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Would turkeys vote for Christmas? New entrant strategies and coopetitive tensions in the emerging demand response industry

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ABSTRACT

To enter a market and scale up, entrant firms often need to cooperate with their incumbent competitors, so they are in coopetition with them. Our goal is to increase the understanding of the antecedents of coopetition and the ways in which new entrant firms navigate coopetitive tensions with incumbents. Moreover, we are interested in the impacts that coopetition has on the value creation and value appropriation of new entrant firms. So far, most literature on cooperation and coopetition in energy markets has provided the perspective of the incumbents. To study the issues empirically, we interviewed 15 demand response (DR) entrants. These firms operate in Finnish energy markets, providing automated DR services, in which Finland is a forerunner country. According to our results, collaboration between new entrant DR firms and energy incumbents was needed in order to establish the new markets. In addition, cooperation with incumbents was beneficial to DR entrants since they were able to gain new customers and increase the efficiency of their resource use due to, for example, common technological development activities. We found that the structure of energy markets was an important factor in shaping the market entry of DR entrants. According to our results, new entrants can enter electricity markets without much cooperation with the incumbents, but cooperation is necessary in natural monopoly district heating markets. As new EU regulations will enhance automated DR services, the results of this study have relevance in other EU Member States where automated DR markets have not yet been established.

1. Introduction

Large-scale deployment of clean technologies is needed in order to enable a socio-technical transition towards sustainable energy systems [1,2]. However, clean technologies face considerable hardship in their diffusion as they need to be embedded in user practices and preferences, societal discourses and expectations, regulation, business models and transnational actor communities [3]. In addition, the energy sector is 'locked in' to conventional technologies because energy production is a capital-intensive activity, which leads energy companies to have vast sunk costs [2,4]. Therefore, even if societal expectations and discourses for clean energy are emerging [5], incumbents' sunk costs remain one of the main obstacles to the diffusion of clean technologies in the energy sector [4,6]. Resultingly, a lot of emphasis is given to new entrant firms as key actors for accelerating the transition to clean energy technologies [1,6,7].

However – to enter a market and scale up – entrant firms often need the support and cooperation of the incumbents with whom they also compete [8]. Thus, they find themselves in the paradoxical situation of simultaneous cooperation and competition (i.e. *coopetition*) with the incumbents [9]. Research shows that multiple factors can drive coopetition and various benefits can accrue for the actors involved in a coopetitive relationship [8,10]. Coopetition can increase the *value creation, value appropriation* and *financial performance* of the firm [10,11]. In addition, there is some evidence that coopetition can contribute to creating *socio-environmental value* by, for example, enhancing the efficient use of resources or by creating 'a common playing field' for new clean technologies [12,13].

Coopetition often generates what scholars refer to as *coopetitive tensions*. Hence, tension management is essential for successful coopetition [8,9,14]. In recent years, various authors have discussed the tensions generated by coopetition. For instance, Gnyawali and Charleton [14]

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proposed a conceptual model of coopetition in order to understand how firms in coopetitive relationships manage the balance between competition and cooperation, as well as to understand the way in which the value they create is divided. Ansari et al. [8] introduced *coopetitive tension strategies* with differing levels of business model adaptation for new entrants. However, except for the seminal work of Ansari et al. [8], there is virtually no research on how new entrant firms manage coopetition and mitigate the associated tensions [11].

In this paper, we aim to increase our understanding of energy markets entry. We are interested in clean energy entrants that are in coopetitive relationships with energy incumbents. Specifically, we study the antecedents of coopetition and the ways in which new entrant firms navigate coopetitive tensions with incumbents. Moreover, we are interested in the impact that coopetition and coopetitive tension management has on the value creation and value appropriation of new entrant firms. We identify strategies that clean energy entrants can employ when entering an energy market and upscaling a clean technology. To fulfil our research aim, we develop a conceptual framework building on the seminal works of Hoffman et al. [11], Gnyawali and Charleton [14] and Ansari et al. [8]. Empirically, we study demand response (DR) services in the context of energy markets. Since DR markets are subsidiaries to the mainstream energy markets, and regulation is still evolving, DR entrant firms need to cooperate with incumbent energy companies to establish themselves in the market. For these reasons, the DR industry represents an interesting case with which to study coopetitive strategies. The research questions we answer in this study are formulated as follows:

(1) What motivates entrant DR firms to coopete with incumbent energy companies?
(2) How do entrant firms navigate the coopetitive tensions with incumbents?
(3) How does coopetition and coopetitive tension management impact on the value creation and value appropriation of the entrant DR firms?

Our data consisted of interviews with 15 entrant companies that provided automated DR services in Finland. Automated DR is based on smart ICT technologies; hence it is not related to traditional programmes promoting consumers' behavioural change [15–17]. While time-variable energy tariffs remain an important incentive to adapt energy consumption behaviour, having to constantly keep track of rates and usage may be tiresome and lead to so-called 'response fatigue' [18,19]. In addition, for real-time system balancing purposes (e.g. frequency regulation), behavioural changes are too slow [18,20,21]. Thus, automation can help to tackle both these issues [18,22,23]. This makes our paper different from many previous studies that have explored more conventional forms of DR [e.g. 19,24–26]. The lack of studies considering smart and innovative DR technologies has been raised by some researchers, and it has been linked to the non-existence or low uptake of automated DR technologies in many countries [19,27].

Flexibility technologies, such as automated DR, are crucial for promoting a deeper penetration of renewable energy sources and the decarbonisation of the current energy system [19,25,27]. DR can help balance energy systems that are experiencing a simultaneous increase in weather-dependent renewable generation and the phasing out of fossil fuel–based power plants [28,29]. Furthermore, even without changes in the energy-generation infrastructure, DR is a more sustainable approach for system balancing than fossil fuel–based power plants. This is because the efficiency of conventional power plants may decrease when they are used for balancing purposes and thus lead to higher fuel use and increased emissions [30,31,32]. Markets for automated DR services are still fairly small or even non-existent in most countries [19,27]. However, when DR technology is upscaled, it can lead to a change from a situation where flexibility services are mainly provided through alterations in energy generation capacity to a situation where both energy use and energy generation provide flexibility services [33]. Thus, DR companies compete with the energy sector's incumbents both directly and indirectly.

In this paper, we choose to focus on Finland because it is considered a pioneer in automated DR services [25,27,34–36] and has one of the most developed legislative frameworks for DR in Europe [36,37]. However, our findings are of relevance to other EU countries due to the requirements (e.g. the access of DR aggregators to ancillary service markets, the deployment of smart metering systems, the final customer's right to dynamic electricity price contracts) laid down in the recent EU Electricity Directive 2019/944, which are expected to promote the market growth of automated DR services across all the EU Member States.

This paper contributes to energy research in two main ways. First, we provide novel insights into clean energy entrants that are in coopetitive relationships with energy incumbents. There are studies on entrant and incumbent companies promoting transformative innovations in the energy sector that touch upon the subject of the simultaneous collaboration and competition of companies [38–46]. In literature, there are also examples of cooperation between energy incumbents and new entrant firms in order to gain access to crucial resources [38,41,43,44,46]. However, as the majority of these studies provide the perspective of the incumbents, deeper insights into the strategies of new entrant companies as they enter, interact and establish themselves in the energy sector are still largely missing.

Second, the development of DR and smart grid markets has been studied by identifying technical, regulative and institutional barriers and drivers, as well as general business model archetypes [31,37,47,48,49,50,51]. These studies stress the role of institutional factors in the development of DR markets. For example, Burger and Luke [50] found that novel DR business models are significantly shaped by market regulations that enable or deny the participation of different actors in electricity markets. Recently, more attention has been given to social and political processes (e.g. power struggles and the divergent interests of actors) that affect the emergence of smart grids [13,48,51]. Lockwood, Mitchell and Hoggett [51], for instance, show how energy incumbents have affected the capacity market regulation in the UK, making it more difficult for entrants to enter. Our study enriches this growing research on DR market development by providing in-depth knowledge of the entrants' strategies and tensions with incumbents.

The rest of this article is organised as follows: Section 2 presents a more detailed background of the emerging DR industry in Finland. Section 3 describes the theoretical motivation for the paper – in particular, coopetition literature and coopetition tension management literature – and our conceptual framework. Section 4 presents our research design and data. Then, in Section 5, we report the findings, and in Sections 6 and 7, we discuss them and draw some conclusions.

2. The emerging DR sector in Finland

The energy sector contributes considerably to greenhouse gas emissions both in Finland and globally [52]. The production of electricity and district heating in Finland accounted for 33 percent of Finland's greenhouse gas emissions in 2018 [53]. In order to decarbonise the Finnish energy sector, emission-intensive production capacity is gradually declining, whereas renewable energy production is rapidly increasing.[1] In Finland, new nuclear power capacity will also be entering the power markets in the upcoming years [55]. As renewable energy (especially wind and solar power) fluctuates according to the weather and as nuclear power is used for baseload generation, neither can offer the flexibility needed to maintain the balance between supply and

[1] The share of renewable energy in Finland is high (37% of total energy consumption in 2018) and nuclear power is also an important source for electricity (accounting for 25% of electricity supply in 2018) [54].

demand. Therefore, new solutions are needed to increase flexibility. DR can offer a solution to the lack of flexibility and be an important enabling technology for the energy transition [56,57].

Automated DR technologies started to emerge in Finland after 2012, and their commercialisation has mainly occurred after 2016 [5]. There are multiple reasons for Finland to be an automated DR forerunner country. First, automated DR is based on ICT technologies, and the ICT sector is considerable in Finland – accounting for 37 percent of service exports in 2019 [58]. Indeed, most DR companies operating in Finland have their background in ICT and electronics, especially in the former mobile-phone giant, Nokia [5]. Second, Finland has one of the most progressive DR regulatory and market frameworks [36,37]. In Finland all the market places operated by the Finnish transmission system operator (TSO) Fingrid are open for DR in order to maintain system balance; aggregated loads are eligible [34] and residential loads also participate in these markets via aggregation.[2] Independent aggregators (operators that are not electricity suppliers or who balance responsible parties in electricity markets) are currently allowed to provide frequency-controlled reserves and their participation in balancing the energy market is being piloted during 2020–2021 [60]. DR has become a significant competitor to flexible generation, especially in the Frequency Containment Reserve for Disturbances (FCR-D), which became the first market place to allow independent aggregation in 2017 [60].[3] Third, almost all electricity end users are equipped with hourly registering smart meters [55]. Fourth, even small customers, such as households, are offered electricity supply contracts in which the price varies hourly based on the prices in the Nordic power exchange, and by the end of 2019, about 11 percent of Finnish retail electricity customers had chosen such a contract [55].

Therefore, Finland is an interesting country to look at as the uptake of automated DR has already started [25,27,65]. Most of the DR services in Finland are provided to buildings because, in a cold climate, the bulk of the energy demand originates from the building stock. To illustrate, 47 percent of the residential sector electricity use goes to space heating in Finland compared with the EU average of 13 percent [66].[4] Variation between the different types of households is, however, large in Finland as, while electric heating is the most common heating method in detached and semi-detached houses, district heating is the most common method in terraced houses and apartments [68].

The heating and heat storage capacity of the building stock (as well as the lighting of bigger buildings) is used as an 'energy reserve', and it is controlled by the DR companies. This is done in such ways that the users of the buildings do not notice the DR control, meaning that the changes in their indoor temperature or illumination are minor. Smart DR technologies are employed both in district heating and electricity markets in Finland.

3. Coopetition literature

3.1. A conceptual model of coopetition

Although there have been numerous coopetition studies over the years, a shared definition of the term *coopetition* is still missing. In this paper, we use Gnyawali and Park's [14, p. 2513] recent definition of coopetition: 'simultaneous competition and cooperation among firms with value creation intent.' Although in the DR industry, the new entrant companies compete with the energy incumbents [47,51], some studies have suggested that cooperation between the energy sector entrants and established energy market actors is beneficial [38,41,44,46]. Therefore, coopetition is a useful concept with which to study new entrant firms' strategies in the DR industry.

Since coopetition literature is still evolving rapidly, a common model for coopetitive decision-making and coopetition strategies for companies is missing. However, Hoffmann et al. [11, p. 3044] proposed a roadmap mapping the antecedents, coopetitive relationship decisions, coopetitive tension management, coopetition consequences and coopetition implications for a company. Their roadmap was intended for future research. Thus, we build our conceptual framework on this seminal work in the field. We also build on the work of Gnyawali and Charleton [14, p. 2514] who, around the same time, proposed another conceptual model for studying coopetition.

The frameworks proposed by Hoffman et al. [11] and Gnyawali and Charleton [14] are general models for all types of actors in coopetitive relationship. Our framework (see Fig. 1) differs from them by taking the perspective of new entrant firms that are in coopetitive relationships with incumbents. Thus, we have slightly modified the original frameworks of Hoffmann, Lavie, Reuer and Shipilov [11] and Gnyawali and Ryan Charleton [14] to fit them to our research questions, especially by embedding the coopetitive tension strategies proposed by Ansari et al. [8].

As Fig. 1 shows, the coopetition antecedents have an impact on the coopetitive relationships between the companies, and both of these influence the complementary assets a company can gain from coopetition. The features of a coopetitive relationship impact on the coopetitive tensions that companies face and the coopetitive tension strategies that companies adopt. All of the above-mentioned factors influence the value creation and value appropriation that companies gain from a coopetitive relationship.

The following sub-sections present the categories of the conceptual model of coopetition as shown in Fig. 1. They are also used for the data analysis (see Section 4), and the results are presented accordingly (see Section 5).

3.2. Coopetition antecedents

The antecedents of coopetition are diverse, and they can be linked to the business environment of the firm, its organisation or its management [11]. The *business environment antecedents* include, for example, the emergence of new technologies, the decline of old technologies or technological developments, which are typical for knowledge-intense industries [9,11]. The *organisational antecedents* are often linked to smaller companies improving their competitive position and managing the competitive tensions by cooperation, for example, in order to enter a market [10,11]. *Managerial antecedents* include, for instance, the personal relationships, personality traits and values of managers [11].

3.3. The coopetitive relationship

A coopetitive relationship is characterised by simultaneous competition and cooperation between companies, and it can occur between two companies (dyadic coopetition) or between multiple partners (multilateral coopetition) [11,69]. Competition and cooperation can be *explicit* or *implicit* [11]. In explicit competition the companies often operate in the same markets, and in implicit competition they can, for example, share similar resource bases [11,70]. In explicit cooperation companies often sign formal cooperation agreements, and implicit cooperation can, for example, take a form or collaboration in an industry organisation [11].

Coopetition can be cooperation dominated, competition dominated or a balance between the two [14]. Luo et al. [71] stated that in a situation of balance, the magnitude of competition and cooperation is even. However, this situation is rare and firms in a coopetitive

[2] For example, the Finnish energy company Fortum has utilised residential water heaters in the market for a frequency-containment reserve for normal operation [59].

[3] In the yearly FCR-D market, DR represented 50% of contracted flexible capacity in 2017 (which was twice as much as in 2016) and has varied between 60 and 70% since 2017 [61,62,63,64].

[4] An average Finnish household consumes about 7800 kWh of electricity per year compared to the EU average of about 4000 kWh [67].

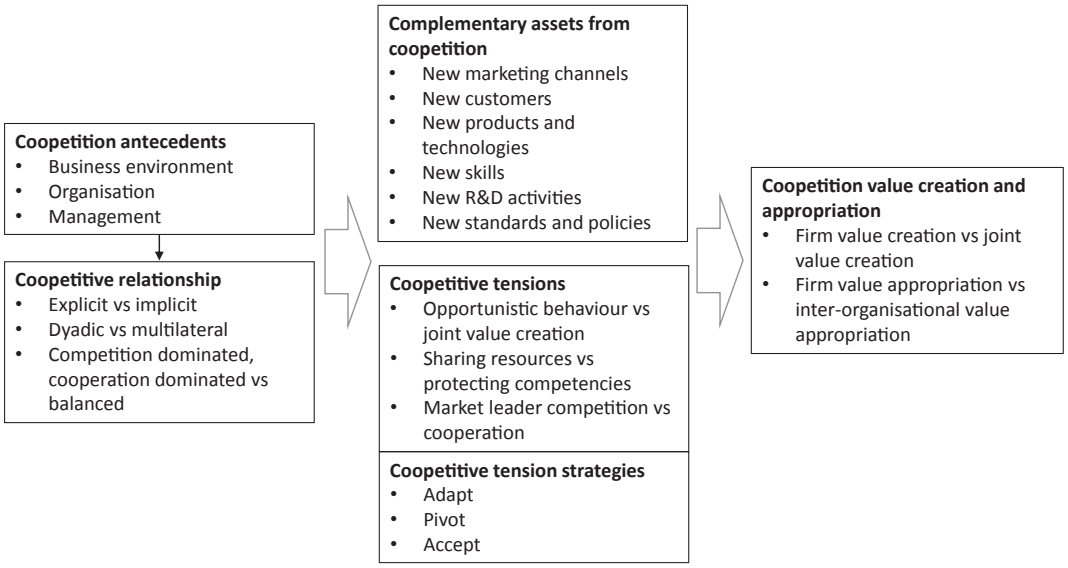

Fig. 1. A conceptual coopetition model for entrants in coopetitive relationships with incumbents.

relationship must constantly *navigate between competition and cooperation* [14]. This navigation is important for coopetitive tension management [11,14]. Some studies [14,72,73,74] suggest that a balance between competition and cooperation could be beneficial for the stability and success of a coopetitive relationship. To achieve that, companies can, for example, adjust their relationship by adjusting the intensity of cooperation by modifying cooperation agreements [14].

3.4. Complementary assets from coopetition

Coopetition can bring benefits, such as enhanced technological innovations and win–win partnerships [8–10], and it can enhance the deployment of disruptive innovations [8,14]. Therefore, the companies that are successful in coopetition can gain a competitive advantage over other companies [10]. Coopetition seems to be especially beneficial for companies in knowledge-intensive sectors [75] and when new markets need to be created, for example, by setting common standards [13]. Coopetition between firms can offer *complementary assets* that extend their value creation opportunities, for instance, new marketing channels, access to new customers, new products, new skills or R&D activities [76]. Coopetition can also include a more political mode of cooperation between competitors by creating value for many actors by, for example, developing common industry standards or policies together [75].

3.5. Coopetitive tension strategies

Coopetition causes tensions between actors. In the coopetition literature, at least three important sources of coopetitive tensions have been identified. First, the competition related to inter-organisational value appropriation can cause opportunistic behaviour and diminish joint value creation [9,10,77,78]. Second, the firms in coopetitive relationships share resources, but they also need to protect their competencies [9,10,77]. Third, the coopetition goals of the companies often conflict due to their simultaneous aspirations to be market leaders [9].

The management of coopetitive tensions is important for a successful coopetitive relationship [9,10,14,79]. Furthermore, unsuccessful coopetitive tension management can lead to negative implications for the firms' performance [11,14]. The challenges of coopetition tension management include knowledge leakage, opportunistic behaviour and a lack of commitment [11,75].

Most of the literature on coopetitive tension management focuses on incumbents. However, Ansari et al. [8] proposed a typology of *coopetitive tension strategies* for entrants which is built on the theory of paradoxes and their resolution in organisational systems [80,81]. First, an entrant may choose to *accept* the tension between the actors and 'learn to live with it' [80,81, p. 566]. This does not mean that the tensions are not there nor that they are being ignored. Acceptance of the tensions also has emotional and cognitive impacts on the actors as they face the challenges of the tensions [80,82]. Second, the entrant may *adapt* their value creation in order to meet the needs of incumbents and other actors [83,84]. Although adaptation seeks resolutions to the tensions, it does not necessarily eliminate or fully resolve the tensions but attempts to find compromises between the competing demands [80]. Third, the entrant may choose a 'mid-ground' strategy of *pivoting* [8,85], which we understand as a strategy that uses acceptance and adaptation case by case. Thus, they switch dynamically and deal with one tension at a time [8].

3.6. Coopetition value creation and appropriation

Value creation and *value appropriation* are fundamental to coopetition [9,10,14]. *Value* can be defined as the realised utility of monetary returns and satisfaction (e.g. consumer surplus and shareholder returns) plus the potential for future utility [86]. The value that is *created* through a new product, technology or business model cannot be quantified until the value is *appropriated* [86]. Value can be appropriated as payments or by extracting value from resources [86].

Where competition is seen as a zero-sum game between actors, coopetition can benefit all the firms involved [69]. *Coopetition value creation* refers to value that could not have been created if the companies had acted in isolation, and it can only be created through the coopetitive relationship [12]. The value creation in a coopetitive relationship can be divided into firm value creation and joint value creation [14,76]. *Joint value creation* refers to 'the size of the total pie' generated by all the partners in the coopetitive relationship by their mutual efforts [14]. *Firm value creation* refers to the additional benefits an individual firm creates in a coopetitive relationship [14]. The value created jointly or by one company is often dissipated to multiple actors, such as customers, partners, competitors and other actors [86].

Firms in coopetitive relationships aim at maximising their

performance by appropriating value from joint value creation (i.e. expanding their share of the pie at the cost of their coopetitive partners) [11,69,76]. Di Gregorio [86, p. 42] called the value distribution between firms *inter-organisational value appropriation*. The appropriation capacity of a firm partly depends on its bargaining power, meaning its ability to negotiate favourable coopetition agreements [76]. It can be challenging for newcomers to bargain with powerful incumbents about the terms of a coopetitive relationship [76]. However, if they have the possibility to choose their cooperators from among their competitors, they have more bargaining power [76]. It is important to note that companies in a coopetitive relationship are willing to help each other and they are not aiming to 'destroy the enemy' as long as coopetition improves their performance [69, p. 761].

In addition to the firms in a coopetitive relationship, the created value can be appropriated by multiple actors, including customers and suppliers [11]. Thus, *performance implication* relates to a firm's net benefits from a coopetitive relationship, including financial performance, innovation capacity, competitive position and market entry [11].

The literature on coopetition focuses largely on value creation and appropriation at the firm level or inter-organisational level. Recently some studies have addressed *coopetition for sustainability*, that is, the potential of coopetition to contribute to sustainable development by creating *environmental and/or social value* [12,87–90]. Firms create *environmental* and *social value* via business model innovation. Geissdoerfer, Vladimirova and Evans [91] show that the process of sustainable business model innovation varies between new entrant and incumbent firms. It can comprise the development of an entirely new business model – as in the case of start-ups, the transformation of an existing business model or the acquisition and integration of new business models by incumbent firms in a focal sector – or a process of business model diversification by firms entering an adjacent market. In coopetition literature, studies dealing with the processes of sustainable value creation and appropriation are limited [13,92]. The potential of coopetition to create sustainable value has mainly been studied from the viewpoint of the more efficient use of natural and human resources [13,87,90,92]. Research also shows that coopetition can promote the establishment of a novel sustainable industry via the creation of 'a common playing field', for example, common market rules, regulations and practices [13]. In order to realise sustainability benefits from coopetition, it is important that the actors share a common vision and goals [13]. However, from the new entrant's perspective, this can be challenging since the incumbents' goals may diverge considerably from the new entrant's goals [93,94].

4. Research design and data

Our data consists of 15 semi-structured qualitative interviews with 15 DR companies operating in Finland. This approach was chosen to get a deep understanding of the factors behind the DR companies' decisions and strategies. The interviews were conducted in Finnish and English between summer and autumn 2018. An interview guide is presented in Appendix 1. The interviews were recorded and transcribed verbatim. The duration of the interviews varied from 33 min to 94 min, and altogether resulted in 151 pages (in Verdana font, 8pt) of transcribed interview data. The interview guide was planned by all four authors of this paper, and two of the authors performed the interviews.

The sample of studied companies was chosen in two steps. First, we performed an internet search to identify companies that we thought could provide DR services using the search words '*kysyntäjousto*' (demand response), '*jousto*' (flexibility) and '*energianhallinta*' (energy management). The initial sample of companies obtained was then evaluated by performing a desk study on company websites and by making telephone calls to find out what their service offerings included and if they had business plans that considered participation in the DR markets. In total, we identified 32 companies that stated that they had some activities in the DR sector in Finland. At this stage, we realised that besides the new entrant firms, seven incumbent energy firms also had DR-related operations. However, as our focus is on the new entrants' perspective, we decided to exclude the incumbents active in DR from this study. In addition, since we were interested in DR for the building stock, three DR companies that did not provide services to buildings were not considered. Seven companies stated that they were either at too early a stage in their DR development or that they could not allocate time for an interview.

Eventually, the sample was limited to 15 companies that are either currently developing DR services in Finland or are already offering such services. Our sample of firms gives a comprehensive view of the new entrant firms operating DR services in Finland and, therefore, provides a good basis for a sector-level analysis. The DR companies selected are either (1) new start-up and growth companies or (2) companies that did not initially belong to the energy sector (e.g. they are from the building automation or electronics sectors) but have started DR services and are thus newcomers in the energy sector. To ensure full anonymity, we refer to the studied companies with the letters running from A to O in Section 5. The interview data was complemented with data from the interviewed companies' websites.

The transcripts of the interviews were coded with the support of Nvivo 12 software. We coded the interviews with a coding scheme (see Appendix 2, 'First stage coding scheme') that was based on the literature, although we allowed new themes to emerge from the data. The coding process was aimed to identify, for example: (1) the markets the company operates in, (2) DR business model elements and the level of upscaling, (3) barriers to DR services and the drivers of DR services, (4) competition aspects, cooperation aspects and the strategies adopted, (6) entrant–incumbent interactions, conflicts and related business model adaptations and (7) policy implications. Based on the initial coding, we found that the new entrant firms were coopeting with the incumbents and had different strategies for handling the tensions arising from coopetitive behaviour. Thus, we decided to analyse this issue in more detail. To this end, we built a conceptual framework based on coopetition literature (see Section 3). Subsequently, we analysed our data (see Appendix 2, 'Second stage coding scheme') against our conceptual framework by looking for similarities or differences in the coded material and identifying recurrent themes and developing categories [95]. The analysis was conducted by two of the four authors who coded the interview material until saturation was reached and the final categories become stable. The results are presented in the next section as the antecedents of coopetitive behaviour; the nature of the coopetitive relationship and the consequent tension management strategies adopted; and the impact on value creation and appropriation. A summary of the main results and how they were mentioned in the interviews is presented in Appendix 3.

5. Results

5.1. Coopetition antecedents

The emergence of the ICT technologies enabling automated DR was one of the main antecedents we found for coopetition between the DR entrants and incumbent energy companies. Furthermore, pressure on incumbent energy companies to phase out fossil fuels, especially coal, and the growth of renewable energy production capacity were two other favourable conditions for coopetition between the DR companies and

energy sector incumbents.

The starting point for a coopetitive relationship was often mere complementarity. The DR entrants had their know-how in ICT and the programming, optimisation and control software, as well as know-how in building monitoring hardware, but they were new to the energy sector. On the other hand, the energy companies had an established customer base and were powerful actors in the energy markets, but they lacked the DR know-how.

The business environment of the DR firms operating in electricity markets and in district heating markets had significant differences. Four of the studied DR companies operated in district heating markets, ten in electricity markets and one in both. Since Finnish district heating markets are closed, local and natural monopolies, the DR companies saw that cooperation with the dominant district heating market actor was necessary in order to enter and operate in heat markets. In the competitive electricity markets, intense cooperation was not seen as important as it was seen to be in the heat markets. This point was explained by one of the interviewees in the following way:

The electricity market is somewhat more straightforward because electricity can be sold or consumed anywhere. So, cooperation is not as essential as it is in the case of a natural monopoly. (interviewee, Company B)

The size of the studied DR entrants ranged from very small firms, like start-ups, to large firms, for example, international corporations. However, they were all newcomers to the energy market. We did not find any indication that the size of the company acted as an antecedent for coopetition with the incumbents in the DR sector.

The managers of the DR companies had varying motivations for cooperation and competition with the incumbent energy companies. In many cases environmental values coupled with a strong interest in novel ICT solutions were the reasons behind the decision to enter the energy market and compete with the incumbent energy companies. A personal relationship between the managers or employees of DR entrant firms and incumbent energy companies was often another antecedent of cooperation. The personal connections of the interviewees with the incumbents' managers were based on, for example, existing friendships, having met in energy sector events or based on more formal relationships between the companies.

5.2. Coopetitive relationship

The studied DR entrants competed with energy sector incumbents in multiple ways. Based on our interviews, the ways in which explicit competition occurred were: (1) competition between flexible energy production (e.g. hydro power and natural gas production) and energy flexibility capacity derived from DR, (2) competition in the provision of DR services (some incumbents were developing their own DR business models and/or technologies), (3) competition in providing reserve power (some incumbents had sunk costs in reserve power plants, and large-scale DR makes that business unprofitable), (4) DR allowed smaller energy connection sizes for energy end users[5] and thus diminished the energy connection fee-related profits of the incumbent energy companies.

We also found more implicit ways by which the DR entrants were competing with incumbents: (1) DR enables higher shares of distributed renewable energy in the market, reducing the profitability of conventional power plants, (2) the renewal of energy market regulations for the purposes of DR can improve the market position of DR entrants to the detriment of the incumbents, (3) incumbents may feel threatened by the new actors and increased competition in general in the sector and (4) potential shifts in the market dominance, shifting from energy sector incumbents to DR entrants and their customers.

Based on our results, the increased competition caused some of the incumbent energy companies to oppose DR and they refused to cooperate with the DR companies. Two interviewees described this situation in the following way:

Would turkeys vote for Christmas? (interviewee, Company E)

There can be resistance inside energy companies towards changes – it is normal. They think that these types of services are froth and they are not useful. (interviewee, Company G)

Most DR entrants saw that incumbent energy companies could be divided into two categories: conservative 'grey' companies and progressive 'green' ones. This division did not reflect the energy production portfolio of the energy incumbents, but their openness towards DR. The conservative incumbents were not active in DR, they were against it as they saw that other companies utilising their customers' DR potential may cause costs[6] or revenue reductions for them. The progressive incumbents were active in DR and cooperating with the DR entrants as they were trying to create revenue from DR, or at least trying to minimise the revenue reductions caused by DR. Therefore, the DR entrants had developed coopetitive relationships with the progressive energy companies.

The cooperation of the DR entrants with the incumbents took two explicit forms: sharing (at least part of) their customer base with the incumbent energy companies and technology development. In addition, we found one implicit form of cooperation: developing new market rules, policies and standards. The DR companies that were operating in district heating markets cooperated with the energy company in each local market for which they were providing DR services. Thus, they were in multiple coopetitive relationships simultaneously. In the case of electricity markets, the DR companies typically cooperated with one incumbent energy company.

The cooperation was especially intense when the DR companies shared their customer base with the incumbents. These DR companies provided platform services between the energy company and the customers (i.e. energy users) so that the energy companies could sell energy to their customers and the new entrants could provide the DR software and hardware that enabled the control of the energy use of their shared customers. The customers were reached through the customer channels of the incumbent energy companies. This form of cooperation allowed the DR entrants to increase their DR market share and to reach new customers. Out of the 15 DR entrants studied, six shared their energy end-user customers fully with the incumbents whereas three DR entrants shared their customer base partly. These DR entrants shared the household customers with the incumbent energy companies, but they had a direct customer link to the larger customers. One interviewee put it this way:

Households are not our direct customers; between us and them is a retailer or energy company who serves them. Our direct customers are bigger companies. We have limited resources, so we can't contact each citizen. (interviewee, Company K)

Ten of the studied DR companies were involved in DR technology development cooperation with the incumbents, and in some cases, the incumbents were also their DR technology customers. All the DR entrants took part in some way in shaping the emerging DR market, wherein regulations and market rules were still being framed at the time of our interviews. Cooperation with incumbents was also strategic for the DR entrants due to market emergence. One interviewee described it like this:

Of course, they are important; if they oppose it [DR], they impact on

[5] In particular, district heating tariffs often apply a power-based base fee.

[6] Energy sector companies have expressed fears that third parties controlling their customers will cause imbalances between their energy acquisition and the consumption of their customers [37]. However, when DR resources are utilised in markets where activations are short, the impact on energy use is small [96]. Thus, third-party aggregation is currently allowed in the Finnish frequency-controlled reserves, and arrangements concerning their participation in a balancing energy market are being piloted [97].

the markets and the potential customers. However, if they support us silently, or even a bit loudly, we get it [DR] through much easier. (interviewee, Company B).

5.3. Complementary assets from coopetition

The studied DR companies received multiple complementary assets from coopetition with incumbents. In the case of intense explicit cooperation created by sharing their customer base fully or partly with the incumbents (nine companies), they got access to new customers, which was important for starting and growing their DR business. Common technology development with the incumbents (ten companies) yielded the DR entrant additional resources, and new products and services. All the studied entrants received benefits from implicit cooperation with the incumbents in the form of new practices, standards and policies in the sector.

5.4. Coopetitive tension strategies

We found that the studied entrant DR companies employed all of the three coopetitive tension strategies that were illustrated in the work of Ansari et al. [8]: adapt (seen in four companies), pivot (seen in six companies) and accept (seen in five companies). The companies following the coopetitive tension strategy 'adapt' were very cooperative with the incumbents. Three of them shared their customer base fully with the incumbents. These companies all operated in the district heating markets. One of the companies following the adapt strategy had very tight technology cooperation with the incumbents. Although the adaptive entrants had very cooperative relationships with the incumbents, coopetitive tensions were still evident. A major factor for tensions was the energy users' and incumbents' deviating needs for DR. Since the DR entrants were providing platform services in between the incumbent energy companies and energy users, they had difficulties in pleasing both sides. In practice, the energy user's goal is to decrease her or his energy bill, which can cause profit reductions for the energy producers and retailers. For the incumbent energy companies, the needs for DR are the need to balance the energy system, decrease their balance errors and decrease the costs of the peak demand supply. The DR entrants employing the adaptive coopetitive tension strategy were adapting their value creation in multiple ways for the benefit of the incumbents (see Section 5.5).

According to our results, the reason for the entrants to adapt to the needs of incumbent energy companies when tensions arose was clearly a strategic decision, but this might also be a market entry strategy for these companies. Two of these companies mentioned that in the future, if/when they have a large-enough customer base, they may start to act more competitively in the energy markets. One adaptive DR entrant described their strategy in the following way:

In the beginning we are not asking for anything from anyone. Since we are the last ones in [to the markets], we adapt. But if things go as we expect, new energy contract types, where services are sold instead of kilowatts, will emerge. (interviewee, Company B).

The DR entrants employing the coopetitive tension strategy 'pivot' dealt with coopetitive tensions in differing ways according to the situation. In some cases, they were willing to adapt to the incumbents' needs and in others they were not. For example, they were willing to share the profits of the DR with the incumbent energy companies but were not ready to stop their larger DR customers from competing with the incumbent energy companies in the energy markets. In addition, we found that four of these companies sought compromises when coopetitive tensions arose, so both they and the incumbent energy company adapted to some extent.

According to the interviews, the coopetitive tensions between the entrant firms following the pivoting coopetitive tension strategy and the incumbent energy companies arose from (1) the different coopetition situation of the operations of the company (e.g. cooperating with some customers but competing with others; cooperating with DR technology development but competing in DR markets), (2) the increased competition in the energy markets and (3) the changes that DR causes in the energy markets. Pivoting entrants were struggling as incumbent energy companies did not incorporate DR activities into their core business activities. One interviewee described this situation in the following way:

After the product development and innovation units [of an energy company] we try to get to the core business, but there are hold-ups – they are not in a hurry. (interviewee, Company A)

The companies employing the coopetitive tension strategy 'accept' experienced high coopetitive tensions and pressure to adapt their value creation and value appropriation to incumbents' needs. The tensions with the incumbent energy companies arose from the increased competition in the energy markets and from offering DR to the energy end-user customers of the energy companies. One employee from a DR entrant firm described this in the following way:

The energy company did not want to take the [DR] client themselves. When we explained that we will take the client then, they got angry with us. They tried to tell us that we can't do it, but of course we can. (interviewee, Company O)

Another interviewee explained the coopetitive tensions and their decision not to adapt to the requests of the incumbents in the following way:

The incumbents are saying that it's okay to sell demand response, provided we compensate them for the revenue they don't make – so, we should pay them the amount that the consumers don't pay them because they don't consume their product. That would mean two things. The first thing is, although consumers consume less, suppliers would have the same revenue. That is really weird. It would mean that we reimburse most of our revenue to the retailers. And why did they invent that? It's because if we don't have any revenue left, then we don't exist, and then we don't compete with the generators. (interviewee, Company M).

The reason for these companies to challenge the incumbents was simply the fact that they did not consider incumbent energy companies important to their core business. One interviewee described the motivation in the following way:

We are independent of the retailer, so the electricity retailer or supplier is selling electricity to the customer. We are not selling anything, but the way in which we operate flexibility reduces consumption and thus will reduce the overall consumption and thereby the overall bill that the consumer will pay. (interviewee, Company M)

5.5. Coopetition value creation and appropriation

All the DR entrant companies studied *created joint value from coopetition with the incumbents by establishing new DR markets*. For the five DR companies employing the coopetitive tension strategy 'accept' (see Section 5.3), this was actually the only way to create value from coopetition. They had decided to act independently in the markets so that they did not have to share their profits with the incumbents. The ten other companies in the DR markets employing the coopetitive tension strategies 'adapt' and 'pivot' had deeper cooperation and value creation in their coopetition with the incumbents. They created joint value with the incumbents by increasing the size of the DR markets, accessing new customers and sharing resources in R&D operations. They were willing to *adapt their value creation to comply with the needs of the incumbent energy companies* in all coopetitive tension situations (the coopetitive tension strategy 'adapt') or in some of them (the coopetitive-tension

strategy 'pivot') (see Section 5.3).

Thus, *incumbents appropriated value from joint value creation in exchange for cooperation activities, such as customer sharing*. This decreased the coopetition value appropriation of the DR entrants. However, they were willing to let incumbent energy companies appropriate some of the value created since they gained a larger share of the DR markets, a larger customer base and more efficient use of their resources due to the coopetition.

We found three value creation adaptations: (1) core technology adaptation, (2) profit sharing or cost compensation and (3) phasing out non-DR operations that are competing with energy production. Core technology adaptation was implemented by four DR entrants, and it refers to a situation where the entrants adapted their DR control algorithms so that they took the needs of the incumbents into consideration. This allowed the incumbents to appropriate more value from the joint value creation. The increased value appropriation of the incumbents decreased the value appropriation of the DR entrants and the value they created for their DR customers. One interviewee expressed the reasoning for this in the following way:

In a way, combining the expectations of the building owners and the energy producers is contradictory. We must make sure that the objectives are met from all stakeholders' points of view. […] Algorithms have to be developed in strong cooperation with the local district heating company. (interviewee, Company G)

Profit sharing adaptation was used by six DR entrants, and it refers to a situation where the profits from DR services were shared between the DR entrant and the energy company. Also, this adaptation had negative implications for both the DR entrants' and their DR customers' value appropriation. An interviewee described this in the following way:

They [energy companies] must be part of the profit sharing or at least we must compensate for the harm caused to them. (interviewee, Company H)

The third way to adapt value creation was to phase out non-DR related business activities that were (directly) competing with the incumbents, and this was done by one company. In practice, they stopped their activities involving renewable energy sales. As renewable energy directly competes with energy production, they had decided to discontinue that part of their business. An interviewee described this in the following way:

We sold the renewable energy business. Now that we focus on the [building automation and DR] services, we are a more neutral actor in the eyes of the energy companies because we are not competing with them anymore [in energy production]. (interviewee, Company G)

Four companies following the coopetitive tension strategy 'pivot' were willing to adapt their value creation if the incumbent energy companies were also willing to adapt theirs. Thus, they bargained for conditions under which both parties could appropriate value. The main way in which the DR entrants expected the incumbent energy companies to adapt their value creation was to implement DR in their pricing mechanisms and investment decisions. If the incumbent energy companies made these adjustments, the entrants were willing to, for example, share the profits of DR with the incumbent energy companies. In addition to sharing profits, the DR companies found other ways to compromise with the incumbent energy companies. In the words of one interviewee:

With one energy company we have found a compromise: they advertise our product and we give a discount on our services to their electricity customers. In this way we pay for our advertising. (interviewee, Company C)

6. Discussion

Our results shed light on the different aspects of coopetition antecedents and coopetitive tension management in the DR industry. The focus of our analysis is at the sector level as we studied 15 companies providing DR services in the emerging Finnish DR industry. This approach sets this paper aside from most previous coopetition studies in which researchers have had focused on analysing one or two companies [8,10]. Our approach allowed us to look at coopetition in a broader way, and it also allowed us to find variation between the entrants of the same sector.

We find that whereas the studied DR firms have different organisational and managerial reasons that drive their coopetitive strategies, the main determinant was the nature of the markets they operate in, namely electricity and district heating markets. These results are in line with previous studies, which indicate that regulatory and political factors significantly shape DR business [31,50]. In addition, we found that the decision to share a customer base fully or partly with incumbent energy companies to get complementary assets in the form of new customers, indicated how the DR entrants navigated coopetition. For example, the DR companies operating in heat markets and sharing their customers with the incumbents employed the coopetitive-tension strategy 'adapt' and had high value creation from coopetition, but also lost a significant part of it in inter-organisational value appropriation.

We found variation in the ways that the Finnish DR entrants navigated coopetition with the incumbent energy companies. However, when considering our results in light of the conceptual coopetition model adopted, some recurrent patterns of firms' coopetitive behaviour can be found. Based on that, we can identify three groups of companies adopting different coopetition strategies (see Fig. 2). We call them *adaptive market expanders*, *win–win solution seekers* and *disruptive challengers*. Some of the companies fall between the three groups, so they do not reflect reality perfectly, but they help us to structure our results.

First, *adaptive market expanders* seek a collaborative relationship with the incumbents and this strategy results in coopetition value creation. Coopetition expands their market share as they can utilise the pre-existing customer channels of the incumbent energy companies. Their coopetition comes with costs as it also entails value appropriation by the incumbent energy companies. Thus, they navigate between value creation and inter-organisational value appropriation in their coopetitive relationship. The adaptive market share expanders operate in district heating markets, which are characterised by a natural monopoly environment and by incumbent firms that control local energy infrastructures and markets. Therefore, in district heating markets, cooperation with the dominant energy companies is necessary for the DR entrants to even enter the market. After they have established their position as a DR cooperator in those markets, they must try to prevent and mitigate coopetitive tensions to keep their position. This entails having low bargaining power in the relationship as the incumbent energy companies might replace them with another DR entrant [76].

Second, *win–win solution seekers* have a relatively well-balanced combination of competition and cooperation with incumbents, which may make their coopetition strategy stable and successful [14,72,73,74]. They navigate between competition and cooperation, and bargain with the incumbents as they are trying to find win–win solutions in their coopetitive relationship. Coopetition leads to value creation but also to inter-organisational value appropriation since they find compromises with the incumbents. In addition, the need for constant bargaining indicates high transaction costs.

Third, *disruptive challengers* operate in the electricity markets, which in the Nordic countries' context are characterised by competition and low entry barriers. Disruptive challengers are very competitive with incumbents and are willing to accept numerous coopetitive tensions. The ongoing tensions can be cognitively taxing [12,13]. Their cooperation with the incumbents is limited to new market formation by creating new standards, regulations and market rules for the sector. Thus, their cooperation deviates from economic cooperation and is in line with what Chen and Miller [69, p. 764] referred to as 'political cooperation'. From this perspective, the energy market is not just an economic entity but also a political one.

When comparing our findings with the related coopetition literature, a balanced situation between competition and cooperation – the

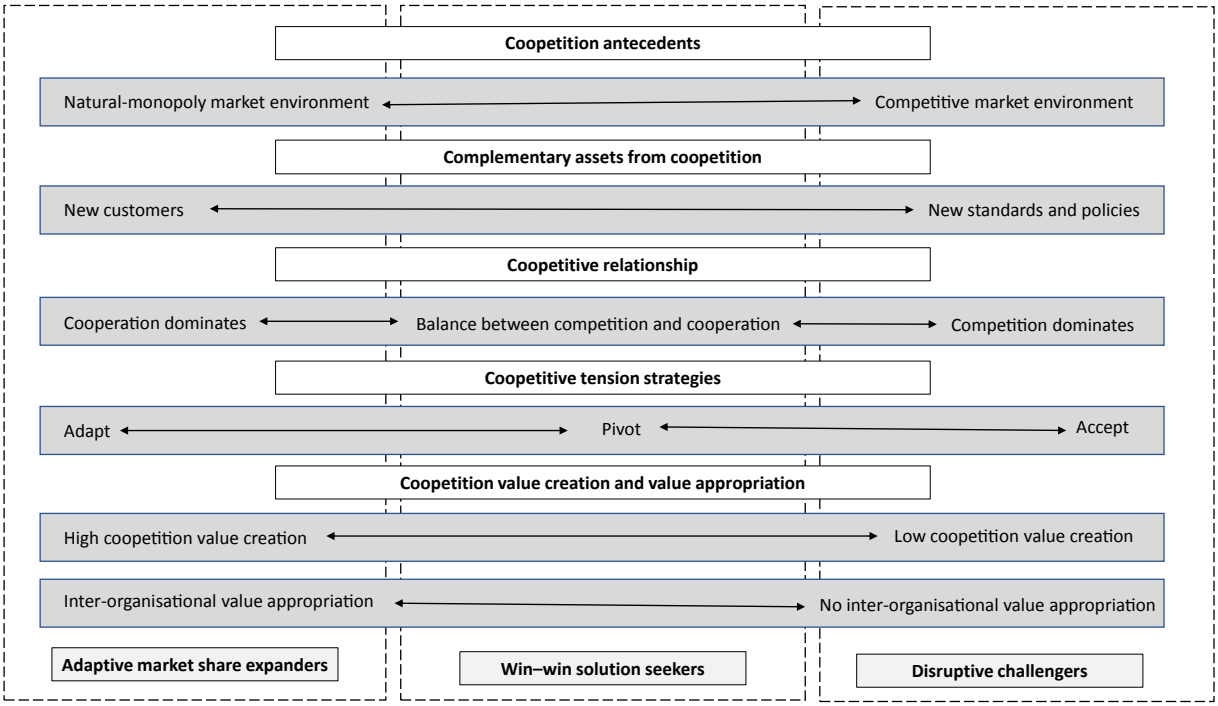

Fig. 2. Three groups of companies and their relation to the conceptual framework.

situation for win–win solution seekers – could be the most stable situation [14,72,73,74]. However, when taking into consideration our findings on market structure impacts, cooperation that is stronger than competition might be the key to success for the adaptive market share expanders operating in the district heating markets. Furthermore, the disruptive challengers were cooperating just to form the DR markets, so in the future coopetition might not be necessary for their success. In addition, these companies did not seem to seek stable coopetition partnerships but more sought future market dominance.

Our findings support the previous energy literature in that energy incumbents cooperate with entrant companies to gain access to the resources needed for divergent innovations, especially technological knowledge in the context of ICT solutions [38,41,44]. However, whereas previous studies have indicated that energy incumbents favour collaboration with other incumbent actors [38,42], we did not find evidence that DR entrant size would have had any effect on the initiation or nature of cooperation. Altogether, our study supports prior research in that, besides energy incumbents, new entrant companies are also central actors and drivers of the emerging field of automated DR services [38,44].

Finland is a considered to be a forerunner in automated DR [25,27,34–36], and our study confirms that new DR markets are emerging within both electricity and district heating markets in Finland. While the situation regarding DR market access and smart meter roll out[7] varies widely even within Europe, implementing the requirements of the recast Electricity Directive 2019/944 will also enhance the conditions for novel DR services in other EU Member States. For example, the directive requires that transmission and distribution system operators treat DR aggregators in a non-discriminatory manner alongside energy producers when procuring ancillary services (i.e. services such as balancing and voltage control). Furthermore, the directive requires the EU Member States to ensure that all final customers equipped with a smart meter can request a dynamic electricity price contract with at least one supplier.

Whereas in the Finnish residential sector the main controllable loads have been related to heating, the loads utilised in the commercial and industrial sector (e.g. lighting, cooling) are more comparable with the international situation. In addition, the goal of the electrification of transport is likely to increase the need for flexibility, but also provide new flexible resources to the market [99,100]. Furthermore, while a similar district heating sector is not prevalent in all countries, Finnish experiences from the monopolistic district heating sector provide useful insights for those countries that have not liberalised their electricity sector.

Although this study provides interesting insights into the coopetitive behaviour of new entrant firms, it has several limitations. First, our results offer a snapshot of an industry in rapid transformation. Therefore, longitudinal studies would offer deeper insight into how the sector is evolving and what coopetition-related decisions and strategies create value in the longer term. Moreover, as we applied qualitative methods in this study, we could not evaluate the magnitude of the benefits linked to coopetitive strategies. Hence, in future, quantitative research on DR value creation could deepen our understanding of the role of DR in accelerating the energy transition and disruption of fossil fuel–based energy generation. Furthermore, we did not find differences in coopetition antecedents based on company size, but this may be a limitation due to the qualitative nature of our data.

7. Conclusions

In this paper we studied coopetition in a new context, the Finnish DR sector. We set out to increase the current understanding of the underlying reasons behind coopetition strategies, as well as the ways in which new entrants create value from coopetition by navigating coopetitive tensions with the incumbent actors. To do so, we developed a conceptual framework that especially builds on the seminal works of Hoffman et al. [13], Gnyawali and Charleton [16] and Ansari et al. [12].

The automated DR market is a novel and knowledge-intensive sector wherein the actors' resources, power dynamics and competences differ.

[7] At the end of 2019, smart meter penetration was over 80% in nine European countries and between 50 and 80% in four countries. Only seven EU Member States had decided to not implement smart meters based on a negative cost benefit analysis or had not made any decision yet [98].

Thus, coopetition is a beneficial strategy for the new entrants [74,75]. We found that it was crucial for the DR entrants to carefully choose their cooperators from among the incumbent energy companies. The DR entrants made a distinction between the progressive incumbents, who shared more similar goals with them, and the conservative incumbents, and were only cooperating with the former ones. When contrasted with the findings of Planko et al. [13], this coopetition strategy can be seen to enhance a clean energy transition and create environmental value from coopetitive relationships.

Based on our findings, DR competed directly with flexible energy production (e.g. by providing an alternative resource in the energy markets) and indirectly with energy production (e.g. by enabling the transition to a low-carbon energy system). Additionally, the new entrant firms also compete with some incumbents in providing DR services. However, there were differences in the cooperation intensity of the DR entrants, and cooperation varied from the cursory to the very intensive. All DR entrants were at least cooperating with the incumbents in the DR market formation. The most intensive form of cooperation we found was sharing the customer base with the incumbents, wherein negotiations on value sharing were crucial.

Both the markets in which the DR entrants were operating and the intensity of cooperation impacted on the employed coopetitive tension strategies. The DR entrants operating in district heating markets and sharing their customer base with the incumbents (the adaptive market share expanders) were most adaptive in their value appropriation when tensions arose with the incumbents. On the other hand, the companies operating in electricity markets with their own customer connections (the disruptive challengers) were competitive and did not adapt to the wishes of the incumbents, even when very high coopetitive tensions arose. The companies 'in the middle' (i.e. the win–win solution seekers) had the strategy of pivoting and handling each tension as it appeared. Since this study focused on the first years of DR entrants operating in energy markets with the novel DR technologies, we do not know which forms of coopetition and which coopetitive tension strategies are profitable in the longer term. To determine which coopetition strategies are most successful for new entrant firms, longitudinal research is required in future.

We found that market structure is an important factor that shapes the market entry of clean energy entrants. Based on our results, new entrant firms should aim to cooperate with energy incumbents in monopolistic markets, such as in the case of district heating networks dominated by municipal energy companies. However, in more competitive settings where new entrants have more bargaining power, they can adopt a broader number of strategies ranging from competition to cooperation. Our results lend support to the view that contextual conditions such as different market structures, regulation, and policies play an important role in shaping the actions and strategies of local energy actors. However, is important to remember that actors' agency and strategies in turn influence the contextual conditions under which they operate.

This paper makes two important contributions. First, by studying entrant–incumbent coopetition strategies, it provides a more nuanced understanding of the roles of new entrant firms in the transition towards a cleaner energy system. Second, the chosen approach to studying a field of companies in an emerging sustainable energy sector allowed us to pinpoint differences between companies and also to find patterns in their coopetition strategies. Future research could build on such an approach in order to quantify the impact of coopetition in terms of how it advances the energy transition by accelerating the penetration of renewable energy and smart energy services while contributing to phasing out fossil fuel–based production.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix 1. . Interview guide

A Company information

1. What is your role in the company?
2. Explain in brief the company's development over time, and how your company got interested in DR. Is there a separate DR unit in your company?
3. Personnel
   a. How much personnel does your company have working for DR?
   b. What is the typical education/background of your DR employees?
4. DR company type
   a. Energy service entity (including DR)
   b. Independent aggregators (only DR)
   c. Other
5. How do you plan to receive revenue from DR?
6. Why do you operate in Finland? Do you operate in other countries?
7. Technology and business model
   a. What technology and/or service do you deliver to your customers (e.g. monitoring technology, digital platforms, customer service)?
   b. Does your company provide the technology and platforms?
   c. Do you think your main innovation is in the DR technology or in your BM, or both?
   d. Is your DR solution easy to scale up (e.g. new areas, markets, customer segments, sectors)?
   e. Are you thinking about developing new DR technologies or services?

B Demand

1. What customer segments do you serve (energy producers, distributers; end-users of energy: what sector)?
2. Are consumers aware of and interested in DR?
3. Are consumers suspicious? Are there trust issues with customers?
4. How does your customer benefit from DR?

C Energy market environment

1. Which market type do you serve:
   a. Electricity market (Nordpool (Elspot and/or Elbas), Reserve and balancing markets, Peak load power)
2. Collaboration and competition
   a. Who are you main competitors in the DR business?
   b. Do you collaborate with other DR-providing companies; if yes, how?
3. Changing market environment:
   a. How does your DR service change the energy system?
   b. Do other actors have to adapt their business to comply with your DR service?
4. Interaction with incumbents
   a. Do you cooperate with energy companies? Why and how early on?
   b. How do the traditional energy market actors feel about DR, and are they similar to each other in their views? How do they adapt to your BM? If not, why?
   c. How has your company taken the energy companies into consideration when planning and developing your DR business model? Did this force your company to make compromises?
   d. Are you collaborating with the energy producers/distributers? If yes, how?
   e. What do you think about other DR companies' cooperation with the energy companies?

D Socio-technical system

1. Readiness for DR in Finland:
   a. Is it possible to have profitable DR business in Finland currently?
   b. Does the Finnish society value DR?
   c. Is the infrastructure in Finland ready for DR?
   d. What do you think about the future of DR services in Finland?
2. Policy:
   a. Is there any financial or other support provided by the government that supports your DR activities?
   b. What kind of policy changes, if any, would you find useful for your company?
   c. How do you try to influence future policies; do you collaborate with other DR providers or other actors?
   d. Why is DR not more widely in use in Finland?
3. What are your most important collaborators/networks we have not discusses yet?
4. Which societal changes are driving your DR business forward most strongly?
5. Which societal changes pose challenges for your business model?

E Conflicts and barriers

1. What are the difficulties in starting the DR business?
2. Has there been DR conflicts between the actors, and how have you adopted your BM in response to them, e.g.:
   a. Different actors have conflicting needs for DR
   b. No clear rules and responsibilities
   c. Financial losses for incumbent actors
3. If other DR companies are successful, does it enhance or harm your business?
4. Do your views on the future of DR align or conflict with other DR providers and other actors?

Appendix 2. . Coding schemes

First stage coding scheme

The coding of the data was done in two stages. The first stage coding was done in NVivo with the transcribed interview and company website data, and the results of coding were downloaded as excel and word files.

0 Basic info	
0.1 DR service type	Node is used to specify on which type of DR service some particular BM element relates to. Covers explanations of how specific type of DR service works. Additionally, comparisons about the different business opportunities of the different DR solutions (e.g. why DR of district heating is more interesting than aggregating). 0.1.1 Spot optimization 0.1.2 Aggregating 0.1.3 District heating 0.1.4 Non-DR = optimizing electricity use at micro grid level, i.e. optimizing real-estate's internal energy use.
0.2 Company history	node covers all discussion that relates to company's history, e.g. previous practices, past finance, personal growth stories etc.
1 Business model properties	
1.1 Value proposition	The value embedded in the DR product. Node covers the benefits the service provides for the customer, energy company, society or environment, or the company itself. BM/ service likely covers other qualities besides pure DR.
1.2 Customer relationship	1.2.1 Customer segment (the customers the company tries to serve) 1.2.2 Market place (node covers how the DR is turned into money, i.e. which markets or to which actors the loads are sold to: TSO markets/Fingrid, Nordpool, for another aggregator or energy company, or if used for balance settlement) 1.2.3 Other (customer channels and relationships. Discussion on how customers are contacted, who contacts the customers or end-users (also if sales are outsourced to partners). Discussion on how the customers/users affect the service and how the company communicates with the customers, before or after the sales)
1.3 Revenue model	How DR brings profit for the company (partly overlapping with value proposition). Node covers the costs and incomes of running the business, and their distribution across business model stakeholders. Additionally, possible financial support by the public sector, or other financiers.
1.4 Structure	1.4.1 Key resources (financial, physical and human resources) 1.4.2 Key networks (informal cooperation with organizations) 1.4.3 Key partnerships 1.4.3.1 Energy company (business and R&D cooperation with energy companies) 1.4.3.2 Other partnerships (business and R&D cooperation with other actors, e.g. sub-contractors, Fingrid, other DR companies etc.) 1.4.4 Key activities (node covers the most important activities needed to provide value proposition, the practices the company specializes in. The node covers also R&D.)
2 Business model critical factors These nodes cover the barriers and drivers that the business experience in Finland, for the node category "7 Exports and imports" has its own nodes for international barriers and drivers.	
2.1 Barriers	2.2.1 Starting the BM (internal or external barriers or hindering factors the company experiences as starting the BM) 2.2.1.1 Internal barriers (barriers or hindering factors the company experiences as launching the BM, that arise within the company, e.g. problems with R&D, tensions within company, lack of finance, unclearness about the BM, trouble in the supply chain.) 2.2.1.2 External barriers (barriers or hindering factors the company experiences as launching the BM, that arise from the selection environment, e.g. lacks in infrastructure, regulation, no demand for DR.) 2.2.2 Scaling up the BM (internal or external barriers or hindering factors the company experiences as scaling up the BM, i.e. factors that prevent the growth of BM, as it is already in the markets.) 2.2.2.1 Internal barriers 2.2.2.2 External barriers
2.2 Drivers	2.2.1 Internal drivers = internal motivations to develop BM for, e.g. environmental values, strategic moves of diversification or networking. 2.2.2 External drivers = external drivers to develop BM for DR, e.g. new opportunities occurring from market or political changes, or more straight forward incentives like suggestions to cooperate.
2.3 Competition and cooperation	Discussion on competitors, who they are, what they do and how it effects the company, is there cooperation etc.
3 Policy	Covers policies, legislation or other regulation and market rules
3.1 Current policy	Discussion on current policies, regulation or market rules, also discussion about research organizations objectives.
3.2 Policy recommendations	Hopes and statements for future policy or changes in market regulation. Also, discussion on lobbying or getting organized.
4 Impacts of regime on BM	The node covers discussion on how traditional energy market actors, current practices and megatrends influence on novel business models and the companies providing them, e.g. compromises made as collaborating with energy companies or changes in the regime opening up new biz possibilities or if the company is asked to cooperate or provide a novel service. Meaning, the node might cover impactors more broadly than the concept of regime.
5 Impacts of BM on regime	Covers all discussion on how various novelties, including megatrends/landscape changes affect the regime pressuring traditional actors to react to development, e.g. wanting to provide DR services, company fusions, falling out of business. Meaning besides BMs and new companies, all change pressures towards regime are coded in this node.
6 Innovation	All discussion on past and future R&D and realizations.
7 Exports and imports	All discussion on DR exports and imports.
8 Strategy	Node contains all discussion that related to business strategy of the company, i.e. the category is quite broad. Discussion on future development, what the company decides to specialize in, how the company views its market position, how it deals with other actors in the field (cooperation, competition, coopetition).
9 Conflicts	Conflicts and tensions that DR or the novel BMs for DR create in the energy markets, e.g. conflicts of interests, fear of losing market status, between traditional market actors or traditional and new-comer actors etc.
10 Scale of BM	10.1 Concept stage = discussion on why BM is under development, not launched yet or doesn't provide any income yet 10.2 Realized stage = discussion that points out that the BM is already put-in-practice and providing some income, though it is not necessarily profitable.
11 Market formation	Information on how the DR market is forming
12 Future visions	Future DR visions of the company

Second level coding scheme

The second level coding was done in excel, and the starting point was the first level coding scheme's output and the conceptual model of coopetition (presented in Section 3.4). The results were collected to summary tables to see if and what kinds of patterns emerge.

Coopetition antecedents	Starting point of coopetition (in terms of skills and customer relationships of the entrants and incumbent energy companies) Business environment (new technologies emerging, old technologies declining, market structure implications) Organization (size of the company and coopetition) Management (friendships, and other personal connections with energy incumbents)
Coopetitive relationship	Competition (what ways of competition were mentioned in the interviews, direct or indirect) Cooperation (what ways of cooperation were mentioned in the interviews, cooperation intensity, how were the cooperators chosen among incumbent energy companies, how many incumbent energy companies did the entrant cooperate with)
Complementary assets from coopetition	Complementary assets the from cooperating with incumbents mentioned in the interviews (customers, marketing, technologies, skills, R&D, standard & policy setting)
Value creation and appropriation	Coopetition value creation (what additional value was created from the coopetition with the incumbents) Coopetition value appropriation (what additional value did the new entrants appropriate from coopetition) Incumbent value appropriation (what value did the incumbents appropriate from the coopetition value creation)
Coopetitive tensions	What coopetitive tensions arose between new entrants and incumbent energy companies?
Coopetitive tension strategies	Adapt (what kind of adaptations did the companies mention in the interviews) Pivot (how did the companies deal with tensions in differing situations, what made the situations different) Accept (why and how did the new entrants accepted the tensions)
Bargaining power	Mentions of power dynamics between the new entrants and incumbent energy companies.

Table A2.2. Second level coding scheme.

Appendix 3. A summary of the main results

Table A2.1 presents the main results of the paper and their mentions in the interviews. The companies are referred to with numbers 1–15, which do not correlate with the letters A-O in the Section 5 to ensure full anonymity for the interviewees.

Coopetition dimension			Mentioned in interviews
Coopetition antecedents	Business environment	Emergence of new technologies	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15
	Business environment	Decline of old technologies	1,3,5,7,10,11,15
	Business environment	DR entrants have DR and ICT know-how	1,2,3,4,5,6,7,8,9,10
	Business environment	Energy incumbents have customer connections and/or are powerful in energy markets	1,2,3,4,5,6,7,8,9,10
	Business environment	District heating markets	1,2,4,6,7
	Business environment	Electricity markets	3,5,7,8,9,10,11,12,13,14,15
	Management	Environmental motivations	1,2,4,6,7,8,9,13,14
	Management	Technological development motivations	2,5,6,7,8,9,10,11,12,13,15
	Management	Personal relationships (old friends, meeting in industry events or in formal negotiations)	1,2,3,4,6,11
Value creation and appropriation	Coopetition value creation	DR market creation (market rules, policies and standars)	1,3,5,6,7,8,9,10,11,12,13,15
	Coopetition value creation	Use of incumbents' customer channels	1,2,3,5,6,7
	Coopetition value creation	Partial use of incumbents' customer channels	8,9,11
	Coopetition value creation	Common technology development	1,2,3,4,5,6,7,8,9,10
	Incumbent value appropriation	Core technology adaptation (at least in some cases/customers)	1,2,4,6
	Incumbent value appropriation	Profit sharing with incumbents (at least in some cases/customers)	3,4,5,7,8,9
	Incumbent value appropriation	Phasing out competitive operations (other than DR parts of the company)	1
Coopetitive tension strategies	Adapt	Willing to adapt to incumbents' needs	1,2,3,4
	Pivot	Different strategies (usually according to which customers the tensions concern)	5,6,7,8,9,10
	Accept	No need or will to adapt to incumbents' needs	11,12,13,14,15

Table A2.1. Summary of the main results.

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