Aalto University
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THE EMERGING INDUSTRY OF AGGREGATION

Novel business models and empowerment strategies for incentive-based demand response in Finland

Master's Thesis
Tiina Ohrling
Aalto University School of Business
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Aalto University
School of Business

Aalto University, P.O. BOX 11000, 00076 AALTO
www.aalto.fi

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Author Tiina Ohrling

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Abstract

In the course of the energy transition, novel business models for aggregation are emerging in the Finnish energy sector. To anticipate and govern the energy transition and its sustainability, knowledge on the current state and development of this novel industry is essential. Hence, the aim of the study is to describe novel business models for aggregation and discourses attached to them, to provide an overall picture of the emerging industry and its relation to energy transition.

The research aim is approached through the theoretical framework of sustainability transition studies and its recent intersection with business models and discursive legitimation, niche empowerment in especial. Methodologically the study adopts the approach of critical discourse analysis and business models as a unit of analysis. The research data bases on a desk study and interviews of 14 companies. The analysis identifies and generalizes novel business models and empowerment strategies for aggregation.

Three general business model archetypes for aggregation are suggested: balance-responsible aggregator, independent aggregator and sub-aggregator. The archetypes differ regarding their market position, customer segments, key resources and motivation to engage in aggregation business. The varying key resources of the archetypes result in interrelated partnerships among the companies. The niche-overarching empowerment strategies favour fit-and-conform legitimation. However, the niche-internal, archetype-specific empowerment strategies are more heterogenous. The balance-responsible aggregator archetype seems to engage in the novel industry to renew and grow its position in the energy sector. The independent aggregator archetype strives to establish a novel market position in the Finnish energy regime, while the strategy of the sub-aggregator archetype is to position in the industry as a technical enabler of others' business models for aggregation.

Previous empirical studies on niche empowerment have mostly been longitudinal, largely portraying niches as unanimous. The study positions in certain moment in time, enriching empirical evidence on the heterogeneity of empowerment strategies of niche advocates, which further reflect the heterogeneity of their motivations and capabilities. In the context of the study it seems that the more peripheral the niche advocate companies are to the regime, the more stretch-and-transform legitimation they employ. Overall, though the archetypes engage in aggregation for different strategic reasons, their main motivations seem rather market than sustainability oriented. The role of the aggregation niche can be described as intermediary regarding the energy transition, as the industry seems to support gradual renewal of the energy regime, and the continuity of its current values and principles in the course of the energy transition.

Keywords demand response, aggregators, energy transition, sustainability transition studies, business models, niche empowerment, discourse, legitimation, critical discourse analysis

Aalto-yliopisto
Kauppakorkeakoulu

Aalto-yliopisto, PL BOX 11000, 00076 AALTO
www.aalto.fi

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Tekijä Tiina Ohrling

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Osana energiamurrosta Suomen energiasektorilla syntyy uudenlaista kysyntäjousto- ja aggregaattoriliiketoimintaa. Tämän uuden toimialan ja sen suhteen energiasektorin laajempaan kehitykseen ymmärtäminen edesauttaa murroksen arviointia ja ohjausta. Täten tutkimuksen tavoitteena on kuvata uusia aggregoinnin liiketoimintamalleja ja niihin kytkeytyviä diskursseja.

Teoreettisesti tutkimus pohjaa taloudellisten murrosten tutkimukseen, sekä alan tuoreisiin haaraumiin liiketoimintamalli sekä diskursiivinen legitimaatio -teorioiden parissa. Metodologisesti tutkimus nojaa kriittisen diskurssianalyysin viitekehykseen, analyysiyksikkönä liiketoimintamallit. Aineisto perustuu 14 yrityksen haastatteluihin sekä verkkosivuanalyysiin. Analyysi tunnistaa ja yleistää uusia aggregoinnin liiketoimintamalleja sekä diskursiivisia legitimaatiostrategioita.

Tutkimus ehdottaa kolmea aggregoinnin liiketoimintamalliarkkityyppiä: tasevastaava aggregaattori, itsenäinen aggregaattori ja sub-aggregaattori. Arkkityypit eroavat markkina-asemiltaan, asiakassegmenteiltään, avainresursseiltaan ja motivaatioissaan aggregoida. Arkkityyppien erilaiset avainresurssit johtavat keskinäisriippuvaisiin kumppanuuksiin yritysten välillä. Toimialaa poikkileikkaavat, kaikkien arkkityyppien suosimat legitimaatiostrategiat mukautuvat energiasektorilla vallitseviin diskursseihin. Toimialan sisäiset, arkkityyppikohtaiset legitimaatiostrategiat ovat moninaisempia. Tasevastaava aggregaattori arkkityyppi on kiinnostunut aggregoinnista uudistaakseen ja vahvistaakseen markkina-asemaansa energiasektorilla. Itsenäinen aggregaattori arkkityyppi taas pyrkii luomaan ja vakiinnuttamaan uuden markkinaroolin energiasektorilla. Sub-aggregaattori arkkityyppi puolestaan pyrkii profiloitumaan toimialalla muiden aggregointiliiketoiminnan teknisenä mahdollistajana.

Aiempi empiirinen tutkimus diskursiivisen legitimaation roolista radikaalien innovaatioiden kehityksessä on suurelta osin perustunut pitkäaikaisaineistoihin, esittäen innovaatioedistäjät legitimaatiostrategioissaan pääosin yhtenäisinä. Tämän tutkimuksen keskittyessä rajattuun ajanjaksoon, tulokset rikastavat aiempia empiirisiä havaintoja innovaatioedistäjien legitimaatiostrategioiden moninaisuudesta, heijastaen näin ollen myös toimijoiden tavoitteiden ja resurssien moninaisuutta. Tutkimuksen kontekstissa yritykset, jotka olivat muita marginaalisempia, viljelivät enemmän energiasektorin vallitsevia rakenteita sekä kilpailijoita kyseenalaistavia diskursseja. Lopulta, vaikka arkkityypit ryhtyvät aggregoinnin toimialalle erilaisista strategisista syistä, kaikkien pääasialliset motivaatiot pohjaavat enemmän markkina- kuin kestävän kehityksen arvoihin. Toimialan roolia energiamurroksessa voidaan kuvata välilliseksi, sen edistäessä energiasektorin asteittaista uusiutumista, kuitenkin tukien nykyisten toimintaperiaatteiden ja arvojen jatkuvuutta energiamurroksen tuoksinassa.

Avainsanat kysyntäjousto, aggregaattorit, energiamurros, taloudelliset murrokset, liiketoimintamallit, innovaatiopolut, diskurssi, legitimaatio, kriittinen diskurssianalyysi

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GLOSSARY

Demand response (DR) is commonly defined in line with the US department of energy (2006, p.6) as ‘changes in electrical usage by end-use customers from their normal consumption patterns in response to changes in the price of electricity over time or to incentive payments designed to induce lower electricity use at times of high wholesale market prices or when system reliability is jeopardized’.

Price-based demand response programs encourage changes in electricity consumption by price signals. Customers can respond to price structure by changing their electricity use, by consuming during lower-priced periods and avoiding consumption during higher-priced periods. (US dept. energy, 2006.)

Incentive-based demand response programs offer consumers payment or some other benefit as an atonement for allowing their load to be remotely controlled. Therefore, incentive-based demand response programs offer customers incentives that are separate from the retail rate of electricity. (US dept. energy, 2006.)

An aggregator refers to a market party that bundles electricity loads of consumers into a bigger entity that is possible bid to marketplaces of electricity. Loads can consist of electricity consumption, production or storages. An aggregator can either be a balance-responsible party or an independent aggregator. (Li et al., 2016; TEM, 2018a.)

An independent aggregator refers to an aggregator that is a non-balance responsible party. Independent aggregators can increase competition and diversify the emerging industry of aggregation. However, these novel market actors also raise questions about the consequences of their actions to other market actors, especially regarding balance responsibility. (TEM, 2018a.)

Transmission system operator (TSO) means ‘a natural or legal person responsible for operating, ensuring the maintenance of and, if necessary, developing the transmission system in a given area and, where applicable, its interconnections with other systems, and for ensuring the long-term ability of the system to meet reasonable demands for the transmission of electricity’. (Council Directive 2009/72/EC.) The Finnish TSO responsible for the main grid is Fingrid.

Balance responsibility refers to the obligation of each electricity market party to maintain a continuous balance between its electricity generation and sales or procurement and consumption. In practice, this is not possible, so each market party has an open supplier that is responsible for the

balance. Furthermore, open suppliers can have open suppliers. The highest party in the chain is Fingrid. (Fingrid, 2019c; 2019d.)

Balance responsible party (BRP) refers to a party that's open supplier is Fingrid. All parties of chains of open deliveries under the balance responsible party, belong to its balance responsibility. (Fingrid, 2019d.)

Imbalance settlement bases on the principle that all inputs and all intakes of electricity should be covered by balance responsibility. Imbalances are balanced via balancing power markets, operated by the TSO. Each BRP is responsible for the imbalances under its responsibility and financially compensates for them to the TSO. After each operation period, an imbalance charge is imposed on those BRPs that are not in balance. Hence, the purpose of imbalance settlement is to establish a financial balance in the electricity market after each operation period. (Fingrid, 2019d; Esett, 2019.)

Market places of electricity in the context of Finland refer to the eight marketplaces of electricity, operated by the Finnish TSO Fingrid, Nordic electricity market Nord pool and Energy Authority of Finland. Non-balance responsible parties e.g. independent aggregators can participate in FCR-D and FCR-N marketplaces, operated by the TSO. Furthermore, FCR-D and FCR-N accept offers, that contain loads under the responsibility of different BRPs. (Fingrid, 2019a; 2019b.)

1. INTRODUCTION

1.1. Background of the study

To mitigate climate change, global CO2 emissions must be cut down rapidly (IPCC, 2018). In the OECD countries, about 40 percent of the CO2 emissions results from power generation, due to the use of fossil fuels (IEA, 2016). Finland aims to reduce its greenhouse gas emissions by 80 percent by 2050 compared to 1990 levels, with sub-goals to phase out the use of coal for energy and increase the share of renewable energy to over 50 percent of the final energy consumption by 2030 (TEM, 2017). These aims to de-carbonize the energy system demand significant changes in various sectors, also referred to as the energy transition.

However, besides decarbonisation, a sustainable electricity system is grounded on values of security of supply and affordable prices of electricity. Furthermore, for the grid to function, electricity generation and consumption need to be equal at all times. As nuclear power and weather-dependent renewable power generation become more general, a larger share of production becomes inflexible in Finland. As simultaneously traditional and flexible combined-heat-and-power generation capacity is disappearing from the markets, Finland is increasingly dependent on imported electricity at times of peak demand (IEA, 2018). Additionally, the electrification of transport and heating is changing the consumption patterns of electricity. Demand response can be a solution that both renews and helps preserve the current market-based electricity system in the course of the energy transition (Fingrid, 2018a).

Demand response (DR) means timing of electricity consumption in short-term according to price signals or incentive payments, to maintain the grid balance (US dept. energy, 2006). Therefore, as weather-dependent generation becomes more common, DR can be used to balance out the fluctuations in electricity generation, supporting the integration of renewable energy into the electricity system (e.g. Strbac, 2008; O'Connell et al., 2014). Furthermore, as DR can cover peak demand by reducing the need for back-up power

generation, it may lower the overall CO2 emissions of the system (Paterakis et al., 2017). Other system-wide benefits of DR include increased system reliability and more low and stable electricity prices (US dept. energy, 2006). Further, Finnish energy sector actors have evaluated that DR services have significant export-potential (Ahonen and Honkapuro, 2017). Additionally, market-based DR may reallocate concentrated market power, through increased market competition (Siano, 2014). For some of these benefits of DR, the Finnish government has stated a goal to forward market-based DR (TEM, 2015).

There are several ways to carry out DR. Most commonly, DR implementation programs are categorized as price-based and incentive-based. In incentive-based DR programs, consumers are offered payment or some other incentive as an atonement for allowing their load to be remotely controlled, e.g. turning off and restarting specific electrical equipment (US dept. energy, 2006). In comparison, price-based programs encourage changes in consumption by price signals. Customers can reduce their electricity bills by adjusting the timing of their consumption, by consuming during lower-priced periods and avoiding consumption during higher-priced periods (US dept. energy 2006). These programs can also be referred to as direct and in-direct load control (e.g. O′Connell et al. 2014), as incentive-based programs are carried out directly according to the grid needs, whereas price-based programs in-directly guide consumption according to price signals, which reflect the predicted consumption and generation of electricity. My focus is on incentive-based DR programs, for the developing sector has some interesting questions to solve concerning the market rules and regulation in Finland.

Traditionally, incentive-based DR programs have focused on large-scale industries. In the case of Finland, to forestry, metal and chemical industries (Fingrid 2019e). This is for to participate in incentive-based programs, the electricity loads need to comply with the load requirements, e.g. size of the load and response time (Fingrid, 2019a). Further, the offered loads compete directly with the supply in the marketplaces of electricity. Therefore, small consumers can participate in incentive-based DR programs only through service providers. As the need for flexibility grows, the issue opens up new business opportunities

and new market actors are appearing in the electricity markets – e.g. aggregators. An aggregator refers to a market party that bundles loads of electricity consumers into a bigger entity, that is possible to bid to the marketplaces of electricity. The loads can consist of electricity consumption, production or storages. (Li et al., 2016; TEM, 2018a.) An aggregator can be either a balance-responsible party like an electricity retailer, or an independent aggregator (TEM, 2018a). Independent aggregators can increase competition in the new industry by introducing more services and earning-opportunities for consumers. However, as these novel electricity market actors are not balance-responsible, their actions can cause costs to the imbalance settlements of balance-responsible parties. (Ibid.)

Finland's national transmission system operator (TSO) Fingrid has paved way for the wider adaption of incentive-based DR. Fingrid has conducted pilots in cooperation with companies and reduced regulatory barriers, especially easing the market participation of smaller players and non-balance responsible parties, like independent aggregators (IEA 2018; Fingrid, 2018b; Fingrid, 2019b). Though Finland has been granted to be a forerunner in adopting market-based DR in comparison to other European countries (SEDC, 2017), there yet remains unanswered questions about some of the market rules and regulation around aggregation, e.g. on the role of independent aggregators and imbalance settlement (Annala et al., 2018; TEM, 2018b). Regardless, novel business models for DR and aggregation are emerging in the Finnish power markets (Ahonen and Honkapuro, 2017). These business models are introduced by newcomer as well as incumbent electricity market actors.

If successful, these business models can forward the wider adaption and utilization of DR (O'Connell et al., 2014; Annala et al., 2018), and in their part forward the energy transition towards a zero-emission energy system (Wainstein and Bumpus, 2016). The wider adaption of DR will significantly alter the Finnish electricity system, as it forwards the integration of renewable power generation, alters the role of the consumers, brings new earning possibilities and possibly even alters the market power structure of the energy sector. However, how significant these changes will be, depends on which kind

of business models for aggregation scale-up and which type of companies establish their status in the emerging industry of aggregation. Under the seemingly unified goal of wider adaption of DR, companies with business models for aggregation can be expected to have individual business interests. For example, Markard et al. (2016) noticed as studying advocacy coalitions in Swiss energy policy, that besides the traditional juxtaposition between environmental and economic values, also the competition of market shares and positions between emerging and established industries is a significant influencer of political interests within the energy transition. Hence, besides the emerging business models for aggregation that constitute the emerging industry, also the motivations that drive the emerge of the industry are important to understand and govern the development and sustainability of the Finnish energy system.

In recent years, several articles have been published that describe novel business models of energy transition and among those business models for DR (e.g. Behrangrad, 2015; Helms et al., 2016; Niesten & Alkemade, 2016; Hamwia & Lizarraldeb, 2017; Burger & Luke, 2017). These studies provide a general picture of the emerging business models for DR. However, studies comparing business models or programs for DR in different economic regions notify that the adoption of DR is more influenced by the institutional environment than by technologies or technical infrastructure (Burger and Luke, 2017; Paterakis et al., 2017). Therefore, these results do not give an accurate picture of how the industry of aggregation is forming in Finland, especially as the market rules and regulation around aggregation are currently being negotiated (TEM, 2018b; Lausuntopalvelu, 2019). Furthermore, I am more interested in understanding the institutionalization process of the industry, and how companies that develop business models for aggregation contribute to this process.

Institutionalization of novel technologies and business models can be studied in the context of sustainability transition studies. The growing field of study that has much studied the development paths of global energy transition. One of the core beliefs of sustainability transition studies is, that as current institutions restrict divergent innovations from scaling up, successful innovation requires co-evolution of technology

and institutions (e.g. Geels and Schot, 2010). This coevolution can be enabled by niches, i.e. protected spaces that shelter radical innovations from immediate selection pressures, until they have developed competitive enough to merge into, or even replace the dominant practices (Kemp et al. 1998; Schot and Geels, 2010). More recently, sustainability transition studies have shed more attention on the role of agency and politics in transitions. Amending from institutional theory, Smith and Raven (2012) have contributed to the discussion by introducing the theory of niche empowerment. Niche empowerment refers to strategic, discursive action of niche advocates, that gradually opens the protected innovation for competition, striving to gain legitimacy for it. Niche empowerment stems for the idea, that by analysing language and ideologies, it is possible to understand how legitimacy is built and questioned by presenting technologies as supporters or challengers of the current institutional structure (Munir and Phillips 2005).

Though research on niche empowerment is growing (e.g. Verhees et al., 2013; Boon et al., 2014; Kern et al. 2015; Raven et al., 2016; Huijben et al., 2016; Bush et al., 2017), the theory could use more empirical studies for further development. Whereas many of the studies have been longitudinal, Verhees et al. (2013) suggest that niche empowerment theories could benefit from studies that cover only short time periods, to get a better glimpse of the tensions and conflicts embed in the empowerment process. However, it seems that so far, possible tensions or contradictions within niche advocates during empowerment processes are not much covered in the literature (besides Martin 2016). The emerging industry of aggregation in Finland has some special features, that make it an interesting case to study these dynamics within and between niche advocates and the wider institutional environment during a socio-technical transition. Regardless that the aim of wider utilization of market-based DR is legitimated up to the level of Finnish government (TEM, 2015), the preferred pathways of regulatory and market development might vary among the niche advocate companies according to their individual interpretations, interests and resources. I assume, that the companies with different type of business models for aggregation strive to affect the institutional forming of the industry from their individual perspectives.

Therefore, I adopt the framework of sustainability transition studies to analyse the institutionalization of the novel industry of aggregation, using business models as a unit of analysis. Focusing on business models enhances the possibilities of achieving a deeper insight on the micro-level of niche empowerment. As Bidmon and Knab (2018, p.908) argue:

> ...while transition research does not consider the inertial forces on the local level, business model research has not yet considered inertial forces on a global, systemic level. Considering the dominant logics at both levels and their mutually reinforcing effect can arguably support a better understanding of the barriers to societal transitions.

1.2. Research objectives

The objective of the study is to describe the novel industry that is forming around aggregation business and position it in relation to the wider energy transition in Finland. Hence, the research questions are:

1. What kind of novel business models for aggregation are emerging in the Finnish energy sector?
2. What discourses the companies employ to gain legitimacy for a) the emerging industry of aggregation in general and b) specific business models for aggregation?

The thesis will provide novel empirical data on the emerging business models for aggregation as well as on the discursive work the companies do to forward their agenda and the wider adaption of incentive-based DR in Finland. Hence the thesis contributes to the discussion of the future development of the Finnish energy sector. Additionally, the thesis offers interesting insight for the sustainability transition literature and niche empowerment theorization by diving into niche dynamics during a specific moment in time when niche-innovations become intertwined with the regime, forming a novel industry.

2. THEORETICAL FRAMEWORK

The chapter reviews literature on sustainability transitions, diving into its recent intersections with business model literature and discursive approach on institutionalization. Building on this literature I form a theoretical framework to guide analysis on how novel business models and empowerment strategies attached to them contribute to the institutionalization of the aggregation industry and the wider energy transition in Finland.

The chapter begins by a short introduction of the general lines of the sustainability transitions studies and its key concepts in subchapter 2.1. Followingly, subchapter 2.2. presents the business model concept as well as the recent links between business model and transition literature. Subchapter 2.3. presents institutionalization as a discursive process and how institutionalization of niche-innovations can be facilitated by niche empowerment. Finally, subchapter 2.4. discusses the how the different social positions of niche advocates and societal context may affect the type of empowerment strategies different niche advocates choose as well as their success.

2.1. Sustainability transitions

Sustainability transition studies examine the dynamics and mechanisms of fundamental societal transitions. The research field emerged in the late 1990's to better understand and govern large-scale and long-term societal transitions, relating it to the aim to forward sustainable development (Markard et al., 2012). The inter- and transdisciplinary research field has grown ever since, amending from various disciplines including innovation research, environmental studies and sustainability sciences, as well as multiple social sciences (Loorbach et al. 2017). Hence, societal transitions can be approached from various epistemological and normative standpoints, and the research field contains a broad range of conceptual and theoretical frameworks (Van den Bergh et al., 2011; Markard et al., 2012; Lachman, 2013; Sovacool and Hess, 2017). Loorbach et al. (2017) identify three dominant research approaches to sustainability transitions: socio-technical, socio-institutional and socio-ecological. In this study, I amend from both the socio-

technical and socio-institutional approaches to conceptualize and analyse the research issue. The socio-technical approach draws from science and technology studies, evolutionary economics and sociology and views transitions as most of all re-alignments of technological and social constellations, where the emerge of radical innovations is central (Loorbach et al., 2017; Geels and Schot, 2010). Whereas the socio-institutional approach covers a broad range of approaches that amend from social sciences such as economics, sociology, political science or geography. The socio-institutional approach tends to stress the meaning of incumbent institutions, like regulations, routines, interests and discourses, and how these are challenged, hence highlighting power, politics, and agency within transitions. (Loorbach et al., 2017.) These approaches to sustainability transitions are not distinct from each other but rather intersecting.

The socio-technical approach, and in especial the theoretical framework of multi-level perspective, lie in the foundations of sustainability transitions studies (Loorbach et al., 2017). Within the socio-technical approach, sustainability transitions are typically conceptualized as radical, but long-term and non-linear transformation processes of socio-technical systems towards more sustainable modes of production and consumption (Markard et al., 2012). Socio-technical systems are alignments of social and technological elements that are organized to provide some societal function, e.g. energy, water supply or transport (Geels and Schot, 2010). Socio-technical systems have developed around dominant technologies, thereby forming an interdependent web of material and social elements, e.g. infrastructure, regulation, organizations, business models, technology, user practices. Due to this multidimensional and interdependent nature of socio-technical systems, socio-technical transitions are gradual and long-term, taking approximately 40–50 years. Transitions are co-evolutive processes that include development of technological innovations as well as their selection and adaption, which refers to both immediate selection and adoption by consumers as well as broader societal embedding. The selection and adaption of radical technological innovations requires interaction between various social groups and multiple changes in the system. For example, changes

in these infrastructure, regulation, organizations, business models, user practices, which partly complement, partly substitute the existing ones. (Ibid., p.11-12.)

The multi-level perspective views socio-technical transitions as interaction of three analytical levels: niches, regimes and the broader landscape (Rip and Kemp, 1998; Geels, 2002; 2004; 2018). Socio-technical regimes are in the centre of transitions as they represent the selection environment for innovations and are the subject of transitions. Socio-technical regimes are defined as semi-coherent set of rules that have emerged around dominant technologies and that guide the action of actors that reproduce socio-technical systems (Geels, 2004; Raven et al., 2010). Regimes are constituted by incumbent actors to maintain, defend and incrementally improve the existing socio-technical system (Fuenfschilling and Truffer, 2014). Therefore, regimes create but stability, also inertia, path dependency and technological lock-ins (Geels 2004). Though theoretically regimes are typically presented as more or less uniform, empirical studies note that also incumbent regime actors employ different positions and attitudes towards different radical innovations (Bosman et al., 2014; Wesseling et al., 2015; Markard et al., 2016). Incumbent actors may resist, delay or derail transitions or, on the other hand, reorient their strategies to accelerate regime realignment (Geels, 2018; see also Wesseling et al., 2015; Apajalahti et al., 2018).

Due to the persistent nature of regimes, the approach of multi-level perspective suggests that radical innovations emerge in niches. Niches are defined as temporary protected spaces that shelter radical innovations from immediate selection pressures of the regime (Kemp et al., 1998; Geels 2004). Therefore, niches refer to new and relatively instable sets of rules and practices that are emerging around innovations (Geels, 2004; Geels and Raven, 2006; Raven et al., 2010). As radical innovations emerge, their performance might first be low, prices high and they might not fit to the rules of the existing regime, e.g. user preferences, market rules, legislation or other institutions (Geels and Schot, 2010). In other words, niche-innovations are not competitive within the existing regime. However, they can emerge and mature in niches, which allow divergence or misalignment from the rules of the current regime (Geels, 2004). The protected space can be provided by targeted

policy support, or alternatively, the innovation can gain foothold within a specific context, e.g. specific user segments or geographical areas (Kemp et al., 1998; Geels and Raven, 2006; Smith and Raven, 2012). In other words, niche construction can be a government-driven or a market-based process. Niches are constructed by niche advocates, that aim to promote the development and wider adaption of the radical innovation, including e.g. technology developers, companies, lobby groups and politicians (Raven at al., 2016). Although niches are peripheral to the existing regime, niche-innovations can be promoted by incumbent regime actors also (Geels and Schot, 2007; 2010; Geels 2018). For example, empirical studies have shown that incumbent companies can act simultaneously as niche advocates, while striving to preserve their status as regime actors (Ulmanen et al., 2009; Berggren et al., 2015; Wesseling et al., 2015; Apajalahti et al., 2018; Heiskanen et al., 2018). Furthermore, incumbent actors from other regimes can be significant niche advocates in the focal regime that is in the middle of re-alignment process (Raven and Verbong, 2007; Martin, 2016; Heiskanen et al., 2018).

The last level of the multi-level perspective, the socio-technical landscape, refers to the broader societal context over which singular actors have little or no influence (Geels, 2004; 2018). However, landscape developments influence regimes. Landscape developments refer to both slow-changing societal mega-trends as well as exogenous shocks, e.g. decline of birth rate, climate change or economic depression. Landscape pressures or persistent regime-problems open 'windows of opportunity' in the regime for niche-innovations to breakthrough. (Ibid.)

Geels along with his colleagues has proposed several typologies of socio-technical transition pathways – i.e. different alignments of niches, regimes and landscapes (Geels and Schot, 2007; 2010; Geels et al., 2016). In simplified terms, as niches and regimes co-evolve in the course of a socio-technical transition, successful niche-innovations either replace the regime, or merge into it. In cases closer to the latter characterization, niches contribute to a more gradual, rather than radical, transition. Whichever the case, the struggle between socio-technical regimes and niche-innovations remains in the centre of all socio-technical transitions (Geels, 2018).

It should be noted that though different in size and stability, socio-technical regimes and niches are similar type of structures – both are constellations of shared rules that structure the behaviour of actors (Geels 2004; Geels and Schot, 2010). Institutions, on the other hand, can be defined as socially constructed structures, that exist to provide stability and meaning to social behaviour, and that attain a high degree of resilience (Scott, 2008). Building on Scott's (2008) three pillars of institutions, Geels (2004) has proposed that regimes consist of three types of rules: regulative, normative and cultural-cognitive. The regulative dimension refers to formal rules, e.g. legislation and regulations. Whereas the normative dimension covers informal social rules e.g. values, norms and role expectations. Lastly, the cultural-cognitive dimension refers to symbol systems, e.g. words, gestures and shared beliefs, which almost subconsciously shape the meanings we attach to objects and activities. (Scott, 2008; Geels, 2004.) Therefore, institutions can be understood as more and less acknowledged, formal and informal "rules and practices", that construct the social world and guide human action. Regimes are well-established, yet not necessarily coherent configurations of institutions, that support and reproduce the current socio-technical system (Geels 2004; Raven et al., 2010). Whereas niches are characterized by instability and locality, as niche advocates still negotiate over best practices on how to develop and promote the innovation (ibid.). In other words, niches and regimes differ regarding their potential to influence actors, as regimes are highly institutionalized, whereas niches' institutional structure is yet forming (Fuenfschilling and Truffer, 2014). Therefore, I understand niches and regimes as constellations of established and emerging institutions, institutional structures that have develop or are developing around specific technologies.

In the context of this study, I consider the institutional structure of the Finnish energy sector to be the regime. Whereas the industry of aggregation is still raw, its institutional structure regarding e.g. regulation, market rules, user habits and market demand is still in need of further development. Therefore, I conceptualize the emerging rules and practices of the niche advocates of aggregation in Finland as a niche. However, as the niche is yet un-institutionalized, the niche advocates can be expected to have diverse interpretations,

practices and interests regarding the niche. Hence, different niche advocate companies can be expected to develop diverse business models for aggregation, that might embed different values and motivations or require different institutional changes in the regime.

2.2. Business models in sustainability transitions

Sustainability transition studies have traditionally concentrated on radical technologies as a source of disruptive change. However, in recent years, business models have increasingly gained attention within the literature (e.g. Hannon 2012; Tongur and Engwall, 2014; Huijben et al., 2016; Bolton and Hannon, 2016; Wainstein and Bumpus, 2016; Schaltegger et al., 2016; Sarasini and Linder 2018; Bidmon and Knab, 2018; Waes et al., 2018). Recent research has suggested that a viable business model might be even more important than the superiority of technology in regard to socio-technical transitions (e.g. Wainstein and Bumpus, 2016; Bidmon and Knab, 2018). In this subchapter, I present the concept of business model and some properties attached to it in recent academic literature. Followingly, I discuss how these properties of business models can be beneficial as analysing an emerging industry, and how they explain the three roles for business models in transitions, as proposed by Bidmon and Knab (2014; 2018).

There is no singular definition of the business model concept in the academic literature, as the research on business models has largely developed in 'silos' of different branches of literature (Zott et al., 2011). On a general level, business model can be defined as a description of how an organization creates, delivers and captures value (Osterwalder and Pigneur, 2010; Zott and Amit, 2010; Teece, 2010; Chesbrough, 2010). Hence, a business model can also be viewed as a reflection of the company's realized strategy (Casadesus-Masanell and Ricart, 2010). Following the work of Zott et al. (2011), I present three general properties of the business model concept.

First, the business model concept describes both the content and the process of 'doing business', i.e. what companies do and how they do it (Zott et al., 2011). Various conceptualizations of the elements of business model appear in the literature (e.g. Chesbrough and Rosenbloom, 2002; Osterwalder, 2004; Osterwalder and Pigneur, 2010;

Zott and Amit, 2010; Boons and Lüdeke-Freund, 2013). In line with e.g. Teece (2010) and Tongur and Engwall (2014), I adopt a framework that comprises three following elements:

1. Value Proposition – the value the company offers to its stakeholders, i.e. the value embedded in the product
2. Value Creation – how this value is created and delivered
3. Value Capture – how this value is monetized and distributed among company stakeholders

The elements can be used to create typologies of business models (Zott et al., 2011). For established business models it is possible to specify these elements, whereas for emerging business models some may be unclear (Boons and Lüdeke-Freund, 2013).

Secondly, business models are increasingly viewed as boundary-spanning systems within the literature (Zott et al., 2011). This is largely due to Zott and Amit's (2010) idea of business models as 'activity systems', which refer to a system of interaction between the focal company and its multiple stakeholders, e.g. suppliers, partners and customers. Hence, the business model spans the boundaries of the focal organization. A business model's total value can be defined as a sum of the value it creates for all its stakeholders (ibid.). The approach highlights the importance of networks for a successful business model.

Thirdly, business model can be either a vehicle for innovation or a subject of innovation itself (Zott et al., 2011, p.1034). Business models enable value capture from novel technology, i.e. the process of commercializing novel technology (Chesbrough and Rosenbloom, 2002). Business models can also be innovations themselves, and hence a source of competitive advantage (Chesbrough, 2010). Companies that strive for competitive advantage can alter the elements of their business model to execute their strategies in the market (Casadesus-Masanell and Ricart, 2010). The approach highlights the relation of company strategies and business models.

For these three properties, I view the value of business models as a unit of analysis as following. By identifying the elements of a business model, it is possible to gain knowledge of the nature of the business, as well as of the stakeholders that are crucial for the emerging industry. Hence, business model elements enable but comparing the business models of different companies, also seeing their interrelatedness. Furthermore, as a subject to innovation and source of competitive advantage, business models reflect the strategy of the company regarding transitions (Huijben et al., 2016). Hence, business models can shed light on the future development of the industry.

Further, related to these properties of business model, Bidmon and Knab (2014; 2018) propose three roles for business models within socio-technical transitions. The first role of business models is stagnating, as incumbent business models restrain transitions. As part of the existing regime, incumbent business models benefit from and support the current institutional structure. As these incumbent business models in their part constitute the regime, they reinforce the stability of the current socio-technical system. (Bidmon and Knab, 2018.)

On the other hand, business models can boost transitions by acting as intermediates between technological niche-innovations and regimes, supporting the institutionalization of novel technologies. Hence, the second role of business models in transition is intermediary. These type of intermediary business models can be either novel or existing business models. (Bidmon and Knab, 2018.) As described above, business models enable the commercialization of technologies (Chesbrough and Rosenbloom, 2002; Chesbrough, 2010), and hence business models are needed for the market entry of niche-technologies (Schaltegger et al., 2016; Bolton and Hannon, 2016). Additionally, due to the boundary-spanning nature of business models (Zott and Amit, 2010), business models can widen the networks of the niche and hence widen its resource base (Bolton and Hannon, 2016; Bidmon and Knab, 2018). Hence, business models support the development of technology and vice versa, technological development might encourage business model innovation (Tongur and Engwall, 2014; Bidmon and Knab, 2018). However, it should be noted, that though incumbent business models can support the institutionalization of a

novel technology, they simultaneously reinforce the stability of the existing regime. Therefore, adopting an incumbent business model might hamper the overall radicality, and the potential sustainability of the innovation.

Lastly, a business model itself can be a divergent innovation – a business model niche – that drives the transition independent of technological development (Bidmon and Knab, 2018). Further, Bidmon and Knab (2018, p.909-910) suggest that novel business models emerge at a higher level of institutionalization than novel technologies, and hence can contribute to regime reconfiguration more directly and powerfully. Therefore, business models can either support, drive or hamper socio-technical transitions, depending on the nature and context of the business model (Bidmon and Knab, 2018; Waes et al., 2018).

I adopt business model as a unit of analysis, to study the role of novel business models during the institutionalization of the aggregation industry and its relation to the wider energy transition in Finland. As establishing business models entails creating networks and shared understandings within them, I understand business models as constellations of rules and practices within its stakeholders. Business models for aggregation might support or challenge the incumbent energy regime, while simultaneously contributing to the emerge of the industry of aggregation.

2.3. Institutionalization and empowerment of niches

I view the development, selection and adaption of niche-innovations as institutionalization – a process during which new rules and practices emerge and become legitimated (Maguire et al., 2004). Institutional theory suggests that legitimacy can be achieved through strategic use of discourse (e.g. Phillips et al., 2004). In recent years, the discursive approach on societal change has been increasingly adopted within sustainability transition studies as well (e.g. Ulmanen et al. 2009; e.g. Verhees et al., 2013; Boon et al., 2014; Bosman et al., 2014; Kern et al. 2015; Lauber and Jacobsson, 2016; Markard et al., 2016; Raven et al., 2016; Martin, 2016; Bush et al., 2017). I follow this line of research and adopt the framework of niche empowerment (Smith and Raven, 2012) to study how companies strive to legitimate their novel business models and affect the

institutional forming of the emerging industry of aggregation. To understand the process of institutionalization and how it can be governed, I describe the role of legitimacy and discourses in creating, maintaining and challenging institutions. Followingly, I discuss how these concepts relate to institutionalization of niches and how it can be facilitated by strategic linguistic action, i.e. niche empowerment.

As institutions can be defined as socially constructed structures that guide and give meaning to human behaviour (Scott, 2008), the concept of legitimacy is central to the processes of institutionalization. Legitimacy can be understood as a common perception, that the actions of an entity are socially desirable or appropriate in a specific context (Suchman, 1995). Hence legitimacy implies alignment with 'some socially constructed system of norms, values, beliefs, and definitions,' though gaining legitimacy is not dependent on any specific "gatekeepers" (Suchman, 1995, p.574). Institutionalization itself, can be defined as a process during which new rules and practices emerge and become legitimated (Maguire et al., 2004).

Institutional theory views linguistic action and discourses as the main tool for achieving legitimacy (e.g. Phillips et al., 2004; Munir and Phillips, 2005; Lawrence and Suddaby, 2006; Battilana et al., 2009). Linguistic action refers to individuals and organizations producing text to create shared meanings. Shared meanings then constitute discourses. A discourse can be defined as 'an interrelated set of texts, and the practices of their production, dissemination, and reception, that brings an object into being' (Parker, 1992 in Phillips and Hardy, 2002, p.3). Like institutions, discourses exist to guide the perceptions and behaviour of actors. As discourses give meanings to objects and actions, they construct the social world. However, discourses also exclude alternative meanings and ways of interpreting the world. (Phillips and Hardy, 2002.) Meaningful discourses affect strongly how we presume and interpret reality, which enables them to construct institutions (Phillips et al., 2004). Organizations and individuals strive to reshape reality and forward their interests by employing existing discourses and developing new ones (Munir and Phillips, 2005). Meaningful texts affect discourses and discourses produce

institutions (Phillips et al., 2004). Therefore, 'those who control the dominant discourse can control the direction of change' (Ulmanen et al., 2009, p.1407).

For every institution there finds at least one discourse that constructs and supports the institution (Phillips et al., 2004). As I study the emerging industry of aggregation and its contribution to the transition of the Finnish energy sector, we discuss several interrelated institutions that include numerous discourses. The emerge of this kind of institutional structure is much more complex than of a single institution, for there are multiple sets of structured and semi-structured discourses, which constitute as well as challenge the institutional structure (ibid.). Hence, institutionalization of a novel industry is quite an unpredictable process. Drawing from Tolbert and Zucker's (1999), Fuenfschilling and Truffer (2014, p.775) describe the institutionalization of structures as following: 'The structure has become normative or even taken for granted, as discourse about it has settled down, change in design is rare and failures rather low.' Furthermore, the degree of institutionalization is deeper, as ideas and values are translated from discursive level into practice, as technologies, regulations, practices, organizations etc. However, institutionalization is not viewed as an established state, instead, different structures attain different degrees of institutionalization. (Ibid.)

As presented above in the subchapter 2.1, niches and regimes are sets of rules and practices, that differ regarding their degree of institutionalization (Geels and Schot, 2010; Fuenfschilling and Truffer, 2014). Niches are characterised by two qualities. Firstly, by instability and broadness of the rules and practices of niche advocates, and secondly by protection from the external regime pressures (Geels, 2004; Geels and Raven, 2006; Raven et al., 2010). Therefore, institutionalization of a niche is a two-dimensional process, which entails both the development of more stable shared rules among the niche advocates, as well as gradual exposure to selection pressures of the regime (Geels and Raven 2006). The overall process of niche construction can be divided into three iterative processes: shielding, nurturing and empowering (Smith and Raven, 2012). Shielding refers to processes that restrain the selection pressures of the regime, i.e. the protective conditions and measures. Nurturing includes processes that support the development of

niche-innovation: visioning, learning and networking. Empowerment on the other hand, aims to grow the niche-innovation beyond its protective space. Empowerment refers to processes that strive to gain legitimacy for the niche-innovation, to eventually make it competitive within the regime. (Ibid.) However, it should be noted, that these three processes of niche construction are not linear, nor follow one another orderly (Verhees et al., 2013; Boon et al., 2014).

Further, as discussed above, for niches and regimes differ in their degree of institutionalization, they differ in their potential to influence the interpretation and behaviour of actors (Fuenfschilling and Truffer, 2014). As networks of niche advocates grow larger and their rules and practices become more stable and constraining, niches and regimes relation to agency reverses, making it possible for niche-innovations reconfigure or even replace regimes (Geels and Schot, 2010). However, in the beginning, it is likely that there exist several versions of the niche-innovation, and around them various rules and practices. Gradually, as the niche matures, the diverse rules and practices around niche-innovation diffuse, and the niche becomes 'more articulated, specific and stable' (Geels and Raven 2006, p.378). Regarding an emerging industry, in the beginning, various novel business models can be expected to occur, but in time, it is likely that one of them becomes dominant or alternatively, there remains multiple business models that serve specific market segments (Waes et al., 2018). Which ones – if any – of the various and possibly contradicting niche rules and practices come to institutionalize, depends on which one of them manage to gain legitimacy within the niche advocates and the wider audience.

By introducing the idea of niche empowerment Smith and Raven (2012) strive to explain agency and politics within socio-technical transitions, meanwhile strengthening the literature's connections to Institutional theory. Smith and Raven define empowerment as strategic discursive action of niche advocates, which purpose is to gain legitimacy for the niche-innovation by linking it to wider societal discourses. Empowerment refers to processes during which niche advocates open the niche for competition within the regime, aiming to either remove, or institutionalize, the protected space. (Ibid.) The success of

empowerment is dependent on the institutionalization of the used discourses, and whether they lead to institutional changes in the regime (Smith and Raven, 2012; Verhees et al., 2013).

Smith and Raven (2012) differentiate between two empowerment strategies, 'fit-and-conform' and 'stretch-and-transform'. Fit-and-conform empowerment refers to discursive strategies that present the niche-innovation as being 'competitive with mainstream socio-technical practices in otherwise unchanged selection environments' (Smith and Raven, 2012, p.1030). These strategies aim only for minor changes in existing institutions and infrastructure of the socio-technical system. Fit-and-conform strategies are constructed to appeal to the current assessment criteria of the regime and targeted at actors that have dominant status and power within the incumbent regime. For example, protection of the innovation is viewed as temporal and the innovation is presented to support the renewal and continuity of the current system. In terms of socio-technical transition, fit-and-conform empowerment tames disruptive innovation, contributing to gradual rather than radical transition. (Smith and Raven, 2012.)

In contrast, stretch-and-transform empowerment aims to change selection environments to better suit the novelty (Smith and Raven, 2012). With stretch-and-transform strategies, niche actors aim to drive institutional reforms to re-structure and even replace current regime institutions. Therefore, these strategies are typically targeted at actors who might have interest to change or destabilize regime, e.g. actors from political decision making, media or competing industries. Stretch-and-transform strategies are likely to relate the niche-innovation to broader societal problems, presenting it as part of a solution to these problems. (Ibid.) Actually, stretch-and-transform empowerment does not aim to fully removing shielding, but rather institutionalizing parts of it (Verhees et al., 2013).

In practice, these two opposite strategies can occur simultaneously, and it might be difficult to separate between them (Verhees et al., 2013; Boon et al., 2014; Kern et al., 2015). In fact, the combination of fit-and-conform and stretch-and-transform discourses can result in very effective empowerment strategy (Raven et al., 2016). Furthermore,

niche actors seem to alter their legitimation strategies according to the development of the wider socio-political context, or even by the audience (Kern et al. 2015; Raven et al., 2016; Huijben et al., 2016). Hence, I do not assume that the niche advocate companies would choose and clearly follow one strategy, but rather construct several empowerment strategies out of various discourses, that might even contradict with one another.

Smith and Raven (2012) suggest that the discursive choices of niche and regime actors reveal conflicting interests embedded in the institutionalization of niche innovations. As discourses are strategically used to maintain, reshape and create institutions, analysing discourses can shed light on the development trajectories of socio-technical transitions. Furthermore, Huijben et al. (2016) point out the interrelatedness of empowerment strategies and business models: the design of business model elements reflects the strategies that the companies choose for dealing with different regime features. Apajalahti et al. (2018) present, that a successful combination of business and discursive activities explains the ability of incumbent energy companies to gain a foothold and shape emerging industries. Hence, I assume that the analysis of the empowerment strategies of the companies in relation to their business models can paint a wholesome picture of the company strategies regarding the novel industry as well as the wider energy transition.

To sum up, I understand the institutionalization process of a niche as interaction between regime and niche. During the process, both niche and regime evolve, as new institutions are created, and old ones changed. The aggregation niche has successfully institutionalized, as the heterogenous rules and practices around it unify, gain legitimacy and become aligned with the energy regime, either by replacing some of the current regime institutions or by adapting to them. The niche has institutionalized as people come to shared understanding of its meanings. The process can be facilitated by strategic use of discourses, i.e. niche empowerment. In the following subchapter, I discuss the conditions and positions that might affect which type of empowerment strategies the niche advocate companies choose to employ as well as their success.

2.4. Conditions that affect niche empowerment

As discussed above, niche advocates strategically employ discourses to legitimate their agendas and institutionalize niches, conceptualized as niche empowerment (Smith and Raven, 2012). The approach of niche empowerment, and accordingly empirical studies utilizing the approach, have concentrated examining niche-regime interaction, often presenting niches as more or less uniform in their empowerment strategies (e.g. Verhees et al., 2013; Boon et al., 2014; Kern et al. 2015; Raven et al., 2016; Bush et al., 2017). To my understanding, besides Martin (2016) and Huijben et al. (2016), not many empirical studies on niche empowerment have deeply examined the diversity – i.e. the different interests and preferred institutional changes – among the niche advocates during empowerment processes. Therefore, I view some recent literature on the strategies and roles of incumbent and newcomer companies in transitions and emerging industries (e.g. Hockerts and Wüstenhagen, 2010; Tongur and Engwall., 2014; Wesseling et al., 2015; Apajalahti et al., 2018; Heiskanen et al., 2018), to gain insight on the different motivations, resources and positions of niche advocates that might affect which empowerment strategies they choose. I utilize the framework of niche empowerment to study but regime and niche interaction, also the possible competition or tensions within the niche advocates during a emerge of the novel industry.

Though the dichotomy of fit-and-conform and stretch-and-transform strategies refers to how niche advocates position the niche in relation to the regime, Smith and Raven (2012) recognize that there is likely to occur disagreements within the niche advocates over which institutional reforms best forward the wider adaption of the niche. Diversity in and competition between discourses usually exists, for the institutional structure of a niche is yet weak and institutional voids might exist. (Ibid., p.1032.) Further, each niche advocate has different interpretations of the niche, and even more so, different interests regarding the niche. Empirical studies have found, that niche entrepreneur's strategies can be very heterogenous regarding which regime features they choose to challenge or comply to (Huijben et al., 2016), and that niche advocates may frame the niche differently according to their individual interests, competing who can shape the niche's development (Martin,

2016). Moreover, though legitimacy can be built by linguistic action and use of discourses, the success of these activities is highly dependent on the social position of the actors and the societal context (e.g. Battilana et al., 2009). Niche advocates can include actors from various societal domains that hold different social positions. The social positions of actors affect how they understand the niche-innovation, why they are interested in it and their capabilities to forward it. These conditions – interests, capabilities and interpretations of niche advocates as well as the wider societal context – can be expected to affect which type of empowerment strategies different niche advocates choose as well as their success.

The research field of sustainability transition studies embeds a normative goal of forwarding transitions towards sustainability, and in especial socio-technical approaches to transitions often examine transitions from the viewpoint of emerging sustainable innovations (Geels and Schot, 2010; Markard at al., 2012). However, the motivations of niche advocates to develop niche-innovations and forward their wider adaption can be many besides the aim to forwarding sustainability. As Markard et al. (2016) have notified studying advocacy coalitions in Swiss energy transition policy, besides the traditional juxtaposition between environmental and economic values, also the competition on market shares and positions between emerging and established industries is a significant influencer of political interests during energy transition. Incumbent companies are suggested to become niche advocates and innovators of novel technologies and business models to survive socio-technical transitions (Hockerts and Wüstenhagen, 2010; Tongur and Engwall, 2014; Wesseling et al., 2015). However, in their recent study on Finnish energy companies Apajalahti et al. (2018) suggest, that the incumbents have not only tried to survive, but take a leading position within the energy transition. Incumbent energy companies have contributed to niche networks and novel industries rather early, striving to actively shape the emerging field (ibid.). Hence, in the case of incumbent companies, niche-innovations are often presumed to be motivated by direct and indirect business interests, whereas smaller newcomer companies are sometimes generalized as progressive drivers of sustainability (Hockerts and Wüstenhagen, 2010).

How different niche advocates succeed in directing the development of niche-innovation, is dependent on the internal and external power relations of the niche (Smith and Raven, 2012, p. 1032). Incumbent regime actors have typically more possibilities to conduct empowerment strategies, as they possess more legitimacy, and hence capabilities, in comparison to less organized newcomers (Kern at al., 2015; Raven et al., 2016). Further, empirical studies on niche empowerment highlight the importance of networks and network building for successful empowerment (Kern et al., 2015; Raven et al., 2016), despite that networking is an activity that is typically associated with the processes of niche nurturing within niche theorization (e.g. Smith and Raven, 2012). Especially the participation of actors that are legitimate in the eyes of recourse providers, is deemed crucial for successful empowerment (Raven et al., 2016). Within the Finnish energy sector, incumbent energy companies have typically wider and more established networks in comparison to newcomer companies (Apajalahti et al., 2018). However, incumbent energy companies are known to cooperate with newcomer companies to innovate for new energy solutions (Heiskanen et al., 2018).

It seems that as incumbent companies become engaged with an emerging industry, its development takes a leap (Hockerts and Wüstenhagen, 2010; Wesseling et al., 2015; Apajalahti et al., 2018). However, the involvement of these regime actors also seems to dull the radicality, or sustainability, of the innovations (Hockerts and Wüstenhagen, 2010; Martin, 2016; Apajalahti et al., 2018). This might be for incumbent actors have even as niche advocates more legitimacy to promote the niche-innovation than more marginal actors, but they are also more embedded in the current regime. This paradox of embedded agency is well notified within institutional theory (Seo and Creed, 2002). Key actors in an organizational field, e.g. industry, may have power and resources to implement change, but they usually lack the motivation. This is for incumbent actors but benefit from the current institutions, the current institutions also affect how they perceive and understand the regime, and for example, its need for change. Whereas peripheral actors, e.g. novel companies in the energy sector, may have the incentive to create new or challenge existing

institutions, but often lack the legitimacy and resources. (Ibid.) Therefore, embeddedness can be a constraining as well as an enabling condition at the same time.

In line with the paradox of embedded agency, fit-and-conform strategies seem to be more prevalent than stretch-and-transform strategies (Raven et al., 2016). Raven et al. (2016) argue that niche advocates may choose fit-and-conform strategies to convince powerful actors, as the successful implementation stretch-and-transform strategies would require significant political power. However, though incumbent regime actors have legitimacy and resources to conduct stretch-and-transform strategies (Kern at al., 2015), even as niche advocates they seem to conduct regime conformist fit-and-conform empowerment strategies (Martin, 2016; Bush et al., 2017). Bush et al. (2017) suggest that incumbent actors avoid radical institutional changes, as they might threaten the focal organizations, or their stakeholders' interests. Whereas smaller niche advocates – that are less embedded in the regime institutions – might lack the legitimacy and resources to successfully conduct stretch-and-transform discourses (ibid.). In their case study, Lauber and Jacobsson (2016) present that the German Renewable Energy Act, which was originally designed as a stretch-and-transform strategy, in time turned towards fit-and-conform strategy, largely due to incumbents trying to save their established business models. Further, Martin (2016) notes, how regime actors succeeded in framing the niche of sharing economy in commercial terms, conforming it to the general market-oriented discourse. Based on the studies, I assume that incumbent niche advocate companies employ more fit-and-conform discourses. Further I assume, that it is possible that as small newcomer companies cooperate with incumbent companies, they also result in employing less regime-threatening fit-and-conform strategies.

However, as discourses are dependent on the context, also empowerment strategies are noticed to change over time according to the societal context, e.g. political atmosphere or development of the institutional environment (Smith and Raven, 2012; Kern et al. 2015). As transitions proceed, in some cases fit-and-conform strategies are noticed to turn towards, or be accompanied by, more radical stretch-and-transform strategies (Verhees et al., 2013; Wesseling et al., 2015). Also, incumbent companies are noticed to switch

towards stretch-and-transform strategies, as it becomes beneficial in terms of their business strategy (Wesseling et al., 2015). On the other hand, Huijben et al. (2016) suggest that the level niche shielding affects how radical empowerment strategies niche advocates choose. Strong protective measures, e.g. large subsidies, can trigger fit-and-conform strategies rather than stretch-and-transform strategies, as the external conditions enable more straightforward solutions and there is less need for creativity. In other words, a low level of protection can lead to stretch-and-transform strategies, even if the niche is in an early development phase. (Ibid.)

To sum up, the type of empowerment strategies the different niche advocates choose, is dependent on their social position – e.g. capabilities and interests – as well as the societal context. In addition to the shared agenda to forward the wider adaption of market-based, incentive-based DR in Finland, the niche advocate companies can be expected to have diverse interests and interpretations regarding the institutional development of the emerging industry. Further, the companies with business models for aggregation contain both newcomers and incumbents of the Finnish energy regime as well as other regimes. These different social positions of niche advocate companies may affect their interests towards the niche, capabilities to execute empowerment strategies, and hence the type of empowerment strategies they favour. Hence, I apply the framework of niche empowerment and business models as a unit of analysis to study but niche–regime interaction, also the diversity and possible contradictions in the strategies and motivations of the niche advocate companies. I view the empowerment strategies of the niche advocate companies to occur at two levels: niche-overarching and niche-internal (see Table 1).

Table 1. Analytical framework for empowerment strategies

	Fit-and-conform strategies	**Stretch-and-transform strategies**
Overarching discourses	Strategies that aim to legitimate the industry by employing discourses that present the niche as complementary to the regime	Strategies that aim to legitimate the industry by employing discourses that present current regime features as problematic
Internal sub-discourses	Strategies that aim to legitimate specific business models by employing discourses that present the business model as complementary to the regime and other business models	Strategies that aim to legitimate specific business model by employing discourses that present current regime features and other business models as problematic

Overarching discourses are more-or-less shared by the niche advocate companies and should portrait the already established shared meanings of the niche. Whereas internal sub-discourses are less prevalent, aimed to legitimate some specific business models for aggregation, and hence might contradict with the interests of other niche advocate companies. The analysis of sub-discourses can bring out possible tensions and conflicts during the institutionalization of the niche-innovation.

3. METHODOLOGY

The chapter presents the research design and methodological choices of the study. First, subchapter 3.1. presents the research approach of critical discourse analysis and business models as a unit of analysis. Flowingly, subchapter 3.2. describes my interpretation of the research context. Sub-chapter 3.3. presents the methodical choices of data collection and the sample of the study. Finally, the process of data analysis is presented in subchapter 3.4.

3.1. Research approach

As the objective of the study is to describe the emerging industry of aggregation and its relation to the energy transition in Finland, a qualitative research approach is adopted. Qualitative research is characterized by belief, that reality is socially constructed, i.e. produced through shared meanings (Eriksson and Kovalainen 2008). Therefore, qualitative approach aims for holistic understanding of relatively new phenomenon that is not yet comprehensively understood (Ibid.). Within the research tradition of qualitative analysis, I adopt the approach of critical discourse analysis and business models as a unit of analysis to study the research issue.

As described in the previous chapter, institutional change and creation are increasingly understood and studied as discursive processes within institutional theory (Phillips et al. 2004; Munir and Phillips, 2005; Lawrence and Suddaby, 2006; Battilana et al., 2009). More recently, this discursive approach has been adopted in sustainability transition studies as well (e.g. Smith and Raven, 2012; Boon et al., 2014; Kern et al., 2015; Raven at al. 2016; Martin, 2016; Bush et al., 2017). Basing on the approach of critical discourse analysis, Phillips et al. (2004) propose that institutions are constructed through provision of text. Texts reflect actions, meaningful texts construct discourses, and significant discourses construct institutions. Therefore, by analysing language and ideologies, it is possible to understand how legitimacy is built and questioned to support or challenge the current institutional structure (Munir and Phillips 2005). Following this line of research,

I have chosen the approach of critical discourse analysis (CDA) (Fairclough 1992; Wodak and Meyer 2001), to study the institutionalization of the industry of aggregation.

Discursive approaches in general stem from the idea, that social reality is constructed through the use of language (e.g. Pietikäinen and Mäntynen, 2009). Fairclough (1992) describes critical discourse analysis in contrast to "non-critical" linguistics. In his words,

> ... critical linguistics does not just describe discursive structures, but also how discourse is shaped by relations of power and ideologies and the constructive effects discourse has upon social identities, social relations and systems of knowledge and belief, neither of which is normally apparent to discourse participants. (Fairclough, 1992, p.12.)

Critical approaches to discourse therefore view dominant discourses as stabilizing conventions, that hide the effects of power and ideology in the production of meaning, which results in that dominant discourse are often taken as self-evident (Wodak and Meyer, 2001). However, discourses are never completely cohesive, nor able to determine social reality alone (Phillips et al. 2004). Hence, there always remains the opportunity for actors to influence discourses by producing and spreading texts (Fairclough, 1992). Munir and Phillips (2005, p.1667) propose that 'by strategically producing and disseminating various texts, organizations seek to develop discourses that suit their particular interests and advance their preferred technologies'. These theoretical assumptions provide the basis for CDA, that make it a suitable approach to study complex and multi-dimensional processes of emerging social entities, such as organizations, institutions or industries (Phillips and Hardy, 2002).

A discourse can be defined as 'an interrelated set of texts, and the practices of their production, dissemination, and reception, that brings an object into being' (Parker, 1992 in Phillips and Hardy, 2002, p.3). Hence, discourses cannot be studied directly, but only through interpreting texts that constitute them (Fairclough, 1992). Thus, CDA bases on systematic analysis of texts, which enables analysis of the relationship between discourses and social reality (Phillips et al., 2004). Besides written text, there are also other forms to

forward meanings, e.g. discussion, pictures or videos, which can be examined as text. (Phillips and Hardy, 2002; Pietikäinen and Mäntynen, 2009). However, individual or isolated texts tell practically nothing of the reality. Therefore, CDA studies of collections of texts (Fairclough, 1992). The research data of the study includes interviews and desk study of company websites, described in more detail below in the subchapter 3.3.

In line with Fairclough (1992, p.71–73), I consider discourse analysis to move simultaneously at the three dimensions of discourse: text, discursive practice and social practice. The first dimension of text refers to the immediate research data. Secondly, discursive practice refers to how text is related to and communicates with existing discursive practices, e.g. other texts, genres or discourses. Finally, the third dimension of social practice refers to how text and discourses are situated in the wider social and historical context. CDA is equally interested in all the three levels and their relationships. Texts are understood in relation to discourses and other discursive practices, which must be interpreted within a particular context. (Ibid.)

Further, related to the three dimensions of discourse, the concepts of intertextuality and context are essential within the framework of CDA. What makes texts meaningful, is how they link to other texts (Fairclough, 1992). By intertextuality, Fairclough refers to the ability of texts to transform prior texts and existing conventions, like discursive practices, to produce new conventions. For example, by referring to prior texts or separating them from their context, it is possible to affect how existing texts are interpreted and create new meanings. However, not all actors have the same resources for successful textual innovation, as discourses depend on social power relations (ibid.). Therefore, CDA views actors as social and historical subjects that produce text and create meanings in interaction with other texts (Wodak and Meyer, 2001). The three dimensions of discourse highlight how besides interpreting text – the research data itself – CDA requires analysis of the research context. I describe my interpretation of the research context of the emerging industry of aggregation in the following subchapter 3.2.

All in all, CDA provides a framework to explore politics in creation, maintenance and dismantle of institutions. As I am interested in how companies with business models for aggregation strive to gain space, power and other resources in the emerging industry, CDA is a suitable approach for analysis. CDA offers methodological tools that I can utilize to identify possible contradictions within the seemingly unified aim of forwarding the wider adaption of DR, by interpreting the texts that the companies provide.

Further, I choose business models as a unit of analysis and analyse the discourses that the companies employ in relation to their business models for aggregation. As discussed above in the subchapter 2.2, the business model concept enables examining the similarities, differences as well as the interrelatedness of different companies' business activitities and products (e.g. Zott et al, 2011). Further, business models can be understood as a reflection of the company's realized as well as future strategy (e.g. Casadesus-Masanell and Ricart, 2010; Huijben et al., 2016). As emerging business models imply a certain degree of institutionalization (Bidmon and Knab, 2018), I assume that a business model but reflects the empowerment strategy of the company (Huijben et al., 2016), also reinforces the continuity of that chosen strategy. I view the interrelatedness of business models and company strategies as following: business models reflect the company's realized strategy but might also reciprocally affect the future strategies of the company. As one company can have several different type of business models for aggregation, the different business models might affect which discourses the company favours in its legitimation. Therefore, analysing discourses using business models as a unit of analysis – rather than companies for example – can explain contradictions in the empowerment strategies of the companies. I assume that combining business model and critical discourse analysis can provide a wholesome picture of the company strategies regarding the novel industry as well as its relation to the wider energy transition in Finland.

3.2. Research context

As discussed in the previous subchapter, the concept of context or history is initial in the tradition of discourse analysis (Wodak and Meyer, 2001; Pietikäinen and Mäntynen, 2009). According to Fairclough and Wodak (1997, p.276) 'discourse is not produced without context and cannot be understood without taking the context into consideration'. Therefore, discourses are historical, and the context always frames the interpretation of the data. The importance of context has been also notified in the empirical studies concerning legitimation strategies of niche empowerment (e.g. Kern et al., 2015), as discussed above in the subchapters 2.3. and 2.4. of the theoretical framework. As the research focus is on novel business models for aggregation that are targeted at Finnish electricity markets, I briefly introduce the general drivers and barriers that relate to the emerging industry.

The study positions in the wider context of the global energy transition, which refers to fundamental changes in the production and consumption of energy, driven especially by the aim to cut down CO2 emissions and mitigate climate change. Accordingly, Finland aims to phase out the use of coal for energy and increase the share of renewable energy to over 50 percent of final energy consumption by 2030 (TEM, 2017). These aims lead to significant changes in the production and consumption patterns of electricity, increasing the need for flexibility in the electricity system. Hence, Finland has set a goal of wider utilization of market-based DR (TEM, 2015) and is granted to be a forerunner in adopting market-based DR in comparison to other European countries (SEDC, 2017). However, aggregation is yet a novel area of business, especially regarding customer segments of small-time electricity consumption, and the field is quite un-institutionalized. For example, there remains questions of some market rules and regulation considering incentive-based DR and aggregation, and the consumers are in general unaware of the concept and business case of DR (Annala et al., 2018; TEM, 2018b). Also, it is to be noted that also EU and Nordic-level policies strongly affect the national regulation of the Finnish electricity sector and DR markets (see Annala et al., 2018). Studies comparing DR business models or programs between different economic regions notice that the

commonness of DR is more influenced by the institutional environment than by technologies or infrastructure (Burger and Luke, 2017; Paterakis et al., 2017). Hence, the future development of the institutional environment will change the premises for the aggregation business in Finland, and the companies with business models for aggregation have limited capabilities to affect this development. Therefore, the study takes place in a historical moment, in a certain institutional environment that on the other hand encouraged by the government but shadowed by insecurity of the regulatory development.

On the other hand, though the Finnish energy sector and electricity markets are currently going through a radical transformation, they can be characterized as highly institutionalized. As described in the flowing subchapter 3.2, some of the sample companies with business models for aggregation are incumbent actors and some newcomers in the energy sector, they possess quite different social positions. The different social positions of the niche advocate companies mean that they position differently in relation to the formal and informal institutions of the Finnish energy regime, which further affects their motivations and capabilities to act in the emerging industry of aggregation. However, as data gathering happened through interviews, the immediate context of the study took place in a setting, where the interviewees were relevantly free to present their agendas, though conscious of their presumed audience. Hence, in the context of the study, all the sample companies – though embedding very different social positions in the energy regime – got approximately the same amount of space to present their views.

3.3. Data collection and Sample

The data of the study was gathered by a tentative desk study on the company websites and semi-structured interviews of companies that have launched or are developing business models for aggregation. The sample was limited to companies, therefore excluding the views of other actors who contribute to the development of the emerging industry, e.g. politicians, public officers, distribution system operators, lobby

organizations, electricity users. The decision was made, for the initial interest of the study are novel business models for aggregation, the dynamics within and between the niche advocate companies and the regime, and how the previous affect the institutionalization of the industry and contribute to the wider energy transition in Finland. However, to gain a pre-understanding of the field, two specialists were interviewed, one from Fingrid and another from Finnish Energy, i.e. Energiateollisuus ry.

The sample was chosen by first performing an internet-search detecting companies that might provide DR services, using search words such as 'demand response' (kysyntäjousto), 'flexibility' (jousto), 'energy management' (energianhallinta) or 'aggrgegator' (aggregaattori). The initial group of companies was further investigated by performing a desk study on company websites and by sounding phone calls to some of the companies. The aim of this tentative research was to find out what the services offered in the net sites included in practice, or if the companies had plans considering incentive-based DR and aggregation. The final sample was limited to companies that either currently develop or have launched business models for aggregation. Business models for aggregation refer to business models that base on incentive-based DR programs and which target relevantly new customer segments for DR, e.g. small and medium sized industrial and commercial (C&I) and residential consumers. Aggregated loads can be bid to marketplaces of electricity, sub-aggregated to another party or used for imbalance settlement. These type of business models are new and possibly disruptive in the Finnish electricity markets, and there is not yet data about these types of business models.

The data was gathered using a mix-method of desk study and semi-structured interviews, to form more comprehensive view on the nature of the novel business models for aggregation. Based on the tentative desk research, many of the business model were still quite raw, or there was not comprehensive information found about them. Therefore, qualitative interviews was chosen as a data collection method to gain deeper insight of the business models, the ideas behind them and their future development. Semi-structured interview approach was chosen to conduct the interviews, as the approach ensures that specific dimensions of the research are addressed, while leaving space for the

interviewees to offer new meanings to the research issue (Galletta, 2013). Hence, as conducting a semi-structured interview, the interviewer follows an interview guide, but can also follow topical trajectories that stray from the guide, when it is deemed interesting for the research. The interview guide was built based on the research aim and insight from business model and sustainability transition literature. Some theoretical concepts were operationalized to better fit common language. The aim of the interviews was to find out what type of business models for aggregation companies develop or have launched, what they view as most significant challenges and drivers of the emerging industry and how they position themselves in relation to other companies with business models for DR and the Finnish energy sector.

The companies were sent an interview request by email and in some cases phone call. The final sample includes 14 companies, consisting of small and medium sized Finnish and European companies, a few large international companies, as well as some Finnish energy companies. Table 2 presents the sample of companies by year of founding, industry background and country of origin.

Table 2. Sample companies

Company	Founded in	Industry background	Country of origin
1	<1950	Energy company	Finland
2	<1950	Energy company	Finland
3	<1950	Energy company	Finland
4	1990-2000	Energy company	Finland
5	2005-2010	Aggregator, ICT	Foreign
6	>2010	Aggregator, ICT	Foreign
7	2005-2010	Aggregator, ICT	Foreign
8	2005-2010	Aggregator, ICT	Finland
9	<1950	Building automation, ICT, other	Foreign
10	2000-2005	Building automation	Finland
11	1995-2000	Energy	Finland
12	>2010	ICT	Finland
13	1950-1990	ICT	Finland
14	1995-2000	ICT	Finland

The company representatives interviewed were chosen based on the desk research or chosen by the companies themselves. The interviewees' positions within the companies varied between CEOs and product, business development or sales managers. All the

interviewees were men. Twelve of the 14 interviews were conducted in Finnish and two in English. The interviews took place during June-August 2018. The time of the interviews varied from 40 to 110 minutes. The interviews were transcribed in verbatim style, i.e. word-to-word in spoken language.

3.4. Data analysis

The data analysis was two-fold, consisting of tentative content analysis and the initial discourse analysis. In the context of qualitative research, content analysis refers to analysis the content and meaning of research data (Eriksson and Kovalainen, 2008). I used content analysis to get an overall picture of the data and for its preliminary organization. I coded the data with Nvivo-program, structuring the analysis with tentative categories based on business model elements and niche empowerment strategies discussed in the chapter of theoretical framework. Therefore, the content analysis paved way for further interpretation through the framework of critical discourse analysis (CDA). The initial discourse analysis is divided as two sub-chapters according to the two research questions.

In the first part of the analysis, I answer the research question '*What kind of novel business models for aggregation are emerging in the Finnish electricity markets?'*. I approached the question by identifying the three business model elements for each business model for aggregation (see Appendix 1). Based on this preliminary analysis I categorized the emerging business models for aggregation under three generic archetypes, which provide an overall picture of the business activity in the emerging industry.

In the second part of the analysis, I answer the research question *'What discourses the companies employ to gain legitimacy for a) the emerging industry of aggregation in general and b) specific business models for aggregation?'*. I approached the question by identifying discourses that the companies strategically employed to legitimate the aggregation niche. In line with Smith and Raven (2012), I categorized the discourses either under 'fit-and-conform' or 'stretch-and-transform' empowerment strategies. Further – as I apply the framework of niche empowerment to study but niche–regime

interaction, also the diversity in the strategies of the niche advocate companies – I detected but niche-overarching discourses, also niche-internal sub-discourses. The overarching discourses should portrait the already established shared meanings of the niche. While the sub-discourses can bring out some business model specific interests, making visible the variety and possible tensions that can occur during an emerge of a novel industry. I analysed the discourses in relation to the business model archetypes throughout the analysis. Lastly, based on the most prevalent discourses, I formed generalizations of the niche empowerment strategies of the business model archetypes.

4. ANALYSIS

The chapter presents the results of the data analysis, divided into two subchapters according to the two research questions. The first subchapter 4.1. provides a general picture of the emerging industry by presenting archetypes of the companies' business models for aggregation. Followingly, subchapter 4.2 shifts the focus to the discourses that the companies employ to legitimate and institutionalize the niche. The discourses are examined in relation to the business model archetypes, to identify general empowerment strategies of the archetypes.

4.1. Business model archetypes for aggregation

Based on a preliminary analysis of the business models for aggregation (see Appendix 1), I identify three business model archetypes labelled as *balance-responsible aggregator, independent aggregator* and *sub-aggregator,* presented in the Table 3. Below, Figure 1 illustrates how I position the sample companies in relation to the archetypes.

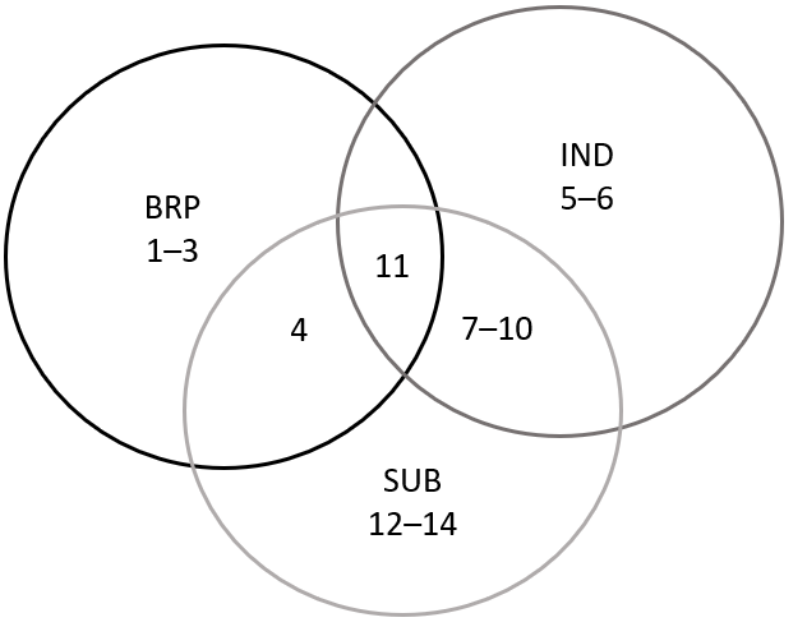
Table 3. Business model archetypes for aggregation

BM archetype	Value proposition	Value creation	Value Capture	Maturity
Balance-responsible aggregator	Aggregation of C&I, residential and sub-aggregator loads to TSO marketplaces. Aggregation service is often embedded in a service package. Load-provider customers are offered financial, sustainability or other benefits for participating in aggregation.	End-user sales provided in-house. In some cases, software and hardware development in-house, but typically in cooperation with partners.	Revenue from bidding loads to TSO marketplaces. Revenue share with C&I and sub-aggregator load-provider customers.	Some of the BMs targeted at C&I customers are at realized stage. Majority of the BMs targeted at residential customers are at concept stage.

Independent aggregator	Aggregation of C&I, residential and sub-aggregator loads to TSO markets. Aggregation service is typically embedded in a service package. Load-provider customers are offered financial, sustainability or other benefits for participating in aggregation.	Software and hardware development mainly in-house. Often striving to cooperate for end-user sales.	Revenue from bidding loads to TSO marketplaces. Various revenue share and compensation models with load-provider customers.	Majority of the BMs are at concept stage.
Sub-aggregator	Sub-aggregation of C&I loads to aggregators or providing white-label service for aggregators. I.e. offering capability to aggregate for aggregators.	Software and hardware development mainly in-house. In the case of forwarding loads to aggregators, end-user sales are provided in-house. Whereas in the case of white label services, there is no need for end-user sales.	Revenue from providing aggregated loads or white label services for aggregators. Revenue share or subscription fee models.	Some of the BMs are at realized stage.

C&I = Small and medium-size commercial and industrial customers
End-user = Electricity end-user
TSO = Transmission system operator
BM = Business model

Figure 1. Sample companies in relation to the business model archetypes for aggregation



BRP = balance-responsible aggregator archetype
IND = Independent aggregator archetype
SUB = Sub-aggregator archetype

Each of the sample companies are mapped in Figure 1 according to the archetype their business model(s) most resemble. Companies, that either have several business models or consider between different type of business models for aggregation, are placed in the intersections of the archetypes. It should be noted, that majority of the business models are yet quite raw, and even the ones at realized stage are in constant development as the companies are experimenting with e.g. different value offerings, customer segments or revenue models (see Appendix 1). Therefore, the archetypes should be viewed as generalizations that necessarily cover up some variation and uncertainties of the data.

4.1.1. Balance-responsible aggregator archetype

The balance-responsible aggregator archetype covers business models, that base on aggregating electricity loads to marketplaces of electricity and that are run by balance-responsible parties, mostly energy companies. Many of the business models under the archetype are already at realized stage.

Within the balance-responsible aggregator archetype, the aggregation service is typically offered for all load-provider customer segments: C&I and residential end-users as well as sub-aggregators. In this context, sub-aggregator refers to a company that forwards its aggregated loads for the focal aggregator. In comparison to other archetypes, the balance-responsible aggregator archetype contains most business models that target residential customers. The aggregation service is usually sold for end-user customers alongside other services, starting with electricity contracts up to various energy management and small-scale electricity generation products. However, for C&I customers, the aggregation service is usually also separately available. C&I and sub-aggregator customers are financially compensated for participating in aggregation. Whereas in the case of residential customers, it is often left unclear if they receive direct financial benefit from participating in aggregation. Instead of direct financial compensation, the service can be marketed by the other benefits that are embedded in the service package and/or by sustainability values. Some of the other service features – e.g. improved energy efficiency or spot price optimizations – can result as cost savings of the load-provider customers energy use.

> *" ... our idea is, that we are happy to adopt a role where we are the market party, an operator in-between (of different stakeholders of aggregation and the marketplaces of electricity)." – Interviewee 2*

Currently majority of the business models of the archetype are run by energy companies. Energy companies have certain advantage in reaching potential electricity end-user customers compared to newcomer companies in the energy regime. Incumbent energy companies have a solid customer base of electricity retail customers and well-established customer channels as their key resource. On the other hand, to manage disperse loads, development of novel hardware and software solutions is needed. As software and hardware development have not been crucial for energy companies traditional core business operations, energy companies are not especially strong regarding these key activities. Some of the archetype's business models base on providing software and hardware solutions in-house, but more often technical solutions are developed in

cooperation with or purchased from partner companies. For example, one of the energy companies is cooperating with a company that offers energy management services. Hence, the aggregation property can be attached to the already existing service package, enabling the energy company to aggregate. Mutually, the company providing the hardware and software solutions gets to access the customer base of the energy company. However, majority of the energy companies expressed their long-term goal to be able to provide more digital solutions in-house and hence become more independent in terms of technological key activities and resources.

In the business models of the balance-responsible aggregator archetype, the revenue comes from bidding the aggregated loads to the TSO marketplaces. Balance-responsible aggregators can access all marketplaces of electricity, hence having more possibilities of value capture in comparison to independent aggregators. Additionally, some of the companies of the archetype also consider the possibility of using loads for their imbalance settlement in the future. In these cases, the profit would derive from savings in imbalance settlement. C&I and sub-aggregator load-provider customers are typically compensated for participation in aggregation through revenue share model. Whereas those business models that target residential customers were still undecided regarding the value capture. Residential loads are relevantly small and therefore the profit from aggregation per unit is quite small, whereas the investment costs might be quite high. Hence, several compensation and billing models were being considered for residential customer segments.

4.1.2. Independent aggregator archetype

The independent aggregator archetype covers business models, where aggregated loads are bid to marketplaces of electricity by a non-balance responsible company. The archetype is quite diverse as approximately half of the sample companies considered business models for independent aggregation, but majority of the business models were at concept stage at the time of the interviews.

The independent aggregator archetype covers business models that target C&I and residential customers as well as sub-aggregators. However, as a separation to the previous balance-responsible aggregator archetype, companies under the independent aggregation archetype typically focus either on residential or C&I customer segments. Some of these business models offer a sole aggregation service, whereas in other the aggregation service is offered only as part of a service package. The aggregation service is usually marketed to the electricity end-users by financial and other benefits as well as sustainability values. Load-provider customers are typically – but not without exception – offered direct financial compensation for participating in aggregation. Again, in some cases, instead of direct financial compensation, financial benefit may result from the other features of the product. However, in comparison to the balance-responsible aggregator archetype, these business models are not as clear-cut regarding which customer segments are offered direct financial compensation, and which other benefits. In line with the balance-responsible aggregator archetype, sustainability is in many cases an essential part of the value offer within the independent aggregator archetype.

Majority of the business models of the archetype have key resources in hardware and/or software development. Hence, the most essential technical solutions are typically provided in-house. However, when it comes to end-user sales, the business models of the archetype can be divided roughly into two categories: newcomers, and dominant actors from other regimes than the energy regime. The newcomer companies are typically foreign companies that do not have a customer base or reference cases in Finland to begin with. These newcomers often strive to cooperate with other companies to reach more electricity end-users. Typically, they seek for sub-aggregators that do not plan to participate in the marketplaces of electricity themselves, but instead would be interested to aggregate the loads of their customers for the independent aggregator. Whereas companies that have established business operations in other industries, e.g. the building automation or ICT sector, typically consider adding the aggregation service in their already existing product. Hence, they are likely to have an established customer base and a proven reputation to leverage as launching the new service. However, aggregated loads

need to fulfil the load requirements of the TSO marketplaces, e.g. size and duration. Further, companies that considering business models for independent aggregation, must often also consider becoming competitors with their partner. Hence, some companies ponder if it would be more profitable to focus on other business operations, rather than invest in business models for independent aggregation. Therefore, established companies from other regimes are often considering in between independent aggregator and sub-aggregator business models.

> *"...then we come to a point, where we are competitors with certain companies, but simultaneously cooperate with them (...) it is not especially exceptional, today the market just is like this, we are competitors with certain companies and simultaneously cooperate with them regarding different segments" – Interviewee 11*

Companies developing business models for independent aggregation, consider various type of revenue models. The main source of revenue of the archetype comes from bidding the aggregated loads to those TSO marketplaces that are accessible for non-balance responsible parties. The load-provider customers are typically compensated with a revenue share model. However, there finds also business models where the aggregation service or a broader service package is billed by a subscription-fee. In the case of subscription-fees, the load-provider customer either receives direct income from the aggregation or is compensated by a lowered subscription-fee of the total service package. Additionally, one of the business models bases on providing a service package including various energy management features free for the customer, without offering any direct financial compensation for participating in aggregation.

4.1.3. Sub-aggregator archetype

The sub-aggregator archetype refers to business models, where the company provides an aggregation service, but does not itself participate in the marketplaces of electricity as a market party. Therefore, by definition, business models for sub-aggregation do not offer an aggregation service, but services for aggregators. Some of the companies with business

models for sub-aggregation have or consider also other business models for aggregation, whereas some of the them focus solely on sub-aggregation (see Figure 1).

The sub-aggregator archetype refers to two distinct service types, that the interviewees refer both to as sub-aggregation. The first type of sub-aggregation service refers to aggregating some loads to another aggregator. Secondly, sub-aggregation can be providing capability to aggregate as a white-label service, i.e. providing the technical capability to aggregate for another company. In both cases, the main customer segments of the sub-aggregator archetype are load-receiver customers. Currently, these load-receiver customers are typically energy companies, but the interviewed companies were open to other load-receiver customer segments as well.

In line with the previous independent aggregation archetype, the key competence of the archetype lies in hardware and/or software development. As discussed in the case of the independent aggregator archetype, some of the companies already have an established status in e.g. the building automation industry, a customer base and a product that enables load control. Whereas those companies offering white-label aggregation services for aggregators, do not have to place any resources on reaching end-users, as it is regarded a responsibility of the focal aggregator. Many of the ICT companies and energy companies that partner regarding business models for aggregation, are also partners regarding other energy products.

Business models for sub-aggregation capture value by providing other aggregators capability to aggregate. The sub-aggregator is often compensated by revenue share model of the profits that derive from aggregating loads to TSO marketplaces. Alternatively, some business models for sub-aggregation base on billing the focal aggregator by a subscription-fee, leasing model or some other form of payment.

4.2. Empowerment strategies for aggregation

In the second part of the analysis, I identify discourses that the archetypes strategically employ to legitimate the aggregation niche. I examine the discourses at two levels,

detecting niche-overarching discourses and niche-internal sub-discourses. Overarching discourses build legitimacy for the industry in general, whereas sub-discourses build legitimacy for specific business models. Table 4 presents the general empowerment strategies of the archetypes, that I have constructed based on the most common discourses among the archetypes.

Table 4. Empowerment strategies of the business model archetypes for aggregation

BM archetype	**Empowerment strategy**			
	Overarching discourses		**Sub-discourses**	
	Fit-and-conform	**Stretch-and-transform**	**Fit-and-conform**	**Stretch-and-transform**
Balance-responsible aggregator	The emerge of the industry is presented as more or less inevitable, and that there is no need for (further) public shielding measures.	The sustainability and system-wide benefits of the industry are highlighted, while some of the current regulation is presented as market-distracting.	Aggregation is presented as a business opportunity for the company, as the industry is anticipated to play a significant part in the future energy system, a possibility to engage customers, and as the company has 'natural capability' to aggregate (customer base, market position). Some of the problems with the scale-up of the BM are related to the general immaturity of the industry.	Possible regulatory developments, that would be harmful for the BM, are mildly presented as market-distracting. Some competitors' capability to aggregate is mildly questioned.

Independent aggregator	The growth in the need for DR is presented as more or less inevitable.	The sustainability and system-wide benefits of the industry are highlighted, while some of the current regulation is presented as market-distracting.	Aggregation is presented as a business opportunity for the company, as the industry is anticipated to play a significant part in the future energy system, a profit opportunity, and that the company has 'natural capability' to aggregate (technology, customer base).	Current regulation and possible regulatory development, that would be harmful for the BM, are presented as market-distracting. Some competitors' capability and motivations to aggregate are questioned. Some of the problems with the scale-up of the BM are related to regime pressures.
Sub-aggregator	The emerge of the industry is presented to happen if its "meant to be", and that there is no need for (further) public shielding measures.	The sustainability and system-wide benefits of the industry are mentioned.	The BM of the company is presented as ' "neutral" within the industry. Aggregation is presented as a business opportunity for the company for it is a profit opportunity and the company has 'natural capability' to aggregate (technology).	None.

BM = Business model

As the categorization the different business models under specific archetypes contains some uncertainties (see subchapter 4.1.), the analysis below is arranged according to the identified discourses. Further, the use of discourses is analysed in relation to the business model archetypes, enabling a generalization of the archetypes' empowerment strategies, as presented in the Table 4.

4.2.1. Niche-overarching discourses

Companies with business models for aggregation employ niche-overarching discourses to legitimate the niche – the emerging industry of aggregation. The overarching discourses are more-or-less shared among the niche advocate companies but differ in their relation to the energy regime. Hence, the discourses are divided as flowing either a regime-conformist fit-and-conform or regime-challenging stretch-and-transform strategy.

The naturalization discourse presents the emerge of the industry of aggregation or the wider adoption of DR as a sort-of self-evident development path alongside the growing need for flexibility in the electricity system. The discourse portraits the emerge of aggregation industry as a non-political process, which success is not dependent on any specific company. The discourse stems from the even more self-evidently taken assumptions of the growth of weather-dependent electricity generation, electric vehicles and other presumed changes in the use of electricity. Hence, the naturalization discourse stems from the broader discourse of energy transition. The future rise of DR is presented as a natural part of the wider development of the energy regime, that in fact supports the current regime during the energy transition. Furthermore, powerful and presumedly non-political authorities that forward the wider adoption of market-based DR in Finland, e.g. Fingrid and Ministry of Economic Affairs and Employment, are used to leverage the discourse. Therefore, I interpret the discourse to construct fit-and-conform empowerment. The discourse is most prevalent within the balance-responsible and independent aggregator archetypes.

> *"And the pot (the need for DR/the market-value of DR) keeps growing, wind turbines keep popping without subsidies. Then, the share of nuclear power generation grows. The equation forces to seek for a bigger pot (...) The pot will grow."*
> *– Interviewee 7*

The sustainability and system-wide benefits discourse is one of the most frequently occurring discourse within the niche. The discourse presents aggregation and DR as a sustainable solution to some of the current problems of the energy regime. Hence, the discourse is challenging the current regime and suits stretch-and-transform empowerment. The discourse is founded on the argument that aggregation enables the integration of more sustainable weather-dependent generation and electric vehicles. Here, the discourse overlaps with the previous, regime-conformist, naturalization discourse. However, the sustainability and system-wide benefits discourse has different tones than the naturalization discourse, which change its meaning and relation to the regime. One of the arguments is that DR can replace back-up generation or electricity import, and hence fix parts of the current regime. These arguments conflict with the naturalization discourse, as they describe an option for DR, even if just to point the superiority of DR. Further, the wider adaption of DR is described to result in cheaper electricity prices. Though, it should be added, that the lower electricity prices are also recognized as a threat to the profitability of the business models for aggregation. The discourse naturally stems from the wider sustainability discourse, but also from the market-oriented and energy transition discourses, as DR is presented as an environmentally friendly, but also efficient and market-based option. The discourse is employed by all the archetypes. However, it is not as evident in the empowerment strategies of the sub-aggregator archetype.

> *"…for the balancing purpose it's exactly the same to reduce the load – the consumption – or to increase generation. But of course, it's much better to reduce the load because you have, less energy used, you save energy. (…) So, it's overall better to use demand reduction than increase of generation."*
> *– Interviewee 5*

The organic market growth discourse furthermore brings out the market orientation of the novel industry. The discourse presents the emerging industry as self-standing and market-based, by stating there is no need for public shielding measures. Instead, the discourse requests for "organic" market growth of DR, that conditional upon the market need and business model competence. The discourse implies, that only the markets know

what are the "right" business models for aggregation. Hence, the discourse presents the industry in line with the dominant market-oriented discourse. The discourse can be regarded as fit-and-conform legitimation as it presents the industry competitive within the current regime. The discourse is favoured by balance-responsible and sub-aggregator archetypes but does not appear as frequently within the independent aggregator archetype.

> *"It is a great thing (the growth of wind generation due to subsidies) but it has distorted the market significantly, so it would be nice to see that DR would scale up by industrial logic, so that the actions would direct where there is the most flexibility and to those technologies that are able to access the markets (...)" – Interviewee 4*

The market-distracting regulation discourse presents the current regulatory regime as causing market distraction, as some of the regulation around aggregation is considered out-dated or otherwise unsuitable. Furthermore, the unpredictable future development of the regulatory regime is perceived to create unnecessary risk. Though the discourse of market-distracting regulation is seemingly contradictory with the previous discourse of organic market growth, the discourses are in fact complementary. The requested regulatory changes would oftentimes result in a looser regulatory framework, rather than as public shielding measures. Hence, the discourse again bases on the broader market-oriented discourse. Though this time, the market-oriented discourse is leveraged to legitimate regime changes and hence fits stretch-and-transform strategies. The mentioned regulatory problems typically concern the current requirements for loads or load verification of the TSO marketplaces, progressive electricity tax, taxation of electricity storages, or legislation considering DSOs (enabling DR as a financial alternative for the physical grid capacity investments). These regulatory requirements consider some business models for aggregation more than others, but they do not give competitive advantage for any specific archetype over other. The balance-responsible aggregator and independent aggregator archetypes employ the discourse most frequently.

4.2.2. Niche-internal sub-discourses

Niche-internal sub-discourses aim to legitimate specific business models. Hence sub-discourses can support, contradict or challenge the emerging rules and practices of the niche, e.g. other business models for aggregation, as well as the current energy regime. Sub-discourses construct the internal empowerment strategies that vary across the niche advocate companies. I divide the sub-discourses that I have identified roughly as three main approaches: legitimation by referring to business opportunities, legitimation by positioning the business model in relation to the other business models, and legitimation by referring to regime problems.

Presenting the novel business model as a business opportunity for the company, was the most common approach to legitimate the business model for aggregation within all the archetypes. However, the approach contains various sub-discourses, that shed light on the archetypes diverse motivations to engage in aggregation. The sub-discourses all originate from the wider market-oriented discourse as well as the energy transition discourse. In general, these sub-discourses do not challenge the regime nor business models of other companies, so the sub-discourses suit fit-and-conform empowerment strategies.

The buzz and hype discourse portraits engagement in aggregation business as strategically beneficial for the company, as aggregation is "the next big thing". Hence, the discourse has strong similarities with the overarching naturalization discourse. However, I have separated the buzz and hype discourse as its own, as the two discourses contain different tones and are used in different contexts. Whereas naturalization discourse appears mostly in the answers to how actors view the future development of DR, the buzz and hype discourse relates to why companies engage in aggregation and questions related to the present stage of DR. The naturalization discourse portraits the growth of DR as kind of self-evident and non-dependent on any specific company. The buzz and hype discourse embeds the same core idea, but from the strategic perspective of a company. Even if the aggregation business model is not profitable just yet, aggregation will likely be a significant part of the energy sector in the future. The aggregation industry has already started to form, and the companies believe that the time to act is now if they want to

establish a status in the emerging industry. The discourse is spiced up by notions, that other companies are also engaging in aggregation. The discourse appears within all the archetypes' empowerment strategies. However, the discourse gains also critical tones in the hands of some balance-responsible and sub-aggregator archetype representatives. As DR and aggregation are repeatedly discussed in the events of the energy sector, some suspect if aggregation is becoming an end in itself. However, it seems that even if aggregation industry's significange will not live up to the hype, companies do not want to miss out.

> *"And if we don't do this (aggregate), someone else will" – Interviewee 7*

> *"...when an industry discusses its internal issues, it is easy to go on the wrong tracks if the hype starts to grow too big, like 'yeah, yeah, yeah, this is such a cool thing', everybody believes in it, but outside that industry, the folks wonder 'what are they…?' So, it becomes its own thing and people praise it, and DR is maybe a little… There is a small danger at the moment, that kinda everybody gets excited, like 'hey, what could we make out of this...?'" – Interviewee 2*

The profit discourse is straightforward. It presents engaging in aggregation as an interesting business opportunity for the direct profits that result from aggregation or sub-aggregation business. The profit discourse bases on the idea that the Finnish aggregation industry has significant untapped value. The discourse is employed by all the archetypes but is most prevalent within the independent aggregator and sub-aggregator archetypes.

The customer engagement discourse, on the other hand, highlights the opportunity to offer new or more diverse services for electricity end-users when engaging in aggregation business. Business models for aggregation can be a way to bind existing and tempt new customers. Aggregation service can be strategically beneficial in building a brand as a pioneer of new energy solutions and a way to differentiate from competitors. The discourse refers to the wider market-oriented and energy transition discourses, as well as the proximate discourses of digitalization and servicification of the economy. The

customer engagement discourse is most employed by the balance-responsible aggregator archetype, though it appears also within the other archetypes.

The natural capability discourse presents engagement in aggregation as a good business opportunity for the company, as the key activities and resources of the company's established business operations can be also utilized in the novel business models for aggregation. The discourse is most used by companies, that plan to offer the aggregation services as part of a service package. If the aggregation service is part of a service package that consists of variety of energy services, some positive synergies can be achieved e.g. more versatile value offer or lower investment costs. The discourse appears in the empowerment strategies of all archetypes. Balance-responsible archetype representatives argue especially, that the business model is most sensible, if electricity market operations and energy services are concentrated for one service provider. Some sub-aggregator archetype representatives support this argument. Whereas some independent aggregation and sub-aggregation representatives refer to their technological capability and the synergies that result from attaching aggregation service in a building automation system.

> *"...as this (aggregation) is often a new thing for the customer (C&I), and they have lots of other stuff to do and they are saturated with energy issues. Electricity retails approach them. DR salesman approach them. Energy effiency salesman approach them. Solar energy salesman approach them (...) customers give feedback that they are getting tired of it (...) so I got a feeling that there is sort of a race (of who gets to sell the new energy solutions to the customer) going on and that it is not necessarily in the best interest of the customer that there is always some salesman knocking on the door." – Interviewee 1*

After the sub-discourses that present aggregation as a business opportunity for the company, the second most popular approach aims to legitimate business models by comparing them to other companies' business models. Hence, some of the sub-discourses embody a challenging tone towards the competing business models, whereas some present their business models as complementary to other business models. The sub-

discourses amend from various broader societal discourses, discussed separately with each sub-discourse.

The questioning capability discourse plants suspicions about the capability of some companies to provide decent aggregation services, suggesting they just ride the hype of DR. Hence, the discourse is powered by the subtle industry-criticism introduced along the buzz and hype discourse. In a sense, the discourse is legitimizing individual business models at the cost of de-legitimizing the industry. The discourse typically concentrates on some specific elements of competitors' business models, most often questioning the capability for software and hardware development, but also for example, if some revenue model is fundamentally illogical and non-profitable. The discourse attacks various and often undefined competitors that operate in the emerging industry of aggregation. Though, incumbent energy companies get their special share of the criticism. Hence, the discourse suspects if some companies have business capability to begin with, or alternatively, if incumbents have capability to survive energy transition. All the archetypes can be noticed to employ the discourse, but it is most commonly employed by the independent aggregator archetype. The discourse is regime-conformist in a sense that it follows the general market-oriented values, like efficiency. On the other hand, the discourse criticizes but some emerging niche practices and rules, also some regime actors and institutions. Hence, I place the discourse within stretch-and-transform empowerment.

The customer first discourse presents the company's business model as customer-centric and that it promotes the interest of the load-provider customers in the emerging industry, whereas business models of some competitors do not. Hence, the discourse is kin to the previous discourse, in it strives to point out the superiority of the company's business model in relation to the competitors. However, rather than the capability of competitors, the discourse questions their motivations and values. The customer first discourse builds on moral arguments that leverage on social sustainability, rather than market-oriented values. Hence the discourse bases on discourses of business ethics and sustainability, as the values of companies are juxtaposed against each other. The discourse is mostly employed by independent aggregator archetype and is often targeted at the incumbent

energy companies. The main argument is that the value offerings of the business models are not as beneficial for the customer, as they are claimed to be or as they could be. Further, it is questioned why energy companies are so keen to develop aggregation services for residential customers. It is suspected that residential end-users are targeted due some strategic or reputational reasons, rather than to forward the best interest of the customers or strive for the greatest system-wide benefits. Further, some companies are accused of greenwashing, claiming to over-market their aggregation service as a sustainable or innovative product, while simultaneously continuing with traditional non-sustainable business operations. Some of the independent aggregator archetype representatives even employ the argument "we are *not* an energy company*"*, to gain legitimacy for their business model. Hence the customer first discourse highlights the importance of customer channels and relations, as well as strives to differentiate the value propositions of business models. As the discourse attacks the emerging rules and practices of the novel industry, as well as the value base of some current regime actors, it can be interpreted to support stretch-and-transform strategies.

> *"So, they have a totally different business model, they don't hope any revenues from the market, they want to sell to consumers. And this is a very limited and actually unfair approach, because it means that those consumers bringing flexibility, they bear the cost." – Interviewee 5*

The no business model is profitable yet -discourse, is interesting in it aims to gain legitimacy for the business model by presenting that neither other business models for aggregation are currently profitable. The discourse bases on the idea that it is not troublesome if the business model is not momentarily profitable, as the industry in general is not mature yet. The discourse is most often employed by the balance-responsible archetype, but also by some independent aggregation archetype representatives. The discourse amends from general market-oriented discourse and can be regarded to construct a fit-and-conform strategy, as it is not challenging the regime nor the emerging institutional structure of the niche.

"We participated in a collaborative project and it seemed that quite many of the companies had this uncertainty, they were waiting to see what is happening and they were examining and they be like "we can't make a business out of this", it was like others choose to wait and others progress aggressively, and we are in the middle ground, so that we are aware and discuss about this (aggregation, DR) a lot but that we are not the first movers nor the laggards." – Interviewee 1

The neutral actor discourse presents the company as a neutral and non-political market party and its business model for aggregation as non-threatening to other companies in the novel industry. The neutral actor discourse is favoured by the sub-aggregator archetype. Some of the archetype representatives clearly stated, that their company is a neutral party in the emerging industry, that does not plan to participate in the marketplaces of electricity. Hence this conformist discourse positions the business model in the novel industry, differentiating it from other business models for aggregation. Interestingly, also few independent and balance-responsible archetype representatives presented themselves as non-political actors as discussing e.g. regulatory issues. Political questions around aggregation and DR are sometimes bypassed and regarded as a responsibility of some public party, whereas the company is presented as non-political, artificially separating business activity from political activity. Hence, the discourse originates once again from the popular market-oriented discourse. This type of arguments can be interpreted as presenting the business model as independent of or flexible in relation to the regime, and additionally, that the company is not driving its individual interests in the industry. Therefore, the neutral actor discourse constructs fit-and-conform empowerment.

" We don't want to (aggregate), we are not a balance-responsible party, we are not an electricity market party, we do not participate in any marketplaces of electricity, we just make it all possible. (...) We provide the technology that enables aggregation, but we are not a market party." – Interviewee 9

Finally, few sub-discourses aim to legitimate specific business models by referring to problems caused by the regime. As the sub-discourses challenge the current regime order

as well as conflict with other novel business models for aggregation, they can be categorized as stretch-and-transform empowerment. Regardless, these sub-discourses mostly amend form the general market-oriented discourse.

The market-distracting regulation discourse – which was already introduced as an overarching discourse – appears also as a niche-internal sub-discourse. As described above, the discourse presents some current or anticipated regulation as harmful for the electricity markets and system. Though this time, the discussed regulatory issues in fact relate to the competitiveness and profitability of specific business models in relation to other. The bone of contention is regulation considering the market role of independent aggregators and above all, should aggregators compensate the bias they cause for balance-responsible parties' imbalance settlement or report it before-hand. The balance-responsible aggregator archetype in general argues, that if aggregators are not held responsible for the deviations they cause in other's imbalance settlement, it will create unfair market bias. However, it should be noted, that the balance-responsible aggregator archetype did not present the issue as an especially urgent and that the argumentation was not especially strong during the interviews. Whereas some representatives of the independent aggregator archetype strongly argue for 'free aggregation'. Independent aggregator archetype representatives argue that the current regulatory regime prevents the industry from achieving the greatest system-wide benefits. Further, some of the interviewees spice up the discourse by question if DR and its benefits are valued at the societal level, e.g. by public officers or politicians. Additionally, policies of the European Union are used to leverage the arguments. The discourse is in line with the general market-oriented discourse but contains also elements of the energy transition and sustainability discourses. As the discourse contains criticisms towards the current regulatory regime, it is labelled to fit stretch-and-transform empowerment.

> *"The rules should be such that – regardless if you are a balance-responsible party or independent aggregator or a balance-responsible party and an aggregator – everybody has the same rules, for example concerning the management of balance or disadvantage caused by it and its compensation. The*

rules should be the same for everyone, so that any certain type of actor would not be favored. If you cause disadvantage for others, then in my opinion it is self-evident that you should compensate for it, and we need some kind of model for that." – Interviewee 2

" If you get more money (referring to system-wide financial benefits), it depends on the relation of demand and supply. So, if the regulators create the operational preconditions, then you get cheaper prices. If they do not create the operational preconditions, well then, we pay [laughter]. That's it, this is just how I try to rationalize it, it's nothing personal, just some logical stream of consciousness." – Interviewee 7

The stagnated industry discourse presents the emerging industry as threatened by the concentration of market power, which would result in un-optimal market conditions. The core argument is, that a healthy industry has a diverse variety of service providers and products, as opposed to a stagnated industry where business is concentrated in the hands of a few. Diverse industry structure feeds competition, that results in lower prices, more innovation and prevents industry lock-ins. Therefore, the discourse leans on the general market-oriented discourse. The discourse is utilized by balance-responsible and independent aggregator archetypes, though the latter archetype yet again employs stronger argumentation. In general, the discourse is utilized by smaller companies. The discourse attacks especially incumbent companies, that already poses large market shares and political power in their sectors. Many of the arguments target large technology providers especially, though often left unnamed. It should be noted regarding the context of the study, that in 2018 Siemens was granted a significant subsidy by the Ministry of Economic affairs and Employment for its virtual power plant business. This struck many by surprise and irritated some of the interviewees, as Siemens is a large, foreign company. On the other hand, also incumbent energy companies get their share of the criticism from the direction of the independent aggregation archetype. Some interviewees argue, that the incumbent energy companies are quite aggressive to preserve their established market position and business partnerships. Incumbent practices and inertia are accused to matter

over technological competence, complicating the market entry of newcomer companies. Furthermore, some interviewees argue the incumbent energy companies make smaller companies "over-cautious". As smaller ICT companies are often partners of energy companies, it is claimed that they do not dare to experiment in the emerging industry of aggregation as it would mean competition with the incumbent companies. Hence, the discourse indirectly portrays some business models as representing a healthy and competitive industry, in contrast to some other business models. Some of the independent aggregator archetype representatives present the emerging aggregation industry as a possibility to redistribute the stagnated market power and renew the regime. As the discourse challenges incumbent companies within the energy regime and proximate regimes, as well as the emerging structure of the aggregation niche, I position the discourse as stretch-and-transform empowerment.

> *" [discusses the challenges of aligning diverse technological solutions] On the other hand [pause], as I was just talking about that, un-named global technology provider, we can very fast end up with, like, large monoliths, that might not be as agile and innovative as some smaller companies, for they have established their market status, and they are in a position to say how it is and they don't have to try all the directions. So, it can become a very stiff entity that is not customer-centric." – Interviewee 3*

> *"Well there are many kind of actors, and there is a lot of suspicion, prejudice [laughter], and then there occurs anticipatory promotion of interests, like, they want to make sure that if some changes happen, we (they) are not the ones paying for that change. Or if somebody is benefitting, we (they) want to be part of it. Or if someone is benefitting, how could we (they) benefit the most [laughter]." – Interviewee 8*

5. DISCUSSION

The chapter discusses the current state of the industry of aggregation and its future development based on the findings of the business model and discourse analysis. I first provide an overall picture of the industry by describing its general structure, drivers and barriers, then shifting the focus on the drivers and barriers specific to the business model archetypes. I then reflect the conclusions made on the existing literature on niche empowerment. Lastly, the industry's relation to the energy transition and sustainability is briefly discussed.

Though majority of the business models for aggregation are quite raw, the activity of the niche advocate companies in the emerging industry is notable. Larger companies – regardless of the archetype – seem to have the most mature business models and can be labelled as the first movers of the industry. The interviewees commonly portraited the aggregation industry to be at a stage, where technical challenges are mostly resolved, but the commercial scale-up of the business models is a timely question. The need for further business model innovation regarding e.g. cost structure, uncertain or undeveloped regulation or uncertain regulatory development and the general unawareness of electricity end-users about DR remain as the most frequently mentioned barriers before the emerge of the industry (see also Annala et al., 2018). The profitability of aggregation business seems to be highly dependent on the investment costs of the different business models. The cost of control equipment and its installation is a frequently mentioned challenge among the interviewees. Additionally, resources that go into "educating" the potential customers about DR can be regarded as an investment cost. Hence, the profitability of aggregation is related to the size of the aggregated electricity loads. The smaller and more disperse the single electricity loads, the higher the substantial investment costs. Additionally, offering the aggregation service as part of a service package can lower the substantial investment costs, as the control equipment has other qualities and use besides aggregation, and the product is likely easier to sell. Hence, I assume that the first business models for aggregation to institutionalize in Finland target larger C&I customer segments and are offered within service packages.

The emerging industry of aggregation can be described as interrelated, as majority of the novel business models for aggregation are co-dependent. Oftentimes, even if the niche advocate companies are competitors regarding one of their business models for aggregation, they may cooperate regarding another. This interrelatedness can also be noticed in the empowerment strategies of the archetypes, which are quite consensus-seeking, and amend from the same fundamental values and dominant societal discourses, most notably the market-oriented and energy transition discourses. Though I label some of the overarching discourses as stretch-and-transform, the overarching empowerment strategies are not strongly challenging the current regime, nor suggest fundamental changes in it. Rather, the overarching empowerment strategies present the novel industry as supporting the current energy regime during transition, instead of suggesting radical changes during times which 'windows of opportunity' are open.

Regardless of the interrelatedness of the business models and the heterogeneity of values within the niche advocate companies, the different archetypes highlighted different elements of the overarching discourses and employed contradicting sub-discourses. These differences reflect the different strategies of the archetypes regarding the aggregation industry (see also Huijben et al., 2016). Though the initial motivation of all the niche advocate companies is commercial success, the archetypes seem to have different drivers – and challenges – to engage in aggregation business.

It seems that many business models under the balance-responsible aggregator archetype, are driven by the aim to gain foothold in the emerging industry. Engagement in aggregation industry seems to be part of the wider digitalization and servicification strategies of many energy companies in the course of the energy transition. This is reflected by the notable interest on residential customers and the common aim to position as a gateway between the different stakeholders of aggregation within the archetype. The customer has a central role in the empowerment strategies of the archetype, as business models for aggregation are portrayed as a possibility to engage customers and expand the role of the company along the energy transition. Business models for aggregation are typically presented as a natural extension to the core business operations of an energy

company, due to their established role as electricity retailers and position as electricity market parties. Hence, the companies within the archetype commonly portrait themselves as a natural 'gateway' between the end-users, sub-aggregators and the marketplaces of electricity. The balance-responsible archetype can be generalized to employ an empowerment strategy that portraits aggregation industry as a sustainable solution that supports the current regime in the energy transition. Though there occurs suggestions on updating some of the current regulation to better fit the transforming electricity system, the emerge of the aggregation industry is presented as more or less inevitable and hoped to be as market driven as possible. Therefore, the archetype in general employs fit-and-conform empowerment, which might reflect the embeddedness of the archetype in the regime. For example, the current regulatory regime is favourable for BRPs in comparison to independent aggregators of which market role is still unclear. In simplified terms, if free aggregation without balance responsibility would be allowed, it would cause more risk and deviations in the imbalance settlements – but also increase competition in the industry. On the other hand, free aggregation can also enrich the business opportunities of the balance-responsible aggregator archetype. (For more detailed discussion see e.g. TEM, 2018b.)

Whereas the independent aggregator archetype is driven to the emerging industry by its direct profit opportunities. In general, the companies of the archetype have the key resources for aggregation – competence for software or hardware development and in some cases an established customer base with controllable devices. Depending on the company background, aggregation can be either the core business or an interesting side-operation for the company. The archetype contains the most newly established companies, and companies from elsewhere Europe. The progressive TSO markets of Finland – i.e. the institutional conditions for market- and incentive-based DR – drawn also foreign companies' attention, though the need for DR is not currently especially high in Finland compared to for example some other European countries. On the other hand, the archetype also contains companies that have established business operations and customer base in Finland. In general, in line with the balance-responsible archetype, the

independent aggregator archetype employs empowerment strategies that presents the emerging industry as a sustainable and sort of self-evident solution that support the energy regime its transition. However, as independent aggregator is an un-institutionalized market position, it is necessary for the companies under the archetype to strive to drive some institutional changes and gain space in the energy sector, to establish the novel market position in the electricity markets. There occurs subtle, but notable, suspicion within the archetype towards the energy regime and its ability to renew and forward sustainability of the energy sector. The competence or motivations of various regime actors is questioned, and the policies of international, legitimate actors like the EU are leveraged to challenge some discourses that occur within the aggregation niche or the wider energy regime. These arguments are often used to leverage regulatory changes, that would affect the profitability of business models for independent aggregation. The independent aggregator archetype especially would benefit from regulatory changes, that would allow free aggregation. Otherwise, the profitability of some of the archetype's business models is endangered. However, the uncertain regulatory development and other risks causes many of these niche advocate companies to ponder between sub-aggregation, independent aggregation as well as different partnerships regarding aggregation. Overall, the independent aggregator archetype can be labelled as adopting a stretch-and-transform approach as its empowerment strategy, though it also utilizes many fit-and-conform discourses.

Lastly, the general strategy of the sub-aggregator archetype seems to be to focus on providing the technical capability for others to aggregate, and thus not to compete in the marketplaces of electricity. Hence, the archetype is driven by the direct profit opportunities of the novel industry. Thought the archetype in general has the technical key resources to aggregate, it chooses to be a technology provider for various reasons, e.g. lack of key resources of customers interface, established business relations in the energy industry that they do not wish to complicate, or perceiving the aggregation as risky or simply not profitable enough. Alternatively, some of the companies have or consider business models for both aggregation and sub-aggregation. The archetype's typical

strategy is to portrait as “a neutral actor” within the emerging industry, and so differentiate its business models from competitors. Hence, the sub-aggregator archetype does not have especially strong interests towards the institutional development of the industry and stands out of the three archetypes by being the most modest of in its use of discourse. The sub-aggregator archetype in general portraits the industry as capable of scaling up without public shielding measures and as a sustainable building block of gradual energy transition. However, argumentation is rather mild within the archetype, which employs almost solely fit-and-conform empowerment.

The findings contribute to the discussion on niche empowerment, as they enrich the findings of previous empirical studies on the heterogeneity of empowerment strategies of niche advocates (e.g. Huijben et al, 2016; Martin; 2016), which further reflect the heterogeneity of motivations and capabilities of niche advocates. The close-up examination of the emerging aggregation industry presents a case where the niche-overarching discourses are more prevalent, but the internal sub-discourses are more in numbers. Though these sub-discourses are broader, hazier and likely less significant than the overarching discourses, they bring visible the diverse and sometimes contradicting motivations of the niche advocate companies within the common the goal to institutionalize the aggregation industry. Overall, in line with previous studies of e.g. Raven et al. (2016), fit-and-conform empowerment was found to be more prevalent than stretch-and-transform. Especially those niche advocate companies that were simultaneously incumbent regime actors, seemed to favour fit-and-conform strategies (see also Martin, 2016; Bush et al., 2017; Lauber and Jacobsson, 2016). However, the larger companies are likely politically more organized and have more legitimacy to conduct empowerment strategies in other arenas, that the sample of the study does not cover. Further, also companies that cooperated with incumbent companies favoured fit-and-conform empowerment. Whereas those niche advocate companies that were more peripheral to the energy regime – including both newcomers as well as incumbents of other regimes – employed more stretch-and-transform discourses. However, a notable share of the stretch-and-transform legitimation was challenging competing niche

advocate companies rather than the energy regime. This might relate to the relevantly high legitimacy that the novel industry enjoys by for example governmental actors and for it is already aligned with some of the regime institutions (TEM, 2015; SEDC, 2017). Additionally, companies that had or considered several business models for aggregation that represented different archetypes, were noticed to have more contradictory use of discourse and diverse mix of empowerment strategies. The findings hint that business models might affect the empowerment strategies of niche advocate companies (see also Berggren et al., 2015). However, as the study is limited to a certain moment in time, no conclusions on causality can be made.

Finally, based on the results and above discussion, I evaluate the emerge of the aggregation industry in Finland to be a rather incremental than radical step within the wider energy transition. In terms of Bidmon and Knab (2018), I view the role of all the business model archetypes as intermediary in terms of the energy transition. Especially the business model archetypes of balance-responsible aggregator and sub-aggregator seem to pose no especial pressures on the current energy regime. Whereas the institutionalization of the independent aggregation archetype might demand more significant regulatory changes, increase competition within the industry and hence shake the market shares of the energy sector to some degree. However, there is no radical difference between the business model archetypes regarding e.g. the role of electricity end-users or relation to the wider market paradigm. What it comes to the sustainability of the emerging industry, there appeared no especial doubt about the sustainability benefits of the wider adaption of DR, though the sustainability of competitors' business models was sometimes questioned. Practically all the companies market their aggregation service for the load-provider customers with sustainability values. Regardless, the main driver of the industry is not the quest for a more sustainable energy system. Altogether, the emerge of the aggregation industry enables the wider integration of renewable power generation and more efficient electricity markets, without demanding any radical changes in the values or principles of the current regime – quite the contrary, it supports them. Hence, the niche portraits as an instrumental development path within the energy transition.

6. CONCLUSIONS

The objective of the study was to describe the novel industry of aggregation and its relation to the wider energy transition in Finland. Knowledge on the type of novel business models for aggregation that are emerging in the course of the energy transition, as well as their drivers and barriers, is essential to anticipate and govern the energy transition and its sustainability. I have approached the issue through the lens of business models and niche empowerment – a discursive approach to emerge of radical innovations. However, empirical studies on niche empowerment are mostly longitudinal and portrait niches as more-or-less unanimous. By limiting the study in a specific period, the findings provide further insight on the heterogeneity of the empowerment strategies of the niche advocates, alongside empirical data on the novel industry and its relation to the transition. Hence, the research questions were:

1. What kind of novel business models for aggregation are emerging in the Finnish energy sector?
2. What discourses the companies employ to gain legitimacy for a) the emerging industry of aggregation in general and b) specific business models for aggregation?

6.1. Key findings

The study proposes three business model archetypes for aggregation: balance-responsible aggregator, independent aggregator and sub-aggregator. The archetypes differ most significantly regarding market position, customer segments, key resources and motivation to engage in the aggregation industry. The market position refers to the general industry background and position in the electricity markets of the companies. In relation to the market position, the key resources of the archetypes vary, which results in interrelated partnerships within the companies to provide the key activities of aggregation. Examination of the niche-overarching discourses and internal sub-discourses in relation to the business model archetypes provides a general picture of the shared as well as conflicting drivers, barriers and desired institutional changes of the emerging industry. While the overarching empowerment strategies favour regime-conformist fit-and-

conform legitimation, the examination of sub-discourses provides a more heterogenous picture.

The balance-responsible aggregator archetype is the most embedded in the energy regime due to its companies' industry background as energy companies. The archetype seems to be driven to the novel industry to maintain, renew or grow its position in the energy regime, by binding electricity retail customers and positioning as a gateway between the different stakeholders of aggregation. The general key resources of the archetype are customer relations and market role as balance-responsible party. The balance-responsible aggregator archetype does not employ strong criticism towards the regime nor competing business models. Whereas, independent and sub-aggregator archetypes contain companies from other regimes as well as newcomers. The two archetypes are driven by the direct profit opportunities of the industry, and their key resources are in general software and/or hardware development. However, the independent aggregator archetype strives to establish a novel market position in the Finnish energy sector. Whereas the sub-aggregation archetype strategically positions in the emerging industry as a neutral actor and technical enabler of others aggregation. The independent aggregation archetype employs most stretch-and-transform empowerment of the archetypes, targeted at both the energy regime and business models for aggregation of competitors. Whereas the sub-aggregator archetype fades to the background with its modest fit-and-conform empowerment.

Therefore, in the context of the study it seems that the more peripheral the niche advocate companies are to the regime – whether incumbents in other regimes or newcomers – the more stretch-and-transform legitimation they employ. Whereas the companies close to the regime as well as companies cooperating with them, favoured fit-and-conform empowerment. Though the archetypes seem to engage in aggregation for different strategic reasons, their main motivations are rather business than sustainability oriented. The aggregation niche positions as supportive in relation to the regime, and as intermediary in relation to the wider energy transition towards sustainability.

6.2. Practical implications for managers

Could the industry of aggregation have more transformative potential, besides its instrumental value within the energy transition? The emerging industry of aggregation can be viewed to have contradictory potential to promote the transition towards more sustainable electricity system, while simultaneously reinforce some of the current unsustainable practices and values, by creating lock-ins of technical solutions or business model elements that are not as sustainable as they ideally could. All the sample companies claim to engage in sustainability; however, the business models are understandably affected by other business interests as well. This led to some of the niche advocate companies to accuse each other of greenwashing and questioning the motivations behind their business models for aggregation. Hence, I would encourage companies that develop business models for aggregation to critically assess their current business model(s) from the viewpoint of environmental and social sustainability. As the industry is still a niche and quite un-institutionalized, the pre-conditions are favourable to reach the full sustainability potential of the industry.

The interviewees lifted environmental as well as social sustainability issues related to aggregation business. Regarding environmental sustainability the main question is, what are the most resource-effective ways to put DR into practice. Which load types or custom segments are most effectively harnessed for aggregation and which technical solutions for load control are most simple, scalable or flexible. For example, how many separate control equipment is needed to install to enable aggregation, has the equipment other use also, or how long is the life cycle of the equipment? Whereas regarding social sustainability, the question is, should the load-provider customers be financially compensated for allowing the control of their electric equipment? If so, how big of a share of the profits is considered fair, or is a fair compensation relative to which type of loads best suit the purposes of aggregation, or which type of load control creates most disadvantage – if any – for the load-provider? Additionally, in the case of some business models targeted at residential customer segments, the question rose, if the customers are

in fact aware that they agree to participate in aggregation, as they purchased a specific smart energy product.

These are the type of questions where it is unlikely to find any standard answers or absolute optimal. The sustainability benefits of DR are difficult to calculate, let alone its sustainability disadvantages. Moreover, some sustainability aspects might be in contradiction with one other. Further, these sustainability questions depend on the wider development of the energy sector – e.g. smart meter implementation, IoT equipment becoming more common, the societal need and valuation of flexibility etc. – of which single companies have little influence. Hence, rather than trying to simplify the complex sustainability issues of DR into quantitative measures, I would encourage companies to be transparent about and discuss the sustainability questions that relate to business models for aggregation during their development, marketing and sales processes. Regardless that not many residential or C&I customer are particularly interested in DR or aggregation, transparency about the matters could prevent suspicion, misperceptions and greenwash accusations – and perhaps encourage societal dialogue.

6.3. Validation of the quality and limitations of the study

In the context of social sciences, the three key principles of reliability, validity and generalizability form a basis for evaluating the quality of research (Eriksson and Kovalainen, 2008). Reliability in general refers to consistency of the measures, procedures and instruments – the repeatability of the study. Secondly, validity refers to the degree to which the findings of the study describe or explain 'what happened'. (Ibid.) Thirdly, the generalizability of the study refers to the theoretical generalizations, that can be made of the findings and transferred to other contexts (Barbour, 2014). Further, as the spectrum of qualitative approaches is very broad (Flick, 2007; Eriksson and Kovalainen, 2008), it has been suggested that qualitative research can be assessed according to approach specific criteria (Eriksson and Kovalainen, 2008; Barbour, 2014). Therefore, as I have chosen critical discourse analysis (CDA) as research approach, I assess the

reliability, validity and generalizability of the study in relation to Leitch and Palmer's (2010) protocols for CDA.

Regarding data collection Leitch and Palmer (2010) suggest that the researcher should consider the 'social significance' and 'multiplicity' of the research data. Social significance refers to how the wider social and political issues in the focus of the study have influenced the choice of data. Or to put more simply, to clear out, why the specific data was chosen and delimited. Whereas multiplicity refers to how the choice and availability of data guide analysis, shape findings and exclude other possible interpretations.

As the sample of the study focuses on niche advocate companies' business models and empowerment strategies, it excludes perspectives of other stakeholders – e.g. users, TSOs, DSOs, lobby groups, politicians, and public officers of Finland, Nordics and the EU. The decision was made to gain a deeper picture of a specific area of the emerging industry, further explicated in the introduction and methodology chapters. Nevertheless, also the other implicit and explicit stakeholders of the industry influence the institutionalization of the niche, let alone the wider transition of the Finnish energy sector. Further, majority of the data was produced in "unnatural" settings – in a formal interview. Typically, discursive approaches prefer secondary data that is produced free of the influence of the researcher (Jokinen et al., 1999). This type of natural data is believed to best capture the meanings, strategies and patterns of interaction (ibid.). However, as there was no comprehensive data available on the opinions, viewpoints and strategies of companies with business models for aggregation – e.g. data on company net sites was very limited – interviews were considered as the most suitable source of data. Though, as Smith and Raven (2012, p.1031) highlight, empowerment strategies might differ significantly depending on the target audience (see also Kern et al. 2015). Hence, under the circumstances of data collection, the interviewees can be expected to have targeted their statements specifically at the researcher and the readers of the research. Despite that the interviews were confidential the statements of the interviewees might have been different in other settings and arenas. Further, the research data was limited to the

company net sites and the interviews, meaning, that all the data was produced by the company representatives. Majority of the data consists of subjective opinions of individual company representatives that reflect the views, ideologies and strategies of their companies to some degree.

Regarding data analysis and interpretation, Leitch and Palmer (2010) suggest three protocols: data inferences, complexity and reflexivity. Firstly, data inferences refer to outlining which of the results "directly" base on the data and which ones are further generalizations and conclusions of the researcher. Secondly, complexity refers to awareness about those aspects of the data that are lost during the analysis process – as the researcher tries to make complex issues understandable and generalizable – and how this affects the findings of the study. Lastly, Leitch and Palmer call for reflexivity about the role of the researcher during both the production and analysis of the data.

To be transparent about my interpretations, I have described the analysis process in the methodology chapter and the uncertainties of the results in the analysis chapter. I first analysed the data as whole coding it based on the analytical framework, then narrowing the focus on the aspects most relevant for the research questions. Though striving for certain degree of objectivity, these choices are subjective by nature as they base on my interpretation. This type of heterogeneity of interpretation is built into the approach of CDA (Fairclough, 1992), and it is acknowledged that same texts can be understood slightly differently by different researchers, therefore leading to different conclusions (Leitch & Palmer 2010). Hence, I emphasize that the business model archetypes and the empowerment strategies attached to them are generalizations. Though the analysis highlights the general differences between the archetypes and alignment within them, it must be acknowledged, that the original data appears as more complex. Further, the choice to construct the analysis through an analytical framework leads to losing some fine tones of the data and creates risk of overseeing some alternative categories and interpretations. Lastly, my experiences, social positions and roles have affected but my research choices throughout the research, likely also other stakeholders' interpretations

of the study, e.g. the interviewees interpretation of the study and its aims or significance, and how the study will be read in general.

Finally, the generalizability of the results of the study in the context of qualitative research refers to e.g. formulation of tentative hypothesis or evaluation of theoretical framework and concepts, rather than statistical generalizability or universal results (Barbour, 2014). Hence, despite that the data of the study is highly context bound, the study provides some insight on niche empowerment theorization, as discussed in the discussion chapter.

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APPENDICES

Appendix I: Analysis of business model elements

Table AI 1 presents the results of the preliminary analysis of the business model elements, providing a simplified version of the sample companies' business models for aggregation.

Table AI 1. Business models for aggregation

Co.	Value proposition				Value creation		Value Capture	Maturity
	Service type	Load provider customer	Load receiver customer	Value for customer	In-house	Partners	Revenue model	
1	Aggregation	C&I	-	Financial, sustainability	End-user	Software, hardware.	N/A	Realized
		Residential	-	Sustainability, other			N/A	Concept
2	Aggregation	C&I	-	Financial, sustainability	End-user	Software, hardware	Revenue share	Realized
		Residential	-	Sustainability, other	End-user	Software, hardware	N/A	N/A
		Sub-aggregator	-	Financial		End-user	Revenue share	N/A
3	Aggregation	C&I, residential		Financial, sustainability	End-user, software, hardware	End-user, software, hardware	N/A	Concept
4	Aggregation	Residential	-	Sustainability	End-user, software, hardware	-	Free service with no revenue share	Realized
		C&I	-	Financial, sustainability	End-user, software, hardware	-	Revenue share	Realized
	Sub-aggregation	-	Aggregator	Capability to aggregate	Software, hardware	End-user	Revenue share	N/A
5	Aggregation	Residential, C&I	-	Sustainability, other	End-user software, hardware	-	Free service with no revenue share	Concept
6	Aggregation	Residential	-	Financial, sustainability	End-user, software, hardware	End-user	Revenue share	Concept
7	Aggregation	C&I, sub-aggregator	-	N/A	End-user, software, hardware	End-user	N/A	Concept
	Sub-aggregation	-	Aggregator	Capability to aggregate	Software, hardware	-	N/A	N/A

8	Aggregation	C&I	Aggregator	Financial, sustainability	End-user, software, hardware	-	Revenue share or service fee	N/A
9	Aggregation Sub-aggregation	C&I -	- Aggregator	Financial, sustainability, other Capability to aggregate	End-user, software, hardware Software, hardware	- End-user	Revenue share Revenue share or service fee	Realized Realized
10	Aggregation or sub-aggregation	C&I	Considering aggregators	N/A	End-user, software, hardware	-	N/A	Concept
11	Aggregation or sub-aggregation	C&I	Considering aggregators	Other	End-user, hardware	Software	Revenue share or lowered service fee with no revenue share	Concept
12	Sub-aggregation	-	Aggregator	Capability to aggregate	Software	Software, hardware	Service fee	Concept
13	Sub-aggregation	-	Aggregator	Capability to aggregate	Software, hardware	N/A	N/A	Realized
14	Sub-aggregation	C&I	Aggregator	Capability to aggregate	End-user, software	End-user, hardware	Revenue share or service fee	N/A

C&I = Small and medium-size commercial and industrial consumers
End-user = Customer relations and channels regarding electricity end-users

Value proposition

Value proposition describes the product the company offers, to which customer segments it is targeted to and what value it offers for customers. The offered products are roughly divided as two type of aggregation services: aggregation and sub-aggregation. Aggregation refers to bidding aggregated loads to marketplaces of electricity. Sub-aggregation refers to aggregation services that are provided for other aggregators, i.e. business models for sub-aggregation do not include participation in the marketplaces of electricity.

Some of the companies are experimenting on several business models, that typically vary according to the customer segment. The customer segments of aggregation services are divided into two main categories of load-provider customers and load-receiver customers. Load-provider customers can be either electricity end-users (C&I and residential customers) or sub-aggregators. Load-receiver customers refer to customer segments of sub-aggregation business models, typically aggregators. However, many of the customerships resemble partnerships, depending on e.g. the revenue model.

The value that the aggregation service provides for the customers is in the case of load-providers categorized as financial, sustainability, and other benefits, and in the case of load-receiver customers as 'capability to aggregate'. Financial benefit refers to direct financial compensation that the load-provider receives by participating in aggregation. Sustainability refers broadly to the environmental and other system-wide benefits of DR, that allow the customer to identify itself as a follower of sustainability values. Other benefits refer broadly to other qualities besides aggregation that are embedded in the product, e.g. energy efficiency, spot-price optimization (i.e. price-based DR), better indoor quality, energy data, energy management, risk management, security services etc. Finally, capability to aggregate broadly refers to either aggregating for other aggregators or providing them white label service.

Value creation

Value creation describes how the product is produced and distributed. I have simplified the key activities and partnerships of the companies as hardware and software development and end-user customer interface.

In general, providing aggregation service demands control equipment - be it a separate control device, building automation system or an IoT device - and a platform to manage the disperse loads according to the needs and requirements of the load-receiver customers or marketplaces of electrcity. The control equipment must be programmed in respect to the initial purpose of the electric equipment, i.e. when and for how long it is suitable to turn the equipment on and off. I refer to these activities as hardware and software development.

Though customer relations are evident regarding all customer segments, I have limited the category to load-provider customers i.e. electricity end-users. The key activities of reaching and selling the product to the electricity end-users are referred to as 'end-users' in the Table AI 1. Further, some functions are needed to maintain the customerships, however, it is not separated for the business models if the company itself or its partners offer customer and technical support.

Value capture

Value capture describes how the company monetizes the value it creates, and how the profit is distributed among the stakeholders. At the time of the interviews, majority of the revenue models were still quite unclear. However, the main source of revenue for the business models for aggregation comes from bidding the aggregated loads to marketplaces of electricity and/or from service fees. Further, the load-provider customers are typically financially compensated for participating in

aggregation. Compensation can be arranged via revenue share model, lowered service-fee or offering free service. Though, also business models where load-providers are not compensated occur.

In the case of most business models, C&I and sub-aggregator load-provider customers are commonly compensated with a revenue share model. In contrast, only one of the companies considered a revenue share model with residential load-provider customers.

There are two type of business models, that base on a service fee as the main source of revenue. Firstly, in the case of business models for aggregation where aggregation service is offered as part of a service package, the load-provider customer can be billed for the overall product with a service fee. In these cases, the aggregation quality might – or might not – lower the total service fee. Secondly, in the case of business models for sub-aggregation, the load-receiver customer can be billed with a service fee.

Maturity

Maturity refers to an approximate evaluation of the commercial maturity of the company's business model. Concept stage refers to business models under consideration or at pilot stage. Realized stage refers to business models that are already put into practice and aggregation happens. However, many of the realized stage business models are still quite raw, i.e. modest in sales volumes and experimental.