviewee in this study either works for an aggregator firm, is one of its stakeholders, or has been involved with research or projects on aggregation. The mixed backgrounds of the interviewees reduce bias and increase the inclusion of all stakeholder perspectives in the aggregation sector. The interviews as part of the study identified several interesting findings. It has been identified that aggregators are experiencing a rapid-changing environment and are positioned with a value pool that is not mature yet. It is expected that the current technical and regulatory changes will positively affect aggregators' business opportunities. The study identified an aggregator's strengths and weaknesses internally of the organization, as well as opportunities and threats for aggregators that are arising outside of their organization.
The interviews have shown that several collaboration opportunities exist for aggregators that have a positive effect on the aggregator's operations.

A number of capabilities must be mastered by an aggregator in order to operate successfully according to the interviewees. These capabilities are regulatory and technical knowledge, IT and AI expertise, developing scalable technologies, and the need to be trustworthy towards its customers.
A large number of revenue streams are possible to exploit as an aggregator, on either the Business-to-Consumer or Business-to-Business side. Revenue can be created by reducing congestion in the grid, as well as charging end-users a fixed cost to deploy their assets, reducing their energy bill. Similarly, the aggregator can take a margin of every kWh being deployed flexibly.
It has been identified that more than a single possible customer profile exists. The earnings for consumers are currently small and thus do not incline end-users significantly to use aggregator services. These consumers demand a seamless experience and want to use their appliances undisturbed. This should be incorporated into the value proposition offered by an aggregator.
Based on the findings from the interviews, Figure 11 and 12 have been established which visualize the business strategy and business model elements for firms entering the market as an aggregator.

The answer to the main research question is as follows. A firm entering the Dutch energy market as an aggregator could design its business strategy and business model by building its business strategy from the 7 strategic components and building its business model from the 9 components of the Business Model Canvas, while implementing the insights found in this study through the collection of interviews by using a conceptual model. An overview of the proposed models for the business strategy and business model with the implemented insights is shown in Figure 11 and 12 and can also be found at the end of this executive summary. These models with the insights from this study are generalizable and their use is not limited to aggregator firms in the Netherlands. The models are also usable by firms entering markets of other countries as an aggregator, however, the extent to which the findings from this study are generalizable in these countries depend on the regulatory and technical specifications of each country along with country-specific market factors such as competition.

The study proposed a business strategy and business model that aggregator firms can use. Although this might be provisionally acceptable, it is recommended that this strategy and business model will be validated further by research and by firms that implement the proposed elements in practice. The proposed strategy and business model can then be adapted and improved, as well as more specific business strategies and business models for different situations or markets. Furthermore, as this study was limited to the geographic area of the Netherlands and its energy system, additional research in the field of aggregators strategies and business models for other countries is advised, creating an understanding of the differences and similarities between countries.
It is recommended that policymakers enable and stimulate aggregators in the Netherlands, for example by introducing subsidies, as the study found that achieving a profitable business case is a challenge for aggregators and considering the fact that aggregation does not only bring economic benefits but also ecological benefits that bring value to society as a whole.
For consultancy firms advising stakeholders in the Dutch energy system such as energy suppliers and grid operators, it is recommended to use the findings of the study to assist in the designing process of their strategy and business model for aggregation, to create awareness of clients' suitability as aggregator based on the study's findings, and to advise strategies to enhance this position.
A general recommendation for aggregatorship is that additional research should be done on aggregators after their market entry, to determine the relationship between a certain strategy and business model, and certain parameters that measure the success of the market entry and operations of the aggregator.
Following from this study, aggregators have the tools to establish their business strategy and business model, after which a business plan can be created in which they investigate which mission, vision, and other firm-specific details they will include for effective operations as an aggregator.

Strategy Overview

External	Internal

Macro-Environmental Factors
• Increasing need for aggregators
• Profound change in energy system
  - Increase in renewables
  - Increase in grid congestion
  - Increase in grid volatility and imbalance
• Legislation aggregator premature but positively changing
• Actors in Dutch energy system developing aggregation offerings
• Past projects and pilots have shown the value of aggregators and their capability to reduce grid imbalance
	Strengths & Weaknesses
	S
	• Demand for aggregator's flexibility services
	W
	• Profit margins for aggregator are small
	• Aggregator does not always have end-user contact
	• Managing customer files and -increasing user base when scaling
	• Standalone challenging for aggregator

Capabilities	Competition	Actors	Dev. Barriers	Dev. Drivers

• Regulatory knowledge
• Technical expertise
• Technical integration know-how
  - IT & AI expertise
  - IT staff
• AI for predictions
• Possessing a reliable & scalable system
• Energy supplier missing essential capabilities and should develop capabilities externally or by acquisitions
	• Competitive environment
	• Positioning in market important
	• Key differentiator in market is developing own platform and vision
	• Increasing customer base enhances aggregator's positive effects
		• Direct aggregation by DSO constrained by regulation, but possibilities for platform creation exist
		• Large organizational structure firms at disadvantage
		• Aggregator should be separate business unit
		• Energy supplier obvious choice for aggregator role
			• End-user consent
			• Control over assets
			• Data storage/privacy regulations
			• Residential power connections require 3-phase power
				• Macro-environmental factors stimulating aggregation
				• When adoption of residential battery storage increases, improvement of aggregator business case

Business Model Overview

Key Partners	Key Activities	Value Propositions	Customer Relationships	Customer Segments

• Balance Responsibility
• Strong relationship DSO & TSO
• Partnership with firms with expertise in predictive algorithms
• Partnership with energy suppliers
• Enabling acquisitions by larger firms by attractive business model
• In the case of using EV as flexible assets:
  - CPO partnerships
  - Car manufacturer partnerships
	Aggregation & deployment of flexible assets
	This includes:
	• Platform management
	• Service provisioning
	• Platform promotion
	Key Resources
	• Controllable assets needed
	• IT platform and staff
	• BRP registration
		Essential is:
		• Simplicity and trustworthy system
		• Seamless customer experience
		• Potentially offering aggregation services through the whole value chain
			• Contact with customers challenging for aggregators
			• More research and pilots needed
			Channels
			• Aggregator's marketing and storytelling crucial when reaching customers
				Potential for aggregators in both B2B and B2C segments
				B2B
				• Firms with flexibility assets such as roof space with large production from solar
				B2C
				• Consumers with EV's
				• Consumers with production from solar
				• Consumers with residential battery storage systems

Cost Structure	Revenue Streams
• IT significant element of aggregators costs - Platform establishment + maintenance • Backoffice staff for administration such as customer contracts • Scaling costs for aggregators relatively low	• An aggregator's business model is currently a function of regulation • Several revenue streams identified • Most revenue at the moment in the imbalance market • Positive ecological impacts should also be acknowledged in addition to economic profits

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List of Abbreviations

ACM	Authority for Consumers and Markets
BRP	Balance Responsible Party
CEP	Clean Energy Package
CPO	Charge Point Operator
DR	Demand Response
DSO	Distribution System Operator
EV	Electric Vehicle
TSO	Transmission System Operator
V2G	Vehicle-to-Grid
VPP	Virtual Powerplants

1. Introduction

As part of the EU's Green Deal, the energy system in the Netherlands is slowly being decarbonized and energy production from renewables increases (European Parliament and the Council, 2019a) (European Parliament and the Council, 2019b) (CBS, 2021). These developments require solutions that balance the grid, as demand and supply of electricity will fluctuate more and becomes harder to predict. Similarly, with the combination of new renewable producers and national economic growth, congestion of the electricity grid occurs (de Vries & Poplavskaya, 2020)(ACM, 2019). Furthermore, there is the problem that individuals that produce energy in relatively small amounts are not able to trade this energy on the wholesale market as the volumes are too small. An aggregator is a new type of actor in the energy system that can aggregate energy production from different sources and regulate energy demand. The services that an aggregator provides mitigate the aforementioned effects and can therefore play an important role in future energy system developments. The Clean Energy Package (CEP) that is adopted by the European parliament in March 2019 emphasizes the importance of this flexibility, as well as the importance of the aggregator (ACM, 2019) (European Parliament and the Council, 2019a) (European Parliament and the Council, 2019b).

1.1 Problem Statement

While it is clear that the aggregator will play an important role in the energy system and the energy transition, the role of the aggregator is not yet defined in the current Dutch Electricity Law (Autoriteit Consument & Markt, 2019) (Dutch Council of State, 1988). The role of the aggregator in the Netherlands is still very immature and only a small number of firms provide aggregation services. These services are still very limited and small-scale. Multiple different actors in the energy system could fulfil the role of aggregator, but it is not yet clear which actor would be the most suitable for this role. As the aggregator is a relatively new concept in the Netherlands, there are no clear business models or strategies tailored to the aggregator in the Netherlands yet. This is identified in the literature review as part of the study which is described in Chapter 2. Scientifically, more research is necessary in order to give more clarity in the strategies and business models that firms can implement when entering the market as an aggregator in the Netherlands, including the barriers and effects of the implementation of these strategies and business models. These problems can be identified globally in several countries, as the aggregator is globally a relatively new concept. Although country-specific research towards the aforementioned problems will be beneficial for aggregators in all countries, this study limits its scope to the energy system of the Netherlands due to the significant differences between countries technically and regulatorily. The discussion chapter in Chapter 5 describes in more detail how the problem in this study and the study's results apply to other countries.
Without a thoroughly explored and implemented strategy and business model, potential actors able to step into the role of the aggregator might not be aware of their opportunities. On the contrary, potential actors to enter the market as an aggregator should have guidance for their business strategy and business model to prevent critical mistakes.

1.2 Research Objective

The main research objective, as well as the academic contribution of this thesis, is *improving understanding of the role of an aggregator in the Dutch energy market, as well as contributing to the existing literature of aggregators in the Netherlands by exploring business strategies and business models for the market entry of aggregator firms in the Netherlands.*
This objective gives insight into which Dutch energy system actors are most suitable for the role of aggregator and argues which business strategies and business models are the best fit for an aggregator's market entry. The research assists aspiring aggregator firms in knowing how they should be equipped, and which approach they need before entering the market as an aggregator. The research also contributes to the available existing research about aggregators and aims to create new insights for the academic world to use in future research related to aggregators and their stakeholders. The study aims at the research gap which identified that there is still much uncertainty which actor in the

Dutch energy system is most suitable for the role of aggregator and how a firm willing to be an aggregator in the Netherlands should design its business strategy and business model.

The Netherlands has been chosen as the geographical area of the study for multiple reasons. First of all, there are large technical and political differences globally that create significant differences between countries' energy systems and differentiate and determine how an aggregator firm can operate. Therefore, certain business strategies and business models that might be effective in one country, might not be possible or wise to implement in another country. The scope of the study is therefore limited to one country; however, the findings of the study might still give valuable insights for aggregators and their stakeholders in other countries, especially the countries that have a similar energy system and regulation as the Netherlands. Furthermore, there are several factors that make the Netherlands a particularly interesting country for the study. One of these factors is that the Netherlands is using a netting arrangement that financially rewards consumers who generate electricity and deliver this back into the grid. With the plans of the Dutch Government to reduce this starting from 2023, an arrangement with an aggregator can become more attractive since the consumers will not get any financial rewards anymore by default when delivering power back into the grid. Additionally, the increase in volatility in energy demand and supply, in combination with the increasing congestion in the electricity grid, creates a much more viable business case for future aggregators in the Netherlands. Furthermore, the Netherlands has one of the densest charging networks globally and is a European leader when it comes to electric driving (Netherlands Enterprise Agency, 2021). Electric vehicles and their charging points are one of the applications for an aggregator's services.

The deliverable is a thesis report containing valuable insights on a market entry as an aggregator and describes which aspects should be considered in an aggregator's strategy and business model.

1.3 Relevance to the MOT Program

During the study Management of Technology at the TU Delft, a student learns to explore and understand technology as a corporate resource. One of the mentioned challenges the study program addresses is: "*How can we use the abundant technological opportunities to affect our mission, objectives and strategies?"* (TU Delft, 2022).

The exploration of business strategies and business models for firms that enter the Dutch energy market as an aggregator is very aligned with this specific challenge as well as with other content of the Management of Technology program. Furthermore, the services an aggregator provides are enabled by technologies and is an interesting example of using technology as a corporate resource in practice.

The study is very insightful for the Technology, Policy, and Management (TPM) department as the concepts that have been taught during the MOT program have been used in this study collectively to explore business strategies and business models for firms aspiring the entry of a certain market (in this case, the Dutch energy market as an aggregator). The approaches used in the study could be useful for plenty of other studies done by TPM students and researchers, that are related to a firm's entry into a new market.

1.4 Scientific & Societal Relevance of the Research

Existing literature contains a research gap about the business strategies and business models for the entry of a firm as an aggregator in the Netherlands. Filling this research gap with this study contributes academically, as well as societally.
As explained in Chapter 1.2, the study is till some extent generalizable and the outcomes of the study can be used by other researchers, as well as by firms in practice.
The business strategies and business models that will be explored in this study can, in addition to researchers and firms studying aggregators in the Netherlands, be applied to aggregator firms entering

other countries, especially countries with similar regulatory and technical specifications as the Netherlands. The exact generalizability depends on how similar the specifications of the country of interest are with the Netherlands that has been used as geographical area in this study.

The findings from this study can also aid in future research of the Dutch energy market and aggregators and can increase the speed with which aggregators enter the market due to the improved understanding of the strategies and business models that can be used. Furthermore, having a well-designed strategy and business model as an aggregator can attract more investors which can lead to more aggregatorship in the Dutch energy market. The findings of the study can thus lead to an improved balance between the demand and supply of electricity, and this also results in several positive societal effects.
An improved balanced supply and demand of electricity can result in a lower electricity bill for end-users as well result in financial savings by Transmission System Operators (and thus savings for taxpaying individuals) as investments in the Dutch electricity grid can be postponed and/or eliminated.

Furthermore, while the concepts and findings that are already known in literature and that are described in this study's literature review do not contribute to newly available information on the topic, the information might be more valuable and understandable for researchers and firms aiming to gain a better understanding of the topic when combined into one study.

1.5 Research Question

The literature review identified that it remains unclear how a firm that wants to enter the Dutch energy market as an aggregator could design its business strategy and its business model. The research as part of the thesis fills this research gap by formulating a research question that will be answered in the report. Furthermore, answering the research question will achieve the objective of the report. The main research question is formulated as follows:
"How could a firm design its business strategy and business model when entering the Dutch energy market as an aggregator?"
To answer the research question, the main research question has been subdivided into sub-research questions.

The sub research questions that are addressed in this report are:

- **SRQ1** *What are the characteristics of the external environment for an aggregator in the Netherlands?*
- **SRQ2** *Do key collaboration opportunities exist in which an aggregator should take part?*
- **SRQ3** *What are the essential capabilities an aggregator should master when entering the Dutch energy market?*
- **SRQ4** *What are possible revenue streams and corresponding cost structures for an aggregator in the Netherlands?*
- **SRQ5** *What is the aggregator's customer profile and what should the value proposition be?*

1.6 Research Approach

The research consists of nine subsequent phases. An overview of this approach is shown in Figure 1. The literature review is done to explore existing research on the topic and to identify the knowledge gap. A research methodology is then chosen with the objective to acquire the information to answer the knowledge gap. Theories from different perspectives on the topic have been used to explore possible solutions and explore considerations to take into account regarding answering the research question. These theories also form a basis for the interview questions. Subsequently, interviews have been held with participants from different fields of expertise. Lastly, the findings of the interviews are analyzed to draw conclusions and recommendations.

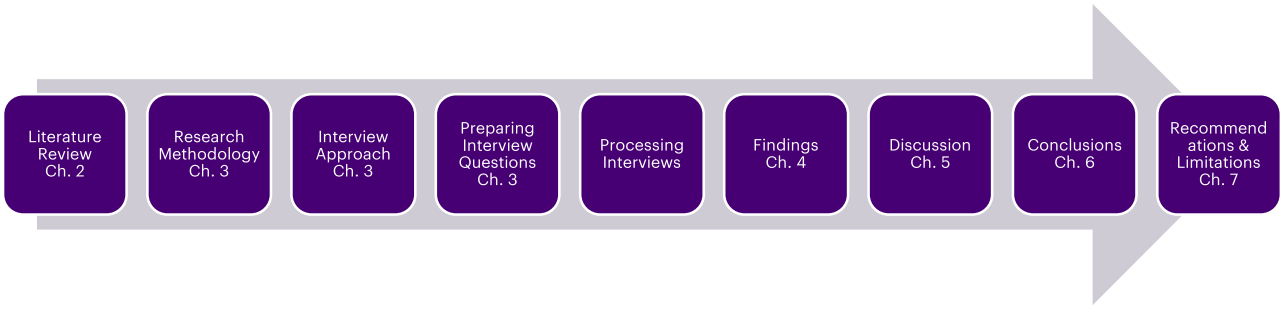


Figure 1: The successive stages of the research

1.7 Thesis Structure

There are 7 chapters as part of this study, including the introduction that has been described in this chapter. Chapter 2 illustrates the literature review as part of the study, in which existing research on the topic is explored. Chapter 3 describes the methodology that has been used for the study. Chapter 4 summarizes the findings of the study, which were established through expert interviews. Chapter 5 is a discussion chapter in which the results are interpreted by the researcher. Chapter 6 describes the conclusions of this study. The sub-research questions and the main research question are answered in this chapter as well. Chapter 7 is the final chapter in which the recommendations for future research and for aggregators are given, as well as described what the limitations of this study are.

2. Literature Review & Conceptual Model

This chapter describes and discusses the existing literature on aggregators and the Dutch energy system. This helps to create an understanding of the aggregator, the environment it is in, and to identify what is currently known in the literature about aggregators and what is not known. Reviewing the literature will reveal the current state of the art of the aggregator and its business. Furthermore, the chapter explores the findings of researchers and evaluates the differences and similarities of the research that has been done, without adding new academic contributions to the existing research.
In order to find scientific literature on the aggregator topic, search engines on the internet have been used. The search engines used to find literature were Google Scholar and Scopus. Search terms used were: *aggregator, aggregat*, aggregator Netherlands, aggregat* Netherlands, energy aggregator, aggregator business models, aggregator strategy, energy market the Netherlands*
Furthermore, the reference lists of articles found during the process of collecting literature were scanned for other relevant articles, and some of these were included. This method is often referred to as the Snowballing method.

Following on this first part of the literature review, a second part is described in this literature review that further explores the existing literature on strategies, business models, and their components. Similarly to the first part of the literature review, the second part used search engines Google Scholar and Scopus to find literature. Search terms used were: *business model, business plan, (business) strategy, strategy OR business model AND definition, competitive advantage, resource-based view, innovation aggregator*

2.1 Aggregator Firms in the Dutch Energy Market

This first section explores the literature for studies and scientific papers on aggregators in the Dutch energy market, to investigate how this market looks like and which definitions are used in the literature.

2.1.1 Analysis aggregator

Scholars in literature identified a number of trends that foster the emergence of aggregator firms and make aggregators unlock value in front of and behind an energy meter (de Vries & Poplavskaya, 2020). These trends are:

- The growing number of renewable energy sources (RES) driven by decarbonization
- Decentralization
- Digitalization which enables a number of new solutions

These trends are stated to strengthen the position of aggregators.

Furthermore, the literature mentions that the availability of value streams an aggregator can exploit depends on technical prerequisites, market design, and regulatory framework, and this creates both challenges and opportunities for aggregator firms (de Vries & Poplavskaya, 2020).

2.1.2 Electricity trade markets

The existing literature has been investigated to identify which markets exist in the Dutch energy system to do business in as an aggregator firm or other actor. The Netherlands has multiple markets in which electricity is traded. These markets exist because electricity cannot be stored in large quantities, and therefore has to be produced when it is needed, making it useful to trade electricity at different moments (TNO, 2015).
According to the literature, electricity is not traded in real-time, for the simple reason that the transport capacity of the electricity grid might not have sufficient transport capacity to deliver the requested amount of electricity at a certain time. In the current markets where electricity is traded in the future, it is ensured that there is enough transport capacity available to transport the traded electricity (TNO,

2015). Although markets to trade electricity on are known by individuals active in the Dutch energy sector and in detail described in literature; how an aggregator can benefit from this cannot be traced from this information.
An overview of the different existing markets for electricity as a product is shown in Table 1.

Table 1: Overview of different energy markets in the Netherlands (data source: TNO, 2015)

Market name	Operator of the market	Description	Participants
Imbalance market	TenneT	The surpluses and shortages in the electricity grid, caused by BRPs not sticking to their programs, are traded in this market as an attempt to bring the system back into balance	Only BRPs, no small consumers
Intra-day market	APX	Market where electricity is traded between the close of the day-ahead market (daily at 12:00) and five minutes before the moment of actual supply	Only BRPs, no small consumers
Day-ahead (or spot) market	APX	Electricity is being traded here the day before it is used. The bids are submitted before 12:00 each day. The parties can bid in hours or other blocks of time	Only BRPs, no small consumers
Long-term markets	Endex, brokers, or BRPs	In this market, long-term electricity agreements are made, such as between electricity producers and energy suppliers, or small consumers who enter a contract with their energy supplier	Producers – suppliers Small consumers – energy suppliers

In addition to the markets where electricity is sold as a product, markets exist in the Netherlands for the transportation of electricity. The actors involved in this market are TSO, DSOs, and actors who require it (TNO, 2015).

2.1.3 Grid flexibility

In a new energy system, consumers and companies are not limited to consuming electricity, but can also become a producer of electricity and flexibility (ACM, 2019).
Flexibility is defined by the Council of European Energy Regulators (CEER) as: "*the modification of generation injection and/or consumption patterns, on an individual or aggregated level, in reaction to an external signal (price signal / network tariff / activation / congestion) in order to provide a service within the energy system or maintain stable grid operation. The parameters used to characterize flexibility can include: the amount of (active) power modulation, the duration, the rate of change, the response time, and the location. The delivered service should be reliable and contribute to the security of the system"* (CEER, 2018) A simpler and more concise definition of flexibility is stated by TNO as: "*the ability of market participants to quickly react to changing circumstances so as to preclude excessive or inadequate electricity levels"* (TNO, 2015). Balancing is therein defined by TNO as: "*the combination of all measures and processes which ensure that energy input and energy uptake are always equal thereby making for a stable system".*

When it comes to demand response, two types can be distinguished. Implicit demand response is where consumers choose to be exposed to time-varying electricity prices and explicit demand response is where consumers change their consumption upon request (Bertoldi et al., 2016).
Figure 2 shows the forecasted growth of flexibility demand in the Netherlands. It can be seen that the largest increase in flexibility demand occurs at the balance responsible parties, that want to keep their portfolio optimized (balance in supply and demand). The increase in flexibility demand for the TSO is relatively small, as the short-term production forecast is not heavily influenced by an increase in wind- and solar energy, as the day-ahead forecasts for these are quite precise (TenneT, 2019)(ACM, 2019). For the DSO, the demand will also increase, as the increase in electrification in households and mobility will lead to congestion problems in local grids (ACM, 2019). Furthermore, research by PWC also indicates an increasing need for flexibility, due to a number of key trends in demand and supply of electricity that occur on both the demand-side and the supply-side (PWC, 2021).

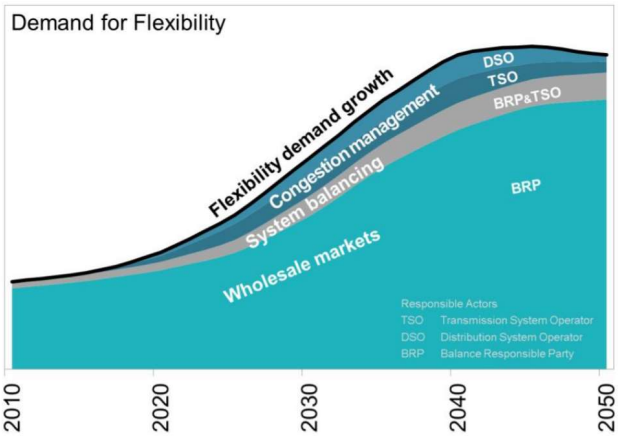


Figure 2: Growing demand (in MWh) for flexibility in the next years (TenneT, 2019)

2.1.4 Aggregator definition

Multiple definitions for an aggregator can be found in literature, although these definitions are similar in nature. According to the European Commission's Joint Research Centre, an aggregator is a service provider who operates – directly or indirectly – a set of demand facilities in order to sell pools of electric loads as single units in electricity markets (Bertoldi et al., 2016).
In other words, the aggregator bundles the flexibility of households or buildings and can supply this flexibility to another actor (ACM, 2019)
An aggregator could use flexibility for different purposes. These purposes are clearly defined in the existing literature and are further discussed in this research report.

2.1.5 Aggregator forms

The aggregator can take multiple different forms. These forms are described in the literature by Ma et al. (2017). How an aggregator operates within the legal framework depends on whether aggregates small consumers or large consumers. As large consumers of electricity already have access to wholesale electricity markets and have balance responsibility, aggregators can make an agreement with these large consumers without the need to make agreements with an energy supplier. The ACM does not see any barriers in legislation for aggregating large consumers (ACM, 2019).
When pursuing to aggregate small consumers, the aggregator is required to get a supplier's license or cooperate with an existing balance responsible party holding a license (ACM, 2019). The Electricity Directive also requires aggregators to arrange balance responsibility, and thus to choose to be balance responsible themselves or to cooperate with another balance responsible party.
Why an aggregator cannot operate without a license is explained in the paragraph titled adoption and business operation barriers. Without balance responsibility for the aggregator, every deviation in the usage of consumers will have to be paid by the energy supplier.

According to article 17 in the Clean Energy Package (CEP) of the European Parliament, independent aggregators should get access to the electricity market and this should be enabled by the policy of each

member state (ACM, 2019)(European Parliament, 2019). The definition of independent aggregator used in this report will be the one introduced by the Electricity Directive (named 'Elektriciteitsrichtlijn' in Dutch) and used by the Netherlands Authority for Consumers and Markets (ACM) as "a market participant that does aggregation and is not affiliated with the supplier of the consumer". The Electricity Directive states that member states, and thus the Netherlands, has to ensure every actor that aspires to be aggregator can enter the market without permission of the other actors in the market (European Parliament, 2019).

2.1.6 Aggregation models

The actor in the energy system that aggregates provides the aggregated flexibility to its customers, which can be Balance Responsible Parties (BRP's), regional grid operators (DSO), and national grid operators (TSO).

This section discusses two aggregation models that can be used for electricity grid flexibility. These two are defined in literature as Demand Response (DR) and Virtual Power Plants (VPP) (Ma et al., 2017)
During Demand Response (DR), sometimes referred to as Demand Side Management, the aggregator can turn on or turn off electrical appliances such as electric vehicles (EV's), heat pumps, washing machines, etc. (ACM, 2019). This shifts the usage of electricity to another point in time and can thus assist to smooth out peaks in electricity demand. In the near future, electric vehicles and heat pumps are the appliances with the most potential for flexibility (ACM, 2019). As part of flexibility, the aggregator could also choose to use batteries as part of households or neighborhoods.

On the supply side, certain individual decentralized units producing electricity can be aggregated to form one large electricity-producing unit. This is referred to as a Virtual Power Plant (VPP). It is important to note that each form of electricity production can differ significantly, and the scale and characteristics of each electricity-producing unit is different. A solar panel for example, produces a small amount of electricity of less than 1 MW and can deliver this instantaneously. However, a producer such as a nuclear plant needs more than eight hours to ramp production up or down and produces 100-1000 MW of electricity (TNO, 2015). Every electricity-producing device thus has certain characteristics that determine for which purpose it can be used.

2.1.7 Existing aggregators & ongoing aggregator projects

Multiple pilots have been done or are currently running in the Netherlands that are described in literature. This paragraph will discuss a number of these pilots and projects in further detail.
Lund et al. (2016) mention a demonstration project that took place on the Danish Island Bornholm. During this two-and-a-half-year project, participants had either automated appliances or had to manually adapt their consumption of electricity. The consumption of electricity was covered mostly by renewable energy production and the project tested a real-time market in combination with small-scale Distributed Energy Resources (DER) and demand response. The project showed that there is a significant demand response that can be obtained with automated control equipment and that forecasting of the response results in an overall improved efficiency of the system. The increased energy awareness did not result in lower overall energy consumption of end-users from both the automated and manual operated appliances and showed that users had less reason to change their consumption due to the trust in the automation (Lund, et al., 2016).

Energy supplier Van de Bron and national grid operator TenneT started a pilot where battery power of EV's is used as a power source. Aggregating these energy resources gives access to adjustable power at relatively low cost (ACM, 2019)
The ACM stated in 2019 that Dutch DSO's were starting with getting experience in purchasing flexibility services (ACM, 2019). The DSO sector launched the platform GOPACS in January 2019 which has the objective to reduce congestion in the electricity grid. The platform first predicts where congestion is about to occur. An energy producer in that same area can then choose to place a 'buy order' on the platform. In order to keep a balance in supply and demand on a national level, this buy order will be

combined with a ‘sell order’ outside the congestion area. The DSO then pays the price difference between the buy- and the sell order (GOPACS, 2021).

2.1.8 Existing business models

According to the ACM, both the demand side and supply side of the market is not developed enough yet (although this is expected to change due to the increase in renewables and appliances with flexibility potential), and there is not yet a business case for small-scale flexibility (ACM, 2019).
The potential of small-scale flexibility appears to be significant, as in a 2012 situation a revenue of 2 billion euro on the day-ahead and intraday market could have been made, by using the power of solar panels and EV’s within the Netherlands (Tariq, 2015).
TNO recommends in one of their reports that further study is necessary to investigate how aggregators can contribute when it comes to the economic value that can be captured from flexibility (TNO, 2015).

2.1.9 Adoption and business operation barriers

One of the large barriers for the aggregator is that the role of the aggregator is not yet defined in the Electricity law 1998. However, the Electricity Directive of the EU mandates that an aggregator is allowed in the energy system. Therefore, when the guidelines from the Directive are implemented into Dutch law, the aggregator will be better defined into Dutch policy.

Operating as an aggregator without a supplier’s license is not possible with the current legal system in the energy system, as the aggregator will not have access to the measurement data of consumers and the settlement system. However, the Electricity Directive states in the third paragraph of article 17 that the aggregator should also get access to consumers’ measurement data (European Parliament, 2019). In the case of aspiring energy suppliers willing to enter the market, requesting such a supplier’s license is not seen as a big barrier, but for parties willing to focus only on aggregation services it might be (ACM, 2019). One of the barriers is also the general delivery obligation, which states that every small consumer should be supplied with electricity if they wish.

A barrier that has been identified by parties in the energy sector is the relatively long time between allocation and reconciliation. Allocation is a certain amount of assigned electricity, which is then recalculated and compensated for (reconciliation) based on the actual use (EDSN, n.d.). According to the ACM, the time between allocation and reconciliation was 17 months for electricity in 2019 (ACM, 2019). Allocation will become harder to predict when aggregators will influence the electricity usage of consumers, and financial risks of reconciliation will also increase as the volumes and values of electricity traded will increase (ACM, 2019). However, there is a solution for this barrier, which is smart meter allocation. In this situation, small consumers have a smart meter, allocation of the meter is applied, and there are separate allocation points between energy supplier and aggregator (ACM, 2019). This situation is not applied yet in the Netherlands for small consumers, but it is mentioned in article 20 of the Electricity Directive (European Parliament, 2019).

The aggregator needs consumers’ measurement data as part of its business. Article 17 of the Electricity Directive mandates that every party willing to be aggregator should get access to consumer measurement data and that a policy should be formed to facilitate this in a non-discriminatory and transparent manner, taking into account the privacy and commercially sensitive (personal) details of consumers. According to the ACM, this promotes competition in the market, which is stimulating innovation and prevents a monopoly in the market (ACM, 2019).

The literature also mentions cybersecurity as a topic that should be worked on further in order to smoothly facilitate the role of the aggregator (ACM, 2019). Changes in the Dutch law related to cybersecurity should prevent the risk of unauthorized persons controlling devices of consumers.
Furthermore, a plan should be made for the situation in which an aggregator files for bankruptcy, as explained by the ACM (2019). An aggregator discontinuing its services could lead to immediate congestion problems for the regional and national electricity grid operators. A potential solution for this is that grid operators are required to have contingency plans available.

2.2 Business Strategy and Business Model Theory

This second section describes the relevant theories that can be found in the existing literature which describe the essential components of a business strategy and a business model and explores the definitions that are used in literature.

2.2.1 Business strategy and business model background

This paragraph explains the definition of a business strategy and business model known in literature and how these differ from similar definitions.
A business model is defined as the model that describes how an organization creates, delivers, and captures value (Osterwalder et al., 2010). The process of creating a business model and adapting it after its creation is part of the firm's business strategy.
It must be noted that a business model differs from a business plan. Where a business plan is a document that is often used to get financing and contains a business' goals and financial projections, the business model is a structure a firm uses that puts more focus on how to use the firm's resources and capabilities strategically to gain competitive advantage.
When entering a market as a firm with a new product or service, a go-to-market strategy can be used as a marketing plan for the product or service. A go-to-market strategy (GTM) is defined as the plan of an organization to deliver a unique value proposition to customers and achieve competitive advantage (Friedman, 2002)(Zoltners et al., 2004). Furthermore, theories exist that are related to a market-entry strategy. These are not further discussed or used in the report, because a typical market-entry strategy is more applicable to firms that have an existing product or service and are planning to distribute this product or services into new (foreign) markets. A business strategy and business model is more tailored to firms that want to do business in a completely new market and describes how to strategically set up their organization to do so successfully.

To summarize, a business model refers to the logic of the firm. It describes the way the firm operates, and how it creates value for its shareholders. A firm's strategy on the other hand refers to the choice of the business model through which the firm will compete in the marketplace (Casadesus-Masanell & Ricart, 2011).
Multiple definitions of 'strategy' can be found in the literature. Strategy finds its origin in the strategic management discipline, originating from the 1950s and 1960s. Mintzberg (1987) states in his academic research that strategy can be divided into five types:

- Strategy as plan
- Strategy as pattern
- Strategy as position
- Strategy as ploy
- Strategy as perspective

Michael Porter's definition of strategy is "…broad formula for how a business is going to compete, what its goals should be, and what policies will be needed to carry out those goals" and "… combination of ends for which the firm is striving and the means by which it is seeking to get there" as "the essence of formulating competitive strategy is relating a company to its environment" (Porter, 1980)

Neoclassical economics

The essence of a business model is ultimately to maximize the firm's profits. This is explained in the theory of Neoclassical economics, which states that the value of a good or service depends on utility maximization by income-constrained individuals and profits made by firms facing production costs and employing factors of production. For the case of an aggregator firm, this means that the customers of the aggregator are likely to influence the prices that the aggregator can ask for its service and that customers' demand is influenced by this set price.

2.2.2 Innovation as part of the business strategy and business model

For an aggregator firm that aims to formulate effective strategies and business models for its business, the technology the aggregator uses should be analyzed for its type and maturity as an innovation. The type and maturity of innovation can give insight to researchers and aggregators of how the adoption of this technology may progress in the future and can further tailor an aggregator's strategy and business model.

Architectural innovation

When discussing the aggregator's products and/or services, it is beneficial to be aware of what type of product or service it is, as it can influence the strategies that fit best to that specific product or service. As the aggregator's services are a relatively new concept that uses existing inventions to offer a new service in the energy market, it could be identified as an innovation. It must be noted that a difference exists between an invention and innovation. This distinction has been repeatedly emphasized by Schumpeter (Ruttan, 1959). Where an invention is the creation of something new that has never been made or done before, innovation is the entrepreneurial aspect of introducing new things to the market or finding useful applications by manipulating existing inventions. The aggregator innovatively uses existing inventions to provide its services.

In the literature, innovation is divided into the following types: radical-, incremental-, disruptive-, and architectural innovation.
An architectural innovation is defined in literature as "…an innovation that uses many existing core design concepts in a new architecture and that therefore have a more significant impact on the relationships between components than on the technologies of the components themselves" (Henderson & Clark, 1990). From the innovation types, the architectural innovation fits best to the services that an aggregator provides.
Furthermore, where incremental innovations tend to reinforce competitive positions of established firms by building on their core competencies, literature identifies a difficulty for firms to recognize which existing knowledge is useful to apply in the new service of an architectural innovation and which knowledge may handicap the firm (Henderson & Clark, 1990)

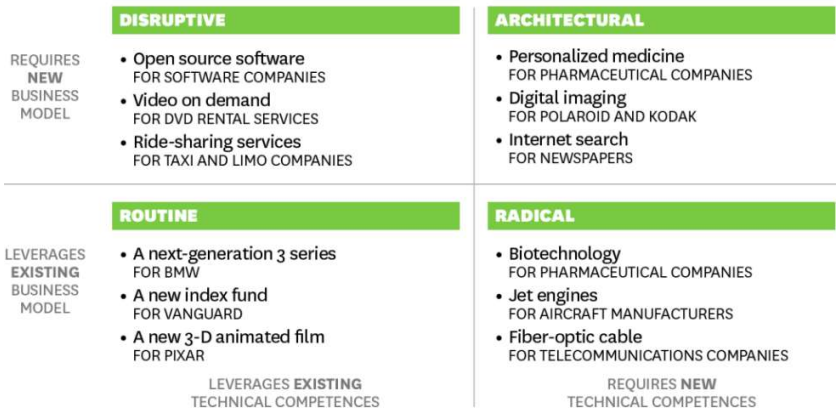


Figure 3: Innovation Landscape Map (Pisano, 2015)

As Figure 3 shows, the type of innovation a firm is working with is a determining factor for the business model and the firm's technical competencies. Architectural innovations require new business models and require the firm to use new technical competencies.

Innovation & pattern of development and diffusion

The aggregator's services can be defined as an innovation, as the definition of Schumpeter et al. (1983) states that an innovation is the practical implementation of ideas that result in the introduction of goods or services, or improvement in offered goods or services. Baregheh et al. (2019) defines an innovation

in a similar way, namely that “innovation is the multi-stage process in whereby organizations transform ideas into new or improved products, services, or processes, in order to advance, compete and differentiate themselves successfully in their marketplace”.
Henderson & Clark (1990) created a framework to divide these innovations into four types: radical innovation, incremental innovation, architectural innovation, and modular innovation. The services that an aggregator provides fit best to the architectural innovation, as an architectural innovation is described as an innovation that changes only the relationship between existing components. While small changes of components often trigger the new interactions, the core concept behind each component remains the same. This is contrary to a radical innovation where not only the architecture is new, but also establishes a new dominant design of a component.

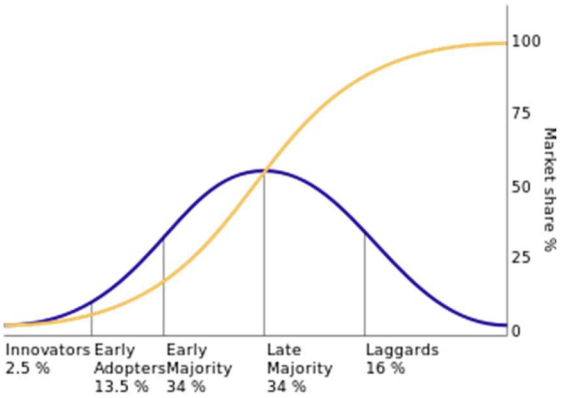


Figure 4: Diffusion of innovations (Rogers, 1962)

The pattern of development and diffusion is a theory introduced by Ortt & Schoormans (2004). It is related to the diffusion of innovations model by Rogers (1962) but shows that between the introduction and large-scale diffusion of an invention, subsequent erratic phases exist in which the invention is often adapted multiple times. Managerial implications of this model are that different strategies should be applied to each phase (Ortt & Schoormans, 2004). The concept of an aggregator can be defined as a product innovation and not as a process innovation. Even though the aggregator will mostly focus on a process instead of a product, this process is new and does not exist in the current form yet. An example of a process innovation would be an existing aggregator business model that is using new methods or skills to perform the service.

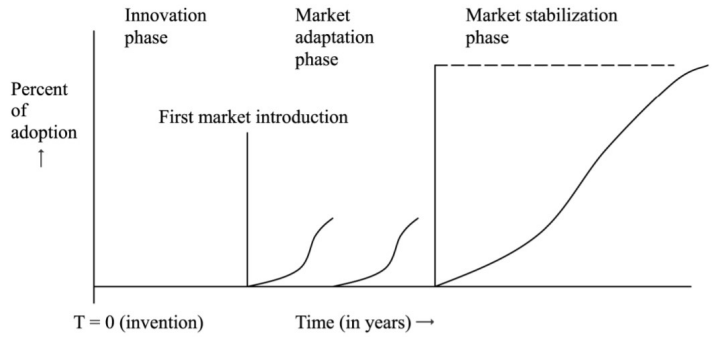


Figure 5: Pattern of development and diffusion (Ortt & Schoormans, 2004)

The services an aggregator offers are still in an early developmental phase and are not yet adopted by a large number of users. The current initiatives are likely to be used by innovators and early adopters. The proposed business models and business strategies for firms aspiring to be aggregator should therefore take into account that the innovation is in this stage and should incorporate strategies related to this early stage.

2.2.3 Business strategy: elements for strategic choices

In literature several components can be found that are related firm's strategies. This section describes these components from the literature.

SWOT situational analysis

The SWOT analysis is a framework developed at the Stanford Research Institute by Albert Humphrey, with which a firm can assess its own strengths and weaknesses internally, as well as assess potential opportunities and threats outside of the firm (Dosher, Benepe, Humphrey, Stewart, & Lie, 1960).

A SWOT analysis can thus help a firm assess its strengths, weaknesses, opportunities, and threats, which is valuable information that must be considered when creating a business strategy and a business model.

Porter's Five Forces: industry attractiveness

The attractiveness and profitability of an industry depend largely on the competition within that industry. Furthermore, the strategy a firm creates should consider its buyers and suppliers.

Porter created the Porter's Five Forces framework in response to the SWOT analysis, which he believed was lacking in rigor, as well as ad hoc (Porter, Argyres, & McGahan, 2002) (Porter M. E., 1979). According to Porter (1979), the attractiveness and profitability of an industry depend on five factors.

These factors of influence are:

- Existing rivalry in the industry
- Threat of new entrants in the industry
- Threat of substitutes
- The bargaining power of suppliers
- The bargaining power of buyers

Figure 6: Porter's Five Forces Framework

Knowledge of the forces within Porter's Five Forces gives a firm the information to create a strategic plan. It can show a firm where certain strategic chances could yield the greatest payoff and describes the current position of the firm in an industry with its strengths and weaknesses. A business strategy can position the firm in such a way by using Porter's Five Forces that the firm can cope best with the industry environment or influence the environment in the favor of the firm (Porter M. E., 1979).

Resource-based view

Firms need resources as input to do their business. These resources can be subdivided into tangible and non-tangible resources. A valuable theory used in strategic management is the Resource-Based View (RBV) theory (Barney, 1994). This theory states that firms can gain a competitive advantage based on the resources they own. If a firm owns certain resources that a competitor does not own, it can gain a competitive advantage. The assumptions for the theory are that the resources are heterogeneous and immobile. Furthermore, the VRIN conditions have to be met. The VRIN conditions state that the firm's resources should be valuable, rare, inimitable, and non-substitutable. Only if the assumptions are correct and the VRIN conditions are met, a firm will be able to sustain competitive advantage. If all conditions are not met, or resources are for example easy to imitate, firms will only have a temporary competitive advantage.

Dynamic capabilities

Contrary to the Resource-Based View that focusses more on sustaining competitive advantage in a static environment, 'dynamic capabilities' is a theory that can be found in strategic management and puts more emphasis on the firm's survival strategies in a competitive rapid-changing environment (Denrell & Powell, 2015). This research will also use the perspective of the dynamic capabilities, as the market for an aggregator is changing relatively quickly and dynamic capabilities will thus be of high importance to achieve sustained competitive advantage.

Penrose (1959) developed an economic theory of growth and described that firms that possess competencies and capabilities to exploit these competencies are rewarded with the highest levels of growth and profitability. This led to the use of the Resource-Based View as a model that can be used as a model to measure business unit performance.
Developing capabilities by which competencies can exploited gives a business unit a competitive advantage as described by Day (1990).

2.2.4 Business model: Business Model Canvas & Value Proposition Canvas

When designing a business model, a firm has to be aware of which components are essential for designing this business model. The Business Model Canvas introduced by Osterwalder et al. (2010) can form the main framework for the business model of an aggregator. The Business Model Canvas is not a theory that will lead to a certain preferred business model; however, the components of the Business Model Canvas tool can be used as a guideline for the different aspects that should be included in the business model. The business model consists of nine areas that each address a different area of the business model. A disadvantage of the framework mentioned in literature is the static nature of the Business Model Canvas (Sinkovics et al., 2014). Additionally, the Value Proposition Canvas exists (Osterwalder et al., 2014), which is a tool in addition to the Business Model Canvas and has the objective to further address how the firm should target consumers and manage relationships with them.

The Business Model Canvas is shown in Figure 8 and shows the nine components of which the Business Model Canvas is composed. These components are (applied to the case of an aggregator):

- Key partners – the partners the firm chooses to collaborate with
- Key activities –the activities the aggregator will focus on
- Key resources – describes the resources that are essential for the aggregator's business
- Value proposition – describes the value proposition, including how the aggregator's services or products are valued by customers
- Customer relationships – explains how the customer relationships are managed
- Channels – describes the channels through which the customers can contact or reach the firm
- Customer segments – which type of customers the aggregator chooses to focus on
- Cost structure – describes the costs as part of the aggregator's business
- Revenue streams – describes how the aggregator is realizing its income stream

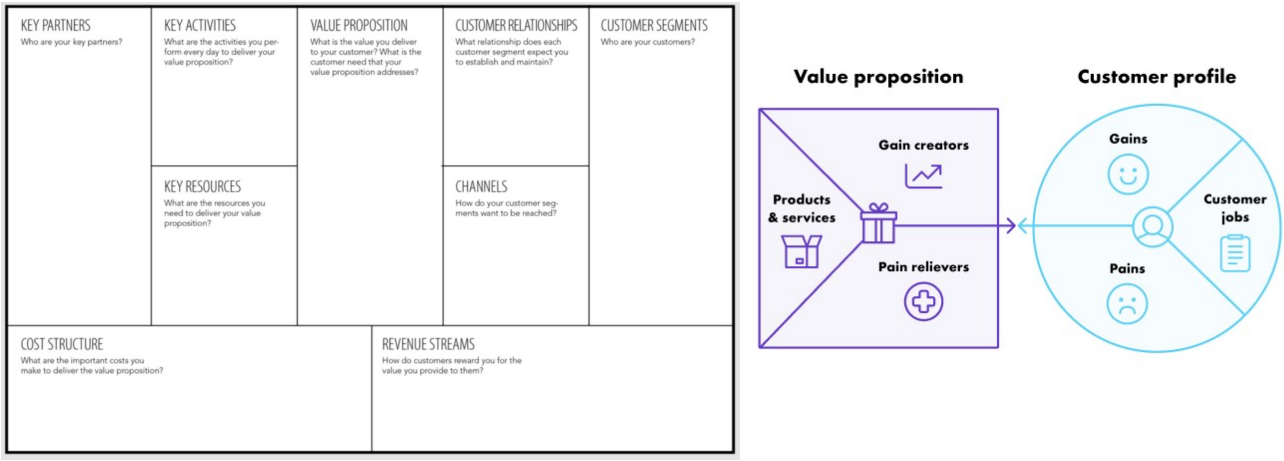


Figure 7: Business Model Canvas and Value Proposition Canvas

2.2.5 Literature review conclusion

The literature identified that there are a number of actors in the Dutch energy system that each could enter the market as an aggregator hypothetically. Furthermore, the literature review mentions a number of barriers for an aggregator when active in the Dutch energy market. Even though the role of the aggregator is still in a premature phase, pilot projects have taken place to investigate the services of an aggregator in practice. The literature also identified that the aggregator can trade its flexibility in multiple markets. It can be concluded from the literature review that it is still uncertain which actor in the Dutch energy system is most suitable for the role of aggregator and how a firm willing to be aggregator in the Netherlands should organize its business strategy and business model. This includes that it is not described in literature which exact capabilities an aggregator firm needs and which factors should be taken into account when entering the market. Furthermore, the literature describes a number of trends related to the external environment of an aggregator, that might affect its business. However, there are likely more opportunities and threats for an aggregator firm in the Netherlands that are not identified in the literature yet. The aforementioned findings from the literature are identified to be the gap and this research gap is further investigated as part of this thesis.

Furthermore, the research identified the definition of a business model as well as the Business Model Canvas as a tool to design a business model. Additionally, the definition of a business strategy is identified and the implications of several components of a business strategy have been explored.

2.2.6 Conceptual model

From the research gap identified in literature, the researcher believes that with the right data collection this study can solve the research gap and guide aggregator firms with designing their business strategy and business model by the help of a conceptual model. This conceptual model will be described in this paragraph. Stebbins (2001) mentioned that confirmatory mechanisms such as hypotheses should not be used for exploratory research. However, this conceptual model will serve as a working hypothesis which is stated to be useful for exploratory research (Casula, Rangarajan, & Shields, 2020). The working hypothesis is then provisionally accepted to be used for future research and can be adapted when more results follow from additional research.

The Business Model Canvas has been chosen as the conceptual framework to propose how an aggregator could design its business model, as it is intuitive and gives a clear visualization of the aggregator's business model components. Furthermore, it is very agile and can easily be adapted when changes occur for an aggregator firm. Additionally, it does not focus on a single aspect of a business, such as the marketing of the firm, but is a holistic visualization containing all the pillars necessary for a business model.

As the Business Model Canvas misses strategic components such as competitive effects and important capabilities for a firm, as well as the framework being 'static' by nature as described in literature, the components found in literature of strategic management and described in the literature chapter, will be part of a business strategy that will be added in the conceptual model to account for more dynamic environments and for more depth in the aggregator's strategic aspects to focus on. Theories such as

the Resource-based view or innovation theories might not directly be implemented in a firm's strategy, but these theories can form a basis for questions that can be asked in interviews (described in further detail in Chapter 3) to collect data for the conceptual model.

In order to propose inputs for each of the nine areas of the Business Model Canvas and Value Proposition Canvas frameworks, information and insight in the possible options is required. Chapter 3 about the research methodology describes this process of data collection in more detail.

The conceptual model for this study can be seen in Figure 8 and Figure 9.

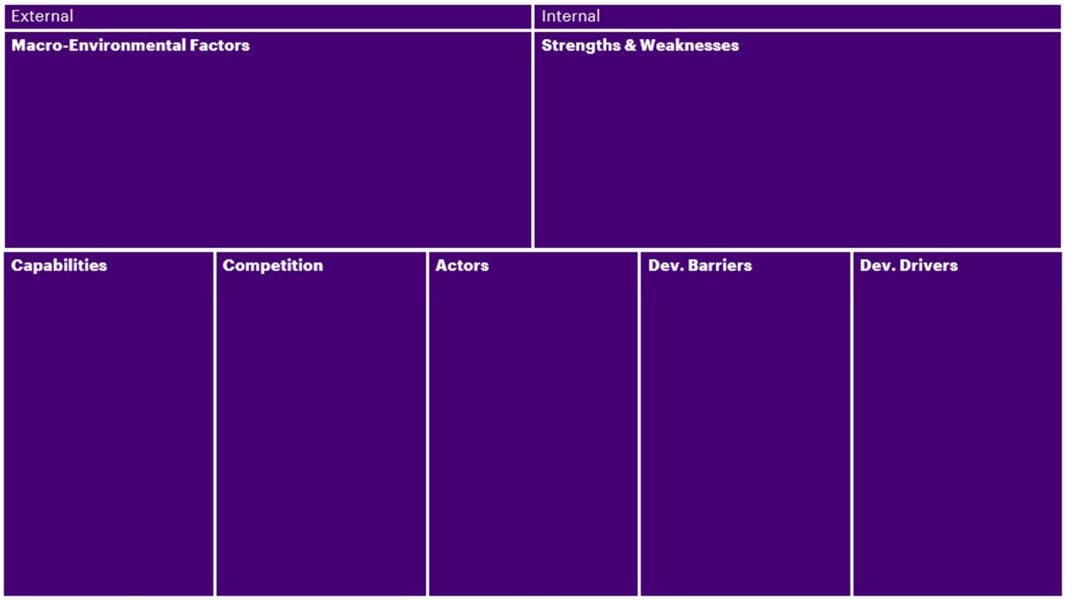


Figure 8: Conceptual model business strategy

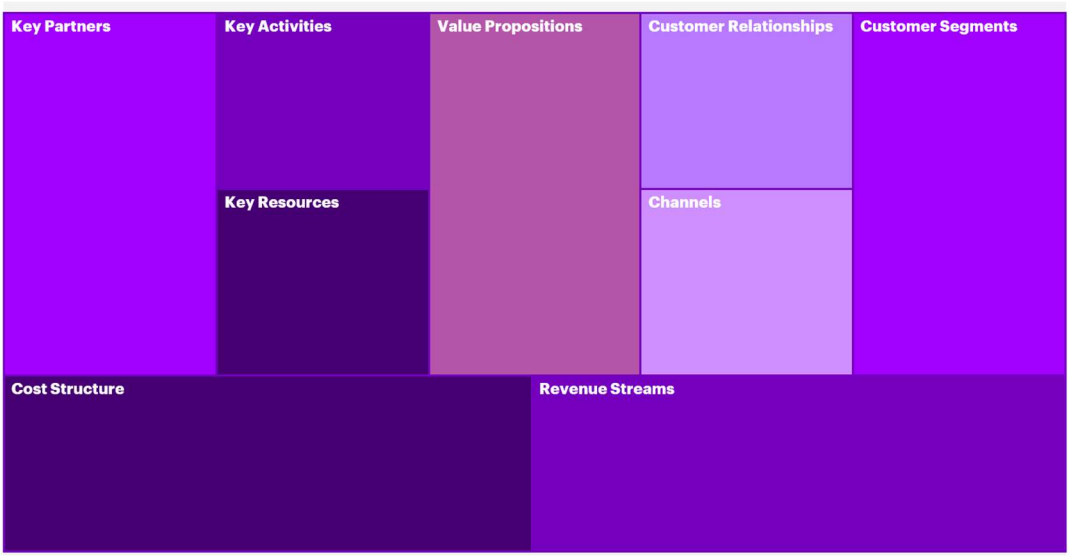


Figure 9: Conceptual model business model

3. Research Methodology

The literature review as explained in the previous chapter identified a research gap. The literature review thus highlighted that additional research is required on the topic of aggregators and their business strategies and business models. The main research question of the study which explores these strategies and business models, as stated in Chapter 1, is formulated as: "*How could a firm design its business strategy and business model when entering the Dutch energy market as an aggregator?".* In order to answer the research question and to complete the research objective, a research methodology is created. The methodology that is used in the thesis is discussed in this section, including the reasoning behind the selection of the research methods used. The objective of using a methodology as part of the research is to create and use a systematic approach during the research, to ensure the research is done in a scientific manner.

This section will explain the research methods that are utilized to answer the sub-research questions, and thereby the main research question. The sub-research questions are:

- **SRQ1** *What are the characteristics of the external environment for an aggregator in the Netherlands?*
- **SRQ2** *Do key collaboration opportunities exist in which an aggregator should take part?*
- **SRQ3** *What are the essential capabilities an aggregator should master when entering the Dutch energy market?*
- **SRQ4** *What are possible revenue streams and corresponding cost structures for an aggregator in the Netherlands?*
- **SRQ5** *What is the aggregator's customer profile and what should the value proposition be?*

3.1 Methodological Approach and Data Collection

The research approach used is exploratory as the aim is to explore how a firm entering the Dutch energy market could design its business strategy and business model. The study explores the concepts related to the topic and can form a hypothesis for further research. In addition to the explorative type of study, the research approach used in this study is of a qualitative kind, as qualitative data fits best to the nature of the sub-research questions. Quantitative research is not able to form a basis for the researcher to draw valuable conclusions, as collected quantitative data is missing the context that is required to answer the sub-research questions and the main research question. As an example, acquiring quantitative data such as data from a survey in which participants are asked to rate, rank, or scale, a number of essential capabilities an aggregator needs, is not possible as this study is exploratory and these capabilities are not known yet.

A number of qualitative research methods are considered. These are: a case study, a survey, or interviews. As the study of exploring business strategies and business models is not aiming to observe phenomena within a specific context, this type of qualitative research is not sufficient. Surveys or interviews are both methods that can give valuable results to answer this research question, however, given a number of disadvantages related to surveys, interviews have been chosen as qualitative research method for this study. The disadvantages of using a survey for this study is that it can be difficult to obtain a high enough number of respondents, as the number of individuals with the expertise of aggregatorship is limited, and as the respondent rate is generally lower compared to interviews, it has been chosen to organize interviews. Furthermore, obtaining data from surveys can miss important relationships between factors and can lead to misunderstandings or might miss valuable perspectives that the author did not think of. Additionally, interviewees have the possibility to ask for clarification of a question during an interview, contrary to a survey that might be misunderstood by a respondent, resulting in a different answer than meant by the participant. The nature of the research question and sub-research questions requires the author to gain an understanding of the context, which is best achieved through interviews.

The interviews are thus used as data collection method to answer the sub-research questions. All sub-research questions are answered by using interviews. This paragraph describes the aim of each sub-research question. The aim of sub-research question 1 is to get insight in topics that describe the characteristics of the external environment that the aggregator will be active in, such as: regulations, competition, and barriers to adopting the aggregator's technology.
The aim of this sub-research question 2 is to investigate whether opportunities exist for an aggregator in partnerships. It is investigated whether partners exist that are beneficial for the aggregator to cooperate with or would have a negative influence for the aggregator's business to cooperate with.
The 3rd sub-research question explores which capabilities a firm needs when entering the Dutch energy market as an aggregator, which is essential for the firm's strategy.
The 4th sub-research question addresses the revenue streams that exist for the aggregator. The revenue streams are methods by which the aggregator can create revenue. Additionally, the cost structure is of importance and shows what the main costs are for an aggregator when it is doing business.
Sub-research question 5 is also answered by interviews. It is important to be aware of the aggregator's customer profile because it influences the value proposition. A certain value proposition can be very effective for one group of customers, and at the same time be ineffective for another customer group. The value proposition has to be created in such a way that it will be convincing enough for customers to be able to use the service and that the advantages of the service outweigh their needed effort of using the service. The interviews will be very valuable for answering this sub-research question, as experts in the field of energy retail have a lot of experience and knowledge of the customer profiles of the stakeholders in the Dutch energy market. As the aggregators in the future will be one of the current stakeholders in the Dutch energy market (or a new independent aggregator), this customer profile is expected to be similar to the existing customer profiles.

3.2 Interview Process

This section will describe how the process of the interviews is constructed, including the preparation and finalization. These steps as part of the interview process are visualized in Figure 10.

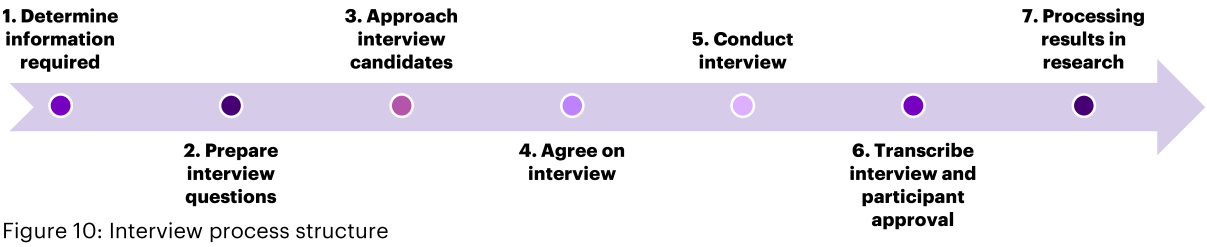


Figure 10: Interview process structure

The first step in the process has been to determine which information is required to fully cover the sub-research questions. The required information is then used as input for the interview questions.
For this study it has been chosen to use the conceptual model described in Chapter 2.2.6. The data to be collected from the interviews should aim towards filling in the gaps in this conceptual model. This means that the interviews collect data about the segments in the Business Model Canvas as well as the strategy components mentioned in the conceptual model. This is often referred to as a 'thematic analysis' in which themes or patterns are examined in data.
As an example, a component of the Business Model Canvas is 'Key Partners'. Interview questions as part of this study will therefore ask interviewees questions related to an aggregators partners, such as whether collaboration opportunities exist for an aggregator to take part in. The findings of this interview that relate to 'Key Partners' will then be categorized in this segment of the conceptual framework. How these findings are transcribed is described in more detail in Chapter 3.4. Each interview question will already point towards a certain theme, and thus not much more interpretation or coding is needed by the researcher to fit the data in the themes of the conceptual model. Additional data that is given in the

interviews that is unrelated to the theme of the interview question will be categorized in the relevant theme/code of the conceptual model.

The chosen form for the interviews in this study is semi-structured. This means that a number of questions that are asked to the participants are predetermined, but with room for additional questions related to answers given during the interview. This allows the researcher to collect additional relevant insights that the interviewees might have and are not included in the questions. The interview questions should be formulated in such a way that each question is accessible, meaning that the question should not contain unnecessary or overly complicated information. The questions should also be clearly formulated and to the point.

In order to establish interview questions that answer the research question of the study, the researcher has oriented himself to ensure that all relevant aspects are included in the interview questions. This is done by a combination of the literature review in which theories for business strategies and business models are explored, a number of meetings with consultants in the Dutch energy sector.

Before approaching any interview candidates for the interview, it is the main priority that the study is fully compliant with the GDPR, as well as the TU Delft ethics regulations. To ensure this, an ethics review including a risk assessment and risk management strategies has been approved by the TU Delft ethics committee. Furthermore, the interview candidates will receive an invitation that states they can withdraw from the study at any time. Additionally, interview candidates are asked to fill in the consent form. Only once the consent form is filled in and interview candidates agree on the interview, the interview will be planned and they become a participant in the study. The informed consent form can be found in Appendix I.

3.3 Sample

The individuals that have been approached to take part in the interviews are individuals that have the expertise of aggregatorship. This means the interviewees either work for or with an aggregator firm, are one of the stakeholders of an aggregator firm, or is an individual that has done previous research or projects related to aggregatorship. In order to avoid bias and to include the perspectives of all stakeholders of an aggregator in the Dutch energy system, interviewees have mixed expertise and backgrounds. Limiting the interviews to a single group such as only interviewing individuals working for an energy supplier, could for example miss a number of barriers an aggregator faces that are only known by a grid operator or individual working for an aggregator firm. The interviewees, therefore, have backgrounds in energy consultancy, academia, energy supplier firms, transmission & distribution of electricity, or aggregator firms. Table 2 gives an overview of the interviewees that have been selected and the motivation for selecting them.

Table 2: Overview interviewees

Interviewee	Job position	Motivation of selection
A	Tech. Consulting Sr. Manager	This interviewee has been selected for the interviews due to his/her experience with clients in the Dutch sector of Transmission and Distribution of electricity (meaning firms that are Transmission System Operator and/or Distribution System Operator). Furthermore, this interviewee has past work experience at a firm that developed and implemented aggregation services. Another reason why several interviewees from the consulting sector have been selected is the variety of clients in the Dutch energy sector they worked with. This can give the researcher a broader picture, contrary to the case when one would only select interviewees that have their experience at a small part of the market, which could reduce the depth of the study, especially since the number of participants in the study is limited.

B	Tech. Consulting Manager	This interviewee has been selected with a similar background as interviewee A. This interviewee also has work experience and regular contact with firms in the Dutch Transmission and Distribution sector. This interviewee also assisted during past theses that focused on aggregators, which could give valuable insights for this thesis.
C	Associate Professor	Has been selected for his/her experience and contributions in the academic field. This interviewee did research about aggregators and the Dutch energy market and his/her research findings and knowledge can result in valuable insights for this study.
D	Business Strategy Sr. Manager	This interviewee is a Business Strategy Senior Manager for a multinational consulting firm and has industry experience with large energy firms, as well as a background in finance. This combination of experience is beneficial to gain more understanding related to the business and strategy aspect of the aggregator.
E	Tech. Consulting Manager	This interviewee works for a consulting firm and is specialized in E-mobility. This specialization in E-mobility makes it that this interviewee works with a lot of different clients in E-mobility, and that this interviewee does not only have valuable insights about an aggregator's strategy and business models, but also about past projects implemented for EV's and insights about customers and their preferences.
F	Management Consultant & ex-employee charging infrastructure trade organization	Has work experience at a Dutch trade organization for charging infrastructure, which are often collaborating with firms in the Dutch energy industry and developing aggregator pilot projects. These experiences are useful for gaining knowledge on the subject of this study.
G	Manager Finance	Is a Manager Finance at a Dutch energy supplier firm that has implemented a number of aggregator solutions for their customers. This practical expertise in combination with the finance background fits very well to the research questions aimed to answer in this study.
H	Business Strategy Sr. Manager	This interviewee is a Business Strategy Senior Manager and his/her long history of work experience with energy supplier clients can give the study more insights into the energy supplier's ins and outs regarding aggregators.
I	Head of Flexibility	This interviewee works for an energy supplier and being the Head of Flexibility makes it a very relevant participant to select for this study. Furthermore, this interviewee has participated in a pilot in which an aggregator system has been tested in practice, which could result in several practical insights for the study.
J	Co-founder aggregator firm	Has been chosen as it is one of the founders of an aggregator firm, thus knowing all ins and outs of starting an aggregator firm, and everything related to an aggregator's daily operations.

3.4 Transcription of Interviews

When conducting the interviews, audio is recorded (with the consent of the interviewees) and the prepared questions are asked. The complete interview is transcribed when the interview is finished. The transcripts are written in Dutch (the language spoken by the interviewees) to avoid translation or interpretation errors when translating this to English and to keep the research transparent and replicable for other researchers. When participants' interview answers result in new views for the study that make additional questions during the interview beneficial, then these additional questions are asked and are transcribed afterward as well. Before the transcripts and conclusions of the interviews are processed into the research, transcripts are shared with the corresponding participant to ensure they agree with

the transcript. If the transcript is not in line with their view, changes can be made before processing the results.
The transcripts are used to establish the findings in this study. This is done by collecting participants' views and statements that the author believes are most relevant to the topic of the study, after which the views and statements of interviewees are compared to each other, to identify whether there is agreement or disagreement. These findings from the interviews are then used to complete the conceptual model.

3.5 Interview Questions

This section describes the interview questions that are part of the research. The questions have been categorized based on the sub-research question they aim to answer. The questions have been established by taking into account the essential parts of a business strategy and business model as described in the theories in Chapter 4 in this study.

Below each sub-research question, a number of questions are shown that are asked from participants. As the interviews are semi-structured, the list of questions mentioned is non-exhaustive, and additional questions based on the participant's answers may be asked, as well as specific questions that fit will to a certain interviewee due to his/her expertise with a certain subject or perspective.

The prepared questions are stated in the following list:

SRQ1: *What are the characteristics of the external environment for an aggregator in the Netherlands?*

- Which aspects do you see as typical for the external environment of the aggregator and do you expect this to change in the next years?
- Which changes can you identify in the new Dutch energy law and how do you think this will affect the role and business of the aggregator?

SRQ2: *Do key collaboration opportunities exist in which an aggregator should take part?*

- Do you think an aggregator can manage to get all the know-how for its business in-house, or should an aggregator merge or acquire with another party?
- Which key partners would you say are crucial for an aggregator?

SRQ3: *What are the essential capabilities an aggregator requires when entering the Dutch energy market?*

- What do you consider as the strengths and weaknesses of an aggregator?
- Which capabilities does a firm require for an aggregator role?

SRQ4: *What are possible revenue streams and corresponding cost structures for an aggregator in the Netherlands?*

- Which specific revenue streams (and related cost structure) do you think an aggregator should consider?
- What are the possibilities and differences for an aggregator between B2B or B2C?
- What strategies do you think are necessary for an aggregator to create a viable business case? Taking into account the expected revenues, costs, capabilities, and external environment.

SRQ5: *What is the aggregator's customer profile and what should the value proposition be?*

- How does the customer profile look like for an aggregator at the moment?
- Do you think the customer profile will change significantly during the next years, and if so, how?
- What components do you think are crucial in the value proposition for the aggregator's customers?

4. Findings

This chapter presents the findings of the semi-structured interviews. The interviews resulted in a large number of findings in a wide range of different aspects related to an aggregator's strategies and/or business model, and therefore the findings have been categorized based on the elements of the conceptual model described in Chapter 2.2.6. Each category in this chapter describes its findings in further detail. Superscripts are used to indicate to which interview a certain finding or statement refers. The chapter first describes the findings related to the strategic part of the conceptual model, after which the findings related to an aggregator's business model are discussed. The chapter starts with describing the findings related to the situational analysis of an aggregator, aiming to describe the external environment of the aggregator at this moment and in the future, after which the other findings follow.

4.1 Macro-Environmental Factors

From the interviews it can be concluded that the need for an aggregator has increased during the last years and will increase further [B,D,F,H,I,J]. The imbalance in the Dutch electricity grid will increase on a national level and at the same time, there is the problem of congestion in the grid in certain regions. An example of this congestion is that in a number of places in the Netherlands, buildings cannot be connected to the electricity grid. This congestion is growing significantly[B,E,H].
Furthermore, the amount of generated energy from renewable sources such as wind and solar is increasing, and this increases the volatility of energy production. There is still a rapid increase in wind and solar is being developed, but it has been found that there is less development in flexibility solutions[I]. If the developments in flexibility will overtake the increase in wind and solar generation, the imbalance in the electricity grid can decrease.
Interviewees highlighted that recently the electricity prices have increased in the Netherlands[B,C], which is one of the trends affecting aggregators. Interviewees mention this could be a temporary effect[B], but it does increase the opportunities for an aggregator in general, such as purchasing and selling energy at certain moments.

Dutch legislation for an aggregator is mentioned to be still premature[A]. However, it is expected that this will change positively for aggregator (but how is still uncertain). A few years ago, there were no possibilities yet for an aggregator, so the environment for the aggregator is changing[B].
There is a new energy law under development called the 'Energiewet' (Ministry of Economic Affairs and Climate Policy, 2020). This law is meant to replace the existing ' Gaswet and Elektriciteitswet' from 1998 (Dutch Council of State, 1988). It is believed this law will strengthen the position of the aggregator[D].
Furthermore, it is expected that the current netting arrangement in the Netherlands will be phased out in the next years. However, it is uncertain if this will actually happen[A].
Currently, there is little view on the exact number of aggregators in the Netherlands. The idea of aggregatorship is still in an early phase and the value pool is not mature enough yet as indicated by interviewees. It is expected that this will happen in the next 5-10 years, although closer to the 10 years mark before the market of flexibility will be mature and will offer greater possibilities for the aggregator to earn money[D,H].
Aggregator projects that have been done in real life such as the 'Energiekoplopers' project showed that such a smart energy system works and that it creates value for the actors in the Dutch energy system[I]. Thus, for the aggregator, the customers, the grid operators, and for the portfolio for the energy supplier. Furthermore, the project proved that the aggregator can significantly reduce the imbalance in the electricity grid. Additionally, it showed that the Balance Responsible Party will face lower risk[I].

Distribution system operators (DSO's) are working on platforms where aggregators can apply for, on which they increase or decrease the production of their energy-producing assets[B]. The aggregator is rewarded for trading the flexibility on these platforms. An interviewee stated that a significant number of firms already applied to transmission system operator TenneT to provide balancing services.

Energy suppliers are used to selling energy to consumers and less used to selling products, however, currently these firms also provide more of these products, such as Essent with solar panels and Eneco with e-mobility charging points[E].
Firms in the energy industry are developing and launching apps at the moment for aggregation services[E], such as in the case of Tesla where users can go 'off-grid' by selecting this option in the app. It is expected that more firms will do this: not only the incumbent energy suppliers but also automotive companies[E].
Charging point operators are also bringing aggregation initiatives to the market[E]. An example of this is Octopus Energy which charges customers a tariff based on the moment that the customer is charging his/her electric vehicle. The customer then either pays the actual market price or a lower price when charging overnight.
It is predicted that many aggregators will enter the market, however, it is uncertain whether this will already happen in the next 10 years[H]. It is expected that consolidation occurs[G,H]. This means that some aggregators will be successful, some will fail, and some will consolidate with other firms or be acquired by firms.
In addition to a few large aggregator firms, it is believed there could be a spread of smaller aggregator firms, to solve local congestion that occurs in the grid[H]. This can be done with help of other stakeholders such as other businesses and municipalities. A party such as TenneT could regulate this by creating a platform solution on which the aggregators could do business[B,H].

A threat for an aggregator mentioned by an interviewee could be the moment when all flexibility solutions available balance out the grid up to the point when there is (almost) no imbalance left[I]. At that point, the services of an aggregator that flexibly deploy assets with the objective to decrease imbalance in the grid are no longer useful. However, short-term this scenario is believed to not occur, and in the long term, it is expected that the growth of solar and wind power (and thus imbalance in the grid) will increase more than the increase in flexibility solutions can cover[I].

The industry attractiveness as part of Porter's Five Forces was found to be difficult to describe, as indicated by an interviewee[C], as not only new entrants and startups can have an aggregator role, but also the incumbent firms (energy suppliers). The exact industry attractiveness is thus dependent on the actor in the energy system.

4.2 Strengths and Weaknesses

The interviews aimed to gain insight into the fundamental strengths and weaknesses of an aggregator. Interviewee D mentioned a strength for an aggregator is that there is a need for their flexibility services due to the increase of decentralized energy production as well as electrification of the energy system[D].
It was mentioned that a weakness of an aggregator can be not possessing good and clean data[A].
Another weakness is that the aggregator does not always have contact with the consumer, and this is a challenge that an aggregator can face[A].
Furthermore, a weakness identified in the interviews is the small profit margins an aggregator has[A,G]. An aggregator thus needs to operate on a large scale in order to make sufficient profits to cover the fixed costs. A potential weakness for an aggregator is that the administrative systems of the aggregator have to be able to manage the customer files well when the aggregator is scaling and the customer base is rapidly growing[C]. This prevents unforeseen large costs.

4.3 Competition

The energy supplier market has been indicated as quite competitive[C]. Due to the recent price increases for energy, some of these firms have even filed for bankruptcy[C].

The Resource-Based View theory states that firms gain a competitive advantage when they own resources that are valuable, rare, inimitable, and non-substitutable. When asked if an aggregator on the Dutch energy market also possesses or can possess the resources to gain a competitive advantage, the opinions of the interviewees were mixed(interviewee C thinks an aggregator does not have this

competitive advantage and interviewee H thinks an aggregator does have it)[C,H]. Interviewees shared in opinion that an aggregator with a large customer base is in an advantageous position, due to scaling effects[C,G,H]. The larger the customer base, the larger the flexibility and the more predictable the demand and supply of the customer base is, and the less imbalance is created on the grid. Furthermore, developing an own platform and a vision that reaches further than what is currently possible for an aggregator is seen as a key differentiator. However, as it is believed to be a competitive environment, trying to develop unique traits and developing smart AI algorithms is something that could be done by all firms. Furthermore, if an aggregator has a similar number of customers as its competitor, the information will be roughly the same as it is believed this information is quite available[H]. A scalable IT platform is also believed to give a competitive advantage.
The interviews also conclude that it is important for an aggregator to be well positioned[D,E,G,H].

4.4 Development Barriers

A number of barriers were identified that hinder the development and the implementation of an aggregator in the Netherlands.
One of these is the GDPR regulations that make it difficult to store customer data for longer periods[C]. This makes it difficult for an aggregator to do smart analyses with the objective to purchase effectively and inspect the results of certain stimuli.

Consumers that would like to participate in an aggregator's services need a 3-phase power connection in their household, in order to be able to use appliances with a high-power consumption or generation such as solar panels or an electric vehicle[E]. Currently, a person from the grid operator must come by in order to arrange the transition from the initial 1-phase connection to a 3-phase connection. Because of this, the process can take several months for a consumer, and this can be a barrier to purchasing certain appliances and participating in aggregation services[E].

In order to use assets such as electric vehicles for aggregation services, it was mentioned in the interviews that this is only possible during times that the owner of the vehicle plugged the vehicle in so that it is connected to the grid[B,E,J]. When this is not the case, for example during driving or when the vehicle is parked and not connected to a charger, an aggregator has no control over this vehicle and its battery. Therefore, the aggregator might need to implement a reward system

Furthermore, an aggregator needs the consent of the user to be able to control their appliances or electric vehicles[B,J]. The aggregator might also need consent to access the electricity usage data of consumers.

4.5 Development Drivers

Several drivers have been identified that stimulate the development and implementation of aggregators. As described in Chapter 4.1 several macro-economic factors exist that stimulate aggregation.
Furthermore, in the case that more households get battery storage systems in the next years, in combination with their own power production (such as from solar), then the business case for energy suppliers to provide aggregation services becomes more attractive[E,I]. This is due to the fact this consumer segment will be less dependent and reliant on electricity from the grid and the energy suppliers will therefore see a part of their profits from this revenue stream disappearing. This situation might increase incentives for energy suppliers to provide aggregation services.

4.6 Capabilities

In addition to essential resources, the aggregator has to possess certain capabilities in order to operate successfully.
One of these capabilities is regulatory knowledge, in order to understand the possibilities for the aggregator's business within the regulatory framework[B].

Furthermore, the aggregator needs technical expertise because the aggregator is controlling physical assets. The aggregator either manages its own assets or has access to another firms' assets[B,E,J]. Therefore, the aggregator needs to be knowledgeable of the limits when controlling these assets and needs to understand how to do this in a safe manner[B].
An aggregator has to have an understanding of technical integration, as an aggregator will integrate with an infrastructure firm such as transmission system operator TenneT[B].
Another capability an aggregator needs is IT and AI expertise, which is part of the IT staff as a resource mentioned in section 4.9[B,C,D,G,H,J]. The aggregator needs this expertise about algorithms to do predictions and it might be smart for the firm's business model to have this expertise in-house.

4.7 Actors Fulfilling Aggregator Role

The distribution system operators (DSO's) are by Dutch regulation not allowed to provide commercial services[F,H]. However, possible options could be either to create a platform on which other aggregators can provide flexibility or to invest in pilot projects[B,F,H]. Then the distribution system operators can be reimbursed for their efforts to reduce costs.
Even if aggregation services with a commercial purpose are not allowed, the transmission system operator (TenneT) can argue that it is a necessary measure from the perspective of safety and in order to guarantee the supply of electricity within the Netherlands.

The interviewees think that the energy supplier is the most obvious actor in the Dutch energy system to have the role of the aggregator[C,E]. This is due to the fact that the energy supplier benefits from shifting demand, as it has to fill in its own profiles. Furthermore, the energy supplier can see what the effect is on their own customers. The large incumbents also have many opportunities to reduce risk which makes them less vulnerable to systematic fluctuations. These incumbents also have the advantage of already having a large amount of customers[C].
On the other hand, it can be observed that the incumbent energy suppliers could aggregator, but do not do this as the organizational structure and company culture is too cumbersome to respond and act on these developments in the industry[C,E,G]. Therefore, it really depends on how well these incumbents are capable to respond to the developments. It is possible that a niche will arise where new entrants can play a role. An advantage of an independent smaller aggregator is being more independent and being able to make deals with other firms, such as Jedlix which has established deals with automotive companies. Furthermore, these firms are better able to anticipate and determine on a neighborhood level where projects will take place. The smaller aggregator firms do however have to scale significantly.

If a large energy supplier is planning to provide aggregation services, the approach will depend on the company, mentioned an interviewee[G]. There are examples of large energy suppliers that created their own business unit in which they do aggregation, and some acquire startup aggregator firms[H]. Acquiring a firm is especially interesting for an energy supplier if this aggregator has a lot of flexibility in its portfolio. Large energy suppliers can sometimes also rely on the knowledge and expertise within the larger parent company and therefore already have the capabilities in-house.

Due to the current crisis in the energy markets, the risks of energy suppliers are increased significantly for the purchasing of electricity and balancing of portfolios[C]. Therefore, aggregation services are said to be a good solution for this issue and the business case of an aggregator has more potential due to this energy crisis.
If the whole system would change in theory and consumers could use real-time pricing for their energy, it would still not work, as households cannot become a Balance Responsible Party[C].
An aggregator in any form without its own assets but only a customer base is believed to have high risk in its business model[C]. This is because the aggregator promises the customer a certain price, and during significant price fluctuations such as during an energy crisis the aggregator would go bankrupt. Therefore, energy suppliers that have their own energy production are vertically integrated and in a more advantageous position. They are hedged and their risk is lower during increased wholesale market prices compared to if they would only sell energy to consumers.

There are doubts on the business case for a standalone aggregator. Some think the aggregator will be part of a larger energy supplier firm and that the aggregation services will be a service within that firm[G]. One interviewee stated that if an incumbent firm aggregates, this should be disconnected from the mother company, so the aggregation should be done in a separate business unit[H]. This is due to the fact that in the early stage, high investments are required with small earnings in order to gain market share. For a smaller firm with more agile investors, it is then easier to adapt their strategy to the needs of the market compared to being part of a larger firm.

4.8 Key Partners

This section describes the findings of whether collaborations exist that are necessary or beneficial for an aggregator as part of its business operations.
For an aggregator with the consumer/end-user as customer, an energy retailer would be a logical partner[A].
As stated before, the aggregator might have to partner with a firm that is able to perform predictions by using algorithms, in the case the aggregator does possess the expertise in this field[A,B,C,J].

A good relationship with regional and national transmission- and distribution system operators is believed to be essential[B].
It could also be advantageous to create a partnership with energy suppliers, as many of these are already developing certain aggregator services and can be an opportunity to scout for future opportunities[B].
The aggregator can also cooperate with car manufacturers to integrate the aggregator's services directly into cars[E].
If an aggregator wants to use public charging points for electric vehicles to provide aggregation services, it is important to know that the charging point operator (CPO) owns the charging point. Therefore, an aggregator needs to establish an arrangement with the CPO (if it is not the CPO who is providing the aggregation services) in order to use the assets[E,J].

For aggregators as new entrants on the market, partnerships with larger firms such as the energy suppliers and grid operators can be beneficial[H]. However, this requires the aggregator to have an innovative and attractive business case in order to be interesting enough for other firms to partner with the aggregator[D]. An aggregator which is a new entrant should be attractive for a possible acquisition by larger firms that are active in the whole chain (energy generation as well as retailing energy) according to an interviewee[D].

4.9 Key Resources

An aggregator requires certain resources in order to maintain its business operations. To be active as an aggregator, a firm is required by Dutch regulation to register as a Balance Responsible Party.
Furthermore, an aggregator needs an IT platform to manage its operations[B,C,D,G,H,J]. This platform should be easy to scale. What this essentially means is that when the number of customers increases rapidly, the costs to maintain this platform should not increase exponentially.
In addition to the requirement of owning an IT platform, an aggregator needs to have staff with IT expertise to build and maintain this platform. The real-time IT component is identified as important for the aggregator[B,C,D,G,H,J].
Another essential recourse for an aggregator is having access to an as large as possible base of assets that could be flexibly deployed[B,J]. These assets could be electric vehicles, household appliances etc. At the same time on the supply side, there are energy-producing resources such as Virtual Power Plants and the application of Vehicle-to-Grid technology that the aggregator can use as a resource. Vehicle-to-Grid technology is still under development and very immature, however, when this is more developed it can strengthen the position of aggregators.
Alternatively, it is possible to outsource this to another firm. The IT systems have to be able to manage the customer files well when the aggregator is scaling and the customer base is rapidly growing[D].

The interviewees indicated that the aggregator has to be accurate and must be able to function at all times[H]. The aggregator has to be trustworthy as a firm towards its customers. The technology of the aggregator is also required to work correctly and be a scalable technology. These capabilities and why they matter to the aggregator's customers are further described in the section 'customer profile'.
Furthermore, the speed of the aggregator's early growth is perceived to be important as in the start the number of customers matters. During the growth of the firm, an aggregator has to minimize the 'growth pains' such as the debts that can arise in the early phase of the company[H].

When looking at the actors in the energy system specifically, it is believed that the energy supplier does not have the capabilities for aggregatorship and that a tech-savvy start-up or firm that fully focuses on aggregatorship and has this vision from the start, is better able to develop these capabilities externally than at an existing energy supplier, as the business operations of an aggregator differ significantly from the business operations of an energy supplier[H]. Furthermore, an energy supplier's current IT systems are said to be not equipped for aggregatorship and it is believed that it is a more obvious choice for an energy supplier to acquire an aggregator firm than developing these capabilities themselves[H].

4.10 Value Proposition

A number of important factors for the value proposition were indicated during the interviews.
In the case customers participate by using an app, the system has to be reliable[B,H].
When the customer has to do something, it has to be extremely easy, so ease of use is important. It has to become a seamless experience for the customer[A,B].

Customers that participate in an aggregator's services by allowing the aggregator to control the charging of their electric vehicle can be rewarded by the aggregator in different ways. There are currently energy suppliers in the Netherlands that provide smart charging points (charging stations to plug in the electric vehicle) where the customers' reward is a lower energy bill compared to if these customers would not be participating with the energy suppliers' smart charging points[J]. It is then a usual practice that the provider of this service also takes care of the administration, installation of the charging point, and provides the customer with a charging card to use in multiple countries. However, it must be noted that currently the majority of all placed charging points are not 'smart' yet and thus not able to control the charging of the connected electric vehicle[J].

When competing as an aggregator in terms of customers, it was indicated that it is important for an aggregator to be at least slightly better than a competitor[H]. Marketing is a factor that plays a role here and the storytelling the aggregator does to the customer.

4.11 Customer Segments, Customer Relationships, and Channels

The exact customer profile for an aggregator depends on who the aggregator will provide its services to. If the consumer/end-user is the aggregator's customer, interviewees stated that the consumer is generally not interested in participating in an aggregator's service. It is expected the segment of consumers will be more diverse, as using electricity at low prices will become more relevant, and consumers are getting more aware of how fragile the prices in the energy market can be. It is then very advantageous for them to be less dependent on the large energy suppliers.
The interviews also made clear that an important factor for consumers is that they can use their appliances without any disturbances[A,B]. Especially due to the fact that it is likely consumers will only earn tens of euros per month from participating in an aggregator's services[A].
The customer segment that an interviewee found most likely for an aggregator is owners of an electric vehicle, owners of solar panels, and owners of residential battery storage. These people are usually not the people who pay attention to every euro they spend according to the interviews.

There is potential for aggregators in both the Business-to-Business (B2B) and Business-to-Consumer (B2C) segments[H,J]. Businesses are a very attractive customer group for aggregators for multiple reasons.
Businesses are large in scale, businesses have the need to make a profit, and businesses have significant potential for green energy such as the available large roof surfaces for solar energy. When acquiring a business as a customer, an aggregator might have a large fleet of electric vehicle assets to control, contrary to the B2C segment, where one household often does not have a high number of electric vehicles. Business offices with a large electric fleet might reach the limit of their power connection to the grid during moments that these vehicles are charging[E]. Therefore, there is an incentive for businesses to participate in services of an aggregator to spread the demand of power over the day and prevent costs for a grid connection with a higher capacity, and to stay in a lower tariff zone for electricity as well.

One interviewee indicated that he/she thinks most flexibility will come from the business market and the so-called 'utility scale', as an aggregator needs large volumes of power[I]. Curtailment could be applied here. However, when focusing on the B2C segment it would be most logical to focus on electric vehicles, as their number is relatively large and are using high power. Home battery storage systems are expected to be used more in the future, however, at the moment there are not many of them in the Netherlands[G,I]. Other options to apply flexibility are by electric boilers and heat pumps. Flexibility management in large industrial processes has potential but is practically not realistic at the moment due to its high impact of it on the factories[I]. In the long term, if the Netherlands has a more developed hydrogen economy, electrolyzers can be used to convert electric energy to hydrogen in order to store this energy during times when electricity is abundant. This is also an example of a flexibility solution.

Other interviewees predicted that B2C is more profitable for the aggregator compared to B2B as the negotiations in the B2B sector are hefty[H]. This is mainly because the importance of energy is increasing in firms' business operations and can be a large cost factor. It must be noted that the profit margins will remain small and a large scale is needed.

As stated before, the aggregator has to be trustworthy and reliable[B,E,H]. The reason for this is that a main incentive for consumers of aggregator services is to earn money by participating. If this service is not functioning well customers will stop taking part in the service. The customer journey has to be excellent in order to bind the aggregator to its customers.
It is important that the consumers will not be burdened but are relieved by taking part in an aggregator's service. Consumers demand an easy and understandable solution that should not require too much of their efforts[B,E,H].
Consumers that have an electric company lease car are less incentivized to take part in an aggregators' services that control the vehicle's charging compared to other electric vehicle owners, as the company often pays for the charging costs[H]. Therefore, the lease drivers are not affected financially when charging during a more expensive time. However, depending on the method of rewarding by the aggregator, there are still possibilities in which the lease drivers of electric cars can benefit from participating in an aggregator's services. Consumers are not inclined to switch often from service provider to service provider, especially if the taking part in an aggregator's services gives the consumers a financial benefit and when the extra profits from switching to a competitor are small.

The aggregation project 'Energiekoplopers' researched extensively which aspects are the most important for consumers when taking part in an aggregator service, in order to develop a value proposition[I]. Consumers indicated that automatic control of the devices is important for them so that they are not required to control buttons and do tasks. Furthermore, they demand the aggregator to be a reliable party as well as get insights into the results[I]. Additionally, the aggregator should showcase an easy-to-understand story which is understandable for consumers, while at the same time taking into account sustainability.

4.12 Revenue Streams

Multiple revenue streams exist for an aggregator. The business model of the aggregator is a function of regulation as stated in an interview, and this regulatory aspect is still immature and imperfect[C]. Every time the regulation changes, the business case might have to be adapted as well.

An aggregator can charge a fixed cost for the service to flexibly deploy a consumer's assets and to reduce the consumer's energy bill. Similarly, an aggregator can also take a margin for every kWh that is being deployed flexibly[A,C,I,J]. In both cases the profit margins are small[C,G]. An interview brought forward that in the case of flexible deployment of heat pumps the costs are larger than the profits. However, it is possible that this could change in the future[A].

An aggregator performing demand response, thus controlling the power usage of appliances, can also monetize this type of business operations, as congestion in the electricity grid is reduced and grid operators can postpone their investments in fortifying the grid.

At this moment the aggregator can currently earn most on the 'onbalansmarkt' (balancing market), however an interviewee noted this is of course a very small part of the whole market[C]. This market can create the most profit for an aggregator as the prices on this market have moved up and down significantly. Furthermore, there is a lot of value for an aggregator in markets of TenneT, which are the primary-, secondary-, and tertiary reserves. The expectation is that the growth of solar- and wind power will continue which will lead to an increase in imbalance in the electricity grid[G,I].

The aggregator could extend its services and also exploit battery storage systems. In the interviews, it was mentioned that there are currently a lot of investments in these battery storage systems[G,I] and that the business case for these battery storage systems is becoming more interesting. These are not battery storage systems for residential use but are meant to be placed on grasslands. It is expected that the growth of solar and wind energy will be larger than the speed at which flexibility solutions come to the market. Therefore, a demand for flexibility will stay and will remain increasing.

In addition to determining the profits of aggregation services, the ecological impact should also be taken into account. This is a factor by which the aggregator creates value but is maybe not directly expressed in financial numbers. The services of an aggregator also affect society, as fortifications of the electricity grid can be postponed or prevented that are normally paid for by citizens via government taxes.

4.13 Cost Structure

In addition to the revenue streams an aggregator can exploit, several costs exist as part of its business. These costs are part of the business model. Aggregators rely heavily on their IT systems for their predictions and operations. When building such an IT platform it is found from the interviews to be a significant part of the cost[D,G,J]. This platform then also requires maintenance which is a cost factor.
Furthermore, an aggregator faces costs for its back-office where it manages the contracts, which is a complex whole with contracts between customers, grid operators, energy suppliers, and the energy markets. This also requires staff costs. The costs to scale for an aggregator are believed to be relatively small, as the aggregator's services are IT-based.

4.14 Findings Summary

The chapter described the findings of the interviews and categorized them based on the elements of the proposed conceptual model. These findings can now be used to fill in the conceptual model to establish a business strategy and business plan that firms can use when entering the Dutch energy market as an aggregator. The resulting overviews are shown in Figure 11 and Figure 12. The next chapter will describe how the author interprets the findings.

Figure 11: Strategy overview

External

Macro-Environmental Factors

- Increasing need for aggregators
- Profound change in energy system
  - Increase in renewables
  - Increase in grid congestion
  - Increase in grid volatility and imbalance
- Legislation aggregator premature but positively changing
- Actors in Dutch energy system developing aggregation offerings
- Past projects and pilots have shown the value of aggregators and their capability to reduce grid imbalance

Internal

Strengths & Weaknesses

S

- Demand for aggregator's flexibility services

W

- Profit margins for aggregator are small
- Aggregator does not always have end-user contact
- Managing customer files and -increasing user base when scaling
- Standalone challenging for aggregator

Capabilities

- Regulatory knowledge
- Technical expertise
- Technical integration know-how
  - IT & AI expertise
  - IT staff
- AI for predictions
- Possessing a reliable & scalable system
- Energy supplier missing essential capabilities and should develop capabilities externally or by acquisitions

Competition

- Competitive environment
- Positioning in market important
- Key differentiator in market is developing own platform and vision
- Increasing customer base enhances aggregator's positive effects

Actors

- Direct aggregation by DSO constrained by regulation, but possibilities for platform creation exist
- Large organizational structure firms at disadvantage
- Aggregator should be separate business unit
- Energy supplier obvious choice for aggregator role

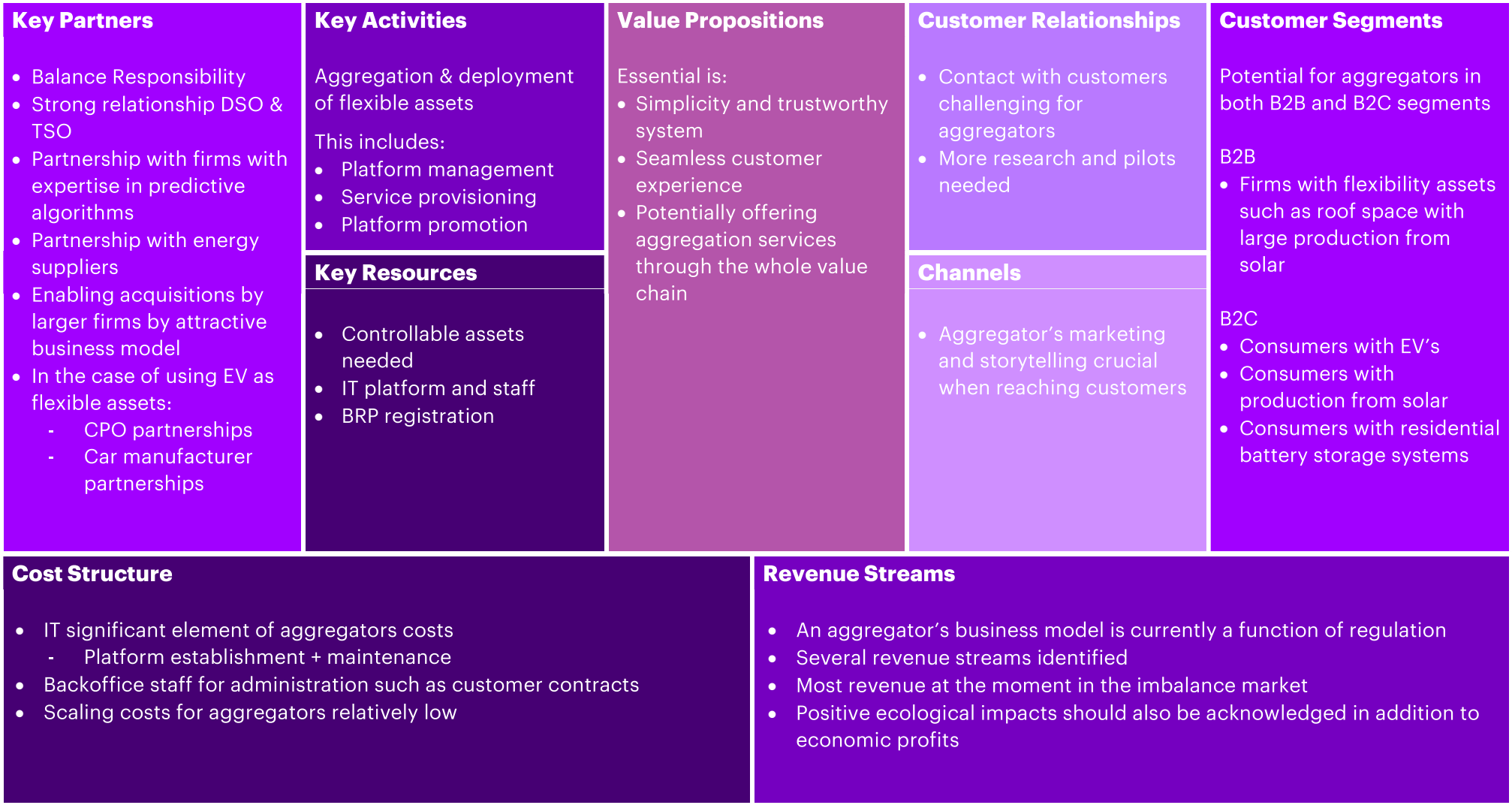
Dev. Barriers

- End-user consent
- Control over assets
- Data storage/privacy regulations
- Residential power connections require 3-phase power

Dev. Drivers

- Macro-environmental factors stimulating aggregation
- When adoption of residential battery storage increases, improvement of aggregator business case

Figure 12: Business model overview



5. Discussion

This chapter presents and describes the interpretations of the analyzed findings. The chapter connects the findings to the research objective and research question.
For the aggregator's business strategy, findings have been collected about macro-environmental factors, strengths and weaknesses, capabilities, competition, actors, developmental barriers, and developmental drivers. For the aggregator's business model, findings have been collected about key partners, key activities, key resources, value proposition, customer relationships, channels, customer segments, cost structure, and revenue streams. These findings could be connected directly with the conceptual model with only light interpretation of the researcher required to categorize findings that were relevant to the research question but not directly answering an interview question that was part of a certain element in the conceptual model.

The findings of the study have shown that there are a large number of factors an aggregator firm has to take into account when designing a business strategy and business model. The findings also show once more that several factors regarding the future of the aggregator remain unclear and this is identified by a mixed type of answers as well as some difficulty that participants expressed when answering certain questions. However, the view of the participants and the findings that resulted from their interviews is similar and there is consensus among their answers, although due to the exploratory type of study with semi-structured interviews, some findings that are similar but are expressed slightly different are difficult to combine into a single finding that is agreed on by all these participants as this could unintendedly distort the real opinion of a participant.

Referring back to the main research question of how a firm entering the Dutch energy market as an aggregator could design its business strategy and business model; a firm entering the Dutch energy market as an aggregator could design its business strategy and business model by building its business strategy from the 7 strategic components and building its business model from the 9 components of the Business Model Canvas, while implementing the insights found in this study through the collection of interviews by using a conceptual model. An overview of the proposed models for the business strategy and business model with the implemented insights is shown in Figure 11 and 12.

Based on the findings and Figure 11 and 12, possibilities for business strategies and business models for aggregators arise.
The energy system with increasing grid congestion, number of renewables, and grid imbalance, are believed to be the most significant macro-environmental factor for the aggregator, as these changes have a large impact on the demand for aggregation solutions now and in the future. The author recommends firms entering the Dutch energy market as an aggregator to use an agile strategy and business model, as Figure 11 shows that the environment for aggregators is rapidly changing and unpredictable.
In terms of agile strategy that is required for an aggregator, this means that for example the mentioned capability for aggregators to have IT staff should be IT staff that has experience working in environments that are facing rapid changes and in which the IT systems have to be adapted frequently, such as in start-up firms where the firm faces major changes during its growth. Furthermore, to account for the competitive environment, the aggregator should position itself well.

In order to differentiate as an aggregator in the competitive market, it is recommended for aggregators to develop their own platform with a unique company vision and put a strong focus on gaining a large customer base. During its market entry and after, the aggregator should keep analyzing the development drivers to scout for new market changes that might affect its business strategy and model positively, as well as identify changing developmental barriers that might create new barriers that the aggregator firm must overcome.

The aggregator can focus on either the Business-to-Business customer segment or on the Business-to-consumer customer segment and tailor the value proposition to the customer group of choice. Targeting both the Business-to-Business and Business-to-Consumer segments is also a possibility and can make the aggregator acquire a larger customer base which is an important factor for an aggregator

to create a profit. Whether it is best to only target one of these segments or to target both, depends on the size of the firm and its capabilities. Independent startup aggregators might be more successful when first focusing on one segment and only considering the other segment when operating at a larger scale. For firms that are already operating at a large scale, such as most energy suppliers, both Business-to-Business and Business-to-Consumer could be targeted to gain an as large as possible customer base and optimal profits.
The revenue stream which is most optimal for an aggregator to sell this customer's flexibility is the imbalance market, as the revenues are the highest there. As regulations determine which actors may be commercially active and how they are allowed to operate, the revenues are very dependent on these regulations. As the regulations for the future years are still very uncertain, aggregators must be prepared for situations in which regulations and thus allowed operations change. It will be an advantage for an aggregator when its organizational structure allows for these fast changes. It must be noted, that in addition to economic benefits of aggregation, also positive ecological impacts are resulting from aggregation. An aggregation example of this is stored energy (from renewables) that can be used as an alternative source of energy for fossil-fuel powered energy. Another example is solar and wind power plants that do not have to be disconnected from the electricity grid anymore when the grid reaches its transmission capacity, as the aggregator reduces this likelihood by balancing supply and demand locally. This ultimately results in lower total carbon dioxide emissions by traditional power plants. In the business model, the key partners of the aggregator are of high importance, as these can not only increase the performance of an aggregator but are also a necessity for an aggregator to be able to operate. The crucial partners here are a Balance Responsible Party when not having arranged balance responsibility for the aggregator firm itself, as well as having the IT expertise by partnerships when not having this in-house.

As the scope of the interviews was relatively large due to do the significant number of elements in the conceptual model and the amount of information required from the interviewees to create a business plan and business model, as well as allowing interviewees to elaborate on new perspectives that the author did not think of, a large number of findings is stated by only a small number of participants. This does of course reduce the internal/construct validity of the study; however, this is known criticism in qualitative studies due to the subjectivity involved and unstructured nature (Makri & Neely, 2021)
Regarding the external validity of the study, it must be noted that the findings of the study can be generalized to other settings or groups, namely firms that enter markets as an aggregator in other countries than the Netherlands. A number of components of the conceptual model might have a higher generalizability such as the capabilities an aggregator needs, and other components such as the key partners of an aggregator and its opportunities in the market might vary significantly in other countries. How generalizable this study will be exactly, depends on the situations of these other countries, and varies depending on which country this study's findings will be used for. More research is needed to investigate this.

6. Conclusions

The study aimed to explore business strategies and business models for firms entering the Dutch energy market as an aggregator. The study used a qualitative approach and collected primary data. This data has been collected through expert interviews. The data collected resulted in a number of findings that will be discussed in this section. The findings are categorized in the sub-research questions that have been established for this study and are part of the main research question that is answered subsequently. The sub-research questions describe the components that enable a firm to design its business strategy and business model when entering the Dutch energy market as an aggregator.

SRQ1 *What are the characteristics of the external environment for an aggregator in the Netherlands?*

The external environment in which an aggregator is active is analyzed in this study. It has been identified that several changes are occurring in the Dutch energy system at the moment. These changes are a combination of technical changes and regulatory changes. The Dutch energy system is facing a growing amount of energy generated from renewables, electrification (replacement of fossil-fuel-powered processes by electric power), an increase in imbalance in the Dutch electricity grid, an increase in grid congestion, and an increase in volatility of energy production. These factors are believed to be the most significant macro-environmental factors for the aggregator, as these changes have a large impact on the demand for aggregation solutions now and in the future. Furthermore, electricity prices have recently increased, however, it is unknown whether this will be a temporary effect or not. From a regulatory perspective, the possibilities for an aggregator to do business were limited, but a new Dutch energy law (the 'nieuwe Energiewet') that is meant to replace the existing Electricity and Gas law is likely to increase the opportunities for aggregators. Actors in the Dutch energy system are now already using opportunities to involve in aggregation. Examples of this are DSO's that are establishing platforms for aggregators (and already experience a significant number of aggregators applying), charging point operators offering flexible tariffs based on the consumers' usage, and energy suppliers that extend their existing businesses by making new offers such as: offering solar panels, charging points for electric vehicles, and/or apps for aggregation services. The rapid and unpredictable changes in the Dutch energy market for aggregators in terms of regulation and technical specifications require aggregators to adopt an agile strategy and business model.

Furthermore, the study identified the strengths and weaknesses of aggregators internally, in addition to the opportunities and threats that have been identified and that affect their business externally. A fundamental strength of an aggregator found during the study is the need for its services by the energy market, as there is a significant demand for the flexibility market and flexibility services. A weakness of an aggregator is that the profit margins currently remain small, however, this might change in the future. This weakness can be countered by operating on an as large as possible scale to make sufficient profits to cover the aggregator's fixed costs. Furthermore, having contact with end-users (consumers) and controlling their assets is a barrier for aggregators who are not acting as an energy supplier, which is a weakness for doing business.
The moment when the number of flexibility solutions available can provide enough balance in the electricity grid that there is no imbalance present anymore is a threat that aggregators should be aware of[l]. At that point, the flexibility solutions of an aggregator do not lead to a further decrease in imbalance and therefore no profits from this revenue stream can be used anymore. However, this is not believed to occur short-term, and the long-term perspective is a significant increase in imbalance caused by the growth of renewable energy producers which increases more rapidly than an increase in flexibility solutions can cover[l].

It was found as part of the situational analysis that the value pool for aggregators is still not mature yet and that it is expected it will take 5-10 years before the flexibility market will be mature and offer greater financial possibilities for an aggregator. When determining the current status of the aggregator, it is found that several aggregator projects have been done in practice to test the feasibility and viability of the aggregator and these projects have shown that value is created by aggregators for the actors in the Dutch energy system. Furthermore, it proved that aggregators significantly reduce imbalances in the grid and identified that Balance Responsible Parties face lower risk in a situation where aggregators implement their services. The attractiveness of entering the Dutch energy market as an aggregator can be described by the theory of Porter's Five Forces and states that this attractiveness depends on five factors. It was found in this study that the attractiveness of entry is difficult to describe at this stage and

is varies for each actor who can do aggregatorship. Thus, more research is needed to explore and visualize the overall industry attractiveness.

SRQ2 *Do key collaboration opportunities exist in which an aggregator should take part?*

The study identified that collaborations exist in which an aggregator can part, as collaborations are an essential part of a firm's strategy and business model and can have a positive effect on the firm's operations. Firstly, it was found an aggregator has to be either registered as a Balance Responsible Party or collaborate with a firm that already has Balance Responsibility. This is a requirement to be able to operate as an aggregator in the Netherlands. Aggregators that choose the end-user (consumer) as their customer segment will benefit from a partnership with an energy supplier. Additionally, a partnership with energy suppliers may create strategic advantages as multiple energy suppliers are currently developing aggregator services and can thus be an opportunity for aggregators to scout and be involved with future opportunities that the aggregator can exploit.
Furthermore, as aggregators rely significantly on algorithms and predictions, an aggregator might have to partner with a firm that is able to perform these predictions by using algorithms if the aggregator does not possess this expertise. On the contrary, the aggregator can develop this expertise in-house and seek to exploit this expertise in other firms that have other focus areas.

Establishing and maintaining good relationships with regional- and national transmission and distribution system operators is essential for aggregators. Furthermore, the aggregator should cooperate with car manufacturers to be able to integrate the aggregator's services into electric vehicles. As charging point operators are the owner of public charging points, aggregators that seek to exploit public charging points have to collaborate with charging point operators to gain control over these assets or to make agreements. In the case the charging point operator is the firm providing the aggregation services, the aggregator is already in control, but could cooperate with other charging point operators to extend its geographic range of operations. For firms aggregating that are just established and not active on the market yet, partnerships with energy suppliers and grid operators can be beneficial to increase their scale and exposure. However, this requires an aggregator to have a business case that is both innovative and attractive to be interesting enough for the larger firms to partner with the aggregator.

SRQ3 *What are the essential capabilities an aggregator should master when entering the Dutch energy market?*

In the study it has been found that an aggregator needs to master several capabilities in order to operate successfully. Regulatory knowledge is needed to understand what the business possibilities are for the aggregator within the regulatory framework. Technical knowledge is needed as well, as aggregators control physical assets, whether these are managed by an aggregator or having access and control over another firm's assets. This technical knowledge creates awareness of the controllable (safe) limits of the assets that the aggregator controls. Furthermore, the essential technical capabilities of an aggregator are IT and AI expertise. This requires staff with knowledge in-house, or alternatively should be outsourced to another firm by the aggregator. This capability is fundamentally essential for an aggregator's operations, as well as to cope with the management of customer files when the customer base of the aggregator is growing while an aggregator is scaling its business. Furthermore, the aggregator has to create a trustworthy image towards customers and its technology should be reliable at all times. The technology should be scalable.

It has been identified that not all actors in the Dutch energy system possess the required capabilities to operate as an aggregator. An example of this is the energy supplier, which has been found to have IT systems that are not equipped for aggregatorship at the moment. For these actors, it is thus a more logical choice to develop these capabilities externally or acquire them from an independent aggregator firm.

SRQ4 *What are possible revenue streams and corresponding cost structures for an aggregator in the Netherlands?*

A large number of revenue streams are possible for an aggregator and the kind of aggregator services an aggregator provides determines which revenue streams could be exploited. As the regulatory system for an aggregator firm in the Netherlands is still immature and imperfect, the business model is still a function of regulation, which means that regulation changes lead to changes in possible revenue streams for aggregators.

Revenue can be created on the consumer side, with an example of a revenue stream that can be exploited, is where the aggregator charges a fixed cost for a service in which a consumer's assets are flexibly deployed and reduces the consumer's energy bill. Similarly, a margin for every kWh of electricity that is being flexibly deployed can also be taken by an aggregator. In addition to this segment, aggregators can also profit financially from the congestion that is reduced by offering their flexibility services on the Dutch power markets, as investments in the grid can be eliminated and/or postponed as a result of the aggregator's services. The study found that aggregators can currently earn the most revenue on the 'onbalansmarkt' which is the Dutch imbalance market, as prices move upwards and downwards significantly. However, it must be noted that this is a small part of the whole market. Furthermore, the markets of the transmission system operator (TenneT in the Netherlands) which are the primary-, secondary-, and tertiary reserves, enable significant value for aggregators to trade in.

Other revenue streams that can be exploited are additional services such as the implementation of battery storage systems. These are mainly the battery storage systems placed on grasslands which are larger in scale and experience a business case that becomes more interesting, contrary to the household battery storage of which experts have mixed opinions and of which the costs and adoption are seen as barriers at the moment. In a number of previously done projects, such as a project with flexible deployment of heat pumps, it appeared that costs are larger than the profits of flexible deployment. In addition to the finding in this study that aggregators need a large customer base to be able to make a profit, this highlights once more that it is challenging for aggregators to establish a profitable business.

SRQ5 *What is the aggregator's customer profile and what should the value proposition be?*

The study identified that instead of a single customer profile, multiple customer profiles are possible for a firm entering the Dutch energy market as an aggregator. An aggregator can offer its services to the Business-to-Consumer (B2C) segment or the Business-to-Business (B2B) segment or a combination of the two. Within these two segments, customers can be divided into smaller separate customer segments that can be targeted.
Businesses have been identified as an attractive customer group for aggregators for several reasons: they are large in scale, businesses have the need to make a profit, and have significant potential for green energy such as their availability for solar energy placement. Furthermore, aggregators might be able to control large fleets of electric vehicles when acquiring a business as a customer, contrary to B2C, where the number of electric vehicles per customer is generally significantly lower. Furthermore, aggregators can take advantage of the fact that businesses with large electric fleets might reach the limit of their grid's power connection when their electric vehicle fleet is charging at the same time. Spreading this demand gradually over the day can eliminate investments in a higher-capacity grid connection and ensure the firm stays in the same electricity tariff zone. On the other hand, the B2B sector has hefty negotiations which make other experts predict B2C is more profitable for an aggregator. This however does require a large scale of operations of the aggregator.
When targeting end-users (consumers), it has been identified that the consumers are generally not very inclined or interested in participating in an aggregator's service. For these customers it is important that they can use their appliances undisturbed, especially considering the consumers can currently only gain earnings in the range of tens of euros per month from participating in an aggregator's services. A logic choice as a customer segment for aggregators was identified to be electric vehicle owners, owners of solar panels, and owners of residential battery storage.

For the value proposition, several factors have been identified to be important when offering the value proposition. Firstly, the marketing and storytelling of an aggregator to the customer plays an important role. Furthermore, an aggregator has to use the earlier mentioned capabilities in this chapter to ensure a trustworthy image and reliability of its services. Additionally, the value proposition should contain that the services of an aggregator are easy to use and offer a seamless experience to its user, as this is found to be an important requirement for customers to use the services. Consumers can be rewarded for participating in an aggregator's services in several ways. Consumers will be offered a lower energy bill compared to consumers who do not participate in an aggregator's services. When an aggregator wants to be active in the e-mobility sector to control consumers' EV's, it must be noted that it is usual practice that the provider offers value from the whole value stream to the customer; administration, installation of charging points, and offering internationally available charging cards. For this value proposition, the aggregator will have to place smart charging points that are, contrary to standard charging points, are able to control the charging pattern of the vehicle.

MRQ. The main research question has been formulated as follows:
"How could a firm design its business strategy and business model when entering the Dutch energy market as an aggregator?"
This main research question resulted in the following answer. A firm entering the Dutch energy market as an aggregator could design its business strategy and business model by building its business strategy from the 7 strategic components and building its business model from the 9 components of the Business Model Canvas, while implementing the insights found in this study through the collection of interviews by using a conceptual model. Overviews of the proposed models for the business strategy and business model with the implemented insights are shown in Figure 11 and 12. These models with the insights from this study are generalizable and their use is not limited to aggregator firms in the Netherlands, but also usable by firms entering markets of other countries as an aggregator, however, the extent to which the findings from this study are generalizable in these countries depend on the regulatory and technical specifications of each country along with country-specific market factors such as competition.

7. Recommendations & Limitations

This study explored how firms could design their business strategies and business models when entering the Dutch energy market as an aggregator.
This chapter will give recommendations based on the outcomes of this study, as well as some general recommendations. Furthermore, the limitations of the study are addressed.

7.1 Recommendations

The study proposed a business strategy and business model that aggregator firms can use. Although this might be provisionally acceptable, it is recommended that this strategy and business model will be validated further by research and by firms that implement the proposed elements in practice. The proposed strategy and business model can then be adapted and improved, as well as more specific business strategies and business models for different situations or markets can be made.
In this study, a scope with the geographic location of the Netherlands has been chosen. It is advised that additional studies will be done for other countries that explore the possibilities for aggregators in these countries. Subsequently, these studies could be combined with this study to generalize and thus give a general picture of how aggregators could design their strategy and business models on a larger scale, perhaps globally, showing the differences and similarities in different geographic areas.
As part of this study, the current situation is analyzed, as well as with an outlook on the coming years. It is recommended that this study is repeated in several years (longitudinal study) to explore the business strategies and business models and their viability under the technical circumstances and regulatory environment at that point in time, as these are changing significantly for aggregators and their stakeholders and affecting the possibilities aggregators have for their strategy and business models.
From a regulatory point of view, the author recommends policymakers in the Netherlands to enable and stimulate the establishment and operations of aggregators in the Netherlands. As the study found that it is challenging for aggregators to make a profit with aggregation, policymakers could introduce subsidies which makes aggregation more attractive. Another argument for this is the fact that the study identified that in addition to economic benefits of aggregation, also ecological benefits exist. Subsidizing aggregator firms or aggregation pilot projects can therefore also contribute to sustainability in the Netherlands. Furthermore, it is recommended that policymakers investigate the possibilities of a central secure data storage with customer data to which aggregators have access, as the study identified that there are currently barriers for aggregators to store customer data and to get their consent to aggregate their assets. Finding optimal solutions for all stakeholders can increase the effectiveness of aggregators and can decrease barriers for customers to participate in aggregation.

Several recommendations for a consultancy firm involved with aggregation can be given. The researcher recommends that the business strategy and business model as depicted in Figure 11 and 12 are used by a consultancy firm to advise client firms (which might be firms such as energy suppliers, grid operators, or other stakeholders in the Dutch energy system) that are investigating their possibilities to provide aggregation services on their business strategy and business model. It might be that these client firms have a few aggregation experts inhouse related to technical specifications and policy, but that this expertise does not include the design process and implementation of a business strategy and business model for their business unit. The findings of this study can be a helpful tool for this. Furthermore, the findings from this study can be used by a consultancy firm to establish a point of view on the topic of market-entry as an aggregator and can be used to inform client firms of aggregation possibilities that were previously unidentified. It is also recommended that the findings of the study are used to create awareness at firms of how suitable their type of firm is for providing aggregatorship and which steps based on this study they should take to enhance their suitability and success as an aggregator. An example of this is the energy supplier, which generally has the advantage of owning a large customer base but is missing some capabilities such as their IT infrastructure that is not designed

for aggregatorship yet as found in this study. To enhance their suitability as an aggregator it is then advised to create a separate business unit to develop their aggregator services or to acquire an independent aggregator that has this capability.
Additionally, as a general recommendation for aggregatorship, it is recommended that research is done on aggregators after their market entry, to determine the relationship between a certain strategy and business model, and certain parameters that measure the success of the market entry and operations of the aggregator such as profit, growth rate, etc. This is outside the scope of this study, and it is advised to do this several years from now on a larger scale when more aggregators are on the market and the market is more mature.

7.2 Limitations

Although this study used the perspectives of experts from different fields and employed or working at different actors in the Dutch energy system, it is recommended to verify the findings of this study with a larger number of participants to increase the reliability of the findings. This is a limitation in this study as the thesis project only allows for a certain time and finding respondents on a large scale was not viable during the given time period of this thesis project.
Furthermore, after an aggregator designs its business strategy and business model, the next step is to establish the business plan. This is the formal written document that in addition to the methods the firm will use, also contains the mission and vision of the firm and the timeframe in which the firm wants to reach its goal. The business plan is very specific for each firm and the most effective business plan will therefore have to be investigated by the firm itself or a partner, that is familiar with the specific details of the firm. This study was limited to the strategy and business model for firms entering the Dutch energy market as an aggregator.

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Appendices

Appendix I: Informed consent form

Information Sheet Interview

You are invited for an interview and are therefore receiving this information sheet and a consent form, to ensure a transparent process and consent.

This research is investigating strategies that firms could use that want to become aggregator in the Dutch energy market. This research aims to provide a business model for these firms.
The interviews as part of this study will aid in gaining an improved context and more in-depth knowledge about possible strategies, their limitations, advantages, etc.
Participation in this interview is not mandatory and participants are able to withdraw at any time, without having to give a reason.

Audio will be recorded during the interviews in order to transcribe/write the interview content as text in the thesis report after the interview. All audio recordings will be permanently deleted after the thesis work is finalized. Interview participants will have the right to request access to their own recording when requested.
After transcribing the interview, the participant will receive the transcript to ensure the participant agrees with the transcript and it is then possible to make any adjustments necessary before it will be used in the thesis report. The report will add the general position of each participant to the corresponding transcript (for example: Consultant Utilities, but the corresponding company name will not be shown or anonymized as Company X or Y where necessary).
Answers given during the interview can be used as a basis for the workshop that will be held at a later stage.

Consent Form for Interview Aggregator Strategic Market Entry

Please tick the appropriate boxes	Yes	No
Taking part in the study		
I have read and understood the study information, or it has been read to me. I have been able to ask questions about the study and my questions have been answered to my satisfaction.	☐	☐
I consent voluntarily to be a participant in this study and understand that I can refuse to answer questions and I can withdraw from the study at any time, without having to give a reason.	☐	☐
I understand that taking part in the study involves answering several questions while audio is being recorded, with the objective to transcribe/write the interview content as text in the thesis report after the interview. All audio recordings will be permanently deleted after the thesis work is finalized.	☐	☐
Use of the information in the study		
I understand that information I provide will be used for the thesis report of the researcher and that this thesis will be published in the TU Delft repository.	☐	☐
I understand that personal information collected about me that can identify me, such as name and e-mail address, will not be shared beyond the study team.	☐	☐
I agree that my information can be quoted (anonymized) in research outputs	☐	☐
Future use and reuse of the information by others		
I give permission for the (transcribed and anonymized) interview answers that I provide to be archived in the TU Delft repository so it can be used for future research and learning.	☐	☐

Signatures

_____	_____ ☐	_____
Name of participant	Signature	Date

For participants unable to sign their name, mark the box instead of sign

I have accurately read out the information sheet to the potential participant and, to the best of my ability, ensured that the participant understands to what they are freely consenting.

__*Jeffry Dijkhuis*_____	_____	_____
Researcher name	Signature	Date

Appendix II: Interview Transcripts

This section includes the interview transcripts of the interviews that have been held as part of the study. The interviewees have different roles and a different expertise, as one of the considerations was to take the view of each stakeholder of an aggregator in the Dutch energy system into account. Participants' names have been anonymized to ensure protection of their privacy.

Interview transcript A

Interviewee:	Tech. Consulting Sr. Manager
Area of expertise:	Transmission & Distribution
Date:	05-01-2022

Which aspects do you see as typical for the external environment of the aggregator and do you expect this to change in the next years?

Als je kijkt naar de markt waarin de aggregator geld wil verdienen dan kijk je naar de markt unbundled en dat is in NL het geval. Daarnaast heb je de Nederlandse wet en regelgeving die nog vrij prematuur is. Ik verwacht dat er zaken gaan veranderen qua wet en regelgeving ten gunste van de aggregator. Hoe dat precies gaat verander is momenteel nog onzeker. Wat er verwacht wordt is dat er meer waardebronnen beschikbaar komen waar de aggregator wat aan heeft. Dat zit met name aan de kant van de DSO. Momenteel heeft de TSO (Tennet) al een balanceringsdienst waar een aggregator op in kan spelen. Voor een DSO is het nog niet mogelijk om financiële prikkels te geven voor het beïnvloeden van gedrag, en ik denk dat dit gaat veranderen. Ik verwacht dat de salderingsregeling ook afgebouwd gaat worden, met de kanttekening dat dit al jaren gepland is en nog niet doorgevoerd is, dus of dit werkelijk gebeurd moet nog gezien worden. Dan ontstaat er ook een waardebron achter de meter waar de aggregator ook een klant in kan helpen.

Which key partners would you say are crucial for the aggregator?

Er zijn veel onzekerheden over hoe deze markt zich precies gaat ontwikkelen. De aggregator heeft met 2 kanten iets te maken. Dit zijn bijvoorbeeld klanten die energie aan kunnen bieden, en de vraag daarbij is of de aggregator zelf met deze klanten in contact gaat of gaat dit via een andere partij zoals een retailer. Richting de consument zou de retailer een logische partner zijn.

De aggregator kan hoofdzakelijk actief zijn in 4 markten, groothandelsmarkt, balanceringsmarkt, congestiemarkt TSO, congestiemarkt DSO. De congestiemarketen zijn nog onvolwassen in NL en gaan over de transportcapaciteit van de elektriciteitsnetten. Wanneer hier fysieke beperkingen in zijn moet dit verzwaard worden, en i.v.m. de lange duur hiervan kan flexibiliteit een oplossing bieden om toch extra load op het net te kunnen aansluiten. De aggregator doet mee op een markt en dit kan soms zelf, maar vereist soms ook een partner. Als de aggregator niet de rol van energieleverancier heeft kunnen ze op sommige markten uitgesloten worden

Do you think the aggregator can manage to get all the know-how for its business in-house, or should the aggregator acquire this knowledge elsewhere?

Het is best een ingewikkeld spel, de flexmarkten en voorspellen hoe prijzen ontwikkelen. Dat vereist veel verschillende capabilities die je samen moet brengen. Als je puur kijkt naar een aggregator, en wat die doet is assets aggregeren, betekent niet dat deze partij ook de voorspellingen doet. Het kan ook een andere partij zijn die marktprijzen voorspelt en op basis daarvan prikkels aan de aggregator geeft die dat vertaald in een signaal naar de assets. Ik denk dat je als je nu begint 'from scratch' als aggregator je een grote achterstand hebt ten opzichte van de bedrijven die al langere tijd actief zijn. Het hangt af van de definitie van aggregator, als je puur kijkt naar het aggregeren van assets zonder het slim kijken op welke markten je deelneemt dan denk ik dat dat voor veel partijen wel te ontwikkelen. Het lastige voor veel partijen is dat ze geen eigen assets hebben. Een retailer heeft vaak geen portfolio aan assets.

Een voorbeeld hiervan is Recoy, een partij die onbalansprijzen voorspelt en dat verkoopt als product. Op basis van deze voorspelde onbalansprijzen kunnen partijen met bijv. batterijopslag batterijen opladen en ontladen.

What do you consider as the strengths and weaknesses of an aggregator?

Als je goed wil aggregeren heb je goede en schone data nodig, en dat missen sommige partijen nog. Daarnaast, als je kijkt naar de rol van een aggregator heeft deze als basis niet het contact met de consument en dat is nog wel een uitdaging (het huis binnenkomen v.d. consument en zeggenschap krijgen over het aansturen van de assets). Consumenten vinden het prima als je iets doet met hun energieverbruik, maar willen wel altijd de mogelijkheid blijven hebben om daarin te kunnen bijsturen. Omdat dit klantcontact nog niet zo simpel is denk ik dat dit het beste via een retailer zou kunnen gaan.

De winstmarges zijn miniem en de vraag is daarbij of je dit wil delen met de klant. De vraag voor de aggregator is ook 'hoe betrek je de klant' en deel je de winst met de klant, want dan blijft er (in de huidige situatie) niks over. Bij het flexibel inzetten van warmtepompen spreek je van tientjes winst per jaar, en dit is nog voor een eventuele verdeling met de klant. De situatie kan in de toekomst veranderen, maar hoe precies dat weet niemand.

Which specific revenue streams do you think the aggregator should consider?

Kijkend naar de waardebronnen voor flexibiliteit, dus waar flexibiliteit ingezet kan worden om iets mee te verdienen, kan een aggregator ofwel een vast tarief rekenen voor de dienst om een consument te helpen met het flexibel inzetten, of de aggregator neemt een marge op elke kWh die flexibel ingezet wordt. In beide gevallen zijn de marges momenteel dun. De verhouding tussen kosten en baten voor bijv. de flexibele inzet van warmtepompen is momenteel negatief. Het inrichten van de software algoritmes en het continu communiceren met apparaten en bijbehorende telecommunicatiekosten wegen nog lang niet op tegen de baten. In de toekomst zou dit kunnen veranderen.

What does the customer profile look like, how do you expect to change this in the next years, and what should the value proposition of the aggregator be?

Het ligt eraan hoe je de klant definieert, of de aggregator op de achtergrond werkt of niet. Als je stelt dat de eindegebruiker de klant van de aggregator is, dan denk ik dat het overgrote meerendeel er niks mee te maken wil hebben. De consument willen namelijk hun apparaten gebruiken zonder hinder te ondervinden. Wat de aggregator daarom moet doen is een model kiezen waarbij de klant er zo min mogelijk van merkt, maar waar wel op de achtergrond de flexibiliteit ingezet kan worden. Als het gaat om enkele tientjes per maand zullen veel consument zich er niet druk om maken en wil daarvoor niet alles op een app instellen.

Interview transcript B

Interviewee: Tech. Consulting Manager
Area of expertise: Transmission & Distribution
Date: 19-01-2022

Which aspects do you see as typical for the external environment of the aggregator?

Voor zover ik begrijp wordt de regelgeving qua external environment makkelijker voor aggregators om hun werk te doen. Een aantal jaren geleden was het echt nog onmogelijk om iets te doen maar inmiddels zijn er best wat mogelijkheden om bijvoorbeeld een connectie te maken met TenneT als een aggregator partij om te helpen balanceren van het nationale electriciteitsnet. Dus ik denk dat die ontwikkeling qua regelgeving positief is de laatste jaren, maar best wel recent dus. Verder denk ik dat de noodzaak voor aggregators steeds groter wordt, en is de afgelopen jaren steeds groter geworden. Dit gaat de komende decennia steeds verder groeien denk ik. De potentiele onbalans in het netwerk is alleen maar aan het groeien. Ik geloof dat er ook veel partijen actief zijn al, maar hier heb ik minder zicht op en het aantal aggregators dat er exact zijn, maar ik geloof dat er al heel veel partijen zijn die zich hebben aangemeld bij TenneT als partij die kunnen balanceren.

And how do you expect this to change in the next years? With changes such as the 'nieuwe Energiewet' and the netting arrangement

Een aantal ontwikkelingen zijn zojuist al genoemd, en wat we verder natuurlijk als recente ontwikkeling zien is de prijsontwikkeling van electriciteit. Dit zou heel goed tijdelijk kunnen zijn, maar het is in de recente maanden veel gunstiger geworden om iets slims te doen zoals op bepaalde momenten inkopen of verkopen van energie (in algemene zin). Waardoor waarschijnlijk het hele aggregatorschap veel aantrekkelijker is geworden. De vraag is of dit blijft of dat dit een tijdelijk fenomeen is. Met al deze opties krijgen we wel betere business cases nu (door de huidige prijzen). Het zou ook kunnen dat de prijzen structureel wat hoger blijven.

De behoefte voor een aggregator is aan het groeien en ik denk dat je dat op 2 vlakken wel kunt zien. Op nationaal niveau zorgt de volatiliteit van wind- en zon energieproductie voor grote onbalans die TenneT ook moet oplossen. Dus op dat vlak is er veel meer behoefte aan flexibiliteit, maar je ziet ook bij DSO's/distributiebedrijven dat er wordt gekeken naar flexmiddelen om congestie op te kunnen lossen. Dus dan heb je het niet over de nationale balans, maar over stukjes kabels in regio's die overbelast zijn. Die kun je dan tijdelijk minder zwaar belasten met behulp van aggregators of andere flexmidellen. Ik denk dat vanuit die 2 ontwikkelingen, dus congestie van het electriciteitsnetwerk en de steeds groeiende volatiliteit van productie zorgen wel voor een groeiende behoefte aan aggregators.

At moment it is likely that the aggregator will be rewarded by a TSO for the reduction in grid unbalance, how do you think this will work with a DSO, as they also profit from an aggregator (less investment needed in cables, etc.). Do you therefore think the DSO will also participate in an agreement with the aggregator?

Dat is geloof ik allemaal nog in ontwikkeling. Ik weet dat er DSO's bezig zijn met het opzetten van platformen om precies dat te bereiken en dat aggregators en andere flexpartijen zich kunnen aanmelden en tegen beloning af en toe op verzoek wat productie bij- of afschalen. Bij TenneT worden die kosten doorberekend aan de veroorzakers van onbalans, dus TenneT vergoed het wel maar krijgt die kosten ook weer terug. Dat kan bij een DSO natuurlijk niet, want die kan de kosten niet doorberekenen aan de veroorzakers, maar de businesscase zit dan meer in het besparen op de netwerkuitbreidingen die anders heel veel geld zullen kosten. Ik geloof dat dit in de praktijk nu nog niet bestaat, maar ik weet wel dat er onderzoeken naar zijn en initiatieven om daar platforms voor te maken.

Which capabilities are essential for a firm that wants to be aggregator in the Dutch market?

Je moet begrijpen hoe de regelgeving in elkaar steekt. Dus hoe kan de aggregator op een toegestane manier aggregator zijn en daar geld mee verdienen. Je moet ook begrip hebben hoe je integreert met een infrastructuur bedrijf, dus in de eerste instantie vooral TenneT denk ik. En wellicht zijn er nog wat partijen waarbij je je diensten kan aanbieden. En je hebt sterke technische kennis nodig denk ik, omdat je natuurlijk fysieke assets hebt die je aanstuurt als aggregator. Die moet je in beheer hebben of daar moet je toegang toe hebben, bijvoorbeeld via contracten kun je toegang krijgen tot assets van anderen.

Ik denk dat je daar wel kennis van moet hebben (wat is er mogelijk qua bijsturing, wat kan ik veilig doen, met die technische assets die je als aggregator verbind met jou product). Dus ik denk die 3 dingen: regelgeving, technische integratie, en kennis van de technische systemen die je aanstuurt.

Ook wel een zware IT component, de realtime IT component is heel belangrijk en ook wel een specifieke capability.

Which key partners would you say are crucial for the aggregator? Such as for balance responsibility, or related to price predictions

Je kan ook een passieve aggregator zijn, maar dat is waarschijnlijk niet een heel succesvol businessmodel. Dus om te kijken wanneer de aggregator een verzoekt krijgt om iets te doen en het vervolgens te doen, dus afwachten tot de prijzen bekend zijn. Maar als je een hele sterke AI component toevoegd en als aggregator hele goede voorspellingen kan doen over wat er gebeurd in het electriciteitsnetwerk, hoe meer voorsprong je houdt op je concurrenten. Dus naast de realtime IT component waar je verstand van moet hebben is het ook waarschijnlijk slim voor je businessmodel om sterke AI kennis te hebben en in te zetten voor de voorspellingen.

Als je bepaalde kennis niet in huis hebt moet je met kennispartners samenwerken om dat binnen te halen. Verder is denk ik een goede relatie met netbeheerders landelijk en regionaal essentieel. En wellicht kun je er ook goed aan doen om ook met energieleveranciers een partnership op te zetten, aangezien zij ook met zulke ontwikkelingen bezig zijn.

Coming back to where you said it is important to have a good relation with the DSO and TSO, why is that exactly?

Wellicht is het nemen van de formele route of relatie voldoende, maar omdat die platformen volop in ontwikkeling zijn, en als je dus een beetje vooruit wil lopen op de markt is het best goed om goede relaties te hebben met deze partijen om te kijken wat voor mogelijkheden er in de toekomst aankomen.

Verder kun je denken aan samenwerkingen met autofabrikanten. Zo kun je met elektrische autofabrikanten samenwerken om als aggregator je services direct in de auto te integreren.

What does the customer profile look like and what should the value proposition of the aggregator be?

Ik heb zelf een tijdje een app gebruikt die aggregator services aanbiedt (*name of app anonymized by researcher)* en wat ik vond is dat het heel complex is om het op te zetten en dat het niet soepel werkte altijd. Ook was het niet zo betrouwbaar. Zo wist je niet zeker of mijn auto wel echt gaat laden en morgen vol is. De consument moet vertrouwen hebben wanneer ze zich aanmelden bij zoiets dat alles goed werkt wanneer zij een stukje flexibiliteit weggeven. Het moet extreem makkelijk zijn. Consumenten gaan niet heel veel moeite erin steken om vervolgens 20 euro per maand verdienen (want de opbrengsten zijn momenteel niet zo hoog). De opbrengsten kunnen nog wel gaan groeien, maar voor dat bedrag wil je geen tijd verspillen in een app die niet gebruiksvriendelijk is. Dus het gebruiksgemak is denk ik 1 vd belangrijkste successfactoren. Als je dit ‘seamless’ kan integreren in iemands leven, waarbij het 1 druk op de knop is en de rest gaat automatisch en je krijgt het bedrag er iedere maand op de bank bij, dan heb je denk ik een aantrekkelijk product, ook voor consumenten. Bij consumenten denk ik momenteel nog vooral aan de elektrische auto bezitters, mensen met zonnepanelen, of mensen met accu’s thuis, en dat zijn over het algemeen niet de mensen die op elke euro letten. Dus het moet weinig moeite kosten en betrouwbaar zijn.

Interview transcript C

Interviewee: Associate Professor
Area of expertise: Electricity Market Design
Date: 20-01-2022

How would you describe the energy market for an aggregator, looking from the perspective of Porters Five Forces? (Industry rivalry, bargaining power of suppliers & buyers, substitutes, threat of new entrants)

Dit is wel lastig te beschrijven, want ook de incumbents kunnen aggregator services bieden. De leveranciersmarkt is best wel competitief. Als gevolg van de prijsstijgingen zijn hier recent ook een aantal onderuit gegaan. Dus mijn gevoel zeg dat het best wel competitief is en dat je niet zo makkelijk winst maakt, ook al zijn er niet zoveel 'zuivere' aggregators. Er speelt dat de consumentenmarkt niet echt ontsloten is omdat de consument niet op real-time pricing zit, dus die heeft niet zo'n voordeel bij aggregators en dat maakt het wel complex. Je kan wel werken aan flexibiliteit met consumenten maar de baseline is niet echt gedefinieerd. En dat maakt het voor de businesscase moeilijk. Als je per kwartier wordt afgerekent op de momentane stroomprijs, dan kan dat omlaag gedrukt worden om geld aan te verdienen. Op dit moment word je alleen voor je totale consumptie per jaar afgerekend, dus dat maakt het lastig. Tenzij je elektrische auto's etc. apart gaat meten. In die zin is het nog een onontwikkelde markt en de voorwaarden zijn niet allemaal op zijn plek.

En je hebt een beetje een slecht gedefinieerde rol. Je kan bijvoorbeeld energie leveren, en ook diensten aanbieden die een aggregator aanbied. Er zijn ook andere diensten zoals achter de meter service. Zoals het leasen van een zonnepaneel of batterij of energiebesparing thuis, die kunnen worden gecombineerd met aggregator services. Het is dus een amorf veld in een systeem dat eigenlijk niet helemaal op orde is voor de diensten die er verlangt worden.

The aggregator can take many forms, such as an independent aggregator party, the energy retailer who is aggregator, TSO, or DSO. Although from a regulatory perspective it is difficult for a DSO to be aggregator, right?

Ja de DSO's mogen geen commerciele diensten verlenen. Maar leveranciers wel. En onafhankelijke partijen hoeven zich niet aan het aggregator model te houden. Ze zouden ook andere diensten kunnen aanbieden. Het andere aspect is dat je 2 rollen hebt. 1 is het verschuiven van energieverbruik in reactie op het aanbod van duurzame energie, de andere is het energieverbruik binnen de netwerk beperkingen houden. Dat is een dienst aan de DSO. Dus eigenlijk wil je zoveel mogelijk schuiven tot je tegen het net aankomt en dan wil je zorgen dat je de netbeperkingen niet overschrijdt. Dus dat zijn deels conflicterende doelen voor verschillende actoren.

Which actor do you think is the most obvious for the role of an aggregator? For example, an independent aggregator might need balance responsibility, while an energy retailer already has arranged this.

Ik denk in het huidige systeem waarbij de programmaverantwoordelijkheid helemaal bij de retailer ligt, dat die de meeste baat heeft bij het schuiven van de vraag, want die heeft zijn eigen profiel wat hij moet invullen. En hij kan ook zien wat het effect is op al die consumenten van hem. Terwijl als hij de energie levert aan iemand anders, en hij gaat schuiven in de marge, hoe gaat hij er dan aan verdienen? Als je het huidige systeem gaat veranderen en je zet iedereen op realtime pricing dan krijg je een heel ander systeem want je kan nog altijd niet als huishouden balansverantwoordelijke worden. Dat werkt om veel redenen niet. Dus die balansverantwoordelijkheid is nog altijd op een geaggregeerd niveau, bij een retailer. Die kan een zuivere retailer zijn die ook aggregator is, die dus ook op de groothandelsmarkt koopt en dan aan consumenten verkoopt, maar misschien ook geaggregeerd stroom terug verkoopt of met profielen schuift. Maar dat business model valt steeds om, omdat je op een markt komt om mensen een bepaalde prijs te beloven, maar wanneer de gasprijzen ineens omhoog schieten is het bedrijf opeens bankroet. Het zijn bedrijven zonder assets, het zijn bedrijven met alleen een klantenbestand. Dus daarom blijft het terugkomen bij de retailers die ook productie hebben en daardoor verticaal geintegreerd zijn.

So the moment these retailers would make losses with their aggregation services, they would still have their profits from their energy production?

Op het moment dat de groothandelsprijzen omhoog gaan en ze zijn ook producent, dan zijn ze gehedged en hebben ze minder risico dan wanneer ze alleen leveren. Maar je zou ook een model kunnen bedenken waarbij de aggregator nooit eigenaar is van de energie en alleen maar diensten levert. Als iedereen realtime pricing heeft en een retailer levert de stroom, dan zul je altijd een aggregator kunnen hebben die zegt: je betaald mij een abbonement en in ruil daarvoor breng ik jouw stroomprijzen omlaag. Dus dan wordt het echt een dienstenverlener. En dat kan dan met of zonder hardware.

Er zijn ook ideeen over andere markmodellen waarbij de klant een vast bedrag betaald voor de backup capaciteit die beschikbaar is als er straks geen zon en wind is. Dat betekend dat op die momenten je piekverbruik heel hoog is, en zo'n aggregator zou dat slim kunnen oplossen, bijv. door een batterij achter de meter te plaatsen. Daarmee worden de pieken gedempt en dan betaald de klant minder voor die piekmomenten.

It is also still a question for the aggregator, whether it chooses to does the prediction(of prices, solar generation, etc.) itself, or outsource this by a third party, right?

Ja, en aan de andere kant is er het voorspellen van het gedrag van de consument. Dit zou een toegevoegde waarde van een aggregator kunnen zijn, en dat deze voor zijn consumenten een geavanceerde analyse maakt en daardoor niet alleen goed kan inkopen maar ook goed kan regelen. Als deze bijvoorbeeld het rijdgedrag weet van zijn consumenten, en dan voor deze groep inkoopt zodat dit profiel geborgd wordt. En als de aggregator er naast zit kan deze natuurlijk een beetje schuiven met wanneer de auto laadt, zodat deze met het profiel matcht.

This data is then also owned only by this specific aggregator, and not its competitors, and can therefore be valuable to have for the aggregator isn't it?

Ja, maar waar je tegenaanloopt met vragen over een businessmodel voor aggregators is dat het businessmodel een functie is van de regulering. En die is heel imperfect op dit moment. O.a. de congestiemanagement (de flexmarkten). Ik ben sceptisch over de houdbaarheid op de langere termijn, omdat er heel veel geld rongepompt wordt. En de groothandelsmarkt (de commodity markt) is natuurlijk ook incompleet omdat de klant niet op realtime pricing zit. Maar als aggregator moet je dat als uitgantspunt nemen. Er is een markt met een bepaalde marktordening en daarin moet je je businesscase maken. Maar er zijn goeie argumenten om te zeggen op de langere termijn moet die marktordening anders. We weten bijvoorbeeld al dat het salderen van zon op het dak wordt afgeschaft en er een terugleververgoeding komt. En die zal veel lager zijn. Het is dus de businesscase voor de aggregator om te kijken, kan ik die eigen consumptie optimaliseren. Elke keer dat de regels veranderen zal de businesscase ook veranderen.

The number of customers is also important for an aggregator right, in order to be profitable? As the profit margins are very small? Do they then need a few million customers to be profitable?

Ik neem aan dat je gelijk hebt, dat klinkt plausibel.

This probably also depends on the type of revenue stream the aggregator is using?

Ja, waar je je overigens niet op blind moet staren zijn de winsten uit de onbalansmarkt. Want dat is waar je op dit moment het meeste kan verdienen per kWh, maar dit is natuurlijk maar een procentje van de hele markt. En als er straks een hoop slimme aggregators of andere partijen zijn, en bijvoorbeeld 1 groot industrieel bedrijf flexibel wordt, dan kunnen ze de hele onbalansmarkt platslaan. De onbalansprijzen zijn er ook een beetje omdat er wel veel wind wordt ontwikkeld en zon, maar nog niet zoveel flexibiliteit. Maar als dat inhaalt kan zich dat uitdempen, en grote prijspieken komen denk ik meer op de groothandelsmarkt. De onbalansprijzen zijn het gevolg van voorspelfouten. Maar straks krijg je periodes met veel zon en wind, en dan moeten we naar een dure backup, en dat is geen voorspelfout maar gewoon schaarste, dan gaat de groothandelsprijs omhoog. Als de kolencentrales zijn uitgefaseerd en gas meer onder druk komt, verschuiven denk ik die prijspieken naar de groothandelsmarkt en dat is ook waar ze horen te zijn. Maar die zullen misschien ook wel veranderen overigens.

The Resource-Based View states that firms gain a competitive advantage when they have resources that are valuable, rare, inimitable, and non-substitutable. Do you think an aggregator on the Dutch market also has this competitive advantage from the Resource-Based View?

Ik denk van niet. Ik denk dat het in wezen een heel competitief veld is, en je probeert dan uniek te worden door slimme AI algoritmes te hebben, maar dat is ook iets dat iedereen wel kan ontwikkelen. Het is wel mogelijk dat op een gegeven moment het hebben van een groot klantenbestand een voordeel is, zoals ook bij IT bedrijven. Want er zijn natuurlijk schaaleffecten. Hoe groter het klantenbestand, hoe groter de flexibiliteit en meer voorspelbaarheid en hoe minder onbalans etc. Bovendien zijn er denk ik hele lage opschalingskosten, want het is IT gebaseerd, dus hoe meer mensen je hebt, hoe lager de winst is die je per klant moet hebben om winst te draaien. De retailers, de incumbents, hebben een bepaald voordeel want die hebben al veel klanten. Dus als zij aggregators of slimme diensten gaan uitrollen dan hebben ze al gegevens, ze lezen al de meterdata uit, etc. AI is het qua GDPR wel lastig om deze data voor langere periodes te bewaren. De GDPR zal een behoorlijke blokkade zijn om efficient als aggregator aan de slag te gaan, want volgens mij mag de aggregator de klantgegevens niet langer dan een paar maanden bewaren. Dit is natuurlijk lastig, want als je goede data analyses wil maken om slim in te kopen en om de gevolgen te analyseren van bepaalde maatregelen (je geeft een bepaalde prikkel, en dan wil je kijken welke mensen op welke manier reageren, onder verschillende condities) is het wel ingewikkeld als je deze gegevens niet op mag slaan. Er is een ingewikkelde balans tussen slimheid en privacy.

Als je als aggregator een miljoen klanten hebt en je competitor ook dan heb je wel ongeveer dezelfde informatie. Volgens mij is dat wel redelijk open, behalve in bepaalde sectoren, waar een ander niet zo makkelijk in de markt breekt (bijvoorbeeld doordat de aggregator de mensen persoonlijk kent).

Wat je soms ziet in markten is dat incumbents het aggregeren wel zouden kunnen doen in theorie, maar het niet doen, bijvoorbeeld omdat ze te log zijn. Dat de structuur en de bedrijfscultuur het moeilijk maken om in te springen op nieuwe ontwikkelingen. Daarom kun je wel een niche krijgen waar bepaalde partijen inspringen (zoals Jedlix). Het hangt er natuurlijk vanaf hoe goed de incumbents in staat zijn om mee te bewegen met nieuwe ontwikkelingen. Hoe dynamische en groot deze zijn. De bestaande bedrijven hebben wel allerlei manieren om risico's te spreiden waardoor ze makkelijker met systeemschokken omgaan.

Probably in terms of organizational structure, these smaller companies can adapt quicker and are less hierarchical?

Ja maar dat is niet een fundamenteel voordeel – kijk maar naar het voorbeeld van de elektrische auto's (competitie tussen Tesla en de bestaande autofabrikanten). Het is maar de vraag wat het uiteindelijke marktaandeel wordt van een partij die als eerste is.

Als een aggregator heel erg opschaalt maar het klantenbestand niet goed op orde houdt, dan kan het ontzettend duur zijn (bijv. door verhuizende of overlijdende klanten). Dit moet allemaal soepel lopen. In het verleden hadden de incumbents dit probleem ook, maar ze hebben hier van geleerd en hebben hier inmiddels betere systemen voor.

Interview transcript D

Interviewee: Business Strategy Sr. Manager
Area of expertise: Energy Retail & E-mobility
Date: 21-01-2022

When making a SWOT analysis of the aggregator in the Dutch energy market, what would the strengths, weaknesses, opportunities, and threats of the aggregator be?

Opportunities zijn natuurlijk de wet en regelgeving die als het goed is in Nederland (met name de nieuwe Energiewet) de positie van de aggregator gaat vastleggen in de wet. Volgens mij wordt deze positie dus verstevigd en officieel vastgelegd. Een threat is volgens mij dat het verdienmodel uitgewerkt is en ik denk dat het nog steeds erg lastig is om geld te verdienen als aggregator. Partijen zoals Jedlix of PowerD die een platform opzetten om smart charging mogelijk te maken en daar geld aan te verdienen zijn denk ik nog gesubsidieerde initiatieven. Deze partijen spelen erg in op de verwachting dat er steeds meer elektrisch vervoer op de markt komt en dat die markt van flexibiliteit mee gaat groeien. Een strenght of opportunity is denk ik dat er wel vraag is naar die flexibiliteitsmarkt of -diensten die een aggregator kan bieden door de toename van decentrale opwek en electrificatie van het hele energielandschap. Dus volgens mij is er duidelijk een behoefte aan alleen is het businessmodel nog niet helemaal bepaald.

Ik denk dat standalone een aggregator het best moeilijk heeft, en wat je nu ziet is dat ze onderdeel zijn van een groter energiebedrijf of van een leasemaatschappij, etc.

When looking at the possibilities for an aggregator now in the Dutch energy market, which business models or revenue streams are possible? And what are the corresponding limitations?

Misschien dat er aan de klant kant, dus dat er aan de consument/eindgebruiker kant nog wel iets te halen valt, in de zin dat de aggregator de energierekening kan verlagen in ruil voor een betaling voor het platform dat de aggregator ter beschikking stelt. Of dat deze dit verrekend op het voordeel dat de aggregator behaalt voor de eindgebruiker, dus dat zou ook nog een inkomstenstroom kunnen zijn. En dat dan op de balansmarkt. Netbeheerders kunnen volgens mij ook die diensten vergoeden. Een aggregator is natuurlijk in staat om frequentie te regelen, om misschien wel hele extreme apparaten aan en uit te zetten. Dat kunnen ze misschien ook monetariseren richting netbeheerders, want daarmee kunnen netbeheerders natuurlijk hun investeringen in het net uitstellen, of in ieder geval verminderen. En dit is geld waard voor de netbeheerder. Dus ik denk ook dat daar iets te behalen valt.

What are typical costs for an aggregator?

Ik denk dat de IT component heel groot is: er moet een platform gebouwd worden en dat moet onderhouden worden. Dat is denk ik heel belangrijk. Daarnaast is er een stukje backoffice met contracteringen. Het is een complex geheel van allerlei contracten tussen klanten, netbeheerders, energiemaatschappijen, de markten. Dus dat betekend personeelskosten. Ik denk dus IT en personeelskosten als belangrijkste kosten. Waarbij ik denk dat de grootste barriere is om een goed platform te bouwen, wat in staat is om die aggregator rol te kunnen vervullen. Misschien dat een aggregator zelfs wel batterijen zou kunnen exploiteren, dat ze hun dienstverlening uitbreiden.

What does an aggregator have to do in order to be profitable?

Ik denk aan de opbrengstenkant dat ze moeten zorgen dat ze zoveel mogelijk gebruikers op hun platform of netwerk krijgen, en dat de contractering naar de markt toe de goeie contracten zijn met de juiste voorwaardes. Aan de kostenkant denk ik dat de kosten van het platform en het onderhouden dat dat zo minimaal mogelijk is, dat het schaalbaar is, dus dat ze zorgen dat het efficient kan schalen. Dus als het aantal gebruikers keer 10 of keer 100 gaat, wat natuurlijk de verwachting is voor de komende jaren, dan moet dat niet tot exponentieel meer kosten leiden. Ik denk dat dat heel belangrijk is. Voor de rest is het zorgen dat je goed gepositioneerd bent.

For an aggregator entering the market now, what would you recommend this aggregator to do in order attain competitive advantage from its competitors?

Als ik een kleine partij zou zijn, zou ik zorgen dat ik een heel goed schaalbaar platform bouw en zorgen dat ik aantrekkelijk ben voor een eventuele overname door een grote energiemaatschappij, zoals bijv. Shell, die alles heeft in zijn hele keten (opwek energie, en afname kant). En dan met een horizon van 5-10 jaar en zorgen voor een verkoop aan zo'n partij.

Ik vraag me ook af of het een standalone business gaat zijn straks, ik denk dat het ook onderdeel gaat zijn van een energiemaatschappij en dat het een dienst wordt daarbinnen vermoedt ik.

What are key resources of an aggregator?

Juridisch gezien heb je iets nodig om actief te mogen zijn op de markt, dus waarschijnlijk moet je programmaverantwoordelijk zijn, en moet vergunningen hebben (aan de reguleringskant). Verder zoals eerder genoemd het hebben van een goed platform. En je moet mensen hebben die dat kunnen bouwen, dus er zal heel veel zitten rondom product development en dat moet je allemaal in huis hebben. En een andere belangrijke asset is natuurlijk dat je een flinke base hebt van resources die je in kunt gaan zetten. Denk dan aan elektrische auto's, of aan de supply kant Vehicle-to-Grid technologie (wat ook een opportunity voor de aggregator is). Dus ik denk dat wanneer dat een beetje tot ontwikkeling komt het de positie van aggregators ook kan helpen. Dat is nu nog niet het geval.

Interview transcript E

Interviewee: Tech. Consulting Manager
Area of expertise: E-Mobility
Date: 25-01-2022

What is the advantage of a smaller firm (such as Jedlix) compared to an incumbent large firm when it comes to providing aggregation services?

Een voordeel voor Jedlix is dat ze er al best een tijd mee bezig zijn en en al wat ervaring hebben. Ze zijn wat meer onafhankelijk denk ik en daardoor deals met allerlei partijen (bijv. automotive bedrijven zoals Renault, BMW, etc.). Je bent ook erg gespecialiseerd. Ik denk dat Eneco, om als voorbeeld te noemen, er nog steeds baat bij heeft om energie te verkopen. Volgens mij is het idee van de aggregator dat men thuis een batterij heeft en dat je daardoor energie van het net haalt wanneer het goedkoper is, dat je zonnepanelen je batterij opladen, en dat je daar dan je energie uit gaat halen. De belangen van een energiemaatschappij blijven naar mijn idee toch nog wel om bijvoorbeeld energie te verkopen. Daarnaast is een energiemaatschappij een bedrijf dat gewent is om toch een soort service te verkopen met energie. En die zijn minder gewent om bijvoorbeeld producten te verkopen. Je ziet ze wel steeds meer daar naartoe te bewegen (Essent met zonnepanelen, Eneco met Eneco e-mobility laadpalen) dus daar bewegen ze wel naartoe. Eneco e-mobility is heel succesvol omdat zij losgezet zijn van het moederbedrijf. Ik heb het idee dat als je succesvol in dit soort dingen wil worden en mogelijk gaat dat ook gelden voor zulke DER oplossingen, dat je dan losgezet moet worden van het moederbedrijf, want in het begin zul je veel moeten investeren en weinig verdienen om je marktpositie te krijgen. En dat is denk ik een voor een kleine partij met financierders die veel wendbaarder zijn, makkelijker hun strategie kunnen aanpassen op de behoefte van de markt, toch wat makkelijker voor een wat kleinere partij dan dat een grote partij dat kan.

Tesla heeft een functie in de Tesla app ontwikkeld waarbij gebruikers ‘off-grid’ kunnen gaan. Dat soort partijen zie ik dit ook gaan doen, dus niet alleen de standaard utility bedrijven, maar ook de automotive bedrijven (Tesla, Volkswagen met Elli, etc.). Tesla is momenteel ook geregistreerd als energiemaatschappij.

So there will be new kinds of firms in the next years such as Tesla, that will provide these services in the future, and not only the known/incumbent energy suppliers?

Ja.

Tesla verkoopt nu batterijen, zonnepanelen, en verkoopt elektrische auto’s en laadpalen. En zo gaan zij stap voor stap die kant op.

Which customer segment do you think an aggregator should focus on, or what type of customers is this?

Ik denk dat dat steeds gevarieerder gaat worden. Vanaf 2023 gaat de teruglevering afgebouwd worden. Zonnepanelen wekken energie op op tijdstippen dat mensen vaak niet thuis zijn en ze aan het werk zijn, dus dan zal de consument een oplossing willen hebben waarmee deze zijn energie ergens in op kan slaan en kan gebruiken wanneer dit nodig is.

Recent waren er negatieve energieprijzen. Je wilt dan laden als de prijs negatief is. Dit wordt thuis steeds relevanter. Mensen zijn zich er nu wel bewust van hoe fragiel de energiemarkt is met die hoge gasprijzen en elektriciteitsprijzen. Niet afhankelijk zijn van de de grote retailers is dan heel fijn.

In Leeuwarden is een zorginstelling die niet op het net aangesloten kan worden omdat er niet voldoende ruimte is op het elektriciteitsnet. Een oplossing is dan om naar accu’s te kijken. Hierdoor is waarschijnlijk een kleinere netaansluiting voldoende. Op vele plekken (o.a. Utrecht en Amsterdam) zijn problemen met aansluitingen. Hierdoor neemt de relevantie van een aggregator toe, door hogere energieprijzen, congestie op het net, etc.

En niet alleen gebouwen hebben problemen met aansluitingen. Al een paar jaar geleden moesten dealers 1 jaar en 3 maanden wachten tot hun aansluiting verzwaard kon worden.

Last time during one of our conversations you mentioned the process of installing 3-phase power in consumer households is time consuming and should be improved

Ja, nu moet er altijd een netbeheerder komen om de huisaansluiting aan te sluiten. Hier moet eigenlijk iets slims op bedacht worden, en misschien ook wel in combinatie met het verzwaren van slimme meters. Bijvoorbeeld een bevoegdheid voor de installateur om de meterkast van 1-fase naar 3-fase te maken, en vervolgens een aanvraag te doen bij de netbeheerder voor de afronding hiervan. Nu moet er speciaal iemand van de netbeheerder komen om dit te doen.

So this is then also an extra barrier for the consumer (the ones without 3-phase power) for participate in aggregation services, when it takes so long?

Precies, ja.

Previous time you mentioned that the CPO (charging point operator) owns the charging points, and that an aggregator therefore does not have complete freedom to (for example) reward customers for flexibility at a charging point

Ja, en daar zie je dus steeds meer partijen die en CPO zijn en tegelijkertijd met initiatieven komen. Bijvoorbeeld Octopus Energy heeft 2 verschillende tarieven. Eentje volgt de actuele marktprijzen en de andere is voordeliger wanneer de gebruiker ‘s nachts oplaadt. Dat is een positieve manier van stimuleren. En je moet een manier vinden om klanten niet te straffen, en het zo makkelijk mogelijk maken. De gemiddelde mensen zijn nog niet bekend met het begrip aggregator. Dus er moeten oplossingen bedacht worden waarmee dit vraagstuk opgelost wordt, maar die wel begrijpelijk zijn voor een klant. Dus bijvoorbeeld “als jij ons toestemming geeft te bepalen wanneer wij jou laden, dan laadt jij het goedkoopste en het groenste”. Dan kun je nog wel verdere uitleg geven op de website, maar dat moet de boodschap zijn. De klant interesseert het achterliggende verhaal niet zoveel en wil gewoon zo goedkoop mogelijk laden. De proposities moeten makkelijk te begrijpen zijn voor de klant, anders gaan ze het niet doen.

Uiteindelijk kun je een fantastische oplossing hebben zoals flexibiliteit reguleren. Maar de auto van de consument moet wel ingeplugd zijn wil de aggregator die flexibiliteit hebben. Als de auto niet ingeplugd is kan de aggregator niks. Dus hoe kan de aggregator mensen stimuleren om de auto in te pluggen? Misschien kun je wel zeggen dat de consument voor iedere keer de auto inpluggen een punt krijgt, en aan het einde van de maand een bepaald puntenaantal bereikt heeft een financiele beloning krijgt.

Is an increasing use in household battery storage extra incentive for an energy supplier to provide aggregation services? As persons with battery storage become more self-sufficient (‘off-grid’) and might need less energy from energy suppliers – their main businessmodel.

Dat is inderdaad heel belangrijk om te onthouden. Ik denk dat de stimulans voor een energiebedrijf om dit te doen ook in het feit zit dat als iemand thuis een batterij heeft, deze klant minder afhankelijk is van de energie. En dat is waar energiemaatschappijen hun geld aan verdienen. Dus bieden zij niks aan de klant aan, dan gaan ze alleen maar minder verdienen. Wanneer zij een propositie aanbieden waarmee ze een rol blijven spelen, dan blijven zij actief bij de klant en die markt.

2 use cases zijn OVO Energy with Kaluza en Octopus energy.

I am also investigating current ongoing projects related to aggregation

Voorbeelden hiervan zijn: Myenergi, Tesla, Octopus energy, OVO energy, allemaal partijen die hier erg actief mee zijn.

Opvallend is dat veel partijen in de UK actief zijn. Volgens mij is dat omdat de markt in de UK anders is, en het verschil tussen een piek en daltarief erg groot kan zijn. Octopus energy, OVO energy, Myenergi, zijn allemaal partijen uit de UK. Dat heeft volgens mij te maken dat piektarieven zo’n 29cent zijn en daltarieven 10-15cent. Dat is dus denk ik waarom je dat soort bedrijfjes daar vaak ziet.

In the Netherlands there are not many aggregators yet, even though the country is quite a frontrunner in terms of E-Mobility right?

Dat klopt, al heb ik het idee dat er minder aggregator partijen zijn omdat de verschillen tussen piektarieven en daltarieven minder groot zijn. Volgens mij scheelt dat een paar cent. In Engeland loont dat meer om je gebruikspatroon gedeeltelijk uit te stellen.

Daarnaast is het erg interessant om te zien dat windenergie en zonne-energie elkaar in balans houden. Op het moment dat er vaak niet veel wind is schijnt de zon meer, en als de zon niet veel schijnt is er vaak meer wind.

Interview transcript F

Interviewee:	Management Consultant & ex-employee charging infrastructure trade organization
Area of expertise:	Energy Retail & E-Mobility
Date:	25-01-2022

What is the advantage of a smaller firm compared to an incumbent large firm when it comes to providing aggregation services?

Je hebt schaal nodig. Uiteindelijk wil ervoor zorgen dat je er goeie winsten uit kan halen. Aan de andere kant, zeker met Jedlix en andere initiatieven, merk je dat zij vanwege hun eigen grootte beter kunnen anticiperen op wat er gebeurd. En dus beter afstemmen op wijkniveau en bijv. bepalen waar zij projecten uitrollen. In principe zouden ze makkelijker kunnen zeggen: hier lijkt dit de meest kansrijke optie te zijn, terwijl een incumbent partij eerder een algoritme zal willen toepassen en dat overal gelijk willen trekken. Ik denk dat dat een beetje het verschil is. In de algemene zin zou ik wel willen zeggen dat schaal belangrijk is, en dat moeten de kleine partijen dus wel creeren.

Do you know what strategies such small firms with aggregation services use?

Dat durf ik zo niet uit mijn hoofd te zeggen. Maar uiteindelijk is het wel een beetje voorsorteren op de groene smart charging visie en dat willen ze uiteindelijk ook als technologie en algoritmes en dergelijke doorverkopen. Het kan een soort use case zijn die ze proberen te realiseren. En het gebeurde ook wel dat er onderzoek gedaan werd naar bepaalde situaties om te kijken: wat is de potentie hiervan. Zolang dat nog niet de basis is, is er denk ik best een markt om daarmee te experimenteren alvast en daar vervolgens mee kijken wat daar het beste mee kan gebeuren. Enerzijds zelf en anderzijds om dat eventueel juist door te verkopen aan de grote partijen.

Are there any learned lessons from previous projects?

In algemene zin zien ze veel potentie voor smart charging. Je moet dan ook niet alleen kijken naar de winsten, maar ook naar ecologische impact en dergelijke. Door je energievraag mooi te spreiden voorkom je heel veel investeringen in het net op lokaal niveau. En daar zou je ook naar kunnen kijken, dus hoe de netbeheerder hier ook een belang in neemt. Dus door wellicht samenwerkingen aan te gaan. Al is dit misschien lastig vanuit een gereguleerde rol. Maar dat je wellicht wel zegt dat er incentives komen om ervoor te zorgen dat enerzijds zulke partijen meer rendabel zijn en anderzijds de netbeheerders te ontlasten en daarmee ook de samenleving. De samenleving betaald uiteindelijk ook voor de netverzwaring via belasting. Verder wat er uit de onderzoeken komt is inderdaad dat er veel potentie is, maar dan moet je wel kijken naar een zo breed mogelijke schaal en dan ga je dus toch kijken naar wat de netbeheerder doet.

Could a solution be that the DSO creates a platform for aggregators to be active on? As the DSO itself is not allowed to be commercially active due to Dutch regulation?

De netbeheerder mag inderdaad niet commercieel actief zijn, echter zou je wel kunnen rationaliseren dat het voorkomen van netinvesteringen niet commercieel is, want het is alleen maar minder maatschappelijke kosten genereren. Ze zijn ook wel enigzins bezig voor zover ik weet met kijken hoe de energiewet aangepast kan worden om flexibiliteit toe te laten. Dus een platformrol zou kunnen, misschien ook bepaalde rollen die erop lijken. Of in bepaalde pilots investeren als netbeheerder. Dus voor het voorkomen van netverzwaringskosten die bewijsbaar zijn bijvoorbeeld 10% coveren richting de DSO's. Dat is dan allesbehalve commercieel. De DSO maakt dan nog steeds kosten, maar minder kosten.

How would a SWOT analysis look like for a firm entering the market as an aggregator now?

Het ligt natuurlijk aan het bedrijf individueel, qua sterktes en zwaktes met name. Een startup, mits je goeie system hebt bedacht, kun je qua sterkte dit gelijk al kunnen hebben. Als je flexibiliteit kan tonen aan klanten op een bepaalde locatie (verschilt per wijk, mensen laden thuis of publiek) en als je daar op in kan spelen is dat een sterkte. Een zwakte kan zijn het niet hebben van schaalgrootte en je speelt in een speelveld waar ook grote partijen zijn. Een opportunity is

bijvoorbeeld om je technologie te verkopen aan zo'n grotere partij. Een threat zou kunnen zijn: grote partijen met veel marktaandeel die de mogelijkheden wegkapen. Het zoeken van partnerships met die grote partijen kan handig zijn, zoals energieleverancier of netbeheerder. Maar je moet dan natuurlijk wel een innovatieve use case hebben om ervoor te zorgen dat je de aandacht van hun trekt.

What advantages do you think come from these partnerships, or have been identified in the past? In addition to less competition or partnerships to gain missing capabilities

Ik denk dat je het meeste wel covered. Je moet inderdaad de capaciteit hebben om in te kunnen spelen en de systemen hebben. Uiteindelijk is het natuurlijk een stukje schaalgrootte creeren. De aggregator is er om de services op een zo slim mogelijke manier te doen en daar moeten ze zichzelf in kunnen bewijzen, maar door samen te werken en de capabilities en technologie/segmentering toe te passen bij een bedrijf dat wel die klantgrootte heeft, dan heb je de schaalgrootte.

What do you think has the most potential for an aggregator, B2C or B2B?

Er is gigantisch veel potentie bij bedrijven (mits mensen weer naar kantoor gaan). Bedrijven worden gestimuleerd om elektrisch te rijden. Vervolgens heb je ook veel platte daken op die locaties waar je merkt dat de netaansluiting vaak niet voldoende is. Wat je dus kan doen is op die momenten als de zon schijnt en de auto laadt aan de laadpaal, daar gebruik van te maken. Dat is dus iets minder op de energieprijzen inspelen, maar wel op de capaciteit van groene energie. Ik denk dat er veel potentie bij bedrijven ligt: enerzijds qua schaalgrootte, anderzijds vanwege de behoefte om winst te maken. In vergelijking met B2C heb je natuurlijk wel minder aanspreekpunten voor schaal. Dus bij een consumer heb je 1 persoon met 1 elektrische auto. Anderzijds heb je bij een bedrijf wellicht 50 elektrische auto's, dan ben je sneller klaar. Plus daar is veel potentie voor groene energie. Dus ik zie daar wel veel potentie, maar ook wel bij consumers hoor. Alleen moet je wel een algemeen systeem hebben wat je goed kan uitrollen, anders moet je veel te specifiek werken en dat kost te veel tijd en moeite.

For B2C the value proposition is quite known now, but what should the value proposition be for businesses (B2B)?

Er zijn 2 belangrijk onderdelen. Enerzijds het benutten van groene energie die je hebt. Dat levert gewoon lagere laadkosten op. Anderzijds zit er een hele hoop waarde in het voorkomen van verzwaringen in het net en contactcapaciteit. En die contactcapaciteit wordt bepaald op basis van de piek. Als je dus goed deze rol speelt kun je voorkomen dat de piek ontstaat wanneer iedereen zijn auto inplugd. Want als je dat zou stapelen (zegmaar 11kW per auto) dan creer je een gigantische piek en ga je direct het zwaardere tarief in. Dan betaal je veel meer per jaar aan de netbeheerder. Terwijl als je dit verspreid voorkom je andere kosten. Dus hier zie ik ook waarde in.

Interview transcript G

Interviewee: Manager Finance
Area of expertise: Energy Retail Company
Date: 26-01-2022

What distinguishes this energy retailer from others, with the aggregation services you provide?

Ik denk dat het allereerst heel goed is heel exact de definitie te hebben van aggregation services. Want je ziet dat verschillende bedrijven verschillende sub-onderdelen doen. Je weet ongetwijfeld wat een Balance Responsible Party is, maar feitelijk aggregeert iedereen. Namelijk vooral consumptieprofielen van klanten aanbieden op de markt en zo goed mogelijk gas en elektra inkopen, en als daar verschillen in zijn dan kost dat geld. Daarnaast verschillen de klantenaantallen van de energy retailers behoorlijk van elkaar.

Als aggregator heb je meerdere varianten. Eentje waarbij wel voorspellingen gedaan kunnen worden wat iedereen verbruikt, maar niet veel meer dan dat. De andere variant is wat slimmer bijvoorbeeld met laadpalen waarbij niet alleen gekeken wordt wanneer deze gebruikt worden maar ook bepaald wordt of het handig is om op dat moment te laden of wellicht iets meer/minder of eerder/later. Dan begin je al meer over een service te praten. Op een slimme laadpaal kun je bepalen wanneer er wel en niet geladen wordt, afhankelijk wat er te zien is op de markten. Dan praat je al veel meer over een demand-response achtige rol.

Wat ook een verschil is met sommige andere partijen is dat sommigen zich bezighouden met aggregeren van windmolens, zonnepanelen, en batterijen, in een virtual powerplant. Je kan elke windmolen individueel aanbieden en de verwachting aangeven voor de komende uren of dagen en dat op de markt aanbieden. En wat je dan niet correct voorspeld leidt dan tot onbalans, krijg je een andere prijs voor, en het gemiddelde prijsverschil leidt tot een premie die je verzekerd. Sommige partijen verrekenen de windturbines op individuele basis en de onbalansprijzen aan de producent teruggeven. Dus die zeggen eigenlijk: geen verzekering maar volledig marktprijs. Daar kun je er ook tussenin zitten en verzekeren zoals bij consumenten gedaan wordt en aggregeren en de premie bepalen. Een laatste optie is een model waarbij alles ‘op een hoop’ gegooid wordt en dan als virtual powerplant, waarbij de turbines aan en uit worden gezet op basis van marktsignalen. Het mooiste voor de producent is een model waarbij hij zijn asset op verschillende markten ten gelde kan maken. Next Kraftwerke is daar vrij ver in. Een andere onderscheidende factor is een groene base van gebruikers die waarde hechten aan lokale groene stroom. Voor de garantie van oorsprong wordt een kleine premium betaald. En die worden weer doorgegeven aan de producenten. Individueel is dit bedrag niet zoveel, maar met grote klantenaantallen wordt dit al een groot bedrag.

How does it work with smart charging points, do customers get rewarded for using these smart charging points and if so, how?

Hun energiekosten zijn dan lager dan dat ze hadden kunnen zijn. Het overgrote deel dat wordt neergezet is geen slimme laadpaal, moet ik er wel bijzeggen. Dus de service die we aanbieden is de administratie, installatie van de paal, en ervoor zorgen dat er een laadpasje is waarmee je ook in andere landen tegen lokale valuta kan laden.

Je kan ook niet met de helft van het volume (batterijcapaciteit) van een elektrische auto sturen, dus wat er daadwerkelijk stuurbaar is, samen met de factor dat dit verplaatst moet worden van een moment waarop stroom heel veel kost naar een moment waarop het heel weinig kost, dan wordt er pas voordeel gecreeerd. Dus de markt is nog niet volwassen genoeg eigenlijk.

And what makes it extra difficult is that the aggregator can only use this flexibility during times that the consumer plugged in his electric car right?

Exactly, als je over een jaar kijkt wordt misschien maar 40% van de tijd geladen en tussen die laadsessies verschilt het ook. Waarschijnlijk is de helft van de tijd dat de auto aan de lader staat wel vol. Bi-directioneel laden is nog weer moeilijker, want als de batterij van je auto sneller slijt dan dat je opbrengsten hebt aan flexladen, dan is de consument niet bereid om dit te doen.

Tijdens snelladen, zoals bij Fastned, dan heb je met grote frequentie auto's aan je netwerk staan en je laad op veel meer vermogen. Dus met bijv. 100 snellaadstations kun je veel meer vermogen afknijpen dan met 1000 residentiele laadpalen.

Op het gebied van EV verschillen aggregators ook van elkaar. De ene doet consumentenlaadpalen en de andere vooral snelladers.

The aggregator could also focus on B2B on companies with a high number of EV's, to reduce peaks in demand in order to stay within the limits of their grid connection.

Ja absoluut, alleen zijn er wel sommige retailers die niet met grote laadpleinen werken maar met MKB bedrijven die kleinere aantallen EV's en laadpalen hebben. Wij zijn echt een B2C merk en leveren geen B2B energie.

How is the financing organized of aggregators and aggregation projects?

Het voordeel is als je onderdeel bent van een groter bedrijf of groep. En het opdoen van innovatie is dan aanzienlijk goedkoper. Maar er wordt wel van tevoren gekeken of de business case zin heeft, en naar de verwachting van komende jaren gekeken. Er is wel beperkte funding voor innovatie omdat het marktmodel er nog niet echt is. Je ziet bij netbeheerders dat ze in het verleden veel meer innovatie hebben gedaan en dat er meer cash aanwezig was. Die hebben natuurlijk ook een deel van de problemen. Het nadeel is alleen dat er in marktmodel geen commerciele toepassingen gedaan mogen worden door hun. Het geld is er dus wel, en de wil ook, maar ze mogen niet. Dat is een beetje een discussie met retail bedrijven wat wel en geen markt is.

While it is likely there will be more aggregator firms in the next years, do you think a large incumbent is in such a strong position that smaller startup firms are not able to compete with them? Or do these startups have distinguishing capabilities that are crucial for success?

Wat je zegt is wel deels een aanname, dat er meer aggregators zullen zijn. Ik weet niet precies hoeveel aggregators er zijn, maar ik weet wel dat het aantal energiebedrijven momenteel dalend is. Als je kijkt naar telecom zijn er ook niet veel spelers. Energie heeft nog best wel wat spelers, maar mijn verwachting is dat de markt eerder gaat consolideren dan andersom. Dan is de vraag even of er los van de consoliderende partijen nieuwe aggregators ontstaan die alleen daar op focussen (bijv. Next Kraftwerke), of is dat niet zo en moet dat vooral van de huidige spelers komen. Als dat van de huidige spelers komt dan is de kans eerder dat er minder bijkomen dan meer. Dus de vraag is even hoe goed is de rentabiliteit van nieuwe toetreding. En daar zie je dat er nog best weinig aggregators zijn die op grote schaal succes hebben laten zien. En dat betekend dat hun verogen om financiering aan te trekken (zoals Venture Capital en banken) ook minder is. Dus daar zit denk ik een bottleneck. En dan is de vraag: verwachten we dat het aggregator model zelf veel rendabeler wordt? Dan komt het wel goed. En zoniet, dan zal het waarschijnlijk van de grote spelers komen. En dat komt dan vooral doordat er ergens anders in hun businessmodel problemen zitten die ze daarmee kunnen oplossen.

Do you expect that the business model will be more profitable, looking at the trends?

Ik geloof nog niet zoveel in thuisbatterijen, i.v.m. lobby van de PV sector die momenteel heel veel panelen installeert. Bij een bepaald aantal zullen netbeheerders dit niet meer zien zitten. Tenzij dat batterijen ineens bijv. een factor 80 goedkoper zullen worden, dan is het een heel ander verhaal, maar daar ga ik even niet vanuit. Het 2^{e} businessmodel waarover we praatten waarbij een aggregator een probleem oplost ergens anders in het businessmodel van een utility, daar zie ik steeds meer tractie op komen. Veel volatiele prijzen kunnen zich deels met een aggregator rol oplossen. Maar dat betekend niet dat het aggregator model op zichzelf rendabel is. Dus ik verwacht niet zozeer dat er extra spelers zelf zullen bijkomen, maar verwacht meer modellen waarbij je aan de ene kant verdienvermogen in de portefeuille combineert met services, dat dat de sleutel voor de toekomst is.

What are typical costs for an aggregator?

Ja voornamelijk de kosten die je maakt voor mensen die aan IT klussen. Bij infrastructuur denk ik dan vooral aan servercapaciteit en de cloud, dat valt wel mee. Maar het zit hem vooral in de ontwikkeling, de technische complexiteit van het platform. Veel code moet worden geschreven

en dat is duur. Meestal is dat een asset, zoals je ook bij Software as a Service (SaaS) ziet. Een probleem hierbij is dat als je software voor Nederland schrijft, dit niet gelijk toepasbaar is in andere landen.

Daarnaast heb je de marketingkosten, dus de Cost to Aquire om klanten binnen te halen. Ook Cost to Serve, dus de personeelskosten om klantenservice af te handelen. En wat nog een belangrijk is is ook Cost to Scale, daarmee bedoel ik dat aggregation pas zin heeft als je wat hebt om te aggregeren. En je kan vaak een beter bod doen om iemand binnen te halen als je al een portfolio hebt. Met andere woorden is het makkelijker om 1 windmolen te bouwen als je er al 100 hebt staan (omdat je de techniek al hebt staan aan de achterkant en de organisatie, en dit als voordeel hebt in je portefeuille). Als je dus wil schalen moet je investeren door klanten met verlies binnenhalen totdat je een bepaalde grootte hebt, dat noem ik Cost to Scale.

De rol van Balance Responsible Parties is zegmaar het optellen van een portfolio danwel aan de vraagkant dan wel aan de aanbodkant, en je kan dit beter als je er meer van hebt. Met verschillende profielen vorm je een portefeuille, dat aggregeer je, en dan met die portefeuille op de markt zo goed mogelijk matchen met marktprijzen. En dat is dus erg afhankelijk van de grootte van de portefeuille.

Can the aggregator earn the most on the 'onbalansmarkt'?

Ja en nee. Je hebt de jaar-, kwartaal-, maand-, dag-, uurblokken. Wanneer je daarmee ernaast zit betaal je de onbalansprijs. Je hebt bepaalde momenten in die markt dat je veel kan verdienen. Maar je kan ook veel verliezen. Want als je onbalans veroorzaakt, dan moet je betalen. En dat geld stroomt van degene die het veroorzaakt naar degene die het oplost. Dus het kan, want de totale hoeveelheid geld in die markt groeit, maar wat de ene partij wint, verliest de ander. Dus je kan ook veel verliezen als je het fout doet.

So if there is less unbalance in this market there is also less to earn for an aggregator right?

Op de website van TenneT is een dataportal waarin je kan vinden hoeveel onbalans er is in volumes. En die neemt toe en daar kun je mee forecasten. De verwachting is dat deze onbalans zal toenemen. Logisch, want er komt heel veel wind- en zonne energie bij. De veroorzaakte onbalans zal zeker gaan toenemen, en de vraag is of deze harder of minder hard gaat toenemen dan het aanbod van degene die het oplost. Dus we weten vrij zeker dat de vraag gaat toenemen, en de vraag is nog een beetje wat het aanbod gaat doen.

Ik denk dat het aggregatie model voor grote partijen meer loont, want met grote klantenaantallen kun je ook met kleine beetjes (kleine winstmarges) wat bij elkaar schrapen. En wat je ziet is dat veel kleine spelers niet genoeg verdienvermogen hebben op de lagere aantallen laadpalen etc. Dus succesvolle modellen zullen die modellen zijn die schalen over die grote klantenbase en toepassen op grote schaal met heel veel aansluitingen.

Do the smaller aggregators live on subsidies, or are they purposely making negative profits hoping they will acquire enough customers in the next years to become profitable?

Ik denk dat een deel van hun model is om te ontwikkelen en te laten zien dat het werkt. Dat werkt daar misschien wel beter dan bij de grote spelers, want dat gaat trager. En dan hopen de kleinere aggregators natuurlijk verkocht te worden door de grote spelers die dit dan succesvol toepassen. Dus dan is het niet erg dat je even verlies maakt. Dat is vooral een aanloop investering omdat de waarde die je creeert groter is.

Would you say an aggregator is more value driven or cost driven?

Ik zou zeggen het antwoord is in dit geval misschien wel echt beide. Als startup/scale up ben je extreem gefocusst op het creeeren van waarde. Een product en technologie bouwen. De energiemarkt is iets met enorme schaal tegen lage kosten. Dus het aggregatormodel kan uiteindelijk alleen maar werken als het binnen het principe groot volume tegen lage kosten werkt. Maar wat die bedrijven natuurlijk zelf doen is vooral focussen op gave producten bouwen en waarde toevoegen. Dus ik denk dat dat beide noten zijn die je moet meenemen.

Interview transcript H

Interviewee: Business Strategy Sr. Manager
Area of expertise: Energy Retail
Date: 01-02-2022

Does the aggregator already have the required capabilities or are partnerships or acquisitions necessary to acquire these capabilities? And how does this differ between different actors?

Ik denk juist dat een energieleverancier die capabilities niet heeft. Ik denk dat een startup-up of een bedrijf wat zich hier helemaal op focust meer kans maakt om deze capabilities op te bouwen dan een partij die al er al is zoals een grote energieleverancer. En dat heeft er mee te maken dat dit echt een hele andere manier van bedrijfsvoering is en het omgaan met klanten. Een elektriciteits- en gascontract is eigenlijk een administratief proces, maar waar geen actieve sturing op is door het bedrijf zelf. En waar ook de capabilities niet voor zijn. Ze hebben natuurlijk wel uitgebreide IT systemen, maar die IT systemen zijn ook daar niet op ingericht. Dus om dat te kunnen koppelen (elektrische auto's, zonnepanelen, warmtepompen, etc.): ik denk dat dat beter lukt voor een partij die tech-savvy is, dus daar wel in thuis zijn en ook met die visie starten. Ik denk dat het voor een energieleverancier veel meer een acquisitie is dan het zelf opbouwen van deze capabilities. Ik denk dat dat in de meeste gevallen niet gaat lukken om het op zo'n grote schaal te doen.

From other interviews it was often stated that if a smaller independent aggregator would provide these aggregation services, then it should make itself attractive for an acquisition by a larger firm.

Of je bekijkt het vanuit e-mobility, want daar heb je dat al veel meer, een andere granulariteit en sturingsmechanisme wat in ieder geval al in de visie is ingebouwd. En daar heb je dan wel de schaal. Dus de vraag is dan even: wordt dat niet eerder een partner dan dat je het opkoopt. Een concreet voorbeeld hiervan is Newmotion (nu Shell Recharge Solutions) die gelijk vanuit de flexibiliteitsgedachte aan de slag gegaan zijn. En dat is dan een mooie koop. Je zou ook kunnen stellen dat zij al groot genoeg zijn om niet meer gekocht te worden. De vraag is ook is e-mobility een bouwsteen en niet het geheel, en dat is denk ik wel waar het om draait.

Should an aggregator focus more on the B2B or B2C market, or both?

Uiteindelijk moet je je concentreren op de eindklant, dus daar moet je bij kunnen komen. Hoe je dat doet maakt eigenlijk niet zoveel uit. Ik kan me voorstellen dat als je het B2B doet, dan heb je meteen een grotere massa tot je beschikking. Dus niet 1 consument waar je een contract mee afsluit, maar gelijk de fleet van het bedrijf of de panden met zonnepanelen erop. Ik denk dat B2C naar mijn verwachting toch winstgevender is dan B2B en dat heeft met name te maken dat B2B forser onderhandelt. Met name omdat energie ook veel belangrijker wordt in hun hele bedrijfsvoering, dus zelfs een partij die het niet gebruikt voor productie. Voor die waren het onkosten, maar was het nog beheersbaar. Nu met de stijgende kosten maar ook de electrificatie krijgt energie toch een andere belang in de bedrijfsvoering: dat wordt een gigantische kostenpost. Ik denk dat de marges hierop klein zullen blijven. Je hebt dan wel meteen meer volume of meer eenheden tot je beschikking. Maar ik denk dat als je slaagt in B2C, ga je dan hierop focussen. Maar dan heb je dus massa nodig. Dus daar zit een beetje de crux.

Are there certain strategies important to implement as an aggregator?

Ik denk dat 1 van de allerbelangrijkste is dat je nauwkeurig bent en altijd moet kunnen functioneren. Wat een energieleverancier als verplichting heeft vanuit de overheid of de netbeheerder ook, dat zou je als aggregator ook moeten hebben. De betrouwbaarheid is belangrijk, want anders verlies je de klanten omdat zij geld willen verdienen of besparen door de aggregator. Dus als je niet fuctioneerd dan is er een probleem. Daarnaast moet de klantreis

excellent zijn. Daar zit dan ook die betrouwbaarheid in. En hoe zorg je ervoor dat je klanten aan je bind.

En dat zonder de klanten te belasten, maar vooral te ontlasten. De klant wil echt niet invullen wanneer deze wel of niet gaat laden. Er moet geen omkijken naar zijn, tenzij dat de klant er veel geld mee kan verdienen, maar dat is momenteel niet zo. Helemaal voor leaserijders raakt het minder in de portemonnee wanneer men op 'een slecht moment' laadt. Mensen zijn erg op zoek naar gemak.

How will the external environment look like in 5-10 years compared to now: which big changes will occur that an aggregator has to incorporate in its strategy now?

Ik denk dat we nog veel meer aggregators zullen krijgen en dat het eigenlijk nog een beetje in de kinderschoenen staat, omdat er nog te weinig geld achter, de value pool is nog niet volwassen genoeg. Dus ik denk dat dat gaat gebeuren de komende 5-10 jaar, en meer richting de 10jaar denk ik voordat we echt volwassenheid krijgen voor die flexibiliteitmarkt en daarmee dus ook kans om geld te verdienen. En dat zorgt er uiteindelijk voor dat er nu heel veel paddestoelen gaan ontstaan. Ik weet niet of dat al binnen de komende 10jaar zal zijn, maar op een gegeven moment komt er ook wel een consolidatie. Sommige partijen zullen het wel redden, sommigen zullen het niet redden, consolideren of opgekocht worden. Wie slaagt er in om zo snel mogelijk te groeien want het gaat in het begin toch vooral om aantallen. Dus kan je laten zien dat je de aantallen hebt en dat je een bepaalde impact maakt. En dan vervolgens bepaal je hoe schaalbaar je platform is. Dus kan je ervoor zorgen dat je zo min mogelijk groeipijn gaat krijgen. En ik denk dat 1 noodzakelijke of randvoorwaarde is dat de technologie die je gaat gebruiken, dat die klopt en schaalbaar is of kan omschakelen.

So first there will come more aggregators after which a consolidation will take place? Will the market then be very monopolistic?

Ik denk dat het een beetje versnipperd zal zijn en wat ik me ook kan voorstellen is dat je een aantal platforms zijn waar men vertrouwen in heeft. Dus in plaats van zelf de capabilities opbouwen het 'as a service' inhuren. En dan nemen zij er een stukje marge af. Dus ik kan me wel voorstellen dat er een aantal grote partijen zullen zijn, maar uiteindelijk denk ik dat het best wel versnipperd kan, bijv. Om lokale congestie op te lossen. En daarom loont het voor die partijen om hiermee aan de slag te gaan. Stel we houden die lokale congestie en die netbeheerders willen die kabels aanleggen (maar dan zijn we 15-20jaar verder voor dat gebeurd is) dan zullen bedrijven, partijen, en gemeentes ook naar andere oplossingen kijken. En dan zou je kunnen stellen waarom niet die microgrids en daarmee een bepaalde versnippering wat wel ergens bij elkaar moet komen. Dit zou ook gereguleerd kunnen worden door bijv. TenneT die dan een platform neerzet of contracteerd waar op ingeplugd wordt. Dan is er een totaaloverzicht en dan kan er gespeeld worden met een stukje flexibiliteit.

The DSO's are not allowed to be commercially active, is TenneT (TSO) allowed to do so?

Nee TenneT mag ook niet commercieel actief zijn, maar de vraag is natuurlijk ook of ze commercieel actief zijn. Of dat ze veel meer vanuit een veiligheidsperspectief werken, waarbij ze zeggen dat ze anders niet de elektriciteit toevoer van Nederland garanderen zoals ze dat tot nu toe doen en gedaan hebben. Ik denk dat dit best wel hard gemaakt kan worden richting de overheid toe.

Does the aggregator have the resources, in order to attain or can attain a competitive advantage according to the Resource-Based View theory?

Ja ik denk het wel. Ik denk dat dat wel de lucky few zullen zijn, maar dat denk ik wel. Als je een platform hebt ontwikkeld hebt met de visie die verder gaat dan wat er nu mogelijk is of waar nu geld mee te verdienen valt en kan schalen dan is dat wel een key differentiator. En daarmee wordt je ook interessant voor andere partijen om mee samen te werken of voor een acquisitie. Ik denk niet dat dat alle partijen zullen zijn. Veel partijen zullen het wel hebben kloppen in de theorie, maar in de praktijk zal uiteindelijk blijken dat er toch te weinig inzitten bij sommigen. Het gaat er niet alleen om of de aggregator een goed platform heeft, maar ook of het bedrijf genoeg snelheid kan maken. Je moet instaat zijn om klanten aan je te binden, anders heb je een probleem. Het

totaalpakket moet kloppen. Ik denk wel dat er partijen zijn die zich uniek kunnen of zullen positioneren.

And the firms that do position themselves: till what extend can another firm copy them or take their customers?

Het punt voor een klant is denk ik dat als 2 aggregators hetzelfde product aanbieden en eentje bied een vergelijkbaar product of service aan dat net iets beter is, dan kan dat zijn omdat het net iets voordeliger, beter is, etc. Maar elke nieuwe klant kost meer dan een bestaande klant houden. Dus als je gaat concurreren op klanten dan moet je net iets beter zijn. En dat kan ook met marketing. Een stukje storytelling kan belangrijk zijn. Ik denk zelf dat de klant niet uniek is, en uiteindelijk gaat het erom hoeveel klanten je hebt en hoe snel. Hoe sneller je die hebt en hoe langer je die aan je kan binden omdat je dus concurrerent bent qua capabilities of wat je aabied qua diensten, hoe minder snel een klant geneigd is om weg te gaan. Want klanten hebben geen zin om continu te switchen. Als ze het gevoel hebben dat de aggregator hun voordeel biedt in de portemonnee gaan de mensen niet overstappen voor zo'n klein bedrag. Die unieke resources en capabilities zitten volgens mij in het platform. Aan de voorkant wil je dat de klant het gevoel heeft dat ze blij zijn bij bedrijf A en dat het verschil met de competitor B niet te groot is. Het bedrijf A moet dan dus wel zorgen dat ze zo snel mogelijk klanten aan zich binden (en houden).

Interview transcript I

Interviewee: Head of Flexibility
Area of expertise: Energy supplier
Date: 01-02-2022

Explanation aggregator project 'Energiekoplopers'

Bij 200 huishoudens zijn slimme apparaten in huis geplaatst. Hierbij nam de energieleverancier eigenlijk voor het eerst de rol van aggregator aan en kon dan de apparaten aansturen, om zo het electriteitsverbruik te veranderen of te verschuiven. Dat werd dan gebruikt voor ofwel onze onbalans arbitrage, dus de eigen portfolio, of om de pieken te reduceren vanuit de netbeheerder (DSO).

In verband met situatie van de huidige energiemarkt (die flink 'ontploft' is) zijn de risico's die het bedrijf heeft flink gegroeid bij de inkoop van electriciteit en het balanceren van het portfolio dat wij beheren. En dus denken we dat flexibiliteit daar een goede oplossing voor is en dat het verdienmodel extra interessant geworden is.

What findings from this project are important for other future aggregator firms?

We hebben hiervoor het USEF (Universal Smart Energy Framework) gebruikt. Dit is een document dat de interactie tussen de verschillende marktspelers beschrijft. De belangrijkste conclusie is eigenlijk dat we toen aangetoond hebben dat zo'n slim energiesysteem werkt en dat het waarde genereerd voor de spelers in het energiesysteem: zowel voor de aggregator en de klanten, maar ook voor de netbeheerder en de portfolio van het energiebedrijf zelf. Als aggregator is er namelijk geld te verdienen als je flexibiliteit ontsluit, en daar een marge op zet en dat vervolgens doorverkoopt als dienst naar een BRP en DSO. We hebben aangetoond dat het significant pieken kan reduceren, het gebruik van flexibiliteit. Zowel de avondpiek als de zonpiek. En dat zowel in de intensiteit van de piek als in de duur van de piek. En voor de BRP is aangetoond dat het wel degelijk risico's kan reduceren. Aan de klantkant zijn er een paar dingen geconstateerd. We hebben uitgebreid onderzoek gedaan naar wat klanten belangrijk vinden, qua propositieontwikkeling en dergelijke. Ze vonden automatische sturing heel belangrijk, dus niet dat ze zelf aan de knoppen moesten zitten en zelf ermee bezig zijn. Het moet een betrouwbare partij zijn. Inzicht in de resultaten vonden ze erg belangrijk. En je moet als aggregator een eenvoudig verhaal hebben. Je moet het op een hele eenvoudige manier maar wel onder het mom van duurzaamheid. Dus als: 'energie gebruiken wanneer de zon schijnt en de wind waait'. Dus dat zijn de triggers die daarvoor nodig zijn.

Which revenue streams are the most profitable for an aggregator?

De grootste waarde zit nu in de onbalansmarkt, juist omdat de prijzen op de onbalansmarkt echt heen en weer zijn geschoten, dus dat is waar nu de meeste waarde in zit. Er blijft ook waarde zitten in de TenneT markten, dus de primaire reserve, secundaire-, en tertiaire reserve. En de verwachting is dat met de groei van zon en wind die natuurlijk maar blijft groeien dat het systeem steeds meer onbalans zal ervaren en er steeds meer behoefte zal zijn en die markten nog meer zullen groeien. Zeker in volume, en in prijs hangt het er nog een beetje vanaf wat de grote energiecentrales gaan doen. De kolencentrales gaan sluiten en de gascentrales leveren nu nog veel flexibiliteit. Als die straks ook weggaan dan worden manier zoals Demand Response nog interessanter. En dan hebben we nog de netbeheerder. Dus de congestie vanuit TenneT. En die is fors aan het groeien. Het is bekend dat er geen nieuwe datacenters etc. meer aangesloten worden omdat het niet meer past op het net. TenneT koopt er al veel congestie op in. De lokale netbeheerders (DSO's) gaan dat langzaam ook doen. Maar dat gaat nog wel even duren. Het is altijd zo zowel bij TenneT als bij de DSO dat de business eigenlijk per definitie eindig is, dus je moet er als aggregator je business niet volledig op inregelen. De netbeheerder zal van nature altijd gaan willen verzwaren. Dat is technisch gewoon de allerbeste oplossing.

So due to the electrification, these investments in the grid cannot be completely prevented. But with the help of aggregators, it is possible to postpone these investments.

Nee, inderdaad. Dat is wat ik verwacht en dat is ook wat ik hoor van netbeheerders waarmee we in gesprek zijn.

Nu wordt er ook heel veel in batterijen geinvesteerd en de businesscase voor batterijen wordt veel interessanter. Niet de batterijen thuis, maar grote batterijen in weilanden. Op een gegeven moment gaan daar zoveel van zijn dat zij er zo goed voor kunnen zorgen om het systeem goed in balans te houden dat de markt eigenlijk vanzelf weer inzakt. Ik verwacht dat in de komende, zeker 5 jaar en wellicht 10 jaar, de groei van zon en wind nog vele malen harder gaat dan wat er aan flexibiliteitsoplossingen komt. En dus dat de behoefte van flex in de markt nog fors zal blijven groeien.

When looking at threats for the aggregator, a flexibility solution such as this could be a threat as well. But you believe that this will not happen quicker than the growth of unbalance in the grid?

Nee op de korte termijn niet maar op lange termijn wel. Als je nu als aggregator besluit om allerlei langjarige contracten te gaan doen dan kan het weleens zijn dat je over 10 jaar allemaal contracten hebt of assets in je balans hebt die dan helemaal niks meer waard zijn. Omdat er niet zoveel meer te managen is omdat het dan allemaal uitgemiddeld is. Dat is dan zonde als je een investering in bijv. batterijen als aggregator hebt gedaan. Dus dat is zeker een threat. Een andere threat is dat er natuurlijk altijd concurrentie is.

What is the profile of the aggregator in the case of B2C?

Als aggregator zit je in de business van flex. Dus als je flex ontsluit bij huishoudens dan is de consument niet je klant maar je leverancier eigenlijk. Je klant is dan eigenlijk je leverancier van het product flex. Dat betekend dus ook dat je je klant betaald voor flexibiliteit. Als energieleverancier is dat dus ook een beetje wennen, want die zijn gewend om rekeningen te sturen aan de klanten in plaats van dat ze geld betalen aan de klanten.

Ik geloof erin dat het meeste flex voor het systeem uit de zakelijke markt en de utility-scale, de grootschalige apparaten komen. Want uiteindelijk heb je grote volumes nodig. Zelfs met de hoeveelheid elektrische auto's die we in Nederland hebben is dat nog niet voldoende. Als het gaat om B2C dan zijn de elektrische auto's het meest logische om op te focussen. Waarom: er zijn al relatief veel van, ze zijn relatief makkelijk om slim laden op toe te passen en ze gebruiken grote vermogens. Thuisbatterijen gaat er in de toekomst zeker wel een keer komen, maar op dit moment zijn deze er nog bijna niet in Nederland. En voor de rest kun je denken aan elektrische boilers en warmptepompen. Dat zijn nog een beetje de opties die er zijn.

And for the B2B side, the profile is possessing large EV fleets, and solar panels on their roof?

Grootzakelijk moet je denken aan onderwerpen zoals curtailment. Dat zit dan inderdaad of bij zonnepanelen op het dak die worden afgesloten of bij zonnepanelen in een weiland of windmolens in een weiland die worden uitgezet wanneer het nodig is. Daar zit veel groei in. Grootschalige batterijen ook. De vraagsturing uit industriele processes is iets waar wel potentieel in zit maar wat praktisch niet heel haalbaar is, dus een fabriek stilleggen. Dit heeft een grote impact op de fabriek, dus dat zal denk ik niet zo snel gebeuren en zal er dus niet zosnel flexibiliteit uit te halen zijn. Maar in de elektrificatie van de industrie middels hybride e-boilers en hybride warmptepompen zijn daar zeker wel mogelijkheden. En op de langere termijn heb je ook nog elektrolyse die interessant is. Dus als we meer een waterstofeconomie hebben en de vraag naar waterstof toeneemt waarvoor electrolyzers nodig zijn, die zijn eigenlijk per definitie flexibel.

If a large energy supplier would be willing to provide aggregation services such as with the Energiekoplopers project, do you think this would be by acquiring a smaller independent aggregator, or to do this inhouse, perhaps as company spin-off?

Dat verschilt een beetje per bedrijf hoe ze dat gaan doen. Zo heeft Eneco heeft bedrijfsonderdeel Peaks, Vattenfall heeft een paar jaar geleden Senfal gekocht. Als bedrijf kun je soms ook goed gebruik maken van kennis en kunde die het grotere moederbedrijf heeft. Een partij die veel flexibiliteit heeft waar de energieleverancier behoefte naar kan hebben, kan ook een reden zijn om deze te kopen

Interview transcript J

Interviewee: Co-founder aggregator firm
Area of expertise: Aggregation services
Date: 03-02-2022

So your firm established an aggregator platform and arranges the placement of smart charging points: how does your firm trade the flexibility?

Een aantal nuances: de intelligentie zit niet in de laadpaal, maar op een centrale server. De clients zijn de laadpalen. Zolang een laadpaal met internet kan communiceren, en dat kunnen eigenlijk alle laadpalen van de laatste jaren.

We hebben software draaien die berekend op welk moment het het gunstigste is om de auto te laden. Al die auto's worden aangestuurd door dat laadpunt of afstand, in real-time, harder of zachter te zetten qua laadsnelheid. We doen dit wel in onderling verband. Je moet voorspellen als aggregator hoeveel capaciteit ergens benodigd is. Vervolgens ga je uitzoeken waar je de energie vandaan moet halen zodanig dat die lage kosten heeft en/of een lage CO2 emissie heeft en op welke momenten dat zo is. En dan wordt het verbruik gesynchroniseerd met de voorspelde beschikbaarheid van stroom tegen een bepaalde criterium: de prijs.

We doen het zowel predictive als real-time, dus we voorspellen en we maken schema's, maar op het moment dat we aan het laden zijn kijken we continue naar de markt: kan het nog beter. En dan passen we het meteen aan. Dus in die zin is het wel real-time.

What are your revenue streams?

Wij maken gebruik van de energiemarkt en niet van de reservemarkt of iets dergelijks. Dat kan overigens ook, en die technologie hebben we ook in huis. De reservemarkt is weliswaar een hele makkelijke markt om te doen, maar heeft een minder financiele waarde. Je kunt meer financiele waarde halen uit de energiemarkt, dus de day-ahead markt.

We hebben allerlei modellen, we verkopen energie in sommige gevallen tegen een hogere prijs, nou dan hebben we een delta tussen wat we ingekocht hebben en wat we kunnen verkopen aan de afnemer. We hebben een model waarbij de afnemer al het voordeel heeft en en ons daarvoor de service fee betaald. Wij zijn ook zelf energieleverancier. Wij zijn in staat om de elektriciteit die via het huis de auto ingaat (bij thuisladen) om die energie a priorie af te trekken van de energierekening van het huishouden. Dus het huishouden krijgt nooit die stroom op de factuur. Wij brengen die kosten direct in rekening bij een werkgever wanneer het een leaseauto betreft. Bij een levering van stroom van bedrijf aan bedrijf is er ook een btw voordeel en zo kun je ook weer een waarde creeren. Maar dat is niet heel belangrijk voor het aggregator vraagstuk. Het aggregatorvraagstuk is heel simpel, je koopt stroom in als het goedkoop is en je creeert daarmee een financieel voordeel.

What were and are for you the most significant costs, and what are these for an aggregator generally?

De grootste kosten zitten in het maken van software, in het bouwen ervan (als het nodig is). We hebben best veel geinvesteerd en dat doen we nog steeds, want we zijn een bedrijf in ontwikkeling. Dat betekend dat we nog steeds heel veel investeren in platformtechnologie, dus de software. Om meer proposities mogelijk te maken. Om algoritmes te verbeteren. Puur voor het optimaliseren van algoritmes gebruiken we overigens wel externe deskundigen en partners voor, want dat is wel echt een vak. Het kunnen ontsluiten naar nieuwe CPO's (we zijn er ook 1 maar er zijn allerlei partijen die we ontsluiten), de app waarmee we de provider de mogelijkheid geven om allerlei configuraties te doen, dat is ook een ontsluiting naar de stakeholder. En de laatste component waar je in investeerd is in het mogelijk maken van nieuwe proposities. Dat doe je eigenlijk om nieuwe waardestromen te kunnen ontsluiten. Dit is een markt die exponentieel groeit, omdat er organisch heel veel assets bij komen: auto's, zonnepanelen op daken, etc. En er allerlei nieuwe doelgroepen bij komen zoals met mensen met bestelauto's. Hierdoor maak je steeds nieuwe combinaties van mogelijkheden om meer waarde te creeeren.

Where are the costs involved by being or partnering with a Balance Responsible Party?

Wij zijn geen BRP, dat had wel gekund maar dan moet je wel een grote speler zijn. Daar zijn er veel van in Nederland. Daar kun je een overeenkomst mee sluiten. En we creeeren soms bewust onbalans, want het kan ook in je voordeel werken. Dat moeten we uiteraard verrekenen.

Wij geven ons profiel af en kunnen daarin onbalans realiseren als dat gunstig is, en doen dat dan ook. En dat moet je dan elke dag verrekenen.

Which barriers are there at the moment for firms that aggregator or want to aggregate?

Mij past bescheidenheid om uitspraken te doen over de algemene uitdagingen en opportunities voor aggregators. Ik zou zeggen in bredere zin dat aan de productie en consumptiekant van elektrische energie zien we steeds meer volatiliteit. Dat is een opportunity voor een aggregator. Maar je moet wel steeds slimmer zijn om dat goed te gebruiken. Dus ik denk dat daar wel de challenge ligt, wie dat slim kan doen en dat goed beheerst. Die kan dat voor elkaar krijgen. Dus een toegangsbarriere is beschikken over de deskundigheid om het slim aan te vliegen. Ik denk dat een andere barriere is het toegang hebben over assets en andere partijen vinden die assets met jou willen delen om daar je aggregation rol mee te kunnen spelen. Ik denk dat een barriere ligt in diversification: dat zie je ook in het algemeen gebeuren, deze markt wordt professioneler. Dan ontstaan er veel meer soorten assets die allemaal hun eigen specialiteit hebben. Dan heb je denk ik nog de bedreiging dat de energiemarkt best wel de grens overstijgt. Je hebt bijvoorbeeld Sympower in NL die veel dingen doet in o.a. Zweden en Finland, en dus een uitdaging is ook hoe vind je toegang tot die spelers die assets hebben waar je mee kunt gaan werken.

Is the market for an aggregator competitive and how do you gain your competitive advantage?

Jawel hoor die is er wel. Die competitive advantage, oftwel hoe wij ons kunnen onderscheiden in de markt. Wij onderscheiden ons doordat wij onze mogelijkheden om te besparen op energiekosten beschikbaar stellen aan vlooteigenaren (zoals leasecompanies). Dus wij verkopen niet aan consumenten of individuele bedrijven. Het bij elkaar brengen van meerdere auto's geeft je door die combinatie en daardoor het collectief optimaliseren, dat maakt dat het resultaat van aggregatie beter wordt. En dat is logisch want hoe meer bronnen je hebt hoe meer flex je hebt. De ene heeft een beperking in de tijd, de andere weer andere beperkingen. Naarmate je meer ter beschikking hebt kan je beter voor elkaar compenseren en alle pieken en dalen afvlakken die je hebt.

Dat wij onze service aanbieden aan vlooteigenaren maakt dat we de propositie kunnen tweaken/aanpassen aan de behoefte van het bedrijf. Dus iemand die bijv. private lease auto's in de markt zet heeft een ander soort behoefte om smart charging in te zetten dan iemand die aannemer is die bijv. 150 elektrische busjes rond heeft rijden. Wij kunnen dat aggregatiesysteem dat we gemaakt hebben en de waarde die eruit komt: en met name wie er welk ding doet en wie welk stukje vd waarde krijgt, dat zetten we in specifiek voor die partner. En dat is wel fijn voor zo'n partner. Want dan is die waarde die die partner krijgt dus geoptimaliseerd voor hem/haar, en niet generiek, zoals bijv. Jedlix doet waarbij je minder ruimte hebt als businessspeler (B2B) om daar wat mee te gaan doen. Wij tweaken, dat is onze onderscheidende kracht.

Which capabilities are essential for an aggregator?

Dan kom je ook weer bij een aantal, vanuit mij gezien dan, klassieke antwoorden. 1 van de belangrijkste capabilities is het kunnen voorspellen en het optimaliseren van je voorspellingskwaliteit, van energievraag en energiebeschikbaarheid zodat de uitkomst van het hele verhaal mogelijk is. Dat voorspellen, daar zit heel veel kracht. Dat is denk ik 1, ten 2^{e} denk ik goed proposities kunnen maken, goed kunnen snappen hoe pains en gains, dus vanuit marketing oogpunt, zijn voor in een combinatie van leverancier en gebruiker. Je kunt een hele algemene aggregator zijn maar je kunt het ook specifiek maken om meer waarde te realiseren. We zitten nu in een een fase van de energietransitie waarin dus sprake van differentiatie is, we hebben nog steeds veel te weinig productie assets in NL die duurzaam zijn, maargoed dat wordt wel beter. Maar het zijn er al wel zoveel, en (hangt af van hoe je rekend) een kleine 300.000 elektrische auto's in nederland. Dus dat is best wel wat en je kan nu dus specialiseren. En meestal zie je als je zo'n curve tekend dat die versnelling gaat gebeuren zodra differentiatie mogelijk is.

Op het moment dat je dus specialistische oplossingen voor specialistische vragen kan maken, en dat daar een markt voor is, want daar ontstaat dan weer opnieuw een specialisatie in en weer een specialisatie in. En we zitten daar al in, in die dynamiek.