Lowering the Peaks

Assessing the role of an energy cooperative on practices in the smart grid

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Cover: Light bulb with a growing plant (source: www.inaray.com). Interpretation: the seed of community energy has been planted years ago. It has been growing since and brings new 'power' into the energy system.

Preface

In finding a suitable topic for my master's thesis I've changed my mind quite a lot. Marine governance, nature conservation policy, but at a certain point I was grabbed by the energy transition. On an international level, I was not so much interested in the grassroots level. International cooperation in managing the grid and dealing with the intermittent renewable energy supply on an international level, that would be interesting! However, when I found out that Enexis was looking for a graduate student for conducting research related to one of their pilot projects on smart grids, I let go of the international level and oriented myself towards the distribution grid. Eventually the topic of my thesis turned out to be related to the emergence of community energy initiatives, and thus this grassroots level. Despite my interests in the large scale at first, I've been enthusiastic about the topic of my thesis since. Moments that I've lost my motivation or interest have been rare, even during the last month of writing, rewriting and editing. Though, I'm glad to finalise this piece of work.

This thesis would not have been possible without Enexis offering me the opportunity to write my thesis in relation to their pilot project Samen Slim met Energie. Through my presence at Enexis I have learned a lot more about the electricity network and innovations in the energy system. In addition, it has been a great experience to work on the interface between technology and social sciences, which has not always been easy but definitely interesting.

As being the case study of my research, I would like to thank energy cooperative Duurzame Energie Haaren (DEH) for their cooperation in distributing the survey and providing me with the relevant material for my research. In addition I would like to thank the interviewees for the time they made available to me and for providing me with interesting stories, enthusiasm and very useful insights for my research.

Special thanks goes to my supervisor Bas van Vliet for supporting me in writing my thesis at a grid operator and for his guidance throughout the whole research process. I'd also like to thank Marijn Renting, my internship supervisor, especially for critically reviewing my documents from an 'Enexis-perspective' to ensure the usefulness of this research for the project SSmE. In addition I am thankful to Joeri Naus, Charlotte Kobus and Astrid Hendriksen for critically reviewing my documents, helping me in constructing the survey and guiding me in statistical analysis.

Abstract

Rising demand for electricity and a decentralisation of electricity generation are recent developments in the Dutch energy system. They cause bi-directional power flows in the electricity distribution networks and are expected to raise peaks in electricity demand that will exceed the capacity of the grid. Smart grids can contribute to lowering these peaks by providing end-users with real-time insight in their electricity use and generation. Another development in the energy system has been the rise of community energy initiatives in which citizens together take up activities around sustainable energy. They become a new player in the energy system that operate in between the end-users and incumbent actors.

This research analyses the role of sustainable energy cooperative on four social practices that exist on the interface between community energy and smart grids: Renewable Energy Generation (REG), Monitoring Energy Use and Generation (MEUG), Sharing Information (ShI) and Timing of Energy Practices (TEP). Each of these social practices is analysed based on the three dimensions of a social practice: materials, meanings and competences. Resource Mobilisation Theory is used as a framework to analyse the role of the energy cooperative in shaping these practices. The results of this research are based upon data gathered by a survey (N=111) and ten semi-structured interviews with members and non-members of the energy cooperative.

The results of this research show that the energy cooperative has shaped the practices through facilitating the procurement of solar panels and information evenings. Solar panels shape the materials dimension of the practices and information evenings have provided members with the relevant knowledge. By emphasizing the direct personal benefits and the benefits to the environment, the energy cooperative has shaped the meanings dimension of the practices as they exist among members. The role of the energy cooperative on shaping the timing of energy practices in the future is expected to be on connecting the smart technologies with (new) knowledge and motivations.

Key words: resource mobilisation theory, social practices, community energy, smart grid

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Abbreviations and acronyms

DEH	Duurzame Energie Haaren (Sustainable Energy Haaren)
DSO	Distribution System Operator
HEET	Haarens Energie Ecologisch Traject (Haaren's Energy Ecological Trajectory)
LNMH	Landschap Natuur en Milieu Haaren (Landscape Nature and Environment Haaren)
MEUG	Monitoring Energy Use and Generation
REG	Renewable Energy Generation
RMT	Resource Mobilisation Theory
ShI	Sharing Information
SM	Social Movement
SMI	Social Movement Industry
SMO	Social Movement Organisation
SNM	Strategic Niche Management
SPT	Social Practice Theory
SSmE	Samen Slim met Energie (Together Smart with Energy)
TEP	Timing of Energy Practices

1. Introduction

"It's dazzling and sparkling in the country" (Rotmans, 2011). Increasingly citizens organise themselves to take up activities around sustainable energy to contribute to the energy transition (Schwencke, 2012). Recently 900 people representing sustainable energy initiatives, businesses and (local) government(s) in the Netherlands have come together at 'Hier opgewekt' to learn, inspire and make contacts (HIER opgewekt, 2014). It shows that there is a need to learn more about these bottom-up initiatives and their (future) role in the changing energy system.

1.1 Problem description

A changing energy system

Traditionally the energy system has been dominated by large scale, centralised and fossil-fuel based systems. Coal and natural gas have been the main sources of electricity generation by the incumbent electricity producers. The traditional electricity system is a demand driven system in which electricity is generated when demand is high. It is a vertical system that consists of a transmission and a distribution system: the electricity that is generated by large-scale power plants is transported in high voltage over a transmission grid to substations, and in medium and low voltage over the distribution grid to the end-users (Veldman, 2013). It is a one-directional system in which electricity is transported from the electricity generators to the end-users (Veldman, 2013) (see Figure 1-1).

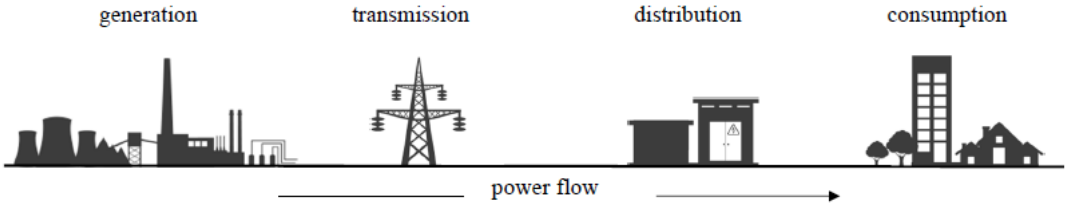

Figure 1-1 Structure of a traditional power system (Veldman, 2013)

On the road to a more sustainable energy system, there are some major developments (Naus, Spaargaren, van Vliet, & van der Horst, 2014; Verbong, Beemsterboer, & Sengers, 2013). Firstly, the demand for electricity is rising, due to the electrification of society: increasingly we use electric devices and use electrical modes of mobility (Verbong et al., 2013). It causes rising peaks in electricity demand which are expected to exceed the capacity of the grid in the future (Taskforce Intelligente Netten, 2010). On the supply-side of the system, an increasing share of electricity is generated by intermittent sustainable energy resources, as solar and wind energy (RVO, 2014; Verbong et al., 2013). As these sources of energy are more difficult to control – we cannot make the sun shine or the wind blow – a change is needed towards a

more supply driven system. In addition, there is a shift towards a more decentralised system of electricity production in which electricity is generated on the traditionally demand side of the grid (Veldman, 2013). Increasingly citizens install solar panels on the roofs of their houses and deliver their excess generated electricity to the net (Kobus, Mugge, & Schoormans, 2013; Veldman, 2013). As a result of this decentralised generation, the role of the end-user changes from being a customer to a co-provider and bi-directional power flows in the distribution network emerge (van Vliet, 2012; Veldman, 2013).

Community Energy

Another recent development in the Netherlands is the emergence of community energy initiatives in which citizens strive for a local and sustainable energy provision (Netbeheer Nederland, 2013; Schwencke, 2012). Since 2009 the number of community energy initiatives in the Netherlands has been rising up to 300 - 400 in 2014, of which 110 energy cooperatives (Elzenga & Schwencke, 2014; Netbeheer Nederland, 2013; Schwencke, 2012). Schwencke (2012, p. 11) defines these community energy initiatives as "citizens that collectively take up activities around sustainable energy and/or energy saving and spontaneously organise themselves in the form of a cooperative, association or looser forms of collaboration". They can take many different forms and include both energy generation and energy saving projects (Seyfang, Park, & Smith, 2013). Netbeheer Nederland (2013) distinguishes four main categories among these initiatives: wind cooperatives, local sustainable energy cooperatives, project developers of wind or solar projects with active participation of citizens and other looser forms of collaboration in neighbourhoods and villages. Large differences exist between these energy initiatives in activities employed and organisational form. Some have just started and others, the so-called 'energy cooperatives', have already developed into semi-professional organisations, (Elzenga & Schwencke, 2014; Netbeheer Nederland, 2013; Schwencke, 2012). They can however all be regarded as bottom-up initiatives in which citizens take the initiative and strive for an improvement of their living environment (Elzenga & Schwencke, 2014; Seyfang, Hielscher, Hargreaves, Martiskainen, & Smith, 2014; Seyfang et al., 2013). They, for example, collectively work to reduce energy demand, invest in the local generation of renewable energy and finance sustainable energy projects (Schwencke, 2012).

Smart grids

The rising peaks on the demand and supply side as a result of the above described developments are expected to exceed the capacity of the electricity grid and thereby to pose serious challenges to the grid and grid operators in the future (Taskforce Intelligente Netten, 2010, p. 6). Instead of simply replacing the old cables by new ones with a higher capacity, a solution could be to add intelligence to the grid in the form of information and communication technology (ICT) (Veldman, 2013; Verbong et al., 2013). Such a grid is also known as a 'smart grid' and can be defined as "a socio-technical network characterised by the active

management of both information and energy flows, in order to control practices of distributed generation, storage, consumption and flexible demand" (Wolsink, 2012, p. 824) (Figure 1-2).

Figure 1-2 Artist impression of a smart distribution grid (Veldman, 2013)

Smart meters function as a key component in smart grids which can provide end-users with detailed information about their electricity use (Kester, González Burgos, & Parsons, 2010). They have the ability to read data on energy use real-time and thereby provide the information which has been shown to enable customers to reduce their energy consumption (van Elburg, 2007). In addition, smart meters enable the use of more complex tariff schemes and thereby allow end-users to shift timing of their electricity use to outside peak hours (Kester et al., 2010). In other words, smart meters can provide consumers with the right information to reduce electricity use and to reduce the peaks in electricity demand. Figure 1-3provides an overview of a smart home. It pictures the smart meter which sends data on electricity use and generation to a monitoring device: the energy display. It also shows smart washing and smart charging for electric vehicles which are connected to the smart meter and automatically start when they receive a signal from the smart meter.

Figure 1-3 Smart Home (Enexis, 2014b)

During the past few years experiments with smart grids have been conducted through 12 pilot projects, Proeftuinen (Test-gardens), in the Netherlands (Taskforce Intelligente Netten, 2010). In these pilot projects has been experimented with a.o. variable pricing and feedback and steering systems in order to stimulate the end user to shift timing of electricity use (Taskforce Intelligente Netten, 2010). According to the theory of Strategic Niche Management (SNM) new technologies develop within a protected space, called a niche, in which is experimented with technology, user practices and regulatory structures (Schot & Geels, 2008). In the energy system, the Proeftuinen could be considered as the niche in which the technologies for smart grids develop. In their research on SNM Schot and Geels (2008) concluded that technology developers tend to focus on optimising the technological aspects within the niche first and thereby neglect other social aspects external to the niche. They argue that "internal niche developments are not the only important factor [and that] external factors also play a crucial role" (Schot & Geels, 2008, p. 545). Correspondingly, Verbong et al. (2013) argue that co-evolution of the technology with the social context is important for the innovation to succeed. This especially holds for the smart grid which is expected to have a considerable impact on the daily life of users (Naus et al., 2014; Verbong et al., 2013). Therefore it is argued that more attention should be given to the social context in smart grid innovations (Verbong et al., 2013).

Community energy and the smart grid

The community energy initiatives, as discussed above, are part of a transition towards a new energy system involving social, economic, political and infrastructure changes (Elzenga & Schwencke, 2014). Examples of these are the decentralisation of energy generation, the changing power relations in the energy market and the empowerment of individuals in overcoming constraints for individual measures (Elzenga & Schwencke, 2014; Seyfang et al., 2013). The community energy initiatives become a new actor in the energy system and operate between the end-user and incumbent electricity generators and grid operators. The rising number of bottom-up energy cooperatives, both in the Netherlands and in other European countries shows the importance of this development (Attema & Rijken, 2013; Netbeheer Nederland, 2013; Schwencke, 2012). This change in social context should be taken into account in the development of smart grids (Schot & Geels, 2008; Verbong et al., 2013).

As mentioned above, smart grids are a new form of grid infrastructure and are expected to contribute to a shift in the timing of electricity use to off-peak hours. In addition to the availability or infrastructures, however, social conventions have also shown to play a role in behaviour (Gram-Hanssen, 2010; Heiskanen, Johnson, Robinson, Vadovics, & Saastamoinen, 2010; Shove, 2003). It is therefore argued that more attention should be paid to the social embeddedness of individual behaviour in order to induce a behaviour change (Heiskanen et al., 2010; Wilhite, Shove, Lutzenhiser, & Kempton, 2000). This research takes a practices approach to account for the availability of infrastructures and social conventions in order to induce a time shift of electricity use.

The smart grid pilot project Samen Slim met Energie

Recently regional grid operator Enexis B.V. and energy cooperative Duurzame Energie Haaren (Sustainable Energy Haaren), DEH, started the pilot project Samen Slim met Energie (Together Smart with Energy), SSmE. In this project is experimented with the characteristic functions of smart grids to stimulate the optimal use of the electricity grid. It not only focuses on the individual, but experiments with the flexibility of a group of people in the timing of electricity use. In addition it seeks to get more insight in energy cooperatives and their needs towards the grid operator. This research is part of the pilot project SSmE and takes DEH as a case study to address the research objective.

The problem situation sketched above has described the context in which this thesis is written. Community energy initiatives become a new player in the energy system, in between the end user and the incumbent actors (Elzenga & Schwencke, 2014). Different studies have already investigated the various types of community energy initiatives that exist in the Netherlands, the activities they employ and the motivations of participants to take part in these (Attema & Rijken, 2013; Netbeheer Nederland, 2013; Schwencke, 2012). Less attention is however given to how these initiatives (can) contribute to (a change in) practices, including the timing of energy practices which can contribute to lowering the peaks in the electricity grid.

1.2 Research objective

This research seeks to account for the wider social context in which the innovation on smart grids takes place and in which behavioural change emerge. Based on the problem situation, as described above, the objective of this research is

"to expand our knowledge on the role of a sustainable energy cooperative on four practices that exist on the interface between community energy and smart grids. "

It thereby ultimately aims to contribute to a future model for smart grids.

1.3 Research questions

In order to achieve this aim, this thesis will answer the following main research question:

"What is, or could be, the role of a sustainable energy cooperative on shaping practices that exist on the interface between community energy and smart grids?"

Building up towards the main research question, the following sub-questions will be answered:

1. Which four social practices can be distinguished on the interface between community energy and smart grids?
2. What are the characteristics of the sustainable energy cooperative DEH; what are the available structural and symbolic resources and how are these resources mobilised by DEH?

3. How can the selected social practices be characterised; what are the materials, meanings and competences within these practices?
4. What is or can be the role of DEH on the four selected social practices, based on the available resources and the ability of DEH to mobilise these?

1.4 Reader guide

The contents of this thesis are divided over seven Chapters. Chapter 1 has presented the context in which this research is written and stated the research questions. In Chapter 2, the conceptual framework is outlined. It describes two schools of theory, how they are integrated in this research and the selection of the four social practices that are the focus of this thesis. Chapter 3, Methodology, describes the case study that this research is focused on and the methodology used for data collection and analysis. Chapter 4 provides the first part of the results and analyses the energy cooperative DEH based on the available structural and symbolic resources. In Chapter 5 the results of the practices' analysis are presented. It consists of four sections that each describe one of the four social practices that have been selected for this research as well as the role of DEH on these practices. In Chapter 6 the research questions are answered from which the conclusions of this research are drawn. Based on these conclusions, recommendations for future research, Enexis, DEH and the pilot project SSmE are given. Chapter 7 reflects on the use of the conceptual framework, the methodology and the outcomes of the research.

2. Conceptual Framework

This Chapter outlines the conceptual framework which is applied in this research. It draws upon two schools of theory: Resource Management Theory (RMT) and Social Practice Theory (SPT). In Section 2.1 and Section 2.2 each of these theories is individually described. They are integrated in Section 2.3 which presents the total conceptual framework. Section 2.4 outlines the selection of the four social practices that are analysed in this thesis.

2.1 Resource Mobilisation Theory and Social Movements

This section provides a description of Resource Mobilisation Theory (RMT) which will be used to gain understanding of the energy cooperative Duurzame Energie Haaren (DEH) regarding the availability and utilization of resources in moving towards its mission. In subsection 2.1.1 the origins of RMT in Social Movement Theory (SMT) is described as well as how RMT developed from this. It is followed by a description of RMT in subsection 2.1.2 and how it is extended for the purpose of this research.

2.1.1 Social Movement Theory

Social Movement Theory (SMT) aims at understanding why and how social movements occur and which consequences they have (Bomberg & McEwen, 2012). Social movements can be defined as "networks of informal interactions between a plurality of individuals, groups and/or organizations, engaged in political or cultural conflicts, on the basis of shared collective identities" (Diani, 1992). Originally social movement theory emerged from the study of protest groups around issues of civil rights, including issues concerning the environment (Bomberg & McEwen, 2012). More recently SMT is applied to mobilisation of citizens around issues of healthcare (Bate, Robert, & Bevan, 2004), wind energy (Toke, 2011) and community energy (Bomberg & McEwen, 2012). Within SMT different approaches exist that emphasize the role of grievances and deprivation generated by social change to explain individual participation in social movements (Jenkins, 1983; McCarthy & Zald, 1977). Although differences existed on the details of the hypotheses, they inhibited common assumptions about the economic irrationality of movement actors and the temporary state of discontent (Jenkins, 1983).

Research to social movements in the 1960s put these assumptions behind the traditional approaches of SMT into question and resulted in a new approach, known as Resource Mobilisation Theory (RMT) (Jenkins, 1983; McCarthy & Zald, 1977). RMT draws specific attention to the availability of resources and the ability to mobilise these resources in explaining the emergence of social movements (Bomberg & McEwen, 2012; Canel, 1997; McCarthy & Zald, 1977). This approach does not go by on grievances as a cause of social movements, but reduces them to one of many components important in mobilising groups (Jenkins, 1983; McCarthy & Zald, 1977). In RMT the focus is on the process of mobilisation and continuation of a social movement, in which more attention is given to the organisational

power, outside actors and the political system, instead of a temporary state of discontent (Canel, 1997; McCarthy & Zald, 1977). RMT thus advanced the traditional model of SMT by emphasizing the role of resources, organisations and political opportunities in the formation and success of social movements (Jenkins, 1983).

2.1.2 Resource Mobilisation Theory

The introduction of this thesis described the recent development of community energy in the Netherlands. Different types of initiatives can be distinguished based on the activities and organisational forms (Elzenga & Schwencke, 2014; Netbeheer Nederland, 2013; Schwencke, 2012). It corresponds to theory of resource mobilisation as developed McCarthy and Zald (1977), who emphasize that the social movement consists of different types of organisations that pursue various goals and organise a range of activities. In addition it directs special attention the role of the organisation in the success of the social movement. Since the organisational power is the focus of attention in Resource Mobilisation Theory (RMT), it is regarded as a suitable framework for this research to analyse the 'role of the energy cooperative'.

In their framework, McCarthy and Zald (1977) distinguish between the social movement (SM), social movement organisation (SMO) and social movement industry (SMI). The SM is defined as "a set of opinions and beliefs in a population which represents preferences for changing some elements of the social structure and/or reward distribution of society" (McCarthy & Zald, 1977, p. 1217). In the case of community energy these are for example the wish to be self-sufficient in energy provision, independence of energy suppliers and the reduction of energy costs (Netbeheer Nederland, 2013; Schwencke, 2012). An SMO is referred to as the formal organization attempting to implement the goals of a social movement (McCarthy & Zald, 1977). These goals do not have to constitute whole of the SM, but can represent a selection of these preferences (McCarthy & Zald, 1977). This implies that, although not all SMOs pursue the same goals, they operate within the same SM. Translated into the context of this research, the SMOs are the community energy initiatives that are (in)formally organized and undertake activities that contribute to operationalising the preferences that exist within community energy. The different SMOs that exist within one SM form the SMI: the totality of preferences, structures and organisations in which a group is mobilised (McCarthy & Zald, 1977). The SMI of community energy thus constitutes of all community energy initiatives pursuing the totality of preferences within community energy. The energy cooperative Duurzame Energy Haaren (DEH), which forms the case study of this thesis, can be regarded as one SMO within the SMI.

This distinction between SM, SMO and SMI emphasizes that the success of an SMI is not so much dependent on the preferences, values and beliefs that exist (the SM), but rather on the organizational capacities to translate these goals into concrete actions (McCarthy & Zald, 1977). The importance of an organisational structure as an authority to give direction towards achieving the goals is made explicit by this distinction.

Resources

The SMOs are the focus of attention in explaining the emergence and success of social movements in RMT. The success of an SMO is believed to largely depend on the availability of resources and the extent by which SMOs can successfully mobilise these resources for collective action (Jenkins, 1983; McCarthy & Zald, 1977). This last element is regarded as most relevant: "resources must be controlled or mobilised before action is possible" (McCarthy & Zald, 1977, p. 1221).

The resources considered in RMT are those resources that are needed on the organisational side (the SMO) to pursue its goals. They encompass intangible human resources (labour, time, social networks), tangible material resources (communication structures, financial resources) and features of the wider political system (e.g. openness) (Bomberg & McEwen, 2012; Jenkins, 1983; McCarthy & Zald, 1977). Each of these resources will be explained in more detail later in this section.

A main point of criticism on the approach in RMT is that it is too narrow: motives, feelings and emotions of individuals are largely neglected and individuals are merely seen as acting in favour of SMOs (Bomberg & McEwen, 2012; Canel, 1997; J. Goodwin & Jasper, 2004; Jenkins, 1983; Walder, 2009). Authors of RMT acknowledge that grievances and ideologies play a role in the emergence of social movements. However, these non-material resources that hold symbolic value, like collective identity, meanings and emotions, are largely left out in the traditional framework (Canel, 1997; Walder, 2009). Research has shown that collective identities, community benefits and social aspects, like friendships and the pleasure of working together, play an important role in sustaining participation in community energy by creating a feeling of connectedness to the community (i.e. the SMO) (Hoffman & High-Pippert, 2010). They can be important in overcoming barriers hindering collective action in community energy initiatives (Bomberg & McEwen, 2012; Della Porta & Diani, 2006; Heiskanen et al., 2010). Moreover, from the point of view that community energy is part of a wider sustainability transition which entails norms, values and beliefs (Geels, 2010), these aspects should be taken into account in the analysis of community energy.

To account for these non-material resources that hold symbolic value in social movements, Bomberg and McEwen (2012) make a distinction between 'structural resources' and 'symbolic resources'. 'Structural resources' are those resources that were incorporated in the traditional RMT framework (i.e. human resources, material resources and features of the wider political system). 'Symbolic resources' are regarded as those resources that hold non-material value for actors (Bomberg & McEwen, 2012).

This research aims to analyse the role of a community in changing energy practices. The organisation and its abilities to mobilise resources has shown to be important to its success by authors of RMT (Jenkins, 1983; McCarthy & Zald, 1977; Seyfang et al., 2013). However, the individual perspectives and values are also relevant in order to understand why community

energy initiatives arise or why individuals participate (Canel, 1997; Hoffman & High-Pippert, 2010; Seyfang et al., 2013). Therefore, this research takes both structural and symbolic resources into account. The next subsection outlines the structural and symbolic resources distinguished in this research.

Structural resources

Structural resources accounted for by RMT are the intangible human resources, tangible material resources and political opportunity structures (Bomberg & McEwen, 2012; Jenkins, 1983; McCarthy & Zald, 1977). A distinction can be made between labour, time, social networks, financial resources, communication and the wider political system. The following paragraphs will explain these resources in the context of community energy.

Labour

Skills, knowledge and unspecialized labour are regarded as relevant human assets in mobilising resources (Bomberg & McEwen, 2012; Jenkins, 1983; Seyfang et al., 2014). Skills encompass both technical and 'soft' skills, like organisational, interpersonal and networking skills (Jenkins, 1983; Seyfang et al., 2014). According to Seyfang et al. (2013), the availability of sufficient skills belongs to the success factors of community energy projects. They will contribute to an 'effective organisation' that is able to overcome obstacles and direct the community energy initiative [the SMO] towards its goals, which is crucial for its success (Seyfang et al., 2013). Unspecialized labour refers to that type of labour which does not require a possession of specific skills or knowledge (Jenkins, 1983). The extent to which these types of labour can be effectively exploited is key in RMT (Bomberg & McEwen, 2012). Regarding knowledge, research on community energy has, for example, referred to the importance of technical expertise in overcoming technical problems in projects (Seyfang et al., 2013). The extent to which labour is provided on a voluntary or on a professional basis depends on the preferences of the organisation. As an SMO grows and expands, the organisation of the SMO and its activities becomes more complex to manage and may require professionalization of staff (McCarthy & Zald, 1977). When more time and labour (both skills and expertise) are required, it might not be possible to depend upon voluntary input from participants and it may be beneficial to hire professionals.

Time

Sufficient time is an important resource in the success of a community energy initiative (Seyfang et al., 2013). In this research time refers to the number of hours that people spend on DEH activities regardless of the type of input they give. McCarthy and Zald (1977) have shown that the willingness to give time is positively correlated to the level of education: the higher the level of education, the more likely the people are willing to give time. On the other hand, the time available is negatively related to the involvement in other voluntary activities, since it is a resource different organisations compete for (McCarthy & Zald, 1977).

Human resources can be offered on different levels which implies that not everybody has to be involved to the same extent. There is a key group which is very active and sets the standards for the people who are involved on a lower level (Hoffman & High-Pippert, 2010). The higher the key group is involved and connected to the movement, the more likely others are more involved as well (Hoffman & High-Pippert, 2010).

Social networks

Strong internal networks enable the SMO to mobilise its resources for collective action (Jenkins, 1983). In the theory of collective action, people are seen as self-interested, rational individuals that act in order to maximise their personal benefits (Olson, 1965). Due to the possibility of free-riding, an individual will not contribute to securing collective goods (Olson, 1965). The free-riding problem arises from the non-excludability of collective goods, through which others can benefit from one individual's action (Frank & Bernanke, 2003; Mankiw, 2011). Social networks can provide a basis for overcoming this free-riding problem through shared identities (Bomberg & McEwen, 2012; Jenkins, 1983).

Authors on RMT also refer to social networks as a resource that helps to bind people to an SMO (Jenkins, 1983; McCarthy & Zald, 1977). Neighbourly relations and face-to face contacts are regarded as success factors in recruiting citizens (Hoffman & High-Pippert, 2010; Seyfang & Haxeltine, 2012; Seyfang et al., 2014). Already existing institutions like sports associations or religious centres, where people meet on a regular basis in an informal manner, can be very useful in the recruitment process (Seyfang et al., 2014). (Local) social networks are therefore seen as particularly important for the recruitment into community energy programs (Hoffman & High-Pippert, 2010).

Contacts outside the community with other community energy initiatives and intermediary organisations are also relevant for an SMO to work towards its goals (Seyfang et al., 2013). For example, knowing manufacturers and installers for solar energy has shown to be very beneficial in organising the collective procurement of solar panels by a renewable energy cooperative (Bomberg & McEwen, 2012). Contacts with other energy cooperatives have shown to be of importance for sharing of knowledge and help in the organisation of activities (Seyfang et al., 2013). Regarding the resource 'social networks' both the internal personal networks as well as networks with organisations outside the community will be taken into account.

Financial resources

Membership fees, but also outside donations or support schemes from for example government authorities, universities, media or (local) businesses can contribute to the financial resources of an SMO (Jenkins, 1983; McCarthy & Zald, 1977). An SMO does not have to be solely dependent on contributions of its direct beneficiaries (Jenkins, 1983). According to (Seyfang et al., 2014), external financial resources are required to ensure a sufficient resource base for a community energy project to achieve its objectives.

Communication

The use of media to communicate with members are relevant to the growth of SMOs (McCarthy & Zald, 1977). This research is inward looking towards the SMO and will analyse the use of different communication vehicles that are used to recruit new people and to announce activities and developments that are relevant to DEH.

The wider political system

The ability of SMOs to mobilise resources is affected by the wider political system (McCarthy & Zald, 1977). The relative openness, access and opportunities for engagement with state actors are important features of a political system that can either facilitate or hinder SMOs in pursuing their goals (Bomberg & McEwen, 2012; Canel, 1997; McCarthy & Zald, 1977). In order to be successful a social movement has to search for and exploit the opportunities available. A supportive national policy context is seen as one of the success factors for community energy projects (Seyfang et al., 2013). Also, the extent to which the SMOs are able to engage with policy makers is important for its success (Bomberg & McEwen, 2012).

Symbolic resources

Symbolic resources are the non-material resources that hold symbolic values for actors and can be used to collectively move groups towards a shared goal (Bomberg & McEwen, 2012). Previous research has identified different types of motivations to participate in community initiatives (Bomberg & McEwen, 2012; Funk, 1998; Seyfang et al., 2013). Funk (1998, p. 604) has shown that participation is driven by "a mix of desires to benefit the self and others". Motivation for participation is thus not only dependent on self-interest, but generosity towards others also plays a role. Based on previous research on community energy, the following symbolic resources are distinguished in this thesis: material benefits, community identity, civic gratification, social gratification and local autonomy.

Material benefits

One of the main reasons why people join a community energy program is to reduce their energy bills (Seyfang et al., 2013). Direct material benefits that accrue to the individual are regarded as an important motivation to participate in community energy initiatives (Hoffman & High-Pippert, 2010). Although material benefits do not inhibit symbolic value, they are incorporated under the 'symbolic resources' as they are a motivation for people to join an energy cooperative.

Community identity

Individual behaviour takes place in a wider social environment that shapes identities (Bomberg & McEwen, 2012; Heiskanen et al., 2010; Shove, 2003; Wilhite et al., 2000). "Feelings of solidarity towards people to whom one is not usually linked by direct personal contacts, but with whom one nonetheless shares aspirations and values" can help an individual to identify with a movement (Della Porta & Diani, 2006, p. 95). Through these collective identities new networks and relationships of trust emerge that stimulate interaction

and support (Della Porta & Diani, 2006). In addition, by creating a feeling of commitment to moral purpose and connectedness to the community, collective identities can help overcome the problems to collective action (Bomberg & McEwen, 2012; Della Porta & Diani, 2006; Jeff Goodwin, Jasper, & Polletta, 2000; Jenkins, 1983). They "can provide assurance that others will cooperate, take action and make similar sacrifices" (Bomberg & McEwen, 2012, p. 441). Aspects of collective identities can for example be shared norms and values, patterns of reciprocity or a shared geographic space (Bomberg & McEwen, 2012; Heiskanen et al., 2010; Walker, Devine-Wright, Hunter, High, & Evans, 2010).

Social gratification

Social gratification can be described as the enjoyment a citizen receives from fulfilling a social desire or goal (Verba, Schlozman, & Brady, 1995). The enjoyment of working with others, networking, creating friendships and making contacts are examples of social gratification (Hoffman & High-Pippert, 2010; Verba et al., 1995).

Civic gratification

Civic gratification refers to "feeling a sense of duty or fulfilling a desire to contribute to the welfare of one's community" (Hoffman & High-Pippert, 2010, p. 7571). It is the desire to make a community a better place to live (Verba et al., 1995). Earlier research has shown that civic gratification is an important element in explaining community energy (Hoffman & High-Pippert, 2010; Seyfang & Haxeltine, 2012; Seyfang et al., 2013). Reasons that were identified as important for participation community energy programs are 'development of strong communities', 'enhancing opportunities for local employment', 'creating opportunities for community' 'participation in determining the nature of the energy system' (Hoffman & High-Pippert, 2010), 'generation income for the community', 'improve local environment', 'improve community health and well-being' (Seyfang et al., 2013), 'community building' (Seyfang & Haxeltine, 2012). In addition, Hoffman and High-Pippert (2010) found that, for continuing participation, community related factors were more important than personal benefits (Hoffman & High-Pippert, 2010).

Local autonomy

Local autonomy can be understood as "the notion that a community can survive on its own, relatively free from dependence on 'outsiders' and enjoy the freedom to make its own decisions, and determine its own future" (Bomberg & McEwen, 2012). Some motivations to participate in community energy that have been identified by previous research and refer to local autonomy are: 'improving local energy independence' (Seyfang et al., 2013) 'building local self-reliance' (Seyfang & Haxeltine, 2012), the 'importance of community owned energy technology' and 'generating local income' (Hoffman & High-Pippert, 2010).

2.1.1 Epilogue Resource Mobilisation Theory

This section of the Conceptual Framework has outlined Resource Mobilisation Theory (RMT) as the framework which will be used for analysing the energy cooperative DEH. It draws specific

attention to the organisational body in the successful mobilisation of the available resources and is therefore deemed appropriate for analysing the role of an energy cooperative on social practices. The framework used in this research combines the traditional approach of RMT with insights from previous research on community energy. It has resulted in a framework in which a distinction is made between structural and symbolic resources, which are both regarded to be important in the success of a community energy initiative.

2.2 Social Practice Theory

In this section Social Practice Theory (SPT) is outlined as it will be used as a framework for the analysis of the selected social practices. First the characteristics of 'electricity use' are described and how that brings us to the use of social practices in this research (subsection 2.2.1). It is followed by a description of SPT in subsection 2.2.2 and the framework that is used in this research. Subsection 2.2.3 describes how the framework is put in the context of community energy.

2.2.1 Electricity Use

Electricity demand is rising and in order to prevent congestion on the net there is a need to shift electricity use to off-peak hours. Questions can however be raised about the use of the term 'electricity use'. Using electricity is not something that people consciously do as an action in itself. Rather, electricity use is a result of activities that need electricity as an input: people do not choose to use electricity, but to do activities for which electricity is used (Warde, 2005). Examples of these are doing the laundry, cooking, playing computer games, using a phone etc. Electricity use should therefore not be seen as an 'action' in itself, but rather as a product of what people do (Strengers, 2012). This implies that in shifting the timing of electricity use, the focus should not be on the electricity use itself but on the electricity-related activities people do (Strengers, 2012). The activities should thus be the focus of analysis when aiming to change 'electricity use', which allows for the use of a social practices approach.

2.2.2 Social Practice Theory

This research adopts a social practices approach for analysing behaviour. Social practice theory has been developed by various authors which each take their own perspective (Gram-Hanssen, 2010; Reckwitz, 2002; Shove & Pantzar, 2005; Spaargaren, 2003; Strengers, 2012). What they have in common, however, is that the world is considered as consisting of practices, which can be described as "a routinized type of behaviour which consists of several elements, interconnected to one other" (Reckwitz, 2002, p. 249). Instead of focusing on the individual and his behaviour, in SPT, social practices are the unit of analysis (Reckwitz, 2002; Shove & Pantzar, 2005; Spaargaren, 2011; Strengers, 2012).

In social practice theory, the individual is merely seen as a carrier of the practice and acts in accordance with how the practice is commonly understood (Reckwitz, 2002). By reproducing the practice, an individual is not only subject to the practice but also sustaining it: the individual is both the driver and the driven of a practice (Shove, 2010; Shove & Pantzar, 2005). As a carrier of practices, wants and desires do not anymore belong to the individual, but to the practice (Reckwitz, 2002). Along the same lines of reasoning, beliefs, attitudes and values can also be understood as arising from the practice (Strengers, 2012). Although they are expressed by individuals, they are inherent to the practice (Reckwitz, 2002). This can be illustrated by the following example of the practice 'creating romance' which I have

conceptualised for the purpose of this thesis: It is commonly understood that lighted candles belong to a romantic evening and thus to the practice of 'creating romance'. The desire to light candles on a romantic evening is not one of the individual, but stems from the practice 'creating romance', since it is a common belief that lighted candles belong to romance. As the individual lights the candles it is a carrier of the practice and the wants, desires and beliefs belonging to it. In addition, by reproducing the practice of 'creating romance' the individual is also sustaining the practice.

Elements of a practice

Authors on social practices differ in the elements they distinguish as constituting a practice (Gram-Hanssen, 2010). Within this research the framework of materials, meanings and competences is adopted (Shove & Pantzar, 2005; Shove, Pantzar, & Watson, 2012). Meanings refer to the 'why' of a practice (Shove & Pantzar, 2005). They are about why a practice exists, why it is carried out and/or what it contributes to. They can be regarded as common understandings of what a practice means and be expressed in social conventions (Gram-Hanssen, 2010; Strengers, 2012). In the example of Nordic walking given by (Shove & Pantzar, 2005), meanings of the practice are that it is 'fun' to do, brings 'health and fitness' or is 'an ordinary activity for ordinary people'. They form the image of the practice. Competences refer to the know-how and knowledge needed to carry out the practice (Gram-Hanssen, 2010; Reckwitz, 2002). In the example of Nordic walking it for example comprises of the knowledge of the (in)appropriate ways to use the sticks under different circumstances as well as the skills of using the sticks the right way [under these circumstances] (Shove & Pantzar, 2005). Training is needed to develop these competences (Shove & Pantzar, 2005). Materials involve the objects used in the practice. In the case of Nordic walking these are not only the sticks in general, but also specific details of the sticks that are relevant to the ground conditions on which the practice is executed (Shove & Pantzar, 2005). For the purpose of this thesis Figure 2-1 was developed which illustrates the framework of a practice as consisting of materials, meanings and competences.

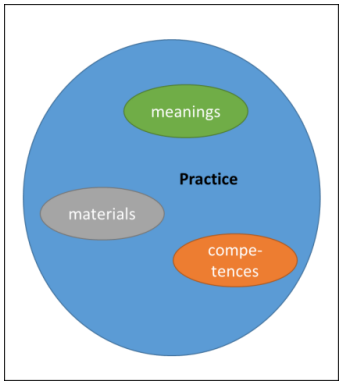

Figure 2-1 Three elements of a practice

Changing practices

Practices should not be seen as static entities. Rather, practices are changing constantly due to changes in the different elements of the practice (Reckwitz, 2002; Shove, 2003). The different elements of the practice should therefore not be seen as separate entities, but are interconnected in the practice and constantly changing (Gram-Hanssen, 2010; Shove, 2003). Meanings, competences and materials shape each other and are shaped by each other. A change in one element can induce a change in another and the dynamic relations between the different elements result in a change of the practice (Shove & Pantzar, 2005). When practices change, old links between the elements are broken and new links are formed (Shove & Pantzar, 2005). Nordic walking became a success in Finland because new links were formed between the three elements. Instead of being associated with infirmity, sticks (materials) were linked to enjoyment (meaning) and training was needed to gain the skills (competences) to use the sticks properly (Shove & Pantzar, 2005). To develop a practice, a change in one element of the practice is not enough. It is about the active integration of these elements and the changing links between them that together change a practice or develop a new one (Gram-Hanssen, 2010). This is illustrated by Figure 2-2 which shows how these three elements are interconnected.

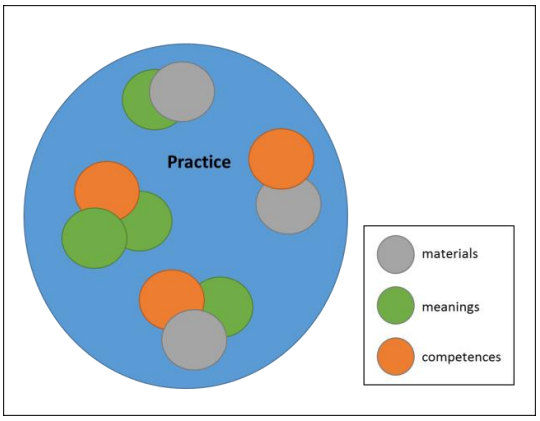

Figure 2-2 Three interconnected elements of a practice

The interaction between these elements in order to change a practice, has shown to be especially relevant in technology developments. Only providing a new technology is not enough for a change in practices, the effective use of this technology is equally relevant: meanings and competences have to change accordingly for an effective use of the technology and a change in the practice (Gram-Hanssen, 2010; Shove & Pantzar, 2005). This interaction between technologies, meanings and competences also shows the importance of both the producer and the end-user in innovations (Shove & Pantzar, 2005). If the innovation has to induce a change in practices, the end-user should be involved in the innovation process in order to successfully reproduce the (new) practice (Shove & Pantzar, 2005). In the context of this thesis, it implies that, when smart grids are designed to induce a time shift of electricity practices, the end-user should be involved in the innovation process of smart grids for the

time shift to occur. The understanding of how to use the smart grid technology as well as what a time shift of electricity practices means are equally relevant for the time shift to occur.

Interrelated practices

Besides the connections of the elements within a practice, there are also links between practices (Gram-Hanssen, 2010). A material, meaning or competence that belongs to one practice can also exist in another practice. Similarly, a change of a material, meaning or competence in one practice can induce a change in another practice (Gram-Hanssen, 2010). In Figure 2-3 this feature of practices is added and shows the meanings, materials and competences as possible connecting elements between practices. It should be seen as an example of how the connections could be, for each combination of practices it can be different.

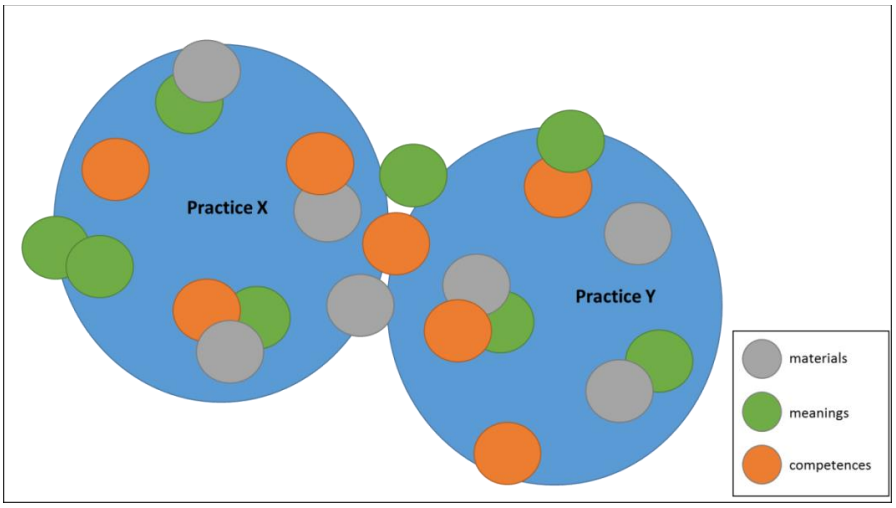

Figure 2-3 Interrelated practices

The figure can be explained by describing the practices 'camping' (Practice X) and 'hiking' (practice Y) in the way they exist to me. Within each of these practices different materials, meanings and competences exist of which some belong to both practices (e.g. backpack, being outdoors and how to use the backpack) (see Table 2-1). Although knowing how to pack a backpack might differ for a 'day hike' and a 'three-week camping trip', they both involve the efficient use of space and using a zipper. This example illustrates the different meanings, competences and materials that exist within camping and hiking, how these elements are interconnected and how the practices are related through these elements.

Practices do not necessarily have to be interrelated through all dimensions, a connection can for example also exist through only meanings or a combination of meanings and materials. In addition, for each combination of practices, the connecting elements can be different. Some practices might only be related through meanings, while other practices only share competences. The figure shows an example of a combination of two practices, it does not necessarily hold for all combinations of practices.

Table 2-1 The practices 'camping' and 'hiking' and how they interrelate

	Camping	Hiking
Materials	Tent, **backpack**, car, camping site, inflatable mattress, sleeping bag	Hiking shoes, **backpack**, water bottle, lunch package, jacket
Meanings	**Being outdoor** To go 'back to basic'	**Being outdoor** Sense of fitness
Competences	How to set up a tent **How to use the backpack** How to find a camping site	How to tie the hiking shoes **How to use the backpack** How to hike in order to maximize 'level of fitness'

2.2.3 Practices and a Sustainable Energy Cooperative

Practices are shared among individuals, and exist in the way they are commonly understood by society (Gram-Hanssen, 2010; Reckwitz, 2002; Strengers, 2012). Changes in links between elements of practices and between different practices thus occur within society. The social interaction between individuals through which these changes are transferred, implies that relationships between individuals are important as they enable transfers in changes of practices from one carrier to another. Societies, their rules and institutions can either hamper or facilitate the exchange of practices. It can therefore be argued that in changing energy practices, the focus should be more on the societal level instead of the individual (Heiskanen et al., 2010; Wilhite et al., 2000). In this research DEH is regarded as the societal context in which these interactions takes place. In Figure 2-4, the societal level and the energy cooperative DEH are added to the figure of social practice to illustrate the embeddedness of practices in the community and wider society.

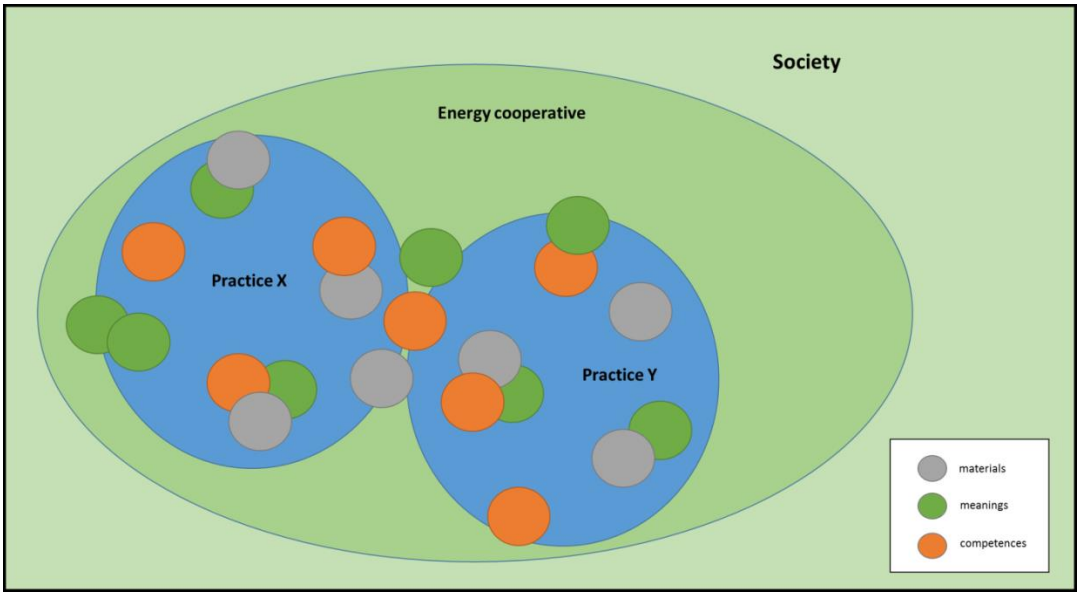

Figure 2-4 Practices embedded in society

2.2.4 Epilogue Social Practice Theory

This section has outlined the theory of Social Practices. This thesis adopts the framework consisting of materials, meanings and competences. Practices are constantly changing due to changes in the elements and the changing links between these elements. In addition, practices are interrelated through these elements and a change in one practice can induce a change in the other. Practices exist in society and shared among carriers of practices. In this research, the energy cooperative DEH is taken as the societal context in which these interactions take place.

2.3 Integrating RMT and SPT

This research analyses role of DEH on shaping practices. To analyse this role, an attempt is made to integrate Social Practice Theory (SPT) and Resource Mobilisation Theory (RMT). RMT is about the availability of structural and symbolic resources to organisations (SMO) and their ability to mobilise these resources. In theories of social practice the unit of analysis is the practice and the focus is on the changing links between meanings, materials and competences that induce a change in the practice. They exist in the way they are shared and commonly understood by society. In this research, the energy cooperative is taken as the society in which practices are shared and is shaped by the available structural and symbolic resources. To illustrate this integration, in Figure 2-5, structural and symbolic resources are added to the figure of social practices as developed in the previous section. The number and types of structural and symbolic resources that are presented in the figure are not fixed. Each type of structural and symbolic resource can have multiple representations (e.g. financial resources can be in the form of member fees, subsidies and/or donations) and the availability of resources differs for each energy cooperative.

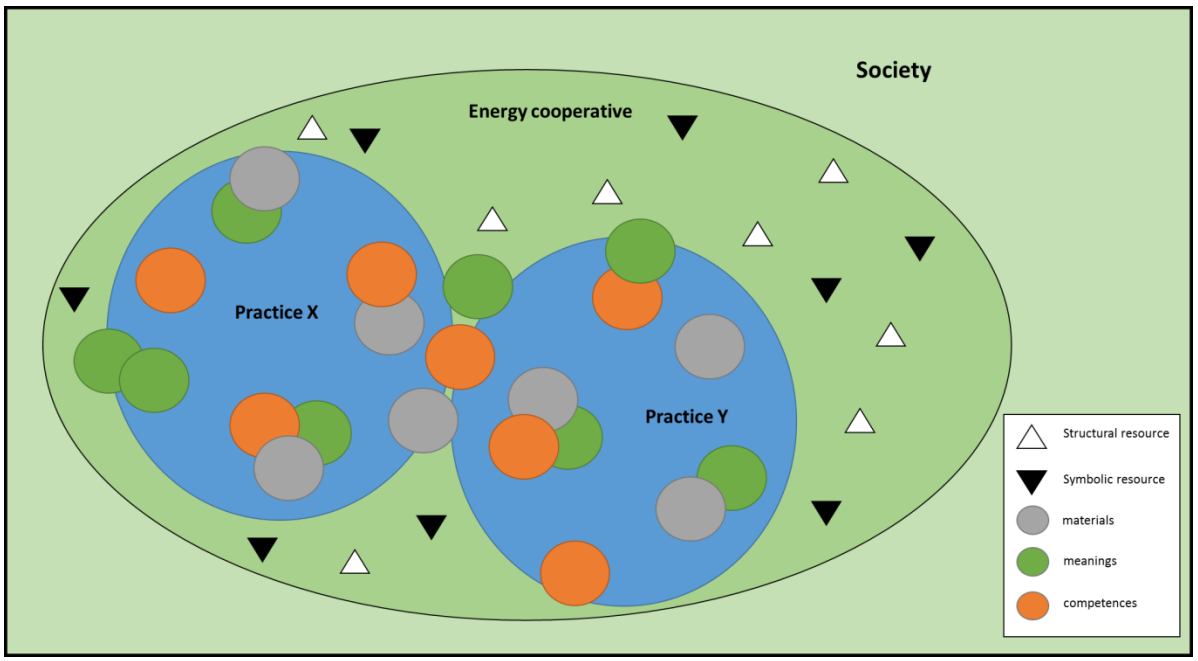

Figure 2-5 Social practices in the context of an energy cooperative

With respect to the type of ontology, Social Practice Theory can be seen as a 'flat' ontology. The different elements that constitute a practice (i.e. meanings, competences and materials) all exist on the same level and are equally important for the practice to exist. Resource Management Theory is more 'hierarchical' in nature: the available resources are controlled and mobilised by the SMO which is part of the Social Movement Industry (SMI). This thesis not only focuses on the availability resources that shape the context in which the practices are shared. It also aims to explore how these resources are mobilised and affect the three elements of a practice, induce breaks in old links and enforce the creation of new links

between these elements. By adding hierarchy this thesis diverges from the conventional practices approach.

2.3.1 Integrating concepts

In order to determine the role of DEH on the selected practices, an attempt was made to integrate the structural and symbolic resources of RMT with the materials, meanings and competences of SPT. Based on the frameworks of RMT and SPT as well as literature on community energy, I have conceptualised possible links between the dimensions of the practice and the types of resources in RMT. The following paragraphs describe how the resources from RMT could be directly or indirectly linked to the dimensions of practices. The results of this research will give more insight to these specific links and which resources are particularly relevant for shaping the practices. The aim of this section is to provide a logic for the set-up of the data collection methods and the first thought regarding the possible existing links.

Materials

Materials are the physical objects in the practice. An SMO could contribute to this dimension to the extent in which they can provide and/or facilitate the acquirement of the materials in the practices. In case the financial resources are sufficient, the SMO could directly provide materials for the practices. This would imply a direct link from 'financial resources' to 'materials'. Previous research has shown that community energy initiatives have organised collective procurements of solar panels and thereby contributed to the decentralisation of energy generation (Elzenga & Schwencke, 2014; Schwencke, 2012). The extent to which the SMO can financially support and/or facilitate the procurement of solar panels could shape the materials of the practice.

Meanings

Both the 'symbolic resources' of an SMO and the 'meanings' of a practice refer to intangible aspects. In addition, the practices that will be analysed in this research exist on the interface between the energy cooperative DEH and smart grids. This implies that the practices could contribute to the mission of DEH and that the motivations to join the energy cooperative could correspond to the meanings of the practices. In this research, the symbolic resources are therefore incorporated in the meanings of the practices.

Competences

Competences refer to the know-how and knowledge belonging to the practice. In the practice 'Nordic walking', it involved knowledge of the appropriate way to use the sticks as well as the skills to use the sticks in this appropriate way (Shove & Pantzar, 2005). Through knowledge transfer and skills training the SMO could for example support the competences of practices. The available human capital belonging to the resource 'labour' (e.g. technical knowledge) could directly shape the competences of the practice. In case the required knowledge for

(changing) the practice is not available within the practices as conducted by its members, the SMO could use its networks to support these competences in the practices.

The possible links between materials, meanings and competences provided in the paragraphs above are my own thoughts on how these *could* be related. Whether or not these links actually exist will show from the results of this thesis.

2.4 Selection of practices

This research is part of the Smart Grid pilot Samen Slim met Energie (SSmE), Together Smart with Energy, in which distribution grid operator Enexis works together with energy cooperative DEH. In this research four practices that connect DEH to smart grids and the role of DEH on these practices are analysed. This section describes the selection of these practices and how they relate to the project SSmE.

The selection of practices that are analysed in this research is based on the playing field where the energy cooperative and smart grids come together. It are practices that take place within DEH and relate to the development of smart grids. They exist on the interface between DEH and smart grids and come together in the pilot project SSmE. In this research four practices that connect DEH to smart grids are conceptualised: Renewable Energy Generation, (REG) Monitoring Energy Use (MEU), Sharing Information (ShI) and Timing of Energy Practices (TEP) (see Figure 2-6). Each of these practices will be described below.

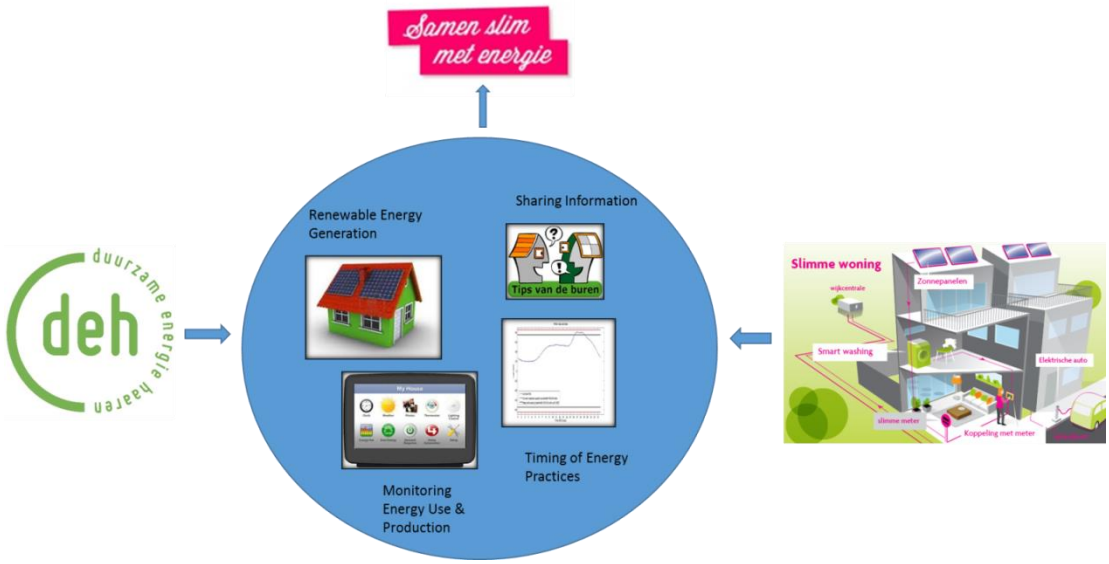

Figure 2-6 Practices on the interface between DEH and the smart grid

Renewable Energy Generation

The collective procurement of solar panels has been one of the main activities of DEH since its start. It has stimulated the generation of renewable energy by private households and thereby contributed to the decentralisation of electricity generation and bi-directional flows in the electricity grid (Veldman, 2013). In a smart home, the generation of renewable energy can be connected to the smart meter and provide the 'co-producer' with real time information on their own energy generation (Kester et al., 2010). Renewable energy generation is thus both related to the energy cooperative DEH and smart grids.

Monitoring Electricity Use and Generation

Energy monitoring use has been regarded as a practice related to smart grids in previous research (Naus et al., 2014; Verbong et al., 2013). Two main characteristics of a smart meter

are that it can be read out digitally and real-time (Kester et al., 2010). Research has shown that this insight can contribute to a reduction of energy consumption (van Elburg, 2007), which contributes to the mission of DEH to become energy neutral. This practice contains both electricity use and generation, since smart grids also enable the inclusion of data on energy generation (Kester et al., 2010). In addition, in the project SSmE an online platform is created where participants can monitor both their electricity use and generation.

Sharing Information

Within DEH, members are stimulated to exchange knowledge and ideas that help households to reduce their energy consumption and to become energy neutral. In the project SSmE, sharing information can be conducted on the online platform (which is enabled by the installation of the smart meter) where households do not only have insight in their own energy use, but can also share this information with others. In addition participants can participate in online discussions on various topics that are raised by fellow participants.

Timing of Energy Use

The fourth practice analysed in this research is the Timing of Energy Use. Through different characteristics of smart grids (e.g. real-time insight in energy use and generation) this new technology could contribute to peak-shaving. Through this project, Enexis aims to gain experience with the flexibility of households in the timing of energy practices to off-peak hours. It is the focus of the pilot project SSmE and therefore included in this research.

Each of these above described practices will be analysed using the conceptual framework as described in Chapter 2. For each practice the meanings, materials, competences and the existing links between these will be described, based on the data gathered. In addition the role of DEH on these practices will be outlined based on the available resources and how DEH has mobilised these.

2.5 Epilogue Conceptual Framework

This Chapter has outlined the conceptual framework that is applied in this research. In analysing the role of a sustainable energy cooperative on social practices, it combines Resource Management Theory (RMT) with Social Practice Theory (SPT). The RMT framework as described in Chapter 2 will be used to analyse the availability of the structural and symbolic resources. SPT provides a framework for analysing the (changing) links between meanings, competences and materials that exist within the practices Renewable Energy Generation, Monitoring Energy Use and generation, Sharing Information and Timing of Energy Practices. DEH is taken as the wider society in which these practices are shared and commonly understood. The next Chapter describes the Methodology used in this research which is based on the conceptual framework.

3. Methodology

In this section the methodology used in this research is outlined in chronological order. First, the case study this research focuses on is described in Section 3.1. It is followed by a description of the data collection methods in Section 3.2 which describes the identification of concepts and indicators, the set-up of the survey and interviews and how the collected data is analysed.

3.1 Case Study Samen Slim met Energie

Samen Slim met Energie (SSmE), Together Smart With Energy, is a pilot project set up by distribution grid operator (DSO) Enexis B.V. and sustainable energy cooperative Duurzame Energy Haaren (DEH), Sustainable Energy Haaren. As a DSO, Enexis is securing a reliable, affordable and sustainable distribution of gas and electricity. It manages and maintains the gas and electricity grid in the Southern, Eastern and Northern provinces in the Netherlands, serving over 2.5 million households (Enexis, 2014c).

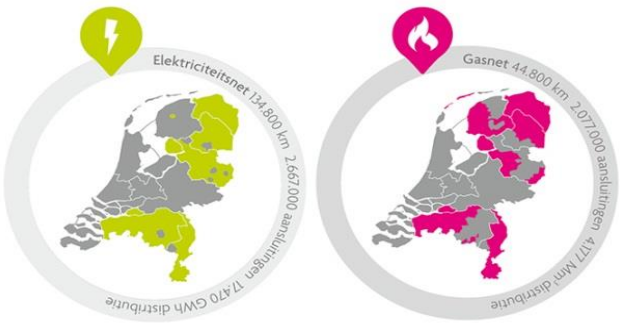

Figure 3-1 Enexis' electricity (green) and gas (pink) distribution network (Enexis, 2014c)

The changes in the energy system as described in the introduction to this thesis can pose serious challenges to the grid and Enexis in the future. The increasing share and decentralisation of more intermittent renewable energy as well as the rising peaks during peak hours have consequences for the tasks of the grid operator (Enexis, 2013).

As the number of community energy initiatives in the Netherlands is increasing, they become a new player in the market which Enexis has to work together with. In order to learn more about these energy cooperatives, their needs and their place in the future smart grid, Enexis has started the pilot project Samen Slim met Energie (SSmE), Together Smart with Energy. In this project Enexis works together with the sustainable energy cooperative Duurzame Energie Haaren (DEH), Sustainable Energy Haaren. Although the project was initiated by Enexis, it is based on co-creation. DEH and its members are actively involved in shaping the project. In this project members will be provided with a smart meter and an online platform which brings them real-time insight in their energy use. This online platform is used to give incentives and experiment with the timing of energy use.

Figure 3-2 Logo pilot project SSmE (DEH, 2014)

With this project Enexis aims to gain knowledge about the needs of community energy initiatives and how she can adjust her services in order to meet these needs. In

Figure 3-3 Logo energy cooperative Duurzame Energie Haaren (DEH) (DEH, 2014)

addition, as a smart grid pilot project, it is aimed to gain a better understanding of the flexibility of people's energy use to reduce the peaks in electricity demand. It addition to other smart grid pilots in which is experimented with individuals or household, this project also takes the flexibility of a group of people, the energy cooperative, into account. By participating in this project DEH aims to increase the awareness of its members with respect to their contribution to an energy neutral municipality. In addition the project is believed to contribute to strengthening the cooperation within DEH.

This thesis is exclusively focused on the energy cooperative DEH and the role it has on the selected practices as executed by its members. It does not take any other community energy initiative into account.

3.2 Data collection methods

3.2.1 Identifying concepts and indicators

Based on literature on Resource Management Theory (RMT), Social Practice Theory (SPT) and community energy a selection was made of concepts and indicators relevant to this research. The concepts used are the three dimensions of the practices (i.e. materials, meanings, competences), the structural resources (i.e. labour, time, social networks, communication, financial resources, wider political system) and the symbolic resources (i.e. material benefits, community identity, civic gratification, social gratification, local autonomy). Within these concepts, indicators have been formulated are based on previous research on community energy and practices (Bomberg & McEwen, 2012; Elzenga & Schwencke, 2014; J. Goodwin & Jasper, 2004; Heiskanen et al., 2010; Hoffman & High-Pippert, 2010; Strengers, 2012). A complete overview of the concepts and indicators used in this research can be found in Appendices

Appendix I. The overview also provides the data source(s) for gathering the information of the concepts.

As described in the integration of the Conceptual Framework (Section 2.3) an attempt was made to integrate RMT with SPT. Therefore the symbolic resources (i.e. 'material benefits', 'community identity', 'civic gratification', 'social gratification' and 'local autonomy') were conceptualised as meanings of the practices. Only when a logical application of the symbolic resource could not be made, the symbolic resources was not incorporated in the survey. In addition to aspects of these symbolic resources, in each of the practices, a meaning was included that represents the pure enjoyment of executing the practice. The reason for this is that research has shown that interest in advanced and new technologies is a main motivator in the timing of energy use (Kobus et al., 2013). People simply enjoy trying out new

technologies. As timing of energy use is the final focus of this research, this motivator is incorporated as a meaning for each of the practices in this research.

3.2.2 Data collection

Having identified the indicators for the concepts used in this research, a survey and a topic list for the interviews were constructed. For this research ten semi-structured interviews were held of which five with members of DEH, four with non-members and one with a board member of DEH. These interviewees had all filled in the survey and indicated to be willing to participate in an interview. The interviews lasted between 1 and 2 hours at the homes of the interviewees. The topic list that was used for these interviews can be found in Appendix III and was used to provide guidance during the interview. During the interviews there was plenty of room to diverge from this list if desired by the interviewer or interviewee. In addition, the topic list was adjusted over time to improve the quality of the interviews. The interviews with members and non-members mainly focused on their membership and perception of DEH, but also included the four practices that are analysed in this research. The interview with one of the board members of DEH mainly addressed the structural resources available to DEH and how these were mobilised into activities. The interviews were held during the period in which the responses from the survey were still being collected.

The digital survey was designed (see Appendix II) and distributed using Qualtrics software. In this survey the questions presented were linked to answers on previous questions in order to shorten the survey for the respondents. Identical surveys were sent to both participants and non-participants in SSmE, but the way the survey was distributed differed among the two groups. Participants in the pilot project SSmE received a personalized survey link using the Qualtrics software (for the sake of future research within the project SSmE), non-participants received an anonymous survey link distributed by DEH. In total the survey was distributed among 419 members of DEH and non-members that had previously shown interest in DEH.

Within the total sample of 111 responses (response rate 25.9%) four groups can be distinguished based on the membership of DEH and participation in SSmE:

A-I. Members of DEH - Participants in SSmE
A-II. Members of DEH - Non-participants in SSmE
B-I. Non-members of DEH - Participants in SSmE
B-II. Non-members of DEH - Non-participants in SSmE

The numbers of responses in each of these four subgroups (in brackets) can be found in the response matrix below (Table 3-1).

Table 3-1 Number of survey responses

		Member of DEH		
		Yes	No	Total
Participant	Yes	A-I (55)	B-I (10)	65

in SSmE	No	A-II (19)	B-II (27)	46
	Total	74	37	

3.2.3 Data analysis

The interviews were analysed using Atlas.ti, a programme for qualitative data analysis. Using this programme, the interviews were coded (see Appendix V) based on the concepts as identified in the previous section. New codes were made when it was deemed relevant to distinguish a new concept. For anonymity reasons, interviewees are referred to by code names in presenting the results in the next Chapters (see Appendix IV).

This research is focused on the role of a community energy initiative on energy practices. Therefore, a comparison is therefore made between members (group A) and non-members (group B) in the analysis of the data. The participation in the project SSmE has not been taken account since it is not relevant for the objective of this research.

The result of the survey were analysed using SPSS software. For most questions only descriptive statistics were generated. In addition, reliability tests, Mann Whitney tests and Wilcoxon signed-rank tests were conducted. The reliability test (see Appendix VI) generates values for Cronbach's alpha which is an indication of the correlation between variables. It was mainly used to determine whether or not the meanings and motivations that were conceptualised as belonging to a symbolic resource indeed belong to that symbolic resource. The Mann Whitney test (see Appendix VII) was used to compare data of two *independent* groups. In this research it was applied to compare members and non-members (e.g. does a larger share of members compared to non-members generate energy at home?). The Wilcoxon signed-rank test (see Appendix VIII) was used to compare data of two *dependent* groups and was therefore applied to compare data *within* the groups of members and non-members (e.g. is a certain meaning more important than another meaning within the practice as it is carried by members?).

In the analysis of the practices and resources, the data from the survey and interviews were combined. For the practices and symbolic resources, descriptive statistics from the survey were used as a starting point and complemented with results from the interviews. For the analysis of the structural resources available to DEH, the interviews have been the main source of information.

3.3 Epilogue Methodology

This Chapter has described the case study DEH that this research focuses on. The research combines data collected by a survey (111 respondents) and interviews (five members, four non-members, one board member) to analyse the practices and resources available to DEH. The statistical analysis is conducted using SPSS and the interviews are coded based on the list of concepts. For reasons of anonymity, the interviewees will be referred to by codenames.

4. Duurzame Energie Haaren (DEH)

This Chapter gives an overview of the sustainable energy cooperative Duurzame Energie Haaren (DEH), Sustainable Energy Haaren, along the lines of Resource Management Theory (RMT). First the development of DEH is described from its origins to its current state in Section 4.1. It is followed by a description of the structural resources and the symbolic resources that exist within DEH in Section 4.2 and Section 4.3. The results of this section are drawn upon the data gathered by the survey and interviews.

4.1 The origins of DEH

Haaren is a municipality located in the province Noord-Brabant consisting of four villages, Haaren, Helvoirt, Esch and Biezenmortel. The total population of the municipality amounts to 13.589, with Haaren and Helvoirt being the bigger village centres with about 5500 and 4500 inhabitants respectively and Esch and Biezenmortel having about 2200 and 1400 inhabitants (Gemeente Haaren, 2014). Figure 4-1 presents the origins of members of DEH. From this figure it can be seen that most members originate from Helvoirt and Haaren. Compared to the number of inhabitants of the four villages within the municipality, Helvoirt is overrepresented whereas Biezenmortel and Esch are underrepresented.

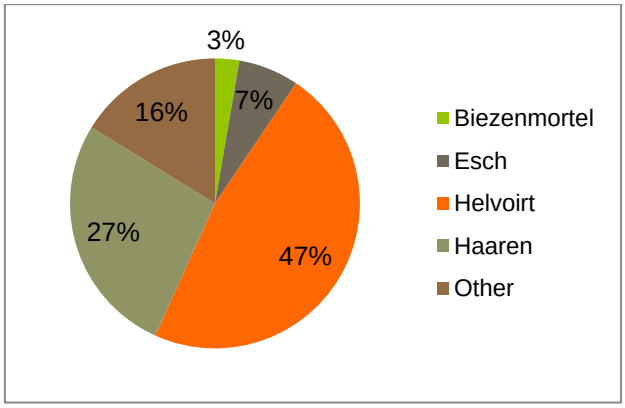

Figure 4-1 Origins of members of DEH

Other demographic data gathered from the survey show that here is a gender imbalance in the respondents of members to the survey (77% male), the members of DEH have a high level of education (72% university of applied sciences degree or higher) and a relatively high income (71% has an income above modal). The results from the survey did not show large differences between members of DEH and non-members on education and income levels.

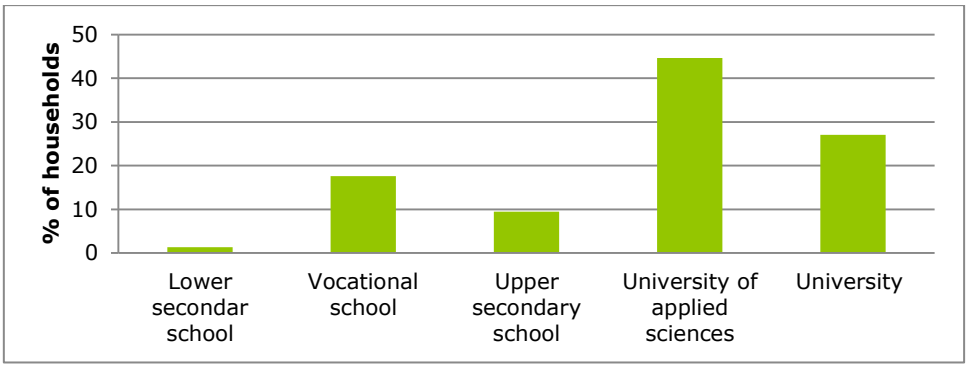

Figure 4-2 Education level of members of DEH

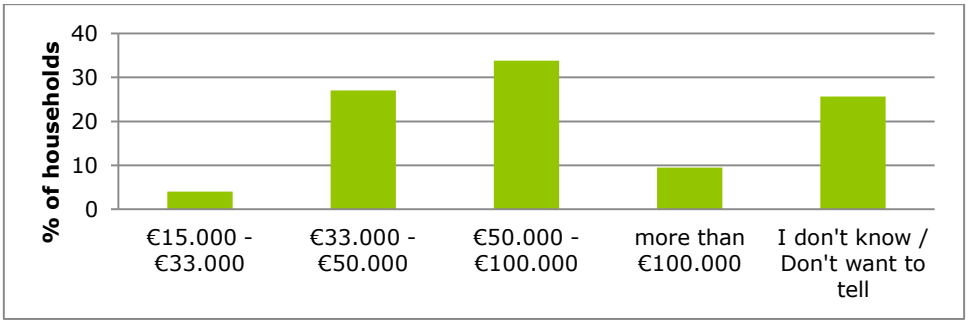

Figure 4-3 Income level of members of DEH

The history of Duurzame Energie Haaren (DEH) goes back to the foundation Landschap Natuur en Milieu Haaren (LNMH), Landscape Nature and Environment Haaren, which is an organisation representing the interests of landscape, nature and environment in the municipality of Haaren. In 2009 Haarens Energiebewust Ecologisch Traject (HEET), Haaren's Energy conscious Ecological Trajectory, was set up to represent the environmentally oriented activities within the LNMH. It started with six members exchanging knowledge and information in order to shape life with respect for nature and environment (IntM). They organised activities such as environmental cafés, repair evenings, energy workshops and the collective procurement of solar panels with the name 'Zonnepanelen Stralen' (Solar panels Shining) (see Figure 4-4).

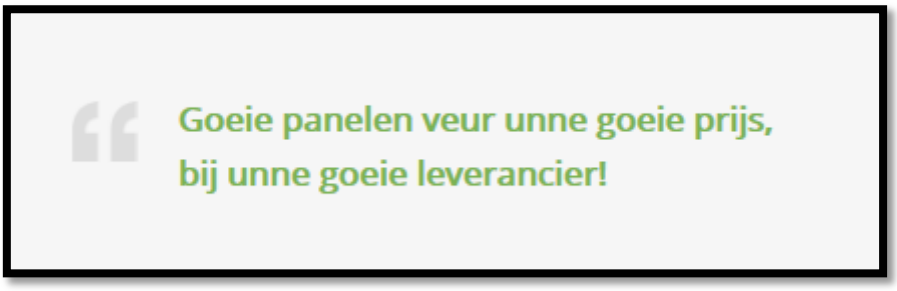

Figure 4-4 Slogan for the collective procurement of solar panels ("Good panels for a good price at a good supplier") (DEH, 2014)

The ambition within this group grew towards providing the whole municipality with sustainable energy by investing in renewable energy, buying wind mills and reselling energy. The financial risks involved were too high to be borne by a foundation and demanded a more entrepreneurial approach (IntM, IntBM). This resulted in the establishment of DEH in 2012.

The main activity of DEH so far has been the collective procurement of solar panels. Besides this there are a couple of information evenings every year, for example about led-lightning, and a yearly general members meeting. In 2014 three extra activities were set up (DEH, 2014). To improve the efficiency of the solar panels they organised the 'DEH wasdagen' (DEH washing days) in which members could participate to have their solar panels cleaned. Secondly, 'Eco Local Fuel', a joint initiative of DEH and a gas station in Helvoirt, was started (DEH, 2014). The gas station compensates the emission of CO_2 of all fuel sold based on international standards. The amount of money generated by this initiative is donated to DEH and used for additional discounts within 'Zonnepanelen Stralen'. The third new activity is Samen Slim met Energie (Together Smart with Energy), in which DEH works together with Enexis B.V. (see Section Case Study Samen Slim met Energie3.1). DEH expects the project to contribute to its mission by increasing the publicity of DEH and thereby attracting new members, increasing the cooperation between members within DEH and raising awareness about the contribution of members to an energy neutral municipality (Enexis, 2014a).

Within DEH there are seven working groups that help to organise the activities of DEH (DEH, 2014). The working groups are involved in the areas of solar energy (e.g. the collective solar panel procurement), energy saving, smart grids (related to the project SSmE), marketing & communication (e.g. recruiting members), production & research (e.g. research to other forms of renewable energy and cooperation with energy producers and other energy cooperatives), the municipality (e.g. informing municipality on sustainable energy) and buying and reselling energy (e.g. investigating opportunities for bulk purchases of energy) (DEH, 2014).

4.2 Structural resources at DEH

Structural resources are the intangible human resources, tangible material resources and political opportunity structures (see Chapter 2). A distinction is made between labour, time, social networks, financial resources, communication and the wider political system.

Labour

Since the start of DEH it has grown to over 200 members (IntBM). Although DEH has evolved out of the LNMH, there is a large discrepancy in the type of members within these two organisations. Members of the LNMH are said to be more nature oriented and concerned with topics around ecology and biodiversity (IntM). Members of DEH are more interested in sustainable energy and driven by the ambition to develop an 'energy-neutral' municipality (IntM). The core group of DEH is formed by four board members and a steering group, which has the role of think-tank within DEH (DEH, 2014). They form the so-called 'cadre' of the SMO

(McCarthy & Zald, 1977). The people in this cadre have different relevant backgrounds (e.g. management, engineering) and are believed complement each other to get DEH to a higher level (IntM). They have the 'soft skills' which have shown to be relevant in the success of a community energy initiative (Seyfang et al., 2014; Seyfang et al., 2013).

The core group is supplemented by a small group of members that participate in one or more of the working groups (IntBM). McCarthy and Zald (1977) refer to this type of labour as 'workers', who are directly involved in the activities of the SMO and work in 'transitory teams'. Most members of DEH are only passively involved, but contribute to DEH by filling in questionnaires and attending information evenings (IntBM). Through these questionnaires, members provide DEH with the necessary information (or knowledge) which enables them to successfully organise activities that meets the needs of its members. In addition, members who were not actively involved within DEH, as in organising activities, indicated to spread the word of DEH by forwarding news letters to friends (IntNM, IntM). This input of members can be seen as 'unspecialized labour' and has shown to contribute to the success of SMOs in community energy (Seyfang et al., 2014). Within DEH there are also members with specific knowledge about the energy system and/or new technological developments, who are willing to share this (IntM, IntM). Mobilising this knowledge is the challenge for DEH.

The analysis above shows that members of DEH provide different types of labour resources to the cooperative, which are mobilised by the core group within DEH. It also shows that the extent of involvement in DEH varies highly among members. This finding corresponds to previous research on participation in a community energy programme which has shown that the success of an energy programme depends both on the commitment of the core group and the participation of minimally engaged citizens (Hoffman & High-Pippert, 2010). The ability of the core group to mobilise this minimal engagement into an effective program is key to its success and the higher the core group is involved in the activities, the more involved passive members will become (Hoffman & High-Pippert, 2010).

Time

All members that actively contribute to DEH do this on a voluntary basis (IntBM). A board member spends about half a day to one day a week on activities related to DEH, for the steering group this is about half a day per week and for a working group member one or two evenings a month. These numbers are all averages and depend on the activities at the moment itself. As all activities within DEH are organised on a voluntary basis, the time to put in is limited. Involvement in other organisations has also been referred to as a limiting factor for being involved in DEH (IntM, IntNM). This corresponds to previous research which has shown that SMOs compete for time (and financial) resources with other organisations (McCarthy & Zald, 1977) and that a lack of time belongs to the greatest weaknesses of community energy projects (Seyfang et al., 2013).

Social networks

Within the social networks a distinction is made between internal and external networks. Most members of DEH are rooted in Helvoirt and Haaren (see Figure 4-1) and the largest social networks can be found in these two village centres within the municipality (IntM). The already existing involvement in the LNMH and/or HEET has for some members been a reason to join DEH (IntM, IntM, IntM). This corresponds to previous research on community energy, which has shown that local social networks and involvement of key persons in other local organisations are important for the recruitment into community energy programs (Hoffman & High-Pippert, 2010; Seyfang et al., 2014). Also face-to-face contact and personal recruitment have shown to be relevant to the success of community energy initiatives (Hoffman & High-Pippert, 2010; Seyfang & Haxeltine, 2012; Seyfang et al., 2014). The face-to-face contact and 'local' image of DEH have been important for the publicity of the collective procurement of solar panels organised by DEH and have induced citizens of Haaren municipality to attend the information evenings and/or participate in the collective procurement (IntM, IntNM, IntM, IntNM).

Within the project SSmE the relevance of personal recruitment and local networks have also come to the fore: Interviewees indicated not to have participated when they would have received the invitation directly from Enexis, and DEH would not have been involved (e.g. IntM, IntM, IntNM, IntNM). "You know who is behind [the initiative] and that convinces you to participate" (IntNM). Even when someone does not know the people within DEH personally, knowing that it is a local organisation and those who have been involved previously, is a motivator to participate (IntNM). In addition, personal relationships have induced participation in the project SSmE (IntNM).

Besides using its internal networks for gaining publicity and in the recruitment of members, DEH also uses external networks in working towards its mission. Previous research has referred to the cooperation between community energy initiatives in the success of SMOs (Seyfang et al., 2013). DEH works together with other energy cooperatives in the region with whom they exchange knowledge and experiences (IntBM). Collectively organising activities is however perceived as complicated as the different organisations have different interests and organisational structures (IntBM). Besides, DEH aims to safeguard the interests of the local community and working together with other energy cooperatives could be contradictory with representing the local (IntBM). Within the pilot SSmE, DEH works together with the regional distribution grid operator Enexis. As DEH sees itself as a new player in the market, in between the consumer on the one side and the grid operator and energy producers on the other side, these contacts with the incumbent energy system are seen as important for the future development of the energy cooperative (IntBM).

Financial resources

The main source of income for DEH is the membership fee, which is a one-time payment of €65. Most of the activities are organised using their own financial resources. Subsidies can be requested, but DEH does not want to be dependent on these subsidies. Their own ambitions have priority and "the power of DEH is that we are autonomous" (IntBM). Subsidies are only requested and used for activities that they have initiated and contribute to their mission. Research has referred to external financial resources as a contribution to the success of SMOs (Canel, 1997; Jenkins, 1983; McCarthy & Zald, 1977). DEH however desires only to use these types of resources when their own financial resources are insufficient for their activities. An example of external resources used is the project SSmE. For this project, DEH can draw on financial resources from Enexis who for example provides the financial resources for folders and the development of the online platform.

Communication

To bring their activities to the attention of its members, DEH uses local newspapers, social media, newsletters and organises information evenings. A kick-off presentation was for example organised for the pilot SSmE in which members received more information about the set up and goals of this project. Also for the collective procurement of solar panels information evenings are organised. They advertise special activities in regional and local newspapers as well as on facebook and twitter. DEH however acknowledges that their biggest group of members only makes little use of social media and that other communication vehicles, like monthly newsletters, are therefore important to keep their members up to date about the recent developments (IntBM).

Wider political system

Government subsidies have enabled the uptake of decentralised renewable energy generation, especially solar panels (IntM, IntNM, IntM, IntM, IntM, IntNM), and thereby the success of one of the main activities of DEH: the collective procurement of solar panels. The "Postcoderoosregeling" is a relatively new fiscal policy, implemented in January 2014, which is intended to support bottom-up initiatives that want to set up renewable energy projects in their local living environment (Franken, 2014). Recently research has been conducted towards the feasibility of decentralised renewable energy projects using this "Postcoderoosregeling", in which three major barriers to a feasible business case have been distinguished: the period of ten years for which the regulation provides fiscal advantages is not financially feasible for these projects; the initiatives are highly dependent of the cooperation of energy suppliers; and, the total height of the compensation does not result in a reliable business case (Franken, 2014). Due to these three barriers, the average business case does not earn its investment back within the lifespan of the project which is generally longer than ten years (Franken, 2014). Although the regulation is meant to enable energy cooperatives in their expansion of activities, most of these cooperatives do not fulfil all requirements and can therefore not reap the benefits which this policy is intended to generate (Schwencke, 2014). An example of such

a requirement is that participants can only be natural persons and legal persons as excluded as participants in the project (Franken, 2014; Schwencke, 2014). Among the members in many cooperatives however, there are also legal persons like small and medium size enterprises (SMEs), the self-employed and housing cooperatives (Franken, 2014; Schwencke, 2014). Although this new regulation is thus intended to support the expansion of decentralised renewable energy initiatives, its requirements do not match the characteristics of energy cooperatives. In practice, it is therefore impossible for energy cooperatives to make use of it and collectively set up a renewable energy project (IntBM). It is seen as a constraining factor in the development of the energy cooperative DEH (IntBM).

DEH sees itself as an intermediary organisation which operates in between the incumbent actors in the energy system (e.g. large scale energy generators and grid operators) and the end users (IntBM). DEH believes that energy cooperatives change the incumbent energy system by introducing new values in the field of energy (IntBM). It is an organisation that stands close to the people and has good relationships with its members. Although there is a split in energy producers and grid operators in the Netherlands, many people are not aware of this and regard Enexis as one of the big incumbent energy producers, which are, at least, not intending to lower their energy bills (IntM). The fact that DEH is a partner in the project SSmE has induced members and non-members to participate (e.g. IntNM, IntM, IntNM). DEH is seen as a trustful intermediary organisation.

This subsection briefly outlined the context in which the energy cooperative operates. Although the success of these bottom-up initiatives is shaped by the wider political system, it is out of the scope of this research to analyse the constraining and enabling factors that are arising from this in full detail. Paulusse (2014) has already described how distribution grid operators and community energy initiatives interact. How the energy cooperative operates as an intermediary organisation and interacts with other actors in the energy system could be the subject of future research.

4.3 Symbolic resources at DEH

Symbolic resources are the non-material resources that hold symbolic value for actors (Bomberg & McEwen, 2012) and are in this research considered to be the motivations for participation in DEH. In the next sections the following symbolic resources are distinguished: material benefits, community identity, civic gratification, social gratification and local autonomy.

4.3.1 Motivations to become a member of DEH

Based on the different symbolic resources as outlined in Chapter 2 and previous research on community energy in the Netherlands, ten motivations of becoming a member of a DEH were conceptualised that I believe to belong to 'civic gratification', 'social gratification', 'local autonomy' and 'material benefits'. An overview is provided in Table 4-1. Although 'material

benefits' does not incorporate symbolic value, it is included here, since it has shown to been one of the main motivations to join a community energy initiative (Seyfang et al., 2013). Community identity was not directly incorporated in the survey due to difficulties in conceptualising specific motivations that belong to this symbolic resource. The results from the open-ended questions in the survey and the interviews provided however useful insights in this symbolic resource within DEH and will be discussed later in this section.

Table 4-1 Overview of motivations to participate in DEH included in the survey

Symbolic resources			
Civic gratification	**Social gratification**	**Local autonomy**	**Material benefits**
• Saving on the environment • Strengthening the local community • Making others aware of their energy use	• Exchanging knowledge and experiences on energy use • Working together with others • Gaining new contacts • Friends have persuaded me to become a member	• Being self-sufficient in my energy use • Countervailing large scale energy suppliers • Becoming aware of my energy use	• Lowering my energy bill • Cheap procurement of solar panels • Becoming aware of my energy use

In Table 4-1 "becoming aware of my energy use" is included both under 'local autonomy' and 'material resources'. Based on the interviews, this aspect could belong to each of these categories: more awareness could improve the self-sufficiency of energy use by for example relating energy generation to energy use, but the insights could also bring material benefits by enabling a reduction in energy use and thereby energy costs.

Reliability tests (see Appendix VI) were used to determine the correlation between the motivations within the symbolic resources. These test generate a value for Cronbach's alpha which is a measure of reliability for the combinations of motivations belonging the symbolic resources as outlined in Table 4-1, Cronbach's alpha took values of 0.739 for 'civic gratification', 0.615 for 'social gratification', 0.687 for 'local autonomy' and 0.688 for 'material benefits' (see Appendix VI – A). Removing "becoming aware of my energy use" from either local autonomy or material benefits lowered the value of Cronbach's alpha to 0.601 and 0.640 respectively. As it results in a lower reliability of the aspects measuring the same resource, it should not be excluded from one of these resources. Therefore this motivation belongs to both 'local autonomy' as well as 'material benefits', as was suggested above.

For each of the twelve motivations respondents could indicate the importance of these aspects for being a member at DEH. A six-point Likert scale was used in which a value of 1 corresponds to very unimportant, whereas a value of 6 corresponds to very important. The distribution of the answers given is presented in Figure 4-5. The different motivations are presented in order of importance based on the average values.

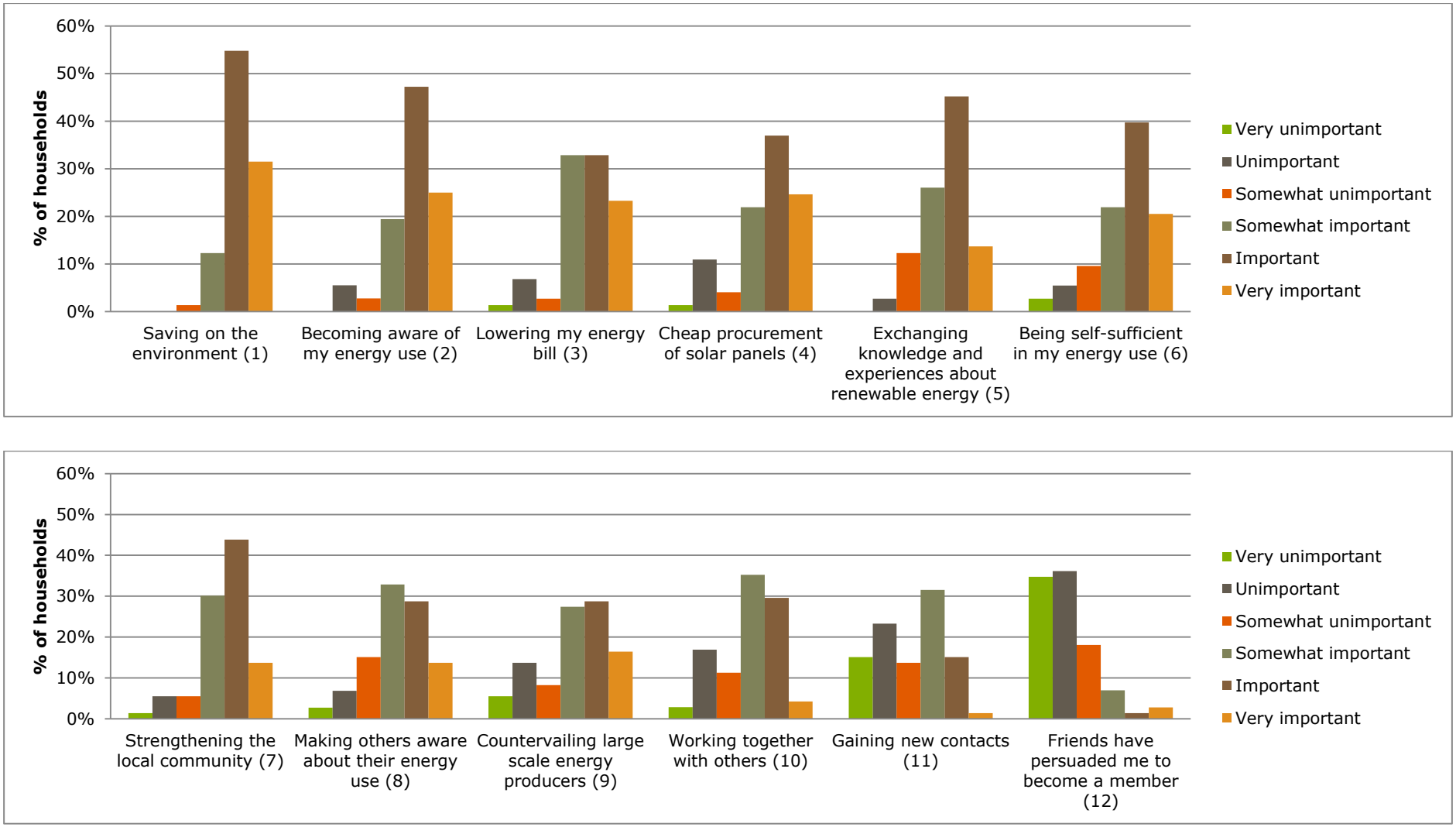

Figure 4-5 Distribution of motivations to participate in DEH (N=74)

Figure 4-5 shows that for nearly all respondents, 'saving on the environment' has been an important reason to join DEH. For only one respondent (1.4%) this aspect has been 'somewhat unimportant'. The only motivations of which a majority of members perceives these as somewhat to very unimportant are 'gaining new contacts' and 'friends have persuaded me to become a member'. On the motivation 'gaining new contacts', members are most equally spread in the answers over the different categories of importance. Just over 50% of the members of DEH see it as an important reason to join DEH, while for just under 50% it is unimportant.

4.3.2 The relative importance of motivations to participate in DEH

Table 4-2 provides the median values, averages an standard deviations of the different motivations to participate in DEH. It shows that 'saving on the environment' is most important and exceeds the second important motivation by 0.34. From the second to the third most important motivation there is a smaller gap of 0.24, after which there are five motivations for which the level of importance is very close. The biggest gaps are between the three least important motivations to join DEH (i.e. "working together with others", "gaining new contacts" and "friends have persuaded me to become a member"). From the median values it can be seen that only "gaining new contacts'" (median value 3) and "friends have persuaded me to become a member" (median value 2) fall in the range of unimportance (value 1-3). All other aspects are seen as 'somewhat important' (median value of 4) or 'important' (median value of 5). From Table 4-2 it can be seen that the motivations belonging to 'material benefits' are all regarded as 'important' to participate in DEH amd that only some motivations belonging to 'social gratification' are regarded as 'somewhat unimportant' or 'unimportant'.

Within the aspects belonging to social gratification, only "exchanging knowledge and experiences on energy use" has median value of 'important'. This motivation was taken into account as belonging to social gratification, since it encompasses the social contacts between people. It can however also be a means to achieve for example a reduction in energy use and costs (IntM). Including this aspect in material benefits resulted in a cronbach's alpha of 0.672, which implies that it also belongs to 'material benefits'.

The Wilcoxon signed rank test (see Appendix VIII) was used to determine the significance of the differences in level of importance between the motivations to participate in DEH. The results of these tests can be found in Appendix VIII – A. The results of this test show that the motivation "saving on the environment" is significantly more important than all other motivations. In second place, "becoming aware of my energy use" is also significantly more important than all other variables except "cheap procurement of solar panels" (p-value = 0.120). The tests also show that the next five motivations (3-7 in Table 4-2) do not significantly differ in level of importance which confirms the numbers in Table 4-2 in which the average values of these aspects are very close.

Despite a difference between the average values of 0.25 (see Table 4-2), "countervailing large scale energy producers" is not significantly more important than "working together with others". An explaining factor for this might be the larger standard deviation of the first of these motivations (see Table 4-2), which is reflected by a more equal spread over the categories of importance (see Figure 4-5). The two aspects on the lower end, "gaining new contacts" and "friends have persuaded me to become a member" are significantly less important than all other aspects.

Table 4-2 Level of importance of motivations to participate in DEH

	Resource	Motivation	Median	Average	Stan-dard dev.
1	Civic gratification	**Saving on the environment**	5.00	5.16	.687
2	Material benefits / Local autonomy	**Becoming aware of my energy use**	5.00	4.83	1.021
3	Material benefits	**Lowering my energy bill**	5.00	4.59	1.165
4	Material benefits	**Cheap procurement of solar panels**	5.00	4.56	1.291
5	Social gratification	**Exchanging knowledge and experiences on energy use**	5.00	4.55	.972
6	Local autonomy	**Being self-sufficient in my energy use**	5.00	4.52	1.237
7	Civic gratification	**Strengthening the local community**	5.00	4.51	1.069
8	Civic gratification	**Making others aware of their energy use**	4.00	4.19	1.221
9	Local autonomy	**Countervailing large scale energy producers**	4.00	4.10	1.445
10	Social gratification	**Working together with others**	4.00	3.85	1.226
11	Social gratification	**Gaining new contacts**	3.00	3.12	1.374
12	Social gratification	**Friends have persuaded me to become a member**	2.00	2.13	1.174

A graphical overview of the relative importance of motivations to participate in DEH is provided in Figure 4-6. The colours represent the resource to which the aspects belong. The levels represent the average level assigned to the motivations by members of DEH on a scale from 1 to 6. From this figure it can be seen that the motivations belonging to 'social gratification' are least important. However, also "working together with others" inhibits a degree of importance.

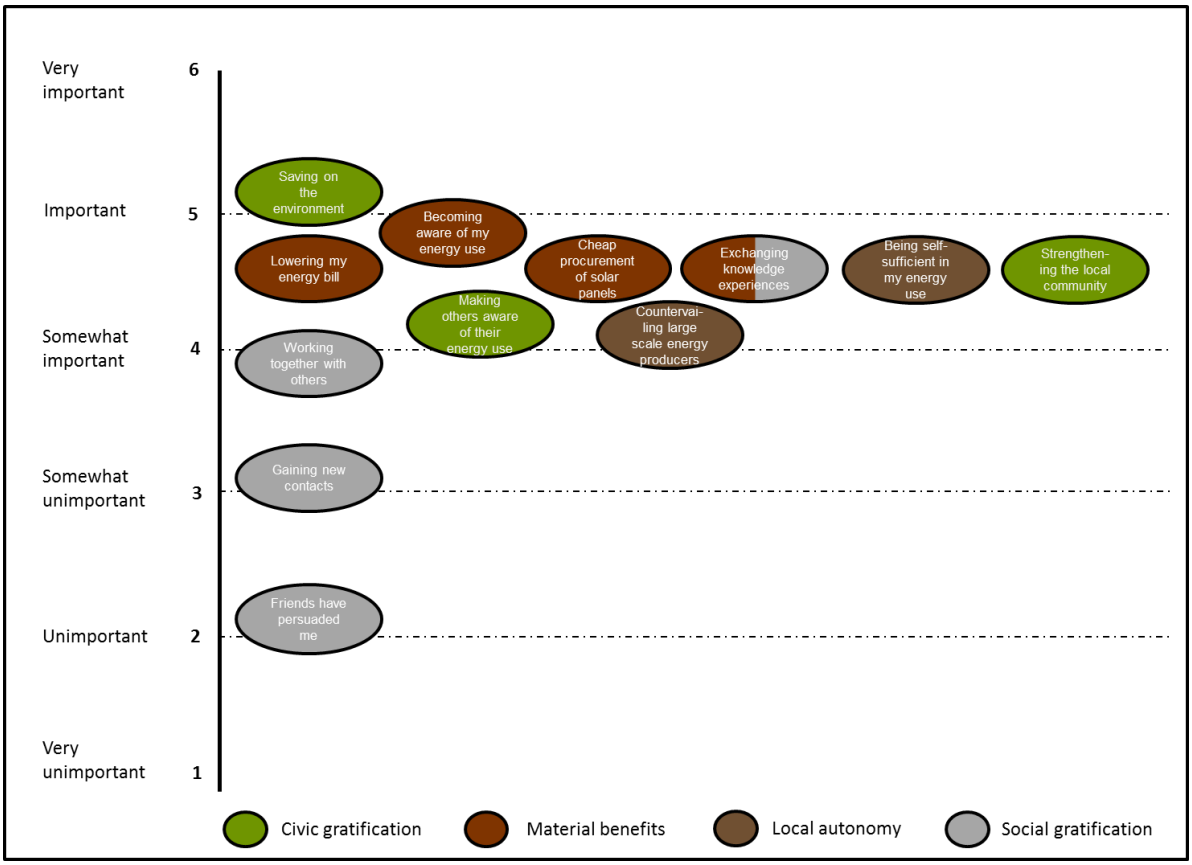

Figure 4-6 The relative importance of motivations to participate in DEH

4.3.3 The relative importance of symbolic resources at DEH

Based on Table 4-1 , the aspects were merged into values for resources. For each respondent the average value of the aspects comprising the resource was taken to determine value of importance of the resource for that respondent. Table 4-3 provides the median, mean and standard deviation of the resources.

Table 4-3 Average level of importance of the symbolic resources in DEH

Resource	Median	Average	Standard dev.
Material benefits	4.67	4.68	0.90
Civic gratification	4.67	4.62	0.82
Local autonomy	4.67	4.51	0.95
Social gratification	3.50	3.41	0.81

From these values it can be seen that 'material benefits' are most important followed by 'civic gratification', 'local autonomy' and 'social gratification'. The differences between the first three resources are very small and social gratification is less important. However, just like the 'material benefits', 'civic gratification' and 'local autonomy', 'social gratification' is a resource playing a role in becoming a member. On average, it is regarded as 'somewhat important' to 'important' (average value of 3.50). As respondents to the survey and IntM indicate, "it is not ór ór but ánd ánd", they are all relevant in becoming a member of DEH. Statistics for the

significance of the differences between the four resources were not produced, because the reliability cannot be guaranteed as it is based on merged variables.

The results from the tables and graphs presented in this section, as well as previous research on community energy (Elzenga & Schwencke, 2014; Hoffman & High-Pippert, 2010; Netbeheer Nederland, 2013; Seyfang et al., 2013) show that all categories of symbolic resources play a role in becoming a member. The paragraphs below describe how the each of these symbolic resources were expressed in the interviews and open questions to the survey.

Material benefits

Corresponding to literature on community energy, 'material benefits' has shown to be one of the main reasons to participate in a community energy program (Elzenga & Schwencke, 2014; Netbeheer Nederland, 2013; Seyfang et al., 2013). One of the main activities of DEH has been the collective procurement of solar panels and people automatically become a member of DEH when they participate in this. For many members of DEH as well as non-members, DEH has been the vehicle for gathering information about and/or buying solar panels (IntNM, IntNM, IntM, IntM, IntNM). As one of the interviewees mentioned: "as we already had plans to buy solar panels we went there [the information evening]. If it [the process of procuring solar panels] is well-searched we like to benefit from that of course" (IntNM). The information provided and the expected financial benefits of buying solar panels through DEH, has induced people to attend the information evenings and to join the cooperative. Also for people who had already invested in solar panels before the start of DEH, and had experienced the complicated process of procuring the solar panels themselves, the facilitating role of DEH had induced them to do a second investment (IntNM).

The lack of material benefits perceived is by respondents to the survey mentioned as a reason not to become a member of DEH. Being unaware of the advantages of DEH or the lack of the advantages of DEH for them personally are a constraining factor. "I haven't bought solar panels" (survey) is an example of these lacking material benefits as a reason not to become a member. In addition, concrete actions, which are perceived to be personally beneficial, are important for gaining attention and recruiting members (IntNM, IntM). An example of this is the project SSmE which has resulted in new members (IntBM).

Civic gratification

Within civic gratification a distinction can be made between the local, social-cultural living environment, for example "strengthening the local community", and wider applications of the term sustainability, for "saving on the environment". From Table 4-2 and Figure 4-6 it can be seen that on average, the wider implications of sustainability are regarded as more important than the local social-cultural living environment. This corresponds to previous research by Seyfang et al. (2013) in which goals referring to the wider application of sustainability were more often cited than the benefits to the local social-cultural living environment. A local initiative like DEH is believed to positively contribute to the awareness regarding the

sustainability of our living environment on a global scope and to be the motor of change (IntM, IntM): "a change in the field of energy will be realised bottom-up" (survey).

Regarding the local social-cultural living environment, interviewees refer to the possibilities of investing returns locally in order to create a thriving sustainable community (IntNM, IntNM). "Strengthening the local economy" and "strengthening the local community" have also been referred to in research on community energy in the Netherlands (Elzenga & Schwencke, 2014; Netbeheer Nederland, 2013). According to Hoffman & High-Pippert (2010) these non-material benefits and/or perceived benefits that flow back to the community are regarded as more important in sustaining participation than personal direct material benefits. Relevant to emphasize here is that civic gratification is particularly important for *continuing* participation, not for joining the community energy program. For joining the community energy program, saving money on energy bills has shown to be more important (Seyfang et al., 2013). Thus, once the direct personal benefits are reaped, non-material benefits and/or direct benefits flowing back to the community become more important and induce members to stay (Hoffman & High-Pippert, 2010).

Social gratification

Of the four symbolic resources, 'social gratification' is in the last place and most of the motivations belonging to this resource have shown to be significantly less important than the motivations belonging to the other symbolic resources. "Exchanging knowledge and experience on energy use" is the most important motivation within this resource. DEH is believed to be a place for access to knowledge and ideas and for advice. A lot of information on energy saving and new technologies is available on the internet, but it takes effort to find this information and another step to convert this into concrete action (IntM). In addition, "when you hear it from a friend, then you think, let's do that too" (IntM). Meeting with people in real-life to talk to each other about energy use and saving has been a reason to join DEH (IntM).

Local autonomy

Regarding the resource 'local autonomy' interviewees referred to their self-sufficiency in electricity use, which is enabled by solar panels. To a lesser extent, DEH is also seen as a way to give more power to the community and to countervail large scale incumbent energy producers (survey, IntM). A "higher control over the energy provision" was also mentioned as a goal of community energy initiatives by previous research on community energy in the Netherlands (Elzenga & Schwencke, 2014; Netbeheer Nederland, 2013). In this research, no distinction was however made between household self-sufficiency and the independence of the incumbent energy producers.

Community identity

Community identity can be explained as those factors that help an individual to identify with others (Della Porta & Diani, 2006; Jeff Goodwin et al., 2000). It has not been directly

incorporated as motivations in the survey or the interviews due to the difficulties in conceptualising this resource a motivation to participate in DEH. Interviewees however mentioned aspects which describe (part of) the community identity within DEH.

DEH is primarily for citizens of Haaren municipality and only has a few of members from outside the municipality, which are all from neighbouring villages (survey). DEH is also not actively recruiting outside Haaren and focuses on the municipality. This geographical characteristic scope has also stimulated non-members of DEH to join the pilot project SSmE (IntNM, IntNM). The possibilities to invest the financial returns of the cooperative in the municipality for social and cultural purposes enhances the sense of having a stake or interest as it will improve your living environment (IntNM). This corresponds to previous research on community energy in which a shared geographic space and a sense of belonging have been identified as an aspect of community identity (Bomberg, McEwen, 2012).

Members of DEH are also identified by the common interest in energy and is what distinguished former HEET from the LNMH. Although HEET was part of the LNMH, they attracted a "different type of people" to their information evenings (IntM). Non-members also expressed a clear des-interest in energy in the open questions to the survey. Research has shown that energy programs are set-up around sustainable energy-related spaces where (alternative) green values can be expressed (Seyfang et al., 2014; Seyfang et al., 2013; Seyfang & Smith, 2007). This corresponds to the interest in 'sustainable energy' that shapes the collective identity of DEH.

4.4 Epilogue Duurzame Energie Haaren

In this section the structural and symbolic resources present at DEH have been analysed. DEH is led by a team with diverse backgrounds that are relevant for the activities they pursue. It is an organisation that relies on the input of its members on a voluntary basis which limits the time available to put in. Also the financial resources are limited as DEH wants to be autonomous. DEH mainly relies on the member ship fees to finance its activities. Regarding the infrastructures it makes use of different types of social media to inform members on the activities and developments of DEH. It uses both its internal and external social networks for working towards its goals.

Members mainly identify themselves with DEH through the geographical scope and the topic of energy which form the collective identity of DEH. The other symbolic resources that were distinguished in the survey have all shown to play a role in becoming a member of DEH. Direct personal benefits, the benefits to the environment as well as the benefits that accrue the local community are all motivations to participate in DEH. In addition, self-sufficiency with respect to energy also plays a role. The enjoyment of social contacts has shown to be least important in becoming a member of DEH.

5. Analysis of Practices

In this Chapter the results from the analysis of the four practices that exist on the interface between community energy and smart grid are presented. The four subsequent sections (5.1 – 5.4) respectively provide the analysis of the four practices: Renewable Energy Generation, Monitoring Energy Use and Generation, Sharing Information and Timing of Energy Use. For each of these practices the three dimensions of materials, meanings and competences are analysed as well as the role of DEH on each of these dimensions. Each practice is concluded with a short overview of the results.

5.1 Renewable Energy Generation

This section gives an overview of the practice Renewable Energy Generation (REG). Subsections 5.1.1, 5.1.2, 5.1.3 respectively describe the three dimensions of a practice: materials, meanings and competences. The results are based on the data gathered by the survey and interviews. Within each dimension, a comparison is made between members and non-members of DEH and the activities of DEH that contribute to the practice are discussed. Wherever possible, reference is made to how these dimensions interact. In subsection 5.1.4 the perspectives of members and non-members on three distinct forms of collective energy generation are analysed. The results are summarized in the epilogue to this section.

5.1.1 Materials

Materials are the material elements used in the practice. Figure 5-1 gives an overview of the different types of renewable energy generation at home by members and non-members of DEH. It is based on 74 member responses (N_M=74) and 37 non-member responses (N_M=37).

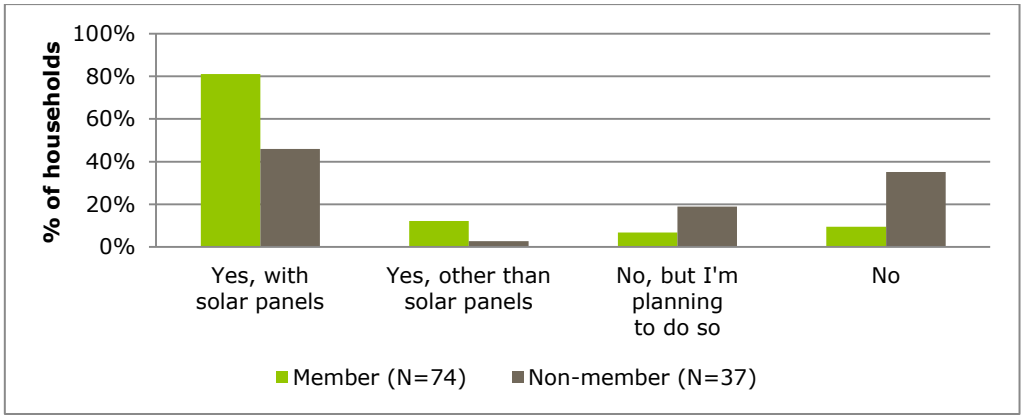

Figure 5-1 Forms of renewable energy generation at home

Figure 5-1 shows that solar panels are mostly used to generate renewable energy at home. The percentage of households generating renewable energy by solar panels is higher for members of DEH (81.1%) compared to non-members of DEH (45.9%). The collective procurement of solar panels has been one of the main activities of DEH and a requirement for participation in this project was a membership of DEH (IntNM). 24.7% of the members

indicated that the cheap procurement of solar panels has been 'very important', 37.0% 'important' and 21.9% 'somewhat important' in becoming a member of DEH. The collective procurement has generated a lot of new members (IntM, IntBM) and can explain the difference between the shares of members and non-members that generate renewable energy with solar panels. Also for other modes of generating renewable energy, the percentage of households is higher among members of DEH compared to non-members: 12.2% versus 2.6%. These other ways of renewable energy generation include heat pumps, biomass, Energy Ball (wind energy) and heat pipes. Among non-members there are relatively more people (18.4% vs 6.8%) who plan to invest in renewable energy generation at home. All plan to do that with solar panels.

Reasons why respondents do not generate energy at home are often related to the dimension of materials. Within these, a distinction can be made between different categories. The first category is financial resources. Although it will save on the energy bill in the future, for some, the initial investment is too high to pay at once. They simply do not have the resources to finance the investment. Subsidies have been an enabling factor in the investment (IntM, IntNM, IntM, IntM, IntM, IntNM). The second category is the type of house the people live in. Sometimes the house is constructed in such a way that the roof is not suitable for solar panels (survey). In other cases people live in a rental house and therefore do not invest in solar panels (survey). The living environment is a third category (survey, IntM). "I live in the woods and it's therefore not possible to generate either solar or wind energy" and "solar energy is not possible because there's is too much shade" are two of the arguments made in the survey. In these cases, the living environment constrains the practice REG as it prevents people from reaping the material benefits of the investment, which is one of the meanings within REG as shown in 5.1.2. Corresponding to literature on practices, it shows the interaction between the dimensions of materials and meanings within the practice for the practice to exist (Gram-Hanssen, 2010; Shove, 2003).

Materials in the practice REG mostly contain materials for solar energy generation. Financial resources PV-panels, energy converters (a device that converts direct current into alternating current), type of house and the living environment are all materials that belong to the practice REG.

5.1.2 Meanings

Meanings give symbolic value to the practice. The meanings distinguished in the practice REG cover the symbolic resources 'material benefits', 'civic gratification' and 'local autonomy'. For each of these resources one or more meanings were conceptualised that correspond to the description of the resources in Chapter 2. Community identity and social gratification were not incorporated in this practice, due to difficulties in conceptualising meanings within REG that would belong to this symbolic resource. In the survey 'material benefits' is included as "lowering my energy bill", 'civic gratification' as "saving on the environment" and "making the

energy system more sustainable" and 'local autonomy' as "being self-sufficient in my energy use", "generating energy on a small scale" and "countervailing large scale energy producers". Research has shown that interest in advanced and new technologies is a main motivator in timing energy practices (Kobus et al., 2013). Since timing of energy practices based on REG could contribute to peak-shaving, a last meaning, "It is fun to generate energy myself", was included.

For each of the meanings respondents could indicate the importance of that meaning within the practice. A six-point Likert scale was used, in which value of 1 corresponds to 'very unimportant', whereas a value of 6 corresponds to 'very important'. In the analysis of the meanings dimension of REG, only those respondents that generate energy at home are included. Therefore, the results are based on 65 member responses (N=65) and 23 non-member responses (N=23).

Reliability tests (see Appendix VI) were conducted to determine the correlation between the meanings within the symbolic resources. These test generate a value for Cronbach's alpha which is a measure of reliability. It indicates whether or not these meanings can be regarded as measuring the same symbolic resource. In the practice Renewable Energy Generation, it is only applied to 'local autonomy' since it constitutes of three or more meanings. Based on this reliability test (see Appendix VII – B), it can be concluded that the three meanings incorporated in the survey constitute 'local autonomy' (value of 0.729 for members and 0.773 for non-members).

In Figure 5-2 and Figure 5-3 the distribution of the answers given by respondents to the survey are graphically presented for both members and non-members. The meanings are presented in order of importance based on the average values assigned by members. From these figures it can be seen that the meanings that fall under 'civic gratification' (i.e. "saving on the environment" and "making the energ provision more sustainable") are important to a certain degree in the practice REG according to all respondents (both members and non-members). This is also the case for non-members on the meanings "lowering the energy bill" and "being self-sufficient in my energy use". Among members there are also some respondents to whom these meanings are not important within REG. Another finding is that on "countervailing large scale energy producers" the percentage of respondents valuing this as 'very important' is higher among non-members compared to members, while this is the other way around for all other the meanings. Regarding the meaning "it is fun to generate energy myself" there is a 21.8 percentage points difference between members and non-members who indicate the fun-aspect to be 'very important'. To members, generating renewable energy is more fun than as compaered to non-members.

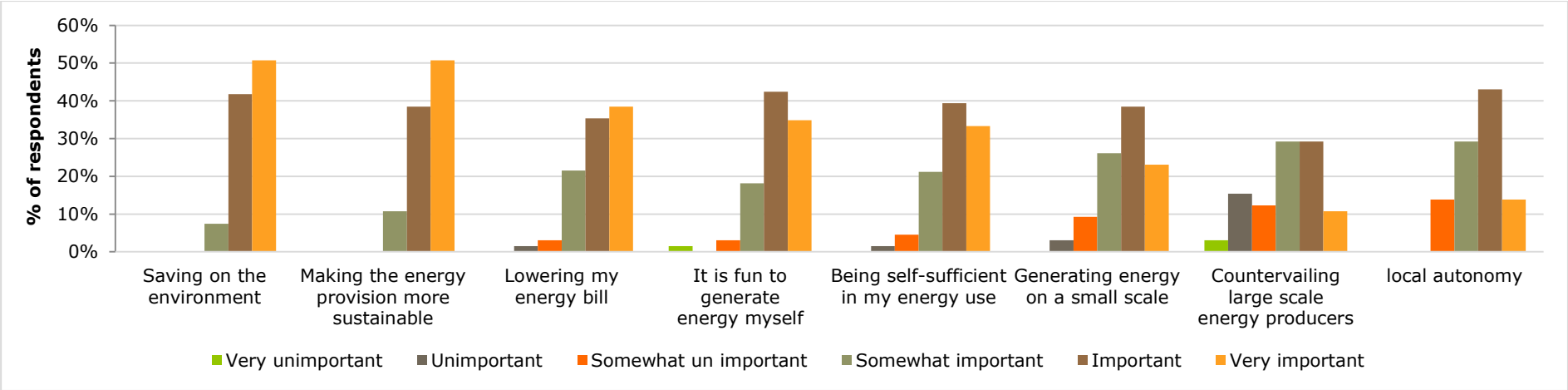

Figure 5-2 Distribution of meanings within REG over levels of importance, members (N=65)

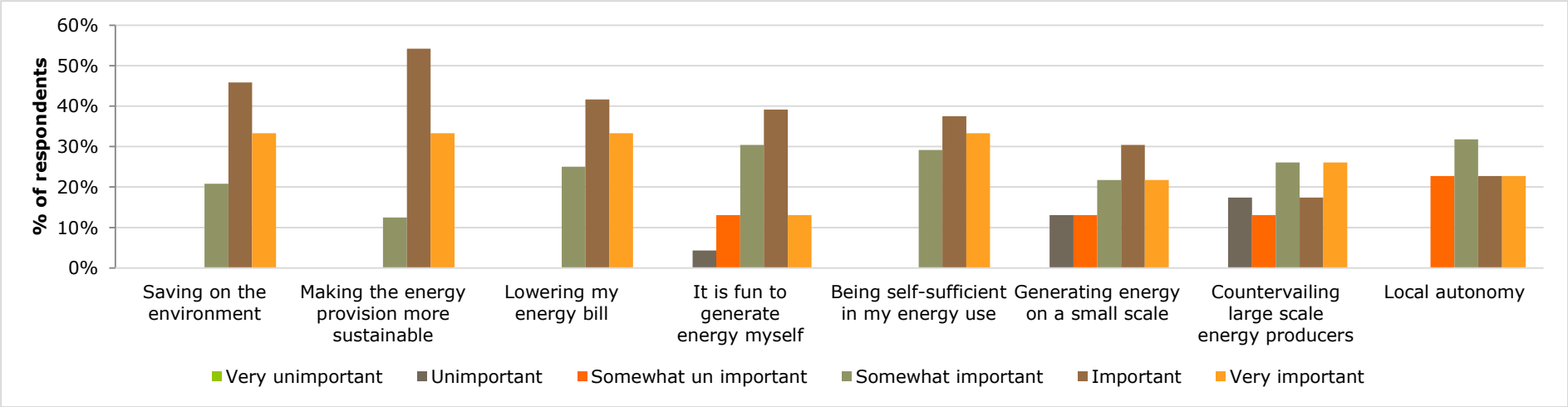

Figure 5-3 Distribution of meanings within REG over levels of importance, non-members (N=23)

The level of importance

Table 5-1 shows the median and average values of importance of each meaning within the practice as well as the standard deviations. The higher the value, the more important the meaning is within the practice. The meanings are listed in order of importance based on the average values assigned to the meanings by members of DEH. From this table it can be seen that to both members and non-members all meanings incorporate a certain degree of importance within the practice REG (median values of 4-6). In addition, to both groups of respondents, meanings with respect to 'civic gratification' are most important followed by meanings constituting 'material benefits' and 'local autonomy'. The order of the meanings "saving on the environment" and "making the energy provision more sustainable" is however opposite for non-members as compared to members. Also "it is fun to generate energy myself" is ranked lower among the meanings within REG for non-members (5^{th} place) compared to members (4^{th} place). In addition, the table shows a larger range of the average values of the meanings to members (5.43 to 3.98) as compared to non-members (5.13 to 4.22). The overarching picture sketched by the table thus shows no large differences with respect to the order of meanings between members and non-members. There are only some differences in the details.

Table 5-1 Level of importance of meanings within REG

Meaning	Member DEH			Non-member DEH			Mann-Whitney test	
	Median	Ave-rage	Stan-dard dev.	Median	Ave-rage	Stan-dard dev.	U	Exact sig. (1-tailed)
Saving on the environment (N_M = 67 N_{NM} = 24)	6.00	5.43	0.63	5.00	5.13	0.74	621.50	0.039
Making the energy provision more sustainable (N_M = 65 N_{NM} = 24)	6.00	5.40	0.68	5.00	5.21	0.66	652.00	0.108
Lowering my energy bill (N_M = 65 N_{NM} = 24)	5.00	5.06	0.93	5.00	5.08	0.78	765.00	0.450
It is fun to generate energy myself (N_M = 66 N_{NM} = 23)	5.00	5.05	0.95	5.00	4.39	1.16	494.00	0.004
Being self-sufficient in my energy use (N_M = 66 N_{NM} = 24)	5.00	4.98	0.94	5.00	5.04	0.81	788.00	0.489
Generating energy on a small scale (N_M = 65 N_{NM} = 23)	5.00	4.69	1.03	5.00	4.35	1.34	650.50	0.171
Countervailing large scale energy producers (N_M = 65 N_{NM} = 23)	4.00	3.98	1.33	4.00	4.22	1.44	664.50	0.256

Members versus non-members

From the numbers in Table 5-1, it can be seen that there are some differences between members and non-members in the values they assign to the meanings within the practice REG. On the two meanings measuring civic gratification members assign a higher value to variables concerning 'civic gratification' than non-members: 5.43 and 5.40 for members versus 5.13 and 5.21 for non-members. Also to the meanings "it is fun to generate energy myself" and "generating energy on a small scale", members assign a higher level of importance than non-members. Non-members assign a higher value to "lowering my energy bill" and "countervailing large scale energy producers".

The Mann-Whitney test (see Appendix VII) was used to determine the significance of the differences between members and non-members with respect to the importance assigned to the meanings within the practice. The last column in Table 5-1 presents the results of these tests. Using a one-tailed significance level (α) of 0.05 it can be concluded that members attach a significantly higher value to "saving on the environment" (p-value = 0.039) and "it is fun to generate energy myself" (p-value = 0.004). As a member of DEH indicated in the survey: "I want to emanate that I am consciously dealing with energy and the environment and to be an example for others." The collective interest in energy (see section 4.3) could be an explaining factor for the higher level of importance of the meaning "it is fun to generate energy myself" among members as compared to non-members.

In their presentation on 'Zonnepanelen stralen', DEH stressed both arguments related to 'material benefits' (i.e. "return 8% - 13% a year") as well as 'civic gratification' (i.e. "a positive contribution to the environment" and "for next generations") (DEH, 2013). Emphasizing the benefits to the environment in this presentation, could have shaped the meanings of the practice. In addition, "saving on the environment" has shown to be the most important motivation to participate in DEH and an interest in energy is part of the collective identity of DEH. These could explain the differences between members and non-members on the meanings and thereby the role of DEH on the meanings dimension of REG.

The relative importance of meanings

The Wilcoxon signed-rank test (see Appendix VIII) was used to determine whether or not one meaning is more important than another meaning within the practice REG. The tests were conducted for the groups of members and non-members separately. The results of these tests can be found in Appendix VIII – B.

Material benefits versus civic gratification

The tests show that, "saving on the environment" is not significantly more important than "making the energy provision more sustainable", in REG to both members and non-members (p-value of 0.795 and 0.625 respectively). To members, both of these meanings are significantly more important than "lowering my energy bill". This implies that, for members, the practice REG is more important in how it contributes to a better environment than as way

of generating personal benefits. To non-members there are no significant differences between the first three meanings in the level of importance.

During information evenings of DEH often questions are asked about the time it takes to earn the investment back (IntM) and there is clearly referred to the financial benefits of the investment in the presentation used for this information evening (DEH, 2013). One of the main arguments made is that solar panels yield a higher return than putting the money on the bank (IntM, IntNM). In addition, a (possible) lack of material benefits is also a reason not to invest and thereby a constraining factor in the practice (survey, IntM, IntNM). "Regarding our age, the period [we have] to earn the investment back is too short" and "I don't know if we will still live here in 10 years" are two examples of arguments made by respondents. Besides, respondents referred to the energy use in general which is in some cases "extremely low" and relatively low in others: "We invest in reducing the use of gas which is three times higher than the use of electricity" (survey). In that case, solar panels as a way to reduce electricity costs will only have a minor effect on the total energy bill and might not weigh up against the costs of investment.

Hoffman and High-Pippert (2010) showed that motivations belonging to 'civic gratification' become more important over 'material benefits' in sustaining participation in a community energy initiative. The arguments given above are about the decision investing in solar panels or not and clearly focus on the material benefits. The question in the survey related to the REG as it is executed and thus after the investment had been made. Taking this into account, the results indicate that, just as in sustaining participation, meanings belonging to 'civic gratification' become more important over 'material benefits' after the initial investment is made. For the decision to invest, the 'material benefits' are most important.

Local autonomy

To members, '"lowering my energy bill" is not significantly more important in the practice than "it is fun to generate energy myself" and "being self-sufficient in my energy use" (p-values 0.874 and 0.753 respectively). In contrast to the member-results, both "lowering my energy bill" and "being self-sufficient in my energy use" are significantly more important than "it is fun to generate energy myself" in the practice for non-members. Members thus not only perceive REG as more fun than non-members (Table 5-1), also relative to the other meanings, it is more important.

Within the meanings compounding local autonomy, "being self-sufficient in my energy use" is significantly more important than the other two meanings for both members as well as non-members (i.e. "generating energy on a small scale" and "countervailing large scale energy producers"). These results indicate that generating energy at home is not so much an activity against the current energy system ruled by the large energy producers, but more directed towards individual autonomy and independence of others.

An overview of the meanings dimension within REG

An overview of the meanings dimension of REG for members and non-members is provided in Figure 5-4 and Figure 5-5. The colours represent the different symbolic resources distinguished ('civic gratification', 'material benefits', 'local autonomy') and the 'fun-meaning'. The higher the meaning in the graph, the more important the meaning is within the practice REG. From these figures it can be seen that members value the meanings belonging to 'civic gratification' as more important than non-members, also relative to other meanings. In addition, the enjoyment of REG is (relatively) more important to members than to non-members. Although the level of importance differs among the meanings, it should be taken into account that all meanings inhibit a certain degree of importance. Corresponding to the results of Chapter 4, in which all motivations incorporated a degree of importance for participation in DEH, it is not only one meaning that is important within REG, it is a combination of meanings that shape the meanings dimension of the practice.

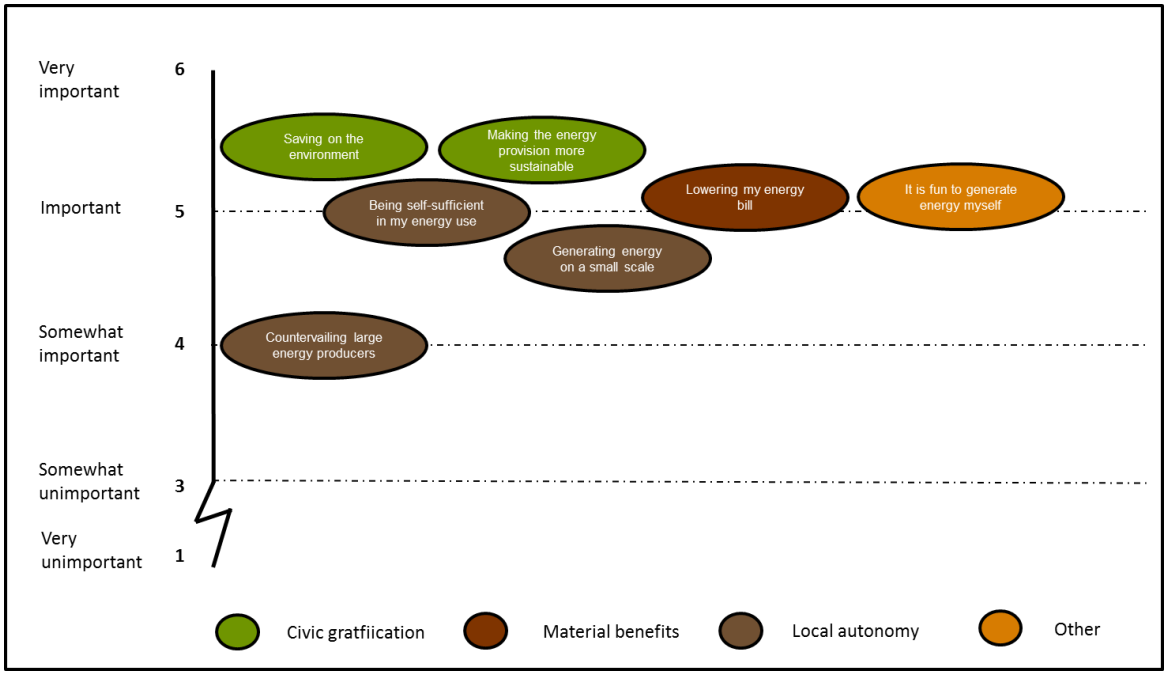

Figure 5-4 The order of importance among meanings within REG, members

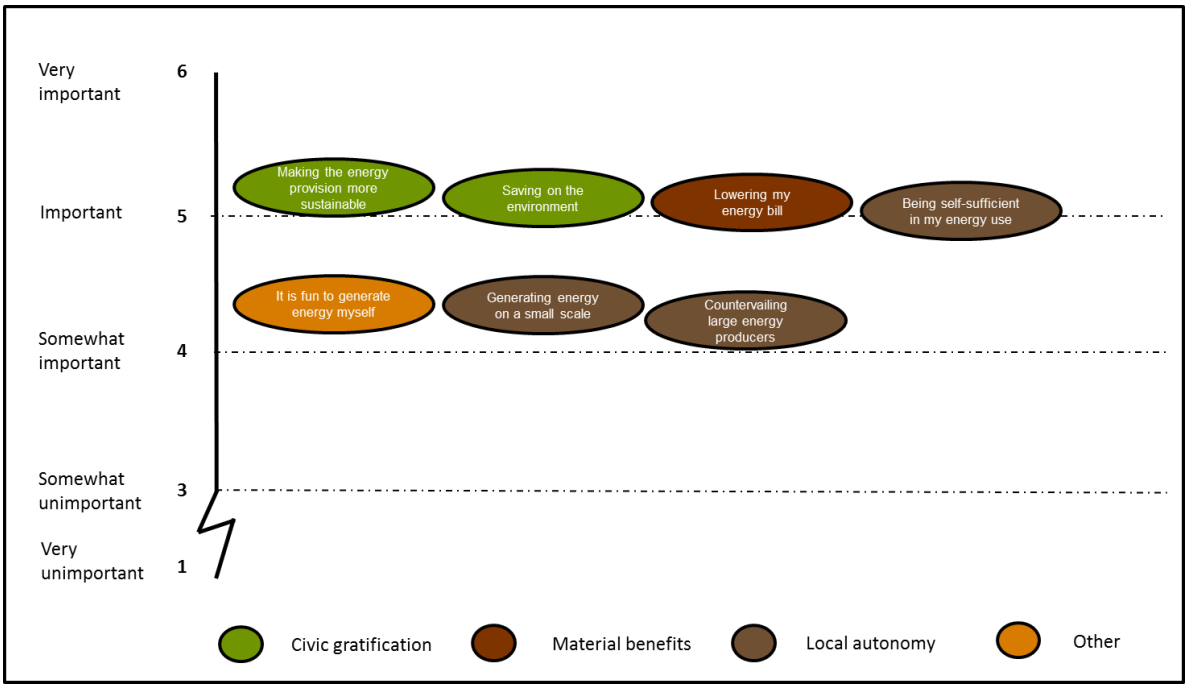

Figure 5-5 The order of importance among meanings within REG, non-members

5.1.3 Competences

Competences refer to the knowledge and skills that exist within the practice. In the survey this is operationalized in three statements regarding the generation of energy at home: "I can give advice about the procurement of PV panels", "I would like to get more information about the possibilities to generate energy at home" and "I know how much my PV panels generate". Figure 5-6 and Figure 5-7 give an overview of these competences for members and non-members respectively.

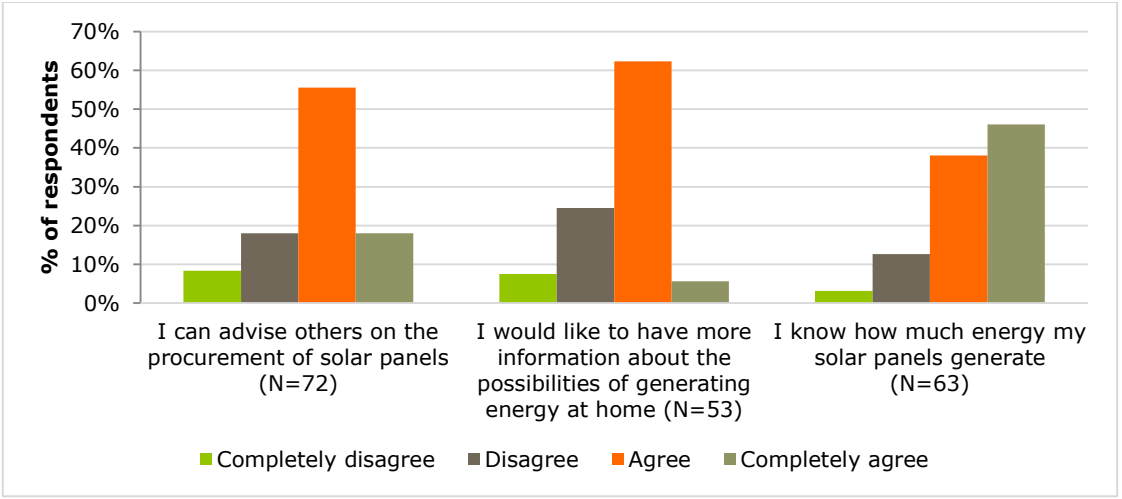

Figure 5-6 Competences within REG, members

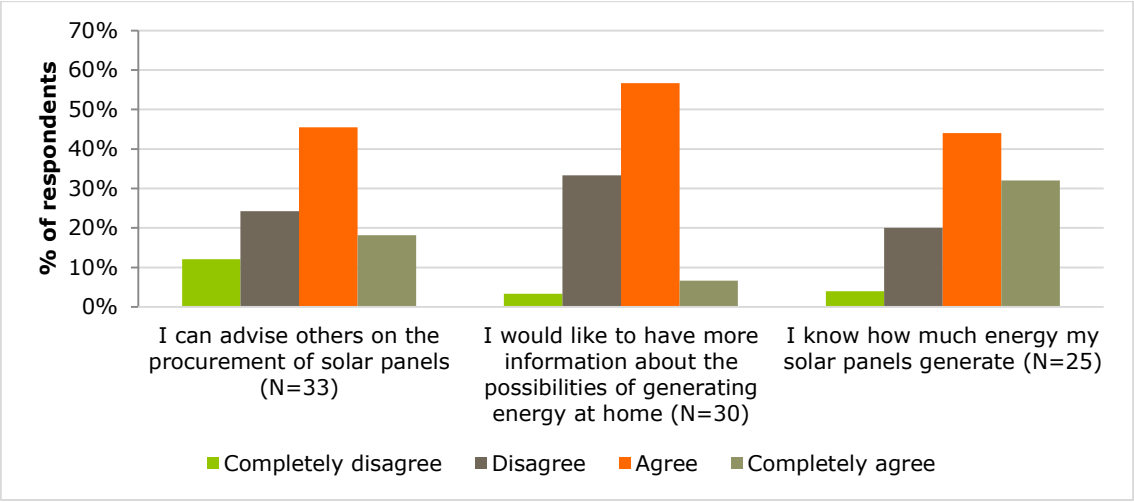

Figure 5-7 Competences within REG, non-members

From these figures it can be seen that among the members of DEH a larger share of respondents agrees with the three statements. Using the Mann-Whitney test (see Appendix VII), the results of the survey do however not show a significant difference between members and non-members of DEH. Splitting the data based on solar panels the results show that 79.2% of the respondents with solar panels agrees to be able to advise others on the procurement versus 46.4% among those that do not have solar panels. This indicates that solar panels shape the competences within REG.

In REG, competences encompass knowledge about the technical specifications of the technology (for example solar panels or heat pumps), the amount of energy it generates and about the situation in which it is a good investment (Interview IntM, IntNM, IntNM, IntM, IntM, IntNM IntNM, IntM). This last competence in many cases relates to whether or not it is financially beneficial and thus to the 'material benefits' as a result by REG. It is an example of how the competences and meanings are related within practices (Gram-Hanssen, 2010; Shove & Pantzar, 2005). Through monitoring the generation of energy, people collect data which they can use to recognise malfunctions of their solar panels and to determine the extent in which they are self-sufficient (survey). It shows how the practice REG relates to the practice monitoring energy use and generation. There are thus not only links between elements of the practice, but also between different practices (Gram-Hanssen, 2010).

In the acquiring the information for the process of procurement, members and non-members of DEH, that invested in solar panels at home, started with gathering information through the internet (IntM, IntNM). They talked to neighbours that already invested in solar panels (IntNM) and asked advice from friends with a technical background about the best offer among the different suppliers (IntM). The procurement process also raised questions and discussions about the right way to connect the meter box and the solar panel installation (IntNM, IntNM). Moreover, not all suppliers could be trusted on their knowledge as some showed not to have the right understanding for these connections (IntNM). Doing the research and analysing the

bids from suppliers has been regarded as time-consuming and complicated, especially for people that do not have a technical background (IntM, IntNM). These experiences have induced DEH to organise the collective procurement of solar panels and thereby to facilitate the process (IntM). DEH did the first investigation of options and selected the best bids based on technique, price and supplier. Members then only had to fill in a participation form. Some people had already invested in solar panels for the first time before DEH was set up. Knowing and having experienced the complexities of the process has induced them to participate in the collective procurement of DEH for a second investment in solar panels (IntM, IntNM). For others, DEH provided the information after which they arranged the procurement of solar panels themselves (IntNM). By facilitating the procurement of solar panels, DEH has provided its members and others with the competences needed for the practice REG.

5.1.4 Collective energy generation

Most people that generate renewable energy, use solar panels on their own roofs. In section 5.1.1 it was shown that the main reasons why people do not generate energy themselves is because they lack the various materials to do so. Currently there are already some examples of cases where people invest in collective energy generation (e.g. LochemEnergie, Winddelen). This could be an opportunity to overcome the lacking materials as people do not need to have a suitable roof for solar panels or large financial resources. In the survey respondents were therefore asked whether or not they would participate in each of the following forms of collective energy generation:

1. Together with friend(s) or closely related people: for example shared solar panels on the roof of a friend.
2. Together with neighbours in a local cooperative: for example shared solar panels on the roof of a school.
3. Together with unknowns in a larger scale energy project: for example participation in a wind park or solar park elsewhere in the Netherlands.

Figure 5-8 and Figure 5-9 present the results from the survey for members and non-members respectively. On the first two statements there are no remarkable differences between members and non-members. Regarding the third form of collective energy generation, however, the distributions of answers from members and non-members are opposite. The larger share of members indicates to be willing to participate while the larger share of non-members indicates not to be willing to participate. Based on the results of the Mann-Whitney test, it can be concluded that, using a significance level of 0.10 (p-value = 0.072), members are more likely to participate in a nationwide collective energy generation project than non-members. An explanation for this could be that members already participate in a local cooperative

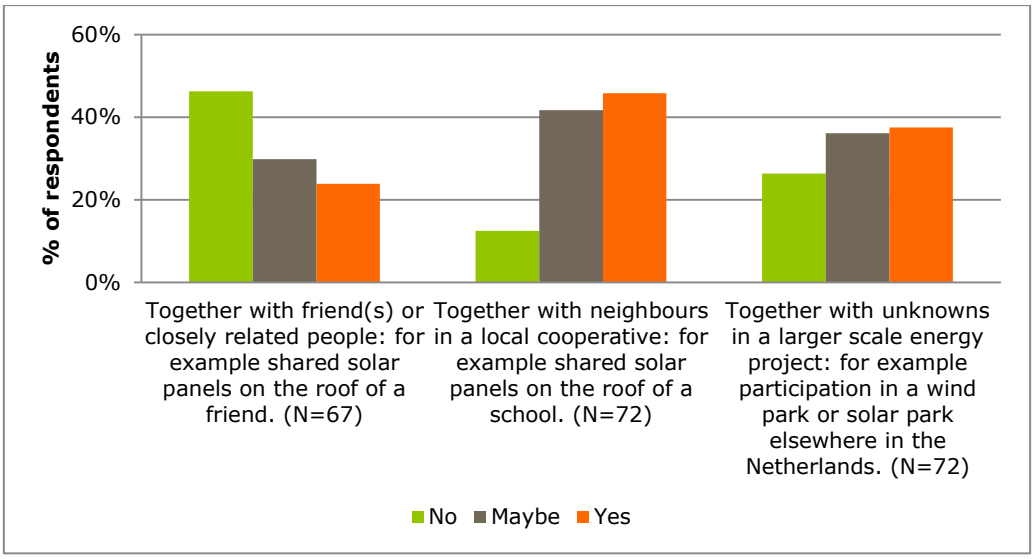

Figure 5-8 Willingness to participate in different forms of collective energy generation, members

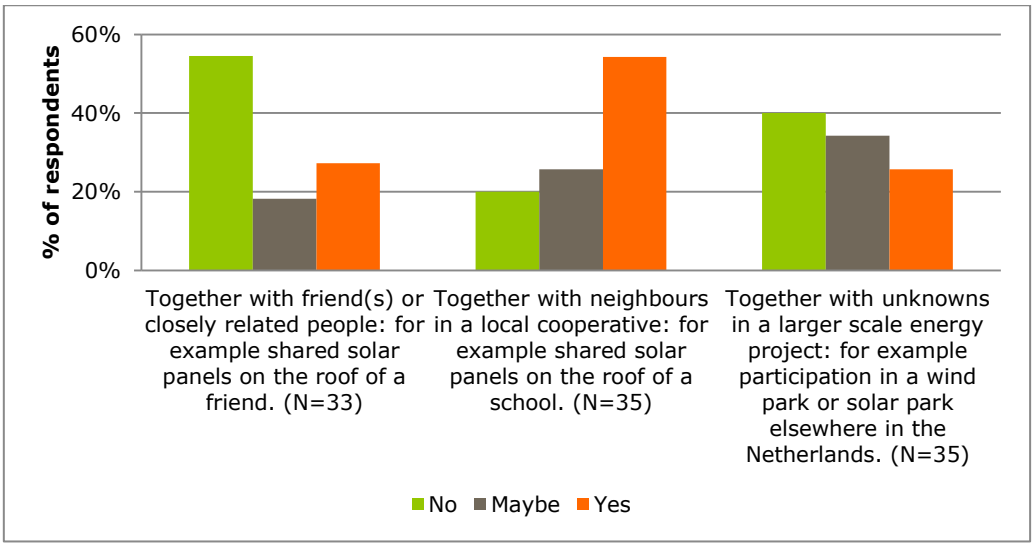

Figure 5-9 Willingness to participate in different forms of collective energy generation, non-members

Advantages and disadvantages of collective energy generation

Table 5-2 summarizes the advantages and disadvantages of the different forms of collective energy generation as mentioned in the survey and interviews. A main advantage of organising collective energy generation on a small scale with friends or neighbours is that the connections to the project are close. The cooperation will be better and the costs to manage the project lower. However, most people indicated not to be willing to participate in a project with friends. One disadvantage mentioned relates to concerns about the continuity of the project when people move and new neighbours move in. People leave and enter the project which makes it more complex to organise. The main reason, however, is that friendship and business should be separated. "Doing business with friends can damage the relationship" (survey). According to the respondents to the survey, members as well as non-members, you should not do business with friends.

The second option has more advantages compared to organising the collective energy generation with friends. Just as with the first option, one of the advantages is that, due to the relatively small scale of the project, people feel more connected which induces minding. "The shorter the lines, the more the people are involved and committed" (survey). People also regard a local, small-scale project as beneficial to the local population and like to be able to control the project. Compared to a national project there are more possibilities for individuals to have a say in it (survey). Additional to the advantages of small-scale projects, a local cooperative initiative also inhibits some beneficial large scale traits. Through working together more can be achieved in the field of renewable energy generation (survey). Furthermore, knowledge and expertise are (better) protected (survey). Perceived disadvantages relate to the relatively small scale of the project. The people participating in such a project have close connections which can create difficulties regarding payments (survey). Additionally it is believed that when you move, part of the money and effort you have put in will be lost (survey). Others just do not believe in small systems and find it undesirable to be dependent on many small-scale companies (survey).

The third option also inhibits some advantages from operating on a larger scale: through working together, more can be achieved in the field of renewable energy generation and knowledge and expertise are better protected (survey). In addition larger scale projects are believed to be more sustainable and to have lower unity costs (survey). One of the disadvantages of a large scale project is that it is distant and that it is difficult to have insight in the project and its results (survey). Opportunities to be actively involved and have a say in the project are limited: the large companies are believed to determine the development of the project and people are rather not dependent on third parties (survey).

Table 5-2 Overview of advantages and disadvantages of different forms of collective energy generation

	Advantages	Disadvantages
Friends	- High level of involvement and commitment due to close connections	- It can damage the relationship with friends - Continuity of the project
Cooperative	- High level of involvement and commitment due to close connections - Able to have a say in the project - Through working together more can be achieved in REG - Knowledge and expertise are protected	- Possible difficulties with payments - You have to put more effort in - Small systems are undesirable
National	- Through working together more can be achieved in REG - Knowledge and expertise are protected - More sustainable	- Distant: difficult to have insights in the operations and results - Dependent on third parties - Limited opportunities to be involved

5.1.5 Epilogue Renewable Energy Generation

The results from the survey and interviews have shown that most people generate renewable energy with solar panels. Few people use other sources like wood or geothermal energy. Financial resources, the construction of the house and the living environment can all be constraining or enabling factors in the materials belonging to REG. All meanings that have been investigated in this research have shown to inhibit a certain degree of importance. Among the meanings, those regarding direct personal benefits and benefits to the environment were most important. The competences within REG encompass the knowledge about the technical specifications of the technology, the amount of energy it provides and about the situation in which it is a good investment.

Within the practice Renewable Energy Generation DEH has contributed to each of the three dimensions of a practice: materials, meanings and competences. For many members, DEH has been the vehicle to invest in solar panels. As a facilitator of the procurement process, DEH has provided people with the knowledge about solar panels and their benefits, for making the investment decision. In addition, by pre-selecting suppliers and types of solar panels they also facilitated the acquirement of the materials, members merely had to participate. Members have shown to attach a significantly higher level of importance to "saving on the environment" and the 'fun' of generating energy as compared to non-members. This difference can be explained by three factors: the emphasis on the benefits of the environment during the information evening on the procurement process of solar panels; the benefits of the environment which have shown to be the main motivator for participation in DEH; and the interest in energy which is part of the collective identity of DEH. It could be explained as the role of DEH in the meanings dimension of the practice.

5.2 Monitoring Energy Use and Generation

This section gives an overview of the practice Monitoring Energy Use and Generation (MEUG). Subsections 5.2.1, 5.2.2 and 5.2.3 respectively describe the three dimensions of a practice: materials, meanings and competences. The results are based on the data gathered by the survey and interviews. Within each dimension, a comparison is made between members and non-members of DEH and the activities of DEH that contribute to the practice are discussed. Wherever possible, reference is made to how these dimensions interact. The results are summarized in the epilogue to this section.

5.2.1 Materials

Within MEUG the materials dimension encompasses the physical objects that are used to get more insight in the use of energy. Figure 5-10 gives an overview of the materials used by members and non-members of DEH in MEUG. From this figure it can be seen that the energy bill and energy meter are by far the mostly used devices among households to monitor energy use. Other devices that people use in MEUG are digital applications enabled by the smart meter, devices by which detailed information can be gathered on the energy use of separate household appliances and solar energy converters from which the domestic solar energy generation can be read (survey). These devices were provided by energy companies or grid operators and only available to a selected group of households.

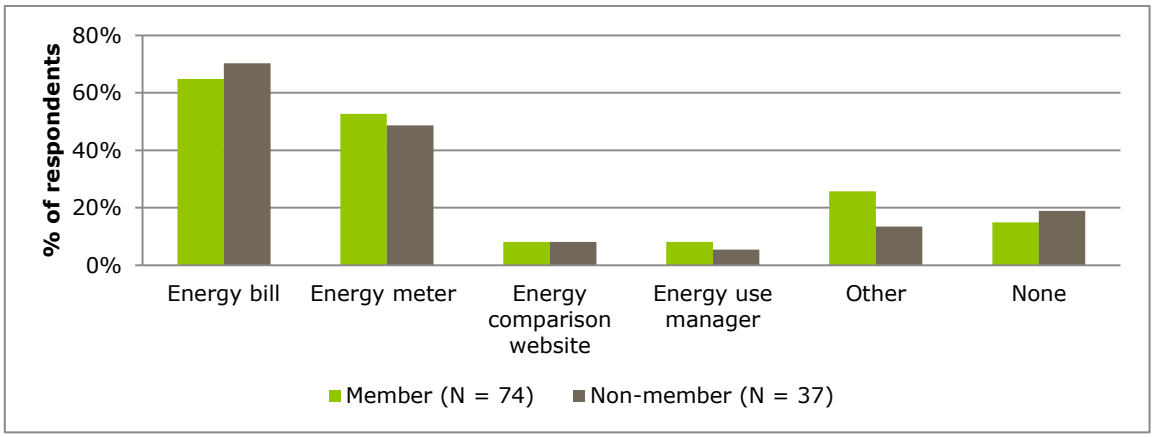

Figure 5-10 Devices used in MEUG

Figure 5-10 shows the frequencies by which members and non-members read the energy meter. Most respondents, members as well as non-members, indicate to do this on a yearly or monthly basis. Only 12.2% of members and 10.8% of non-members reads the energy meter weekly. 1.4% of members and 2.7% of non-members read it daily.

Figure 5-12 shows which sections of the energy bill respondents were most interested in. Total use of electricity and gas is most important to them. Over 50% of the households among members as well as non-members also looks to more detailed numbers on the energy

bill as network costs and taxes. Only 2.7% respondents indicated not to pay any attention to the energy bill.

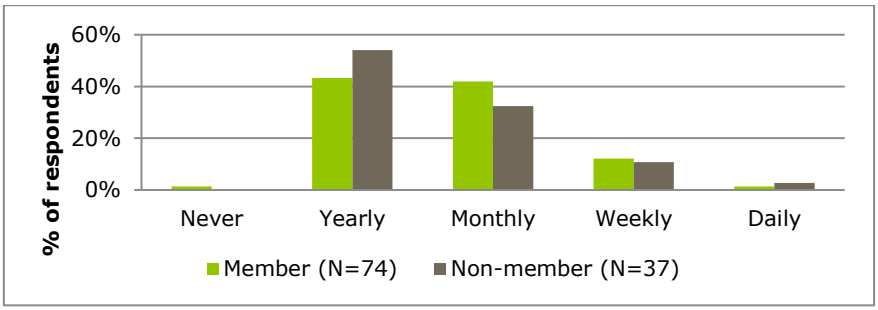

Figure 5-11 Frequencies of reading the energy meter

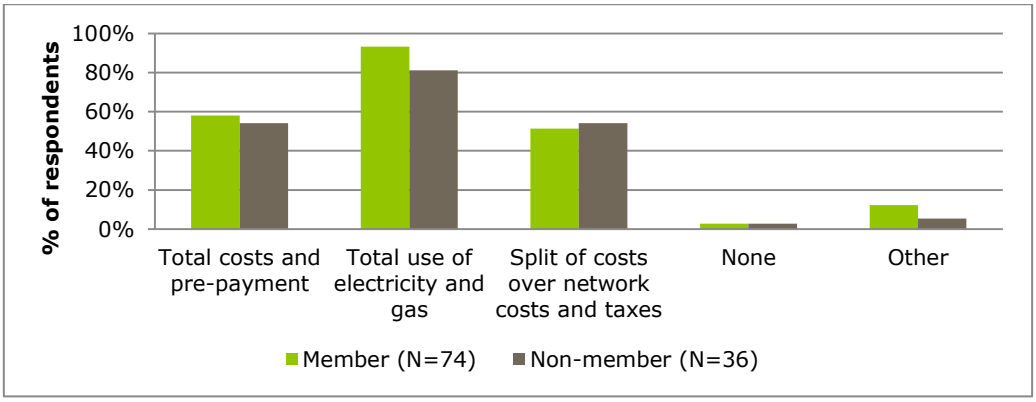

Figure 5-12 Sections of the energy bill that are studied

MEUG is influenced by several factors. When it is a sunny day and there is a clear sky people are more likely to check how much energy is generated by their solar panels (survey). They like to see the difference between sunny days and cloudy days: "It is fun to see that a lot of energy is generated on a sunny day and that we still earn something on a cloudy day." (survey). Having solar panels stimulates the practice MEUG and connects the practice Renewable Energy Generation (REG) with MEUG. The timing of MEUG is also related to the moment of receiving the energy bill. People compare these numbers to what they expected and use it to check the performance of the system (survey). Other factors that influence the monitoring of solar panels are curiosity and easiness (survey). People tend to monitor energy generation where they are around the place where they can check the performance of the solar panels (survey). They are interested in the return of the solar panels and enjoy to see the meter run backwards (survey). The interest however gradually disappears over time and results in a decrease in the frequency of monitoring energy generation (IntNM8).

The monitoring platform in SSmE

"To measure is to know" (IntM, IntM). Insight in energy use is the first step in changing energy practices: once you know about energy use, it is possible to do something about it (IntM, IntM). An online platform, as is created in SSmE, provides a monitoring device to the participants. DEH does not have the capacity to design and set-up this platform on their own,

because the data from the energy meter are not available to them. On the other hand, interviewees indicated not to have participated in SSmE when DEH would not have been involved (IntM, IntM, IntNM, IntNM). This implies that DEH has the networks and reputation to engage people in the project, which Enexis does not have; and that Enexis has the technical capacity to provide the materials, which DEH does not have. Through this cooperation in SSmE, DEH thus shapes the materials in MEUG.

5.2.2 Meanings

Meanings give symbolic value to the practice. The meanings distinguished in the practice MEUG cover the symbolic resources 'material benefits', 'civic gratification', 'social gratification' and 'local autonomy'. For each of these resources one or more meanings were conceptualised that correspond to the description of the resources in Chapter 2. Community identity was not incorporated in this practice due to difficulties in conceptualising one or more relevant meanings within this resource that could belong to the practice MEUG. In the survey 'material benefits' was included as "lowering my energy bill", 'civic gratification' as "saving on the environment" and "making the energy system more sustainable", 'social gratification' as "comparing my energy use to others" and "talking to others about energy use" and 'local autonomy' as "being self-sufficient in my energy use". Research has shown that interest in advanced and new technologies is a main motivator in timing energy use (Kobus et al., 2013). MEUG can provide insights which could contribute to peak-shaving (Kester et al., 2010). Therefore, a last meaning, "It is fun to monitor my energy use", was included.

For each of these meanings respondents could indicate the importance of that meaning within the practice. A six-point Likert scale was used, in which a value of 1 corresponds to 'very unimportant', whereas a value of 6 corresponds to very 'important'. In the analysis of the meanings dimension of MEUG only the respondents that indicated to either "be interested in their energy use" or "thoroughly study their energy bill" in a previous survey question are included. Therefore, the results for members are based on 74 respondents (N=74) and for non-members on 36 respondents (N=36).

In Figure 5-13 and Figure 5-14 the distribution of answers given in the survey are graphically presented for both members and non-members. The meanings are presented in order of importance based on the average values assigned to the meanings by the members of DEH. From these figures it can be seen that for none of the members, the meanings that constitute "saving on the environment" and "making the energy system more sustainable" within MEUG are either 'unimportant' or 'very unimportant'. On the other end of the scale, these meanings are either 'important' or 'very important' to respectively 89.2% and 84.7% of the members.

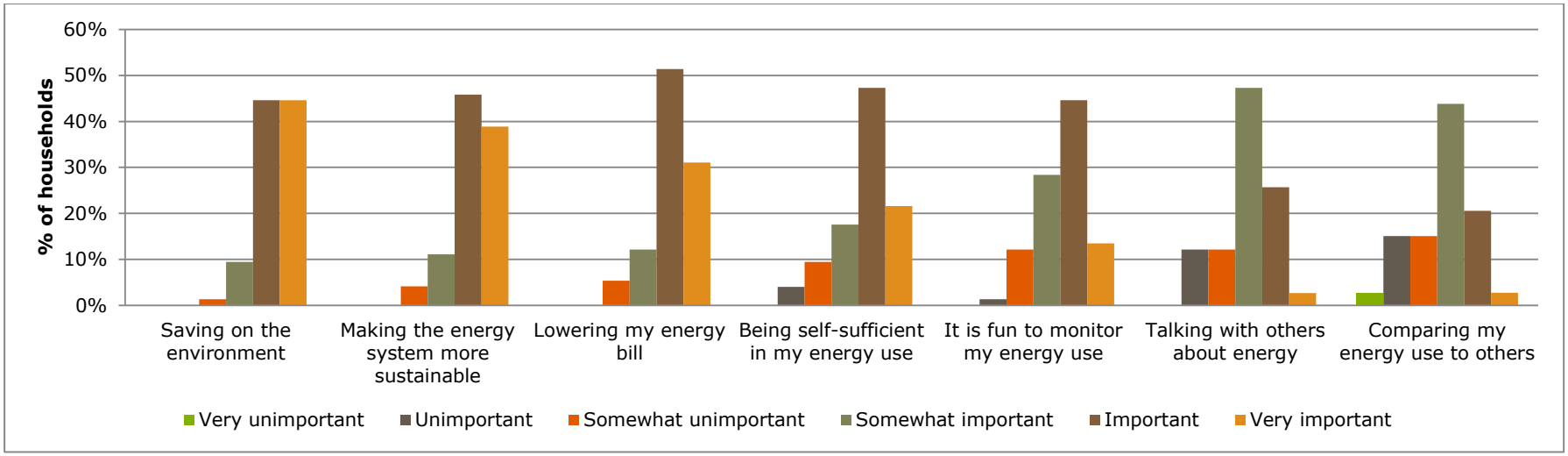

Figure 5-13 Distribution of meanings within MEUG over levels of importance, members (N=74)

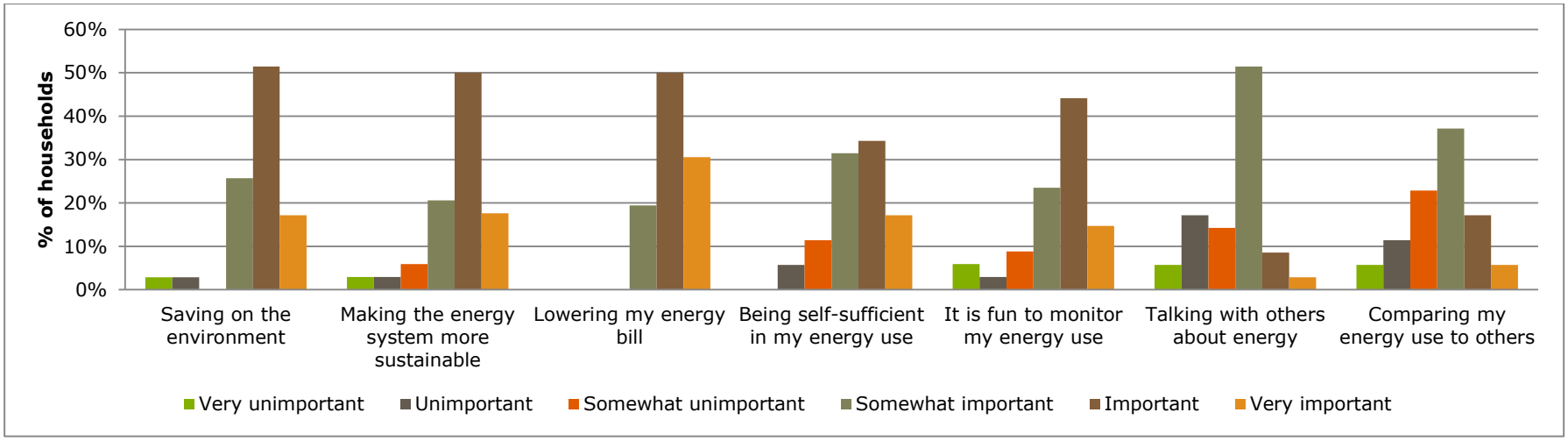

Figure 5-14 Distribution of meanings within MEUG over levels of importance, non-members (N=36)

To non-members these numbers are considerably lower: 68.6% and 67.6%. For all non-members, "lowering my energy bill" is in the range of importance, while for some members this is also 'somewhat unimportant'. On the meaning "comparing my energy use to others", members differ most strongly in perceiving this as a reason to monitor energy use. Some respondents indicate this to be 'very important' while others see this as 'very unimportant' within MEUG.

The level of importance

Table 5-3 shows the median and average values of importance of each meaning within the practice as well as the standard deviation. The higher the average value, the more important the meaning is within the practice. The meanings are listed in order of importance based on the average values attached to the meanings by members of DEH.

Table 5-3 Level of importance of meanings within MEUG

Meaning	Member DEH			Non-member DEH			Mann-Whitney test	
	Median	Ave-rage	Stan-dard dev.	Median	Ave-rage	Stan-dard dev.	U	Exact sig (1-tailed)
Saving on the environment (N_M = 74 N_{NM} = 35)	5.00	5.32	0.70	5.00	4.71	1.05	826.50	0.000
Making the energy provision more sustainable (N_M = 72 N_{NM} = 34)	5.00	5.19	0.80	5.00	4.65	1.12	867.50	0.004
Lowering my energy bill (N_M = 74 N_{NM} = 36)	5.00	5.08	0.81	5.00	5.11	0.71	1323.00	0.486
Being self-sufficient in my energy use (N_M = 74 N_{NM} = 35)	5.00	4.73	1.04	5.00	4.46	1.09	1092.50	0.082
It is fun to monitor my energy use (N_M = 74 N_{NM} = 34)	5.00	4.57	0.92	5.00	4.41	1.28	1238.50	0.448
Talking with others about energy (N_M = 74 N_{NM} = 35)	4.00	3.95	0.99	4.00	3.49	1.15	994.00	0.018
Comparing my energy use to others (N_M = 73 N_{NM} = 35)	4.00	3.73	1.12	4.00	3.66	1.24	1225.00	0.360

From this table it can be seen that to both members and non-members all meanings incorporate a certain degree of importance within the practice REG (median values of 4-5). Except for "lowering my energy bill", the order of the meanings is equal to non-members. This meaning is in third place for members, while being most important to non-members.

Respondents to the survey refer to the monitoring of individual household appliances that helps to uncover the appliances that are responsible for "useless energy use" or "unknown energy use" (survey). The insights of MEUG are used to change behaviour and thereby a reduction of energy use in order to lower costs as well as a the pressure on the environment (survey).

Members versus non-members

The numbers in Table 5-3 also show differences between members and non-members in the values they assign to the meanings within the practice MEUG. All meanings, except "lowering my energy bill", are more important according members as compared to non-members. The Mann-Whitney test (see Appendix VII) was used to determine the significance of the differences in the importance assigned to the meanings within the practice. The last column in Table 5-3 presents the results of these tests. Using a one-tailed significance level (α) of 0.05 it can be concluded that members attach a significantly higher value to "saving on the environment", "making the energy provision more sustainable" and "talking with others about energy", as compared to non-members (p-values of 0.000, 0.004 and 0.018). These results indicate that for members, the benefits to the environment and the enjoyment of social contacts are more important than for non-members, within the practice MEUG. Using a α = 0.1, "being self-sufficient in my energy use" is also significantly more important to members than to non-members, which belongs to 'local autonomy'. These differences could refer to the role of DEH on the dimension of meanings as "saving on the environment" and "exchanging knowledge and experiences on energy use" have also been important motivations to participate in DEH (see Chapter 4).

The relative importance of meanings

The Wilcoxon signed-rank test (see Appendix VIII) was used to determine whether or not one meaning is more important than another meaning within the practice MEUG. The tests were conducted for members and non-members separately. The results can be found in Appendix VIII – C. They show that, for members, the differences between the meanings in level of importance are significant, except for two combinations: "making the energy provision more sustainable" versus "lowering my energy bill" (p-value 0.186) and "being self-sufficient in my energy use" versus "it is fun to monitor my energy use" (p-value 0.155). The values for these combinations of meanings do not significantly differ. For both members and non-members, "talking with others about energy" and "comparing my energy use to others" are significantly less important within the practice than all other meanings. In addition, for members, "comparing my energy use to others" is significantly less important than "talking to others about energy" (p-value = 0.047). It indicates that for members, MEUG is more important as a means to sharing knowledge than to compare data to others. The moderate level of importance of these two meanings also implies that MEUG serves as an input to ShI. More clarity on the relation between MEUG and ShI will be provided in Section 5.3 in which the results of the practice ShI are presented.

There are also differences between members and non-members in the relative importance of one meaning over the other. Particularly interesting is the relative importance of "lowering my energy bill" and "saving on the environment", for which the results for members are exactly opposite to those of non-members. From Table 5-3 it was already clear that the order of "saving on the environment" and "lowering my energy bill" was different for members and non-members. In addition to this, the results of Wilcoxon signed-rank test show that, for both groups the differences between these two meanings are significant: among non-members, "lowering my energy bill" is significantly more important than "saving on the environment", whereas for members "saving on the environment" is significantly more important than "lowering my energy bill". So, with respect to these two meanings, the order is different among members and non-members and for both groups this order is significant.

An overview of the meanings dimension within MEUG

An overview of the meanings dimension of MEUG for members and non-members is provided in Figure 5-15 and Figure 5-16 respectively. The colours represent the different symbolic resources distinguished (civic gratification, material benefits, local autonomy, social gratification) and the 'fun'-meaning. The higher the meaning in the graph, the more important the meaning is within the practice MEUG.

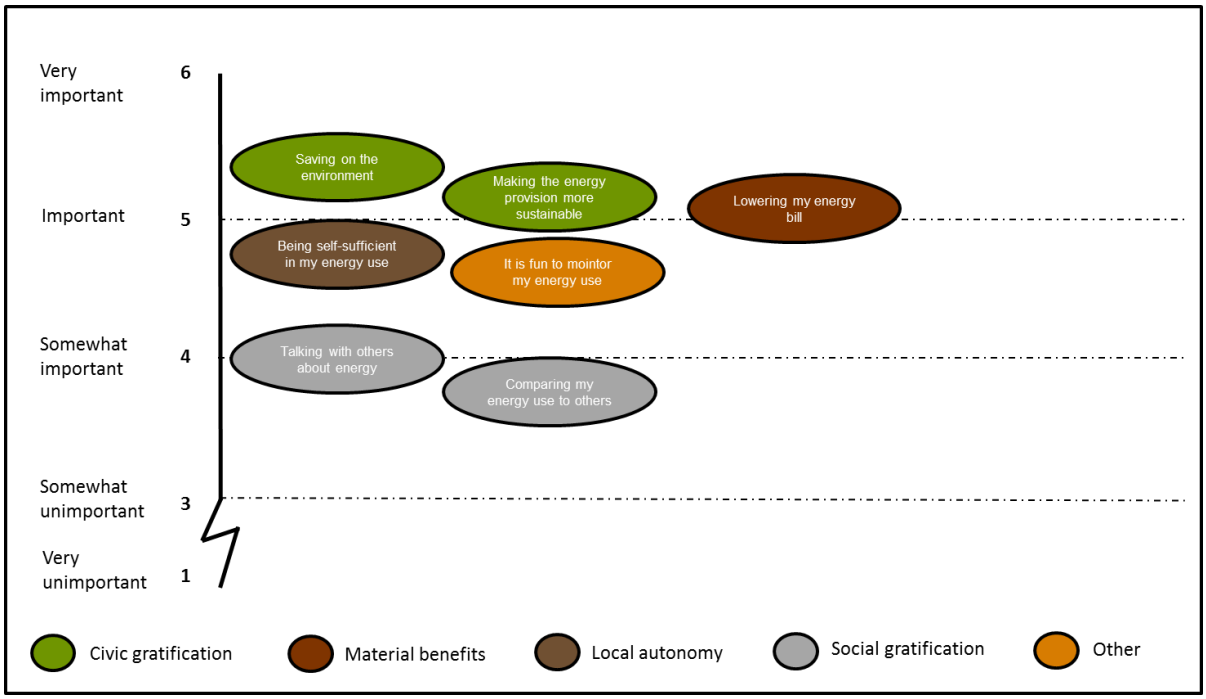

Figure 5-15 Order of importance of meanings within MEUG, members

From the figures it can be seen that, to both members and non-members, the meanings constituting 'social gratification' are of lowest importance within MEUG than all other meanings. In addition, it can be seen that the meanings constituting 'civic gratification' are more important than 'material benefits' in MEUG, while this is the other way around for non-members. Despite these differences between meanings as well as between members and

non-members, it should be noted that all meanings that have been analysed in this practice inhibit a certain degree of importance. It means that, just as in the motivations to participate in DEH and the practice Renewable Energy Generation (REG), it is a combination of meanings that shapes the meanings dimension of the practice.

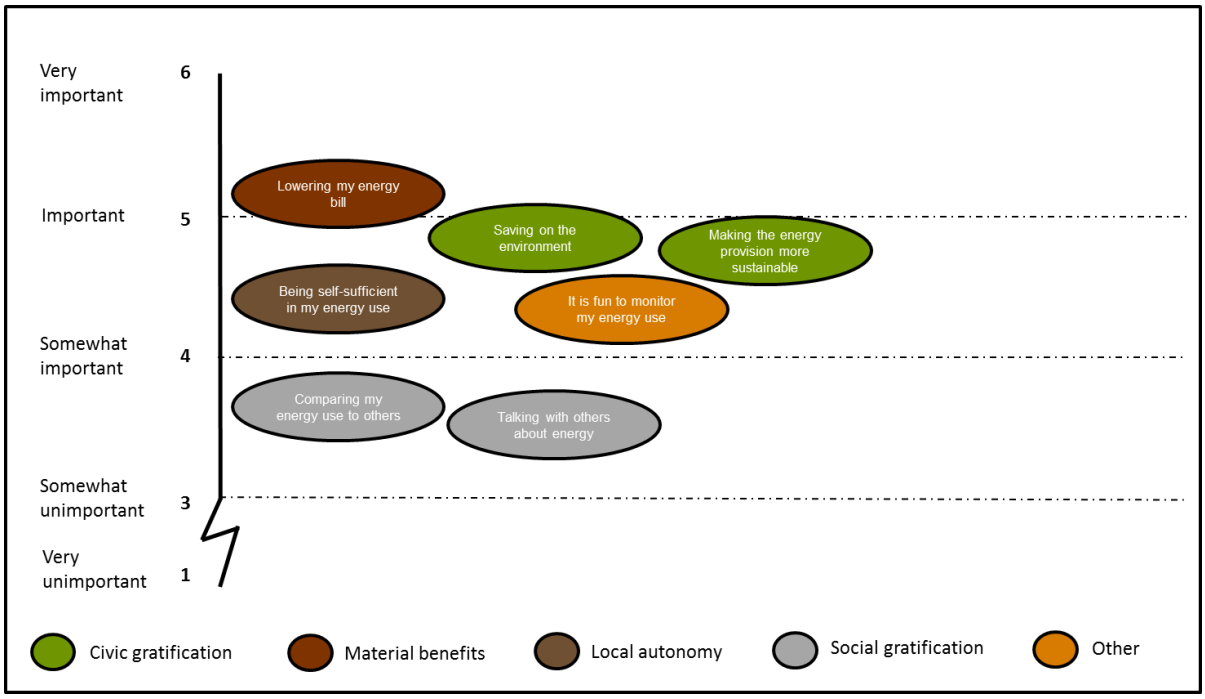

Figure 5-16 Order of importance of meanings within MEUG, non-members

5.2.3 Competences

Competences refer to the knowledge and skills that exist within the practice (see Chapter 2). The extent of monitoring energy use differs greatly among respondents to the survey. Some respondents do not to keep track of their energy use at all, while others note the numbers of the energy meters themselves and put it in a spreadsheet (IntM). Few keep an extensive spreadsheet in which the numbers of the energy meter, solar panels, heat pump as well as weather data are included (IntM). They want to see if "we indeed generated as much energy as we used" (survey).

In the survey competences relating to monitoring energy use are included directly in three statements: "I think my energy bill is unclear", "It is clear to me what the numbers on my energy meter mean" and "I have no idea about the height of my energy use". There are also two other statements that *could* refer to the competences of monitoring energy use. These are "I know what the big energy users in my house are" and "it is unclear to me how I can lower my energy bill". When it is clear to somebody how the energy bill could be lowered, it could mean that one found out about the energy use at home himself, through monitoring. However, it could also be that the person was informed by somebody else on how to lower energy use. In that case, lowering energy use is not a result of the monitoring competences of the person, but rather be an outcome of the practice Sharing Information. This is an

example of how the two practices can interact (Gram-Hanssen, 2010; Shove & Pantzar, 2005), in this case through the meaning "lowering the energy bill" that can be a result of both practices. Also, when it is unclear to somebody how he can lower his energy use, it is not stated what measures have already been taken so far. Have many measures already been taken and does he not know how to reduce his energy use further, or does he not know where to start? As it is not possible to draw any conclusions from these two statements regarding the practice MEUG, the analysis is focused on the other two statements.

The results from the survey are graphically represented in Figure 5-17 and Figure 5-18 below. They show the distribution of answers given on the three statements about the competences of MEUG. From these graphs it can be seen that, for both members and non-members, the larger share of respondents believes to have the competences for monitoring energy use: they understand the energy bill, they know about the height of the energy bill and the numbers on the energy meter are clear to them. From the figures it can also be seen that relatively more members than non-members agree with the three statements. The Mann Whitney Test (see Appendix) does however not yield significant differences between members and non-members on any of these statements using $\alpha = 0.05$. Using a $\alpha = 0.1$, there is only a significant difference between members and non-members on the statement "I think my energy bill is unclear" (p-value = 0.079), which implies that more members than non-members have difficulties with understanding the energy bill. It is however not clear from the data where this difference stems from. It could for example be that members, who have a common interest in energy (see Section 4.3), pay more attention to reading the energy bill. Without reading it thoroughly, one might not see the complexity of the energy bill and understand the rough picture. Once one starts to look at the details, however, the complexity might show and questions may arise. It could thus be that the differences in the results stem from having a more detailed look at the energy bill. Since the data however did not provide any additional information, it is not possible to draw conclusions from the results of these statements.

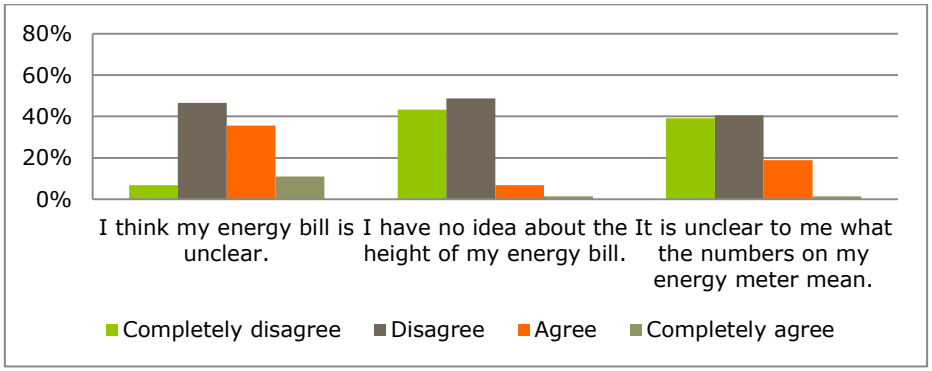

Figure 5-17 Competences in the practice MEUG, members (N=74)

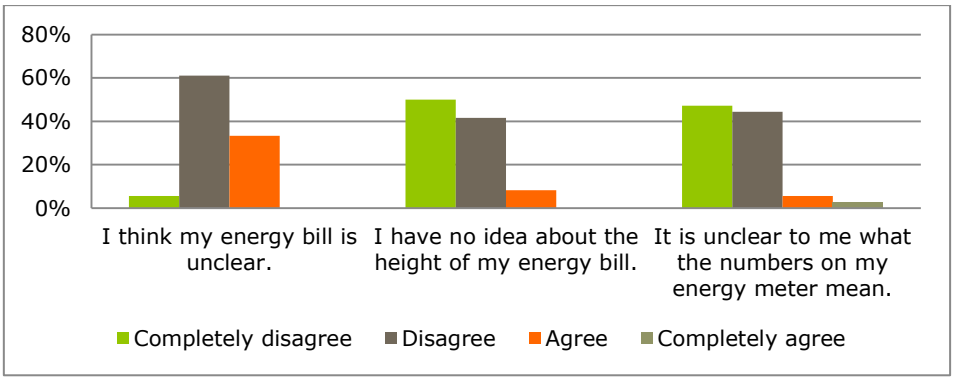

Figure 5-18 Competences in the practice MEUG, non-members (N=36)

The pilot project Samen Slim met Energie will provide an online platform where participants can have detailed insight in their energy use. Using the functions of a smart meter, people do not have to note their energy use themselves. Instead, data are digitally transferred to a data centre which translates this into graphical representations on an online platform. An advantage of this initiative is that it takes most participants no effort to get more insight in their energy use. By logging in on the platform, the overview of energy use is readily available and it is expected that the app will increase the frequency of monitoring (IntNM). Participants do not have to read their meter anymore or note these numbers down. In that respect, the platform will ease MEUG and change the competences from 'how to read the energy meter' to 'understanding the graphs'. The effect of this project, however, has to be determined in the future.

5.2.4 Epilogue Monitoring Energy Use and Generation

Respondents have shown to use the energy bill and energy meter to monitor their energy use, mostly on a yearly basis. People also use, or would like to use, devices by which energy use of specific appliances can be measured to get more insight in the causes of their electricity use. The meanings dimension has been shown to consist of a combination of meanings: all meanings that were taken into account in this research inhibited a degree of importance within MEUG. The meanings that refer to the benefits to the environment or direct personal benefits are most important for both members and non-members. The order of these two meanings however differs between members and non-members. Competences in MEUG are related to skills of tracking data on electricity use and generation as well as the knowledge needed to understand the energy bill and energy meter. For members the energy bill has shown to be more unclear, but an explanation for this cannot be give based on the available data.

The role of DEH in MEUG has been relatively small so far. It has had an indirect impact on the materials dimension of MEUG through the facilitation of the procurement of solar panels which has been shown to increase the extent of monitoring. The effect of participation in the project SSmE and thereby receiving an online monitoring platform has to be determined in future research within this project. On the competences dimension the differences between

members and non-members are not significant and the role of DEH remains unknown. Taking the differences between members and non-members into account, the role of DEH on the practice MEUG has mainly been on the meanings dimension. To members, the benefits to the environment as a result of MEUG were most important, while for non-members the main aim of MEUG is to lower the energy bill. In addition, to members "talking with others about energy" has been significantly more important as compared to non-members. These differences could be explained by the motivations to participate in DEH which involve "saving on the environment" and "exchanging knowledge and experiences with others".

5.3 Sharing Information

This section gives an overview of the practice Sharing Information (ShI). Subsections 5.3.1, 5.3.2 and 5.3.3 respectively describe the three dimensions of a practice: materials, meanings and competences. The results are based on the data gathered by the survey and interviews. Within each dimension, a comparison is made between members and non-members of DEH and the activities of DEH that contribute to the practice are discussed. Wherever possible, reference is made to how these dimensions interact. Subsection 5.3.4 analyses the perspectives of members and non-members on different forms of sharing information. The results are summarized in the epilogue to this section.

5.3.1 Materials

Materials are the material objects used in the practice. In this practice, the people with whom information is shared are included in this dimension. Figure 5-19 and Figure 5-20 respectively give an overview of whom respondents share data of their energy use with and whom respondents share knowledge and experience regarding (their) energy use with.

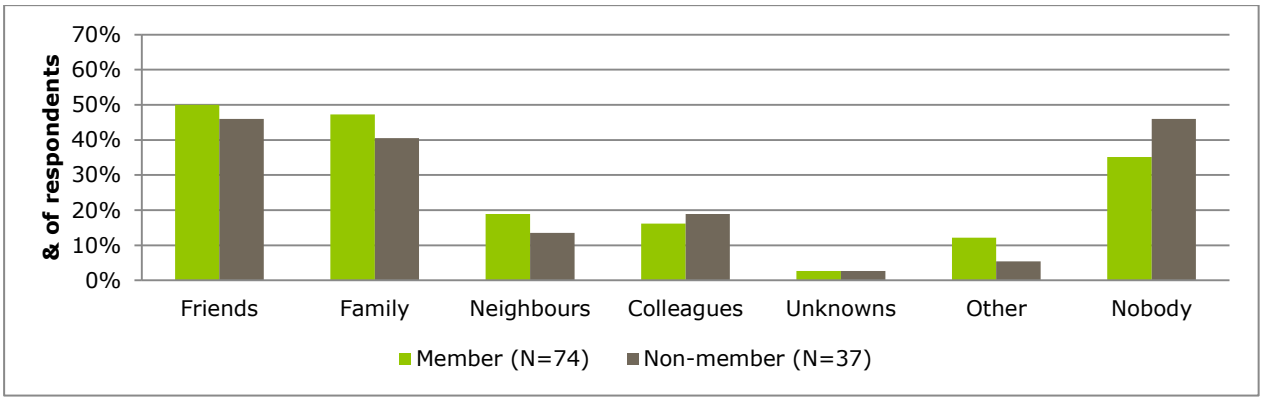

Figure 5-19 Sharing data of energy use with

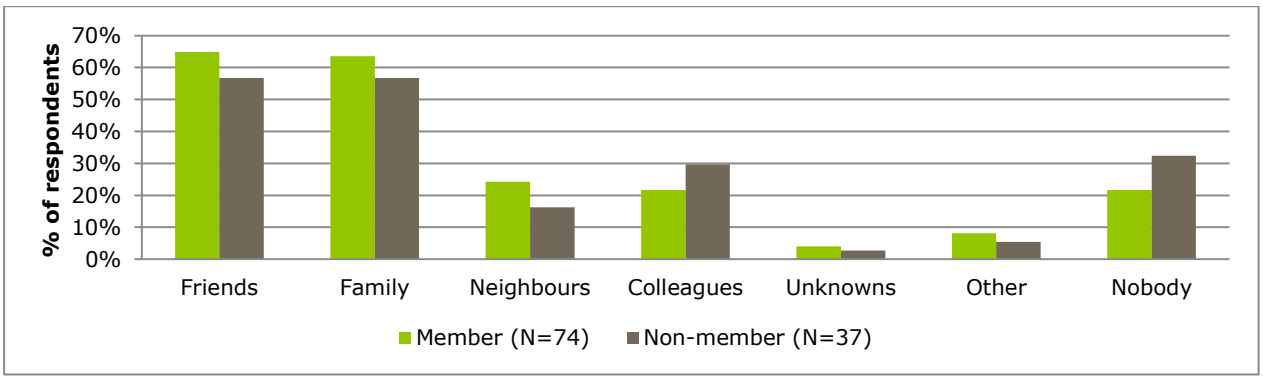

Figure 5-20 Sharing knowledge and experience on energy use with

These two figures show that respondents are more likely to share knowledge and experience with others than data about energy use. Another finding is that most information is shared among friends and family. For both types of information sharing a higher share of the members of DEH shares information with friends, family, neighbours, unknowns and others,

while a higher share of non-members shares information with colleagues. "Exchanging knowledge and experiences" has been shown to be a motivation to participate in DEH and an interest in energy is part of the collective identity of DEH (see Section 4.3). This can explain the higher percentages of sharing information among members compared to non-members. In the category 'Others', members of DEH, eco-team and data from literature are mentioned.

In many cases energy is the subject of conversation 'by coincidence' at social gatherings at home, at work or at evenings organised by DEH. One of the goals of DEH is to stimulate the exchange of knowledge and experiences between members (IntBM). It contributes to that by organising information evenings on different topics, for example on the collective procurement of solar panels, Led lighting, the project SSmE and isolation measures (DEH, 2014). On these evenings DEH provides its members with knowledge about these topics and members are welcome to share their experiences and ideas. In addition, the weather situation, (the moment of receiving) the energy bill, knowledge about energy use and solar panels have all been mentioned as inducing the sharing of information (survey). Interviewees referred to knowledge about energy use as a vital element in ShI.

The previous section has shown that "talking with others about energy" is an 'important' meaning within the practice Monitoring Energy Use and Generation (MEUG). Combining these insights, it can be concluded that the outcome of MEUG (i.e. the knowledge about energy use and generation) is a 'material' in ShI. In addition, solar panels and/or the energy bill have been shown to belong to the practice Renewable Energy Generation (REG) and Monitoring Energy Use and Generation (MEUG). These examples show how ShI is related to the practices REG and MEUG. This corresponds to literature on practices in which practices have shown to be interrelated (Gram-Hanssen, 2010; Shove & Pantzar, 2005).

5.3.2 Meanings

Meanings give symbolic value to the practice. The meanings distinguished in the practice ShI cover the symbolic resources 'material benefits', 'civic gratification', 'social gratification' and 'local autonomy'. For each of these one or more meanings were conceptualised that correspond to the description of the resources in Chapter 2. Community identity was not incorporated in this practice due to difficulties in conceptualising one or more relevant meanings within ShI that would belong to this symbolic resource. Table 5-4 gives an overview of the meanings that were included in the survey, distributed over the different categories. Corresponding to the other practices in this research, a last 'fun-meaning' was included: "It is fun to talk with others about energy related subjects".

For each of the meanings in Table 5-4 respondents could indicate the importance of that meaning within the practice. A six-point Likert scale was used, in which value of 1 corresponds to very unimportant, whereas a value of 6 corresponds to very important. In the analysis of the meanings dimension, only the respondents that indicated to share either 'data on energy use' or 'energy knowledge and information' are included. Therefore, the results for

members are based on 49 respondents (N_M = 49) and for non-members on 19 respondents (N_{NM} = 19).

Table 5-4 Meanings within Sharing Information

Symbolic resources			
Civic gratification	**Social gratification**	**Local autonomy**	**Material benefits**
• Saving on the environment • Making the energy provision more sustainable • Making others aware of their energy use • Helping others to lower their energy bill	• Working together with others	• Countervailing large scale energy suppliers • Getting more insight in my energy use	• Lowering my energy bill • Getting more insight in my energy use

In Table 5-4, "getting more insight in my energy use" is included both under 'local autonomy' and 'material benefits'. More insight could contribute to lower energy costs, but also improve the self-sufficiency of energy use by for example relating energy generation to energy use. A reliability test (see Appendix VI) was conducted to determine the correlation between the meanings within civic gratification. It indicates whether or not these meanings can be regarded as measuring the same symbolic resource. The test generated a value of 0.918 for non-members and 0.878 for members (see Appendix VI – C). This indicates that the number falls outside the reliability range of 0.55 – 0.85 at the higher end, and thus that the correlation between the meanings is very high. It means that, those respondents who assign a higher value of importance to one of these meanings (e.g. "saving on the environment") as compared to other respondents, also assign a higher value of importance to another meaning within this category (e.g. "helping others to lower their energy bill").

In Figure 5-21and Figure 5-22 the distribution of the answers given by respondents to the survey are graphically presented for members and non-members. The meanings are presented in order of importance based on the average value assigned by the members of DEH. From these figures it can be seen that among non-members there is no respondent that perceives any of the meanings as 'very unimportant' within ShI. Within the group of members, only two of the 49 members are responsible for all answers within the category 'very unimportant'. This finding, in addition to the large spread of meanings over the different categories of importance, shows that there are strong differences among respondents on the perceived importance of the listed meanings within the practice ShI.

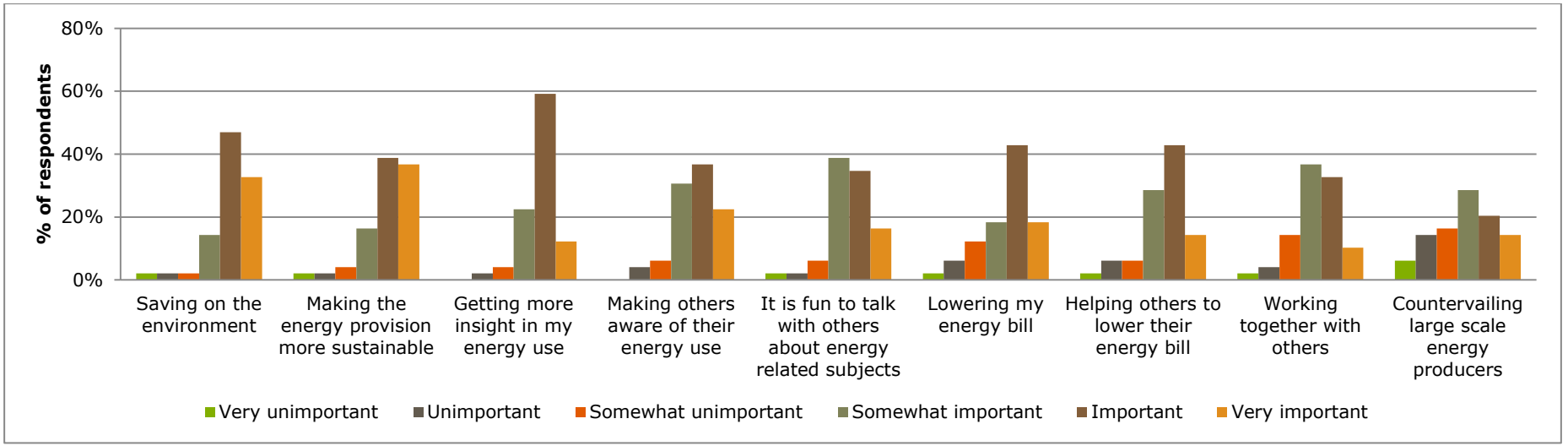

Figure 5-21 Distribution of meanings within ShI over levels of importance, members(N=49)

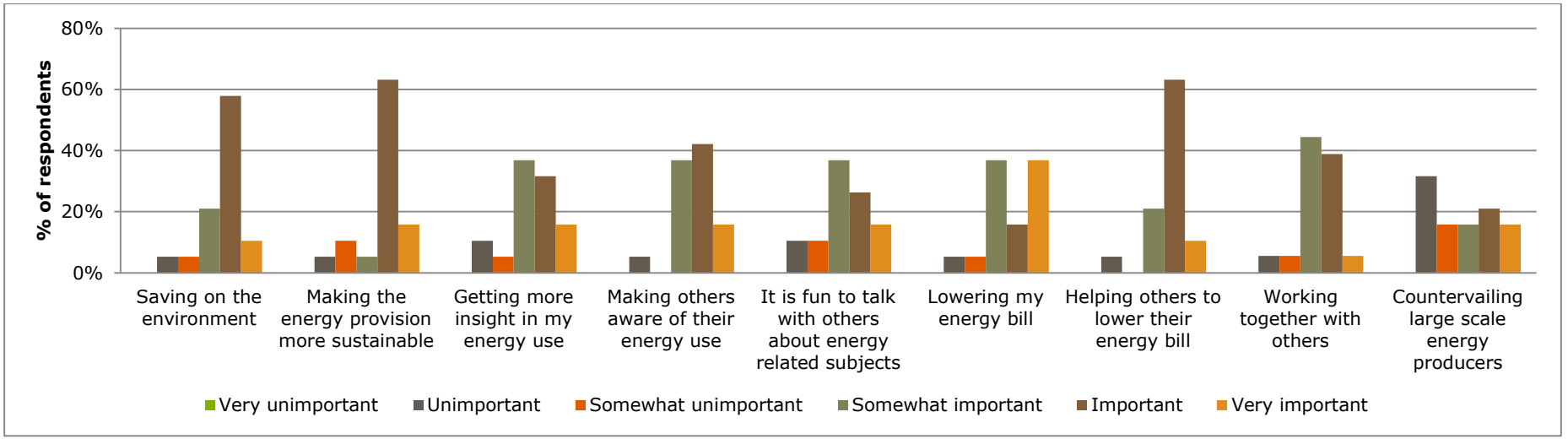

Figure 5-22 Distribution of meanings within ShI over levels of importance, non-members (N=19)

The order of importance

Table 5-5 shows the median and average values of importance of each meaning within the practice as well as the standard deviation. The higher the average value, the more important the meaning is within the practice. The meanings are listed in order of importance based on the average values assigned to the meanings by members of DEH. From this table it can be seen that to both members and non-members all meanings incorporate a certain degree of importance within the practice (median values of 4-5). In addition, the table shows that the order of meanings differs between members and non-members. "Getting more insight in my energy use" is, for example, ranked much lower among non-members than among members. "Lowering my energy bill" and "helping others to lower their energy bill", in contrast, are perceived as two of the most important meanings within ShI by non-members, while they are valued less important relative to other meanings by members.

Table 5-5 Level of importance of meanings within ShI

Meaning	Member DEH			Non-member DEH			Mann-Whitney test	
	Median	Ave-rage	Stan-dard dev.	Median	Ave-rage	Stan-dard dev.	U	Exact sig (1-tailed)
Saving on the environment (N_M = 49 N_{NM} = 19)	5.00	5.00	1.041	5.00	4.63	.955	348.50	.044
Making the energy provision more sustainable (N_M = 49 N_{NM} = 19)	5.00	4.98	1.108	5.00	4.74	1.046	393.50	.146
Getting more insight in my energy use (N_M = 49 N_{NM} = 19)	5.00	4.76	.804	4.00	4.37	1.165	371.50	.083
Making others aware of their energy use (N_M = 49 N_{NM} = 19)	5.00	4.67	1.029	5.00	4.63	.955	451.00	.423
It is fun to talk with others about energy related subjects (N_M = 49 N_{NM} = 19)	5.00	4.51	1.043	4.00	4.26	1.195	409.00	.213
Lowering my energy bill (N_M = 49 N_{NM} = 19)	5.00	4.49	1.227	5.00	4.74	1.195	420.00	.269
Helping others to lower their energy bill (N_M = 49 N_{NM} = 19)	5.00	4.47	1.138	5.00	4.74	.872	403.50	.185
Working together with others (N_M = 49 N_{NM} = 18)	4.00	4.24	1.090	4.00	4.33	.907	423.00	.397
Countervailing large scale energy producers (N_M = 49 N_{NM} = 19)	4.00	3.86	1.443	4.00	3.74	1.522	440.50	.365

Members versus non-members

Table 5-5 shows that the values assigned to each of the meanings differs between members and non-members. The Mann-Whitney test (see Appendix VII) was used to determine the significance of the differences between members and non-members with respect to the importance assigned to the meanings within the practice. The last column in Table 5-5 presents the results of these tests. Using a one-tailed significance level (α) of 0.05, it can be concluded that "saving on the environment" is significantly more important within the practice according to members as compared to non-members (p-value = 0.044). Using α = 0.1, also the meaning "getting more insight in my energy use" (p-value = 0.083) is more important according to members. With respect to the other meanings, the differences are not significant. These differences could refer to the role of DEH on the dimension of meanings, as "saving on the environment" has also been one of the most important motivations to participate in DEH (see Section 4.3).

The relative importance of meanings

The Wilcoxon signed-rank test (see Appendix VIII) was used to determine whether or not one meaning is more important than another meaning within the practice ShI. The tests were conducted for members and non-members separately. The results can be found in Appendix VIII – D.

The tests show that, for members, the two meanings "saving on the environment" and "making the energy system more sustainable" are significantly more important than the other meanings within ShI. On the other end of the scale, "countervailing large scale energy producers" is significantly less important than all other meanings. Also, "working together with others" is significantly less important than most of the meanings, except for "lowering my energy bill" (p-value = 0.141). Among the four meanings in the middle, the differences in levels of importance within ShI are relatively small. Each of these four remaining meanings does not differ significantly from two of the three other meanings. For non-members there are only few significant differences. Using a α = 0.05 "Countervailing large scale energy producers" is significantly less important than all other meanings. In addition, "working together with others" and "it is fun to talk with others about energy related subjects" are both significantly less important than "helping others to lower their energy bill".

An overview of the meanings dimension within ShI

An overview of the meanings dimension of ShI for members and non-members is provided in Figure 5-23 and Figure 5-24. The colours represent the different symbolic resources distinguished (i.e. 'material benefits', 'civic gratification', 'social gratification', 'local autonomy') and the 'fun-meaning'. The higher the meaning in the graph, the more important the meaning is within the practice ShI.

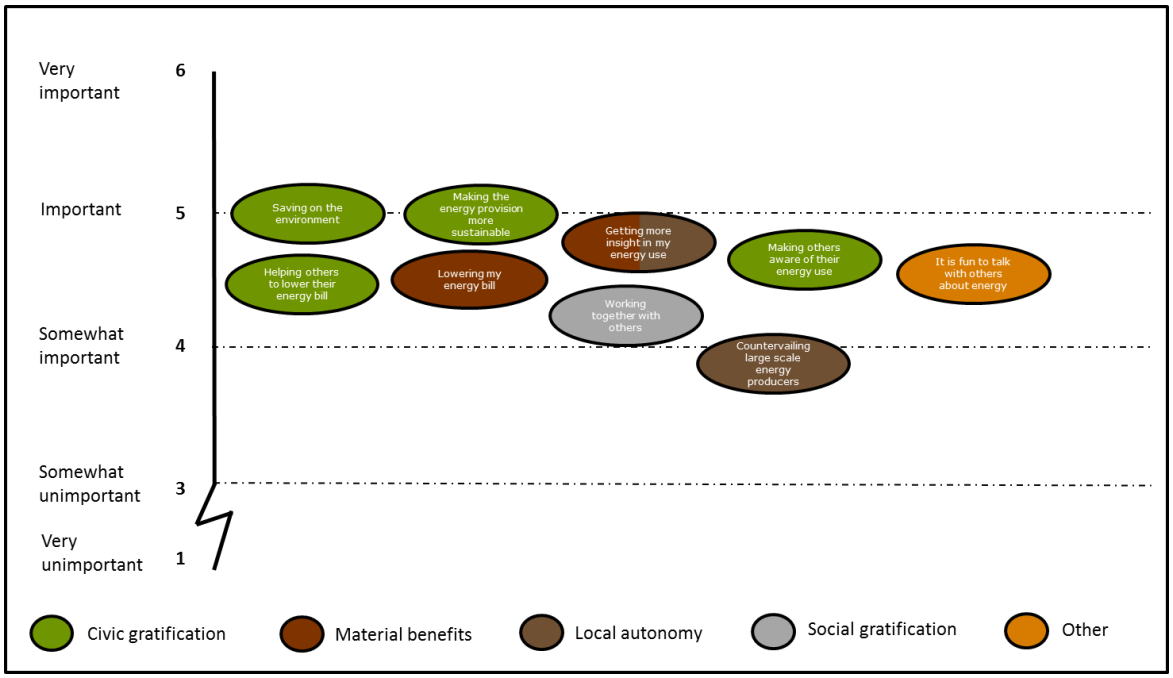

Figure 5-23 Order of importance of meanings within MEUG, members

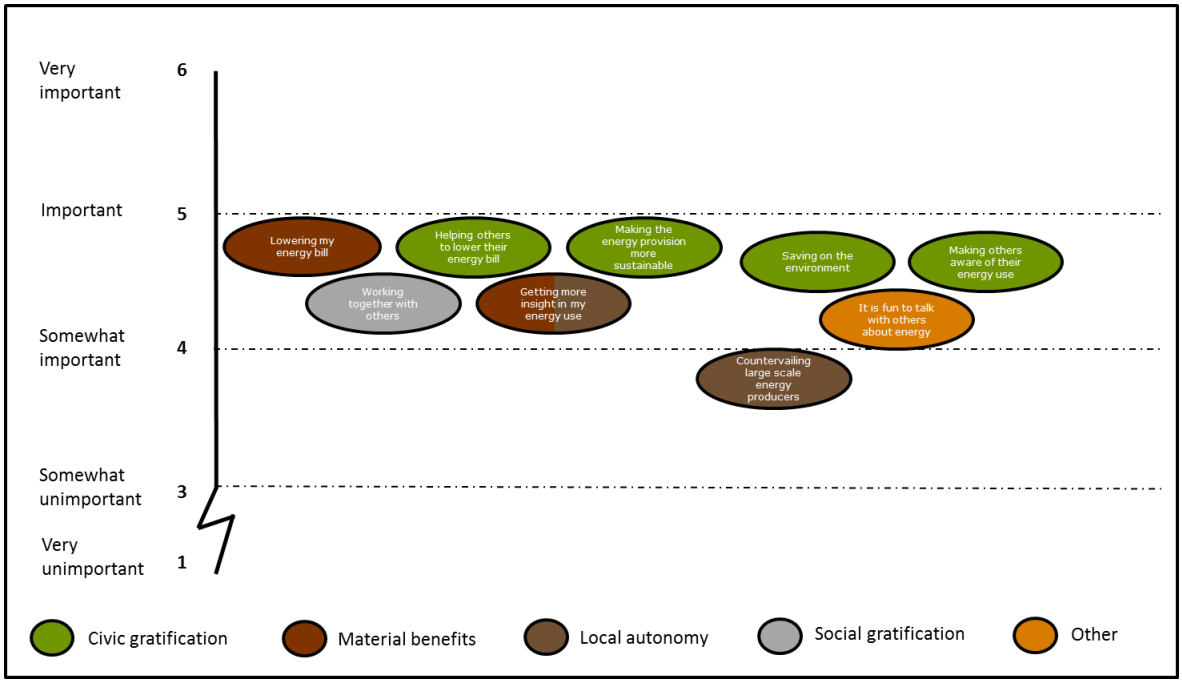

Figure 5-24 Order of importance of meanings within MEUG, non- members

Figure 5-23 shows that the meanings "saving on the environment" and "making the energy provision more sustainable" are at the higher end of the graph. They are significantly more important than the other meanings. "Countervailing large scale energy producers" is at the lower end and significantly less important than the other meanings. The remaining six meanings in the middle do not significantly differ from each other. Compared to Figure 5-23, the meanings in Figure 5-24 are closer together, which shows that among non-members there were fewer significant differences as compared to members. Only "countervailing large

scale energy producers" is significantly less important than all other meanings and on the lower end of the graph. For both groups it should be noted that all meanings that have been analysed in this practice inhibit a certain degree of importance. It means that, corresponding to the previous to practices that have been analysed, it is a combination of meanings that shapes the meanings dimension of the practice.

5.3.3 Competences

Competences refer to the knowledge and skills that exist within the practice. Competences, as described in Chapter 2, would comprise the knowledge about 'how to' share information and the skills to communicate. The competences belonging to Sharing Information could consist of multiple 'dispersed practices' as communicating, explaining and describing (Schatzki, 1996; Warde, 2005). These were however not included in the survey and not investigated in this research.

5.3.4 Sharing Information in a Collective

In the survey respondents were asked about different collective forms in which information can be shared among participants ranging from "with friends at home" to "at an open internet platform". A distinction was made between "sharing knowledge and/or experiences" and "sharing numbers of energy use". Respondents could express their answers on a three-point Likert scale including 'No', 'Maybe' and 'Yes'. Figure 5-25 and Figure 5-26 present the results for members and non-members regarding the cooperative forms of sharing knowledge and/or experiences.

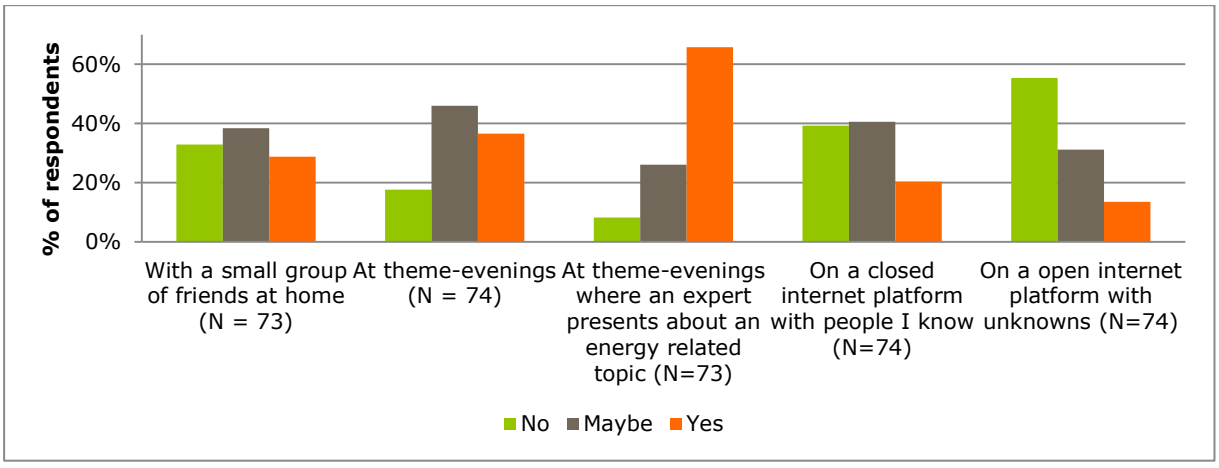

Figure 5-25 Willingness to participate in collective forms of sharing knowledge and experiences, members

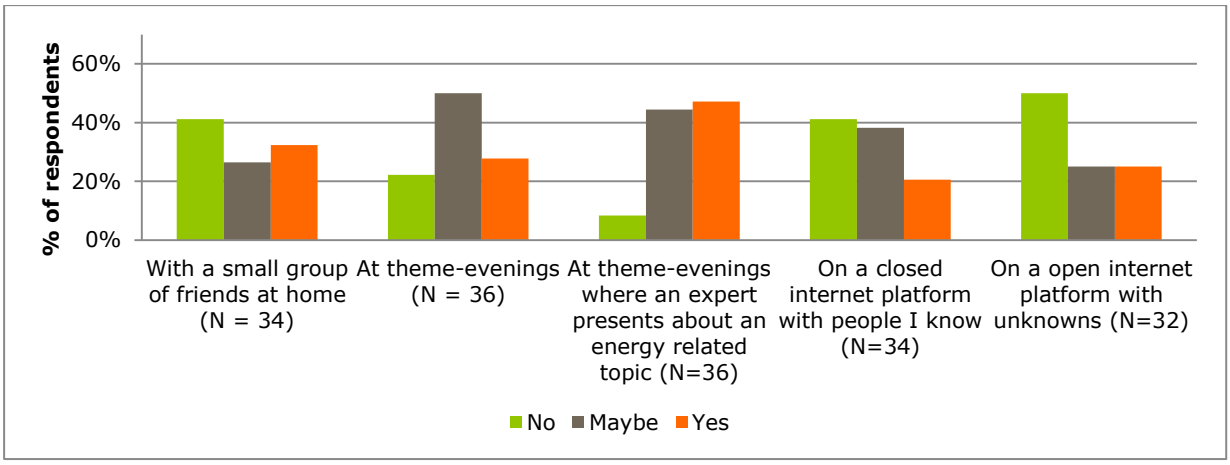

Figure 5-26 Willingness to participate in collective forms of sharing knowledge and experiences, non-members

From the above two figures it can be seen that for both groups a theme-evening with an expert is more attractive than a theme-evening without an expert. They also show an 18.5 percentage-point difference in the shares of members versus non-members that are willing to participate in a theme evening with an expert. Among non-members there is however a larger share that indicates to be 'maybe' willing to participate. From the results it can therefore not be concluded that members are more willing to participate in a theme evening with experts.

5.3.5 Epilogue Sharing Information

Sharing Information (ShI) mostly exists when the carrier of the practice is around friends and/or family in an informal situation. Topics of discussion relate to solar panels, the weather situation and receiving the energy bill. In addition, knowledge about energy use is an input to the practice. Through this knowledge, solar panels and the energy bill, ShI is related to the practices Renewable Energy Generation (REG) and Monitoring Energy Use and Generation (MEUG). All meanings that have been investigated in this research have shown to inhibit a certain degree of importance. The benefits to the environment have shown to be most important and "countervailing large scale energy producers" has shown to be least important. The dimension of competences would encompass skills to communicate, explain and describe. These types of competences were however not included in this research.

DEH aims to stimulate the exchange of experiences and ideas among members. It provides a platform, where those who are interested in energy-related topics can meet. Through information evenings and the facilitation of solar panels it has played a role on the materials dimension within ShI. The analysis of the meanings has shown that there were no significant differences between members and non-members of DEH except for the meaning "saving on the environment", which has shown to be more important to members as compared to non-members. It could be accounted for by the role of DEH, since this meanings has shown to be the main motivator to participate in DEH.

5.4 Timing of Energy Practices

This section gives an overview of the practice Timing of Energy Practices (TEP). Subsections 5.4.1, 5.4.2 and 5.4.3 respectively describe the three dimensions of a practice: materials, meanings and competences. The results are based on the data gathered by the survey and interviews. Within each dimension, a comparison is made between members and non-members of DEH and the activities of DEH that contributed to the practice are discussed. In addition suggestions will be made about how DEH could shape the dimensions in the future based on the role of DEH on the practices discussed in the previous sections, the available resources and the ability of DEH to mobilise these resources. Wherever possible, reference is made to how the three dimensions interact. The results are summarized in the epilogue to this section.

5.4.1 Materials

Within Timing of Energy Practices (TEP) the materials dimension encompasses the physical objects used and situations in which energy practices are timed. In the survey two statements were incorporated that refer to the materials used within TEP: "I adjust my energy use to the day/night tariff" and "I adjust my energy use to my own renewable energy generation". The day/night tariff is a two-rate tariff in which the energy price off-peak hours is lower than during peak hours. As off peak hours are roughly during the night and peak hours during the day it is generally known as the 'day/night-tariff'. Respondents could indicate the extent to which they (dis)agree with the two statements. The results are presented in Figure 5-27 for members and Figure 5-28 for non-members. For the first statement, all members (N_M = 74) and non-members (N_{NM} = 37) that responded to the survey are included. The results for the second statement are only based on those respondents that generate energy at home with solar panels (N_M = 60; N_{NM} = 17).

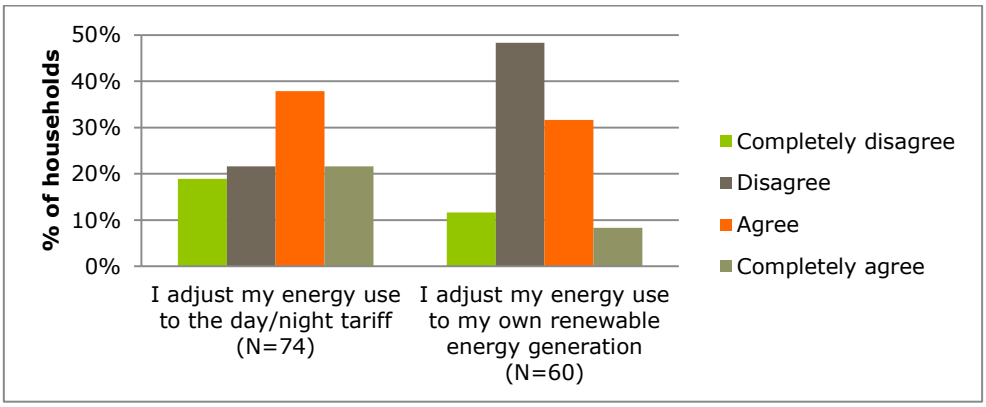

Figure 5-27 Use of the day/night tariff and renewable energy generation within TEP, members

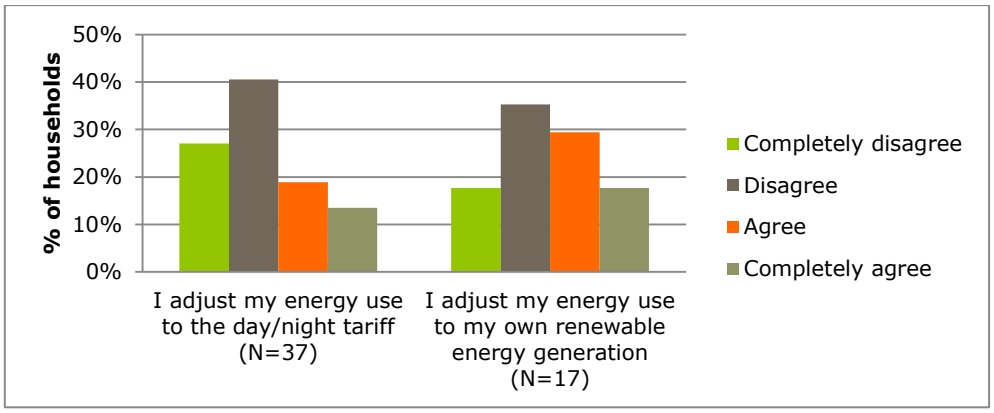

Figure 5-28 Use of the day/night tariff and renewable energy generation within TEP, non-members

Interviewees, both members and non-members, indicated to actively use the day/night tariff in timing their energy use (IntNM, IntNM, IntM, IntM, IntM). This corresponds to Figure 5-27 and Figure 5-28 from which it can be seen that 59.5% of the members and 32.4% of the non-members adjusts the energy use to day/night tariff. The day/night tariff is however not available to every household. In Figure 5-27 and Figure 5-28 both those who do have and those who do not have a day/night tariff are incorporated. Only for those who do have a day/night tariff it would be possible to adjust energy use to this, for those that do not have access to a day/night tariff, it is not be possible. Therefore, the only conclusion that can be drawn from those figures is that the day/night tariff is at least used by some respondents. Regarding the second statement, among those respondents that do have solar panels, 47.1% of members and 40.0% of non-members indicated to adjust the energy use to their own generated renewable energy. Through organising the collective procurement of solar panels, DEH has contributed to the dimension of materials in TEP. DEH does not have the resources to set tariffs for electricity use.

"You have a daily pattern which demands a certain amount of electricity" (IntNM). A shift in the timing of these practices should fit to this daily pattern (IntNM). This is referred to as 'easiness' which is a constraining factor in shifting the timing of energy practices. Related to this is the trade-off that is made between the costs and benefits of changing the timing of energy practices. It is a trade-off between the effort it takes to shift electricity use and the decrease in electricity costs as a result of this effort (IntM, IntNM). In this, the level of comfort also plays a role, which should not be decreased (IntM, IntNM). The discomfort as a result of lowering the temperature is for example a constraining factor. Although it is not a time shift of energy practices, lowering the temperature could lower the total demand for electricity, also during peak hours, and thereby reduce the load on the net.

The results show that timing of energy practices is based on tariff differences and the generation of renewable energy. People are willing to adjust the timing of energy practices if it fits to the daily pattern, does not demand too much effort and does not decrease the level of comfort.

5.4.2 Meanings

Meanings give symbolic value to the practice. The meanings distinguished in the practice TEP cover the symbolic resources 'material benefits', 'civic gratification' and 'local autonomy'. For each of these resources one or more meanings were conceptualised that correspond to the description of the resources in Chapter 2. 'Community identity' and 'social gratification' were not incorporated in the survey due to difficulties in conceptualising one or more relevant meanings within TEP that would belong to these symbolic resources. In the survey 'material benefits' was included as "lowering my energy bill" and "using energy when it is cheapest", 'civic gratification' as "saving on the environment" and "making the energy provision more sustainable" and 'local autonomy' as "being self-sufficient in my energy use". Research has shown that interest in advanced and new technologies is a main motivator in timing energy use (Kobus et al., 2013). To account for this, a last meaning, "it is fun to consciously deal with my energy use", was included.

For each of the meanings included in the survey, respondents could indicate the importance of that meaning within the practice. A six-point Likert scale was used, in which a value of 1 corresponds to very unimportant, whereas a value of 6 corresponds to very important. In the following analysis only the respondents that indicated to adjust the timing of their energy use based on the day/night tariff and/or their own renewable energy generation are included. Therefore, the results for members are based on 53 respondents (N_M = 53) and for non-members on 17 respondents (N_{NM} = 17).

Based on the interviews, the meaning "using energy when it is generated" could belong to both 'material benefits' and 'civic gratification'. Some interviewees indicated to use energy when it is generated, because it is believed to be cheaper (IntM, IntNM, IntNM). From this perspective, the meaning would belong to 'material benefits'. Others indicated to be willing to balance supply and demand of energy to contribute to solving the balancing problems in the net (IntM). In that case, the meaning would belong to 'civic gratification'. Reliability tests (see Appendix VI) were conducted to determine the correlation between the meanings within the symbolic resources, and thereby to which of the two symbolic resources "using energy when it is generated" belongs. These tests generate values for Cronbach's alpha which is a measure of reliability. The tables with the results of these reliability tests can be found in Appendix VI – D. Based on these results, "using energy when it is generated" should be eliminated from the resource 'material benefits'. This contrasts with the results from the interviews, in which interviewees mostly stressed the 'material benefits' as a result of timing energy practices to match with their own energy generation (IntM, IntM). Using both the results from the survey and the interviews it should therefore be concluded that the meaning is related to both 'civic gratification' and 'material benefits'.

In Figure 5-29 and Figure 5-30 the distribution of the answers given in the survey are graphically presented for members and non-members respectively. The meanings are

presented in order of importance based on the average values assigned by the members of DEH. Figure 5-29 shows that to all members "lowering my energy bill" inhibits a degree of important within the practice TEP. For the other meanings there is an increasing number of respondents that value these meanings in the range of 'unimportance'. From Figure 5-30 it can be seen that on six of the meanings there is a gap on the side of 'unimportance' among non-members. Some respondents indicated it to be 'very unimportant' while no respondents perceive it as 'unimportant' and/or 'somewhat unimportant' within the practice TEP. Two of the non-members are responsible to nearly all answers in the category 'very unimportant'. They were not removed from the further analysis, since they attached a higher value of importance to at least one of the other meanings. The figure also shows that non-members are quite equally spread in the level of importance they assign to "being self-sufficient in my energy use", as a meaning within the practice. Members are less equally spread and a larger share of respondents in this group values this meaning in the range of 'importance'.

The level of importance

Table 5-6 shows the median and average values attached to each meaning within the practice as well as the standard deviation. The higher the mean value, the more important the meaning is within the practice. The meanings are listed in order of importance based on the average values attached to the meanings by members of DEH. From this table it can be seen that to both members and non-members all meanings incorporate a certain degree of importance within the practice TEP (median values of 4-5). "Lowering my energy bill" is the most important meaning and contrasts with the findings in the other practices in which the benefits to the environment were more important than the direct personal benefits. Table 5-6 also shows that there are differences between members and non-members with respect to the order of importance of the meanings. "Using energy when it is cheapest" is, for example, most important for non-members, while being only in fourth place for members. And "saving on the environment" is in second place for members, while being in fourth place for non-members. For both members and non-members however, the top four meanings are equal and all belong to the resources 'material benefits' and 'civic gratification'. Turning on appliances during the night and washing during the weekends, "because the price is lower" (IntM) are examples of how TEP has the image of "lowering my energy bill". Although being lower in rank, the meanings "it is fun to consciously deal with my energy use", "being self-sufficient in my energy use" and "using energy when it is generated" are also meanings within the practice. Only relatively small percentages of the total group regard these as unimportant (see Figure 5-29 and Figure 5-30).

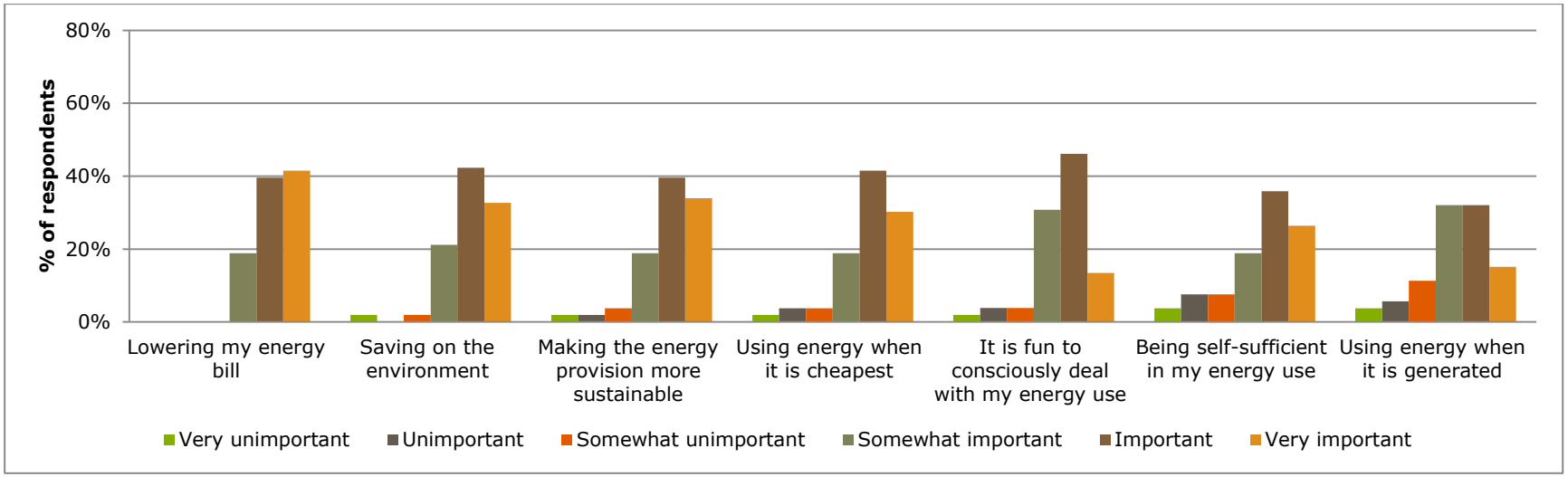

Figure 5-29 Distribution of meanings within TEP over levels of importance, members (N=53)

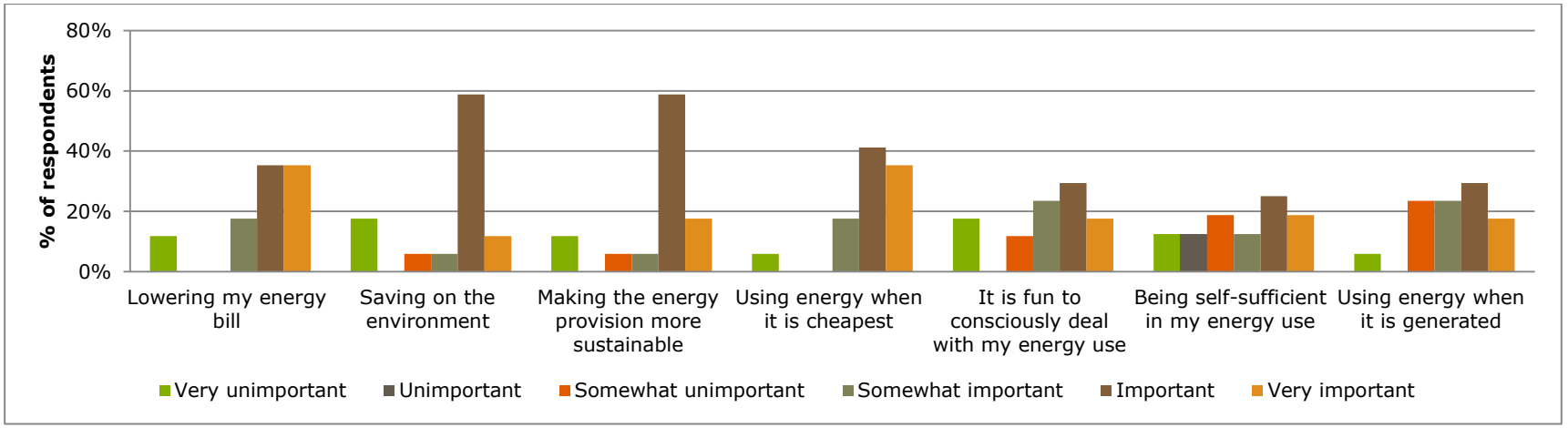

Figure 5-30 Distribution of meanings within TEP over levels of importance, non-members (N=17)

Table 5-6 Level of importance of meanings within TEP

Meaning	Member DEH			Non-member DEH			Mann-Whitney test	
	Median	Ave-rage	Stan-dard dev.	Median	Ave-rage	Stan-dard dev.	U	Exact sig (1-tailed)
Lowering my energy bill (N_M = 53 N_{NM} = 17)	5.00	5.23	0.75	5.00	4.71	1.57	390.00	.199
Saving on the environment (N_M = 52 N_{NM} = 17)	5.00	4.98	1.02	5.00	4.24	1.68	338.00	.062
Making the energy provision more sustainable (N_M = 53 N_{NM} = 17)	5.00	4.94	1.08	5.00	4.53	1.50	390.00	.193
Using energy when it is cheapest (N_M = 53 N_{NM} = 17)	5.00	4.85	1.13	5.00	4.94	1.25	418.50	.327
It is fun to consciously deal with my energy use (N_M = 52 N_{NM} = 17)	5.00	4.56	1.04	4.00	4.00	1.70	372.00	.154
Being self-sufficient in my energy use (N_M = 53 N_{NM} = 16)	5.00	4.55	1.37	4.00	3.81	1.72	320.00	.065
Using energy when it is generated (N_M = 53 N_{NM} = 17)	4.00	4.28	1.25	4.00	4.24	1.35	440.50	.446

Members versus non-members

When comparing the values the meanings between members and non-members, it can be seen that members assign a higher level of importance to all meanings except "using energy when it is cheapest". The Mann-Whitney test (see Appendix VII) was used to determine the significance of the differences between members and non-members in the importance assigned to the meanings within the practice. The last column in Table 5-6 represents the results of these tests. Using a significance level of 0.05 ($\alpha = 0.05$), there are no significant differences between the two groups. Using $\alpha = 0.1$, it can be concluded that members perceive "saving on the environment" and "being self-sufficient in my energy use" as significantly more important than non-members (p-values 0.062 and 0.065). This means that the self-sufficiency as a result of TEP, is more important to members as compared to non-members, but only for $\alpha = 0.1$. These differences between the two groups could refer to the role of DEH on the dimension of meanings, as "saving on the environment" and "being self-sufficient in my energy use" have also been important motivations to participate in DEH (see Section 4.3).

The relative importance of meanings

The Wilcoxon signed-rank test (see Appendix VIII) was used to determine whether or not one meaning is more important than another meaning within the practice TEP. The tests were conducted for members and non-members separately. The results can be found in Appendix VIII – E.

The tests show that for members, all meanings are not significantly different in level of importance as compared to at least one meaning that is higher and one meaning that is lower in rank. For example "using energy when it is cheapest" is significantly of lower importance than "lowering my energy bill" (p-value 0.006) and of significantly higher importance than "using energy when it is generated" (p-value 0.006). It does however not significantly differ from the other four meanings (p-values 0.235, 0.303, 0.112 and 0.137). There are thus no sharp distinctions in level of importance within the order of meanings from Table 5-6. "Using energy when it is generated" is, with $\alpha = 0.1$, significantly of lowest importance.

For non-members there are less significant differences in level of importance between the meanings. "Using energy when it is cheapest" significantly more important within TEP than "using energy when it is generated" (p-value 0.037), "it is fun to consciously deal with my energy use" (p-value 0.040) and "being self-sufficient in my energy use" (p-value 0.004). In addition "being self-sufficient in my energy use" is significantly of lower importance to "making the energy provision more sustainable" (p-value 0.031) and "lowering my energy bill" (p-value 0.010). Within any other combination of meanings there is no significant difference in level of importance using $\alpha = 0.05$. This means that to non-members, the meanings are more equally important within the practice as compared to members.

An overview of the meanings dimension within TEP

An overview of the meanings dimension of REG for members and non-members is provided in Figure 5-31 and Figure 5-32. The colours represent the different symbolic resources distinguished (i.e. 'civic gratification', 'material benefits', 'local autonomy') and the 'fun-meaning' (i.e. 'Other'). The higher the meaning in the graph, the more important the meaning is within the practice TEP.

When Figure 5-31 is compared to Figure 5-32, it can be seen that the top four meanings do not significantly differ from each other in level of importance within TEP. In addition it can be seen that "using energy when it is generated" is the least important meaning within TEP for members while being in the middle for non-members. Self-sufficiency and the enjoyment of timing energy use are ranked higher among members as compared to non-members. As the results from the Wilcoxon signed-rank test showed, there is no sharp distinction in relative level of importance among members. This can be seen from Figure 5-31 in which all meanings are overlapping on the horizontal level with at least one of the other meanings.

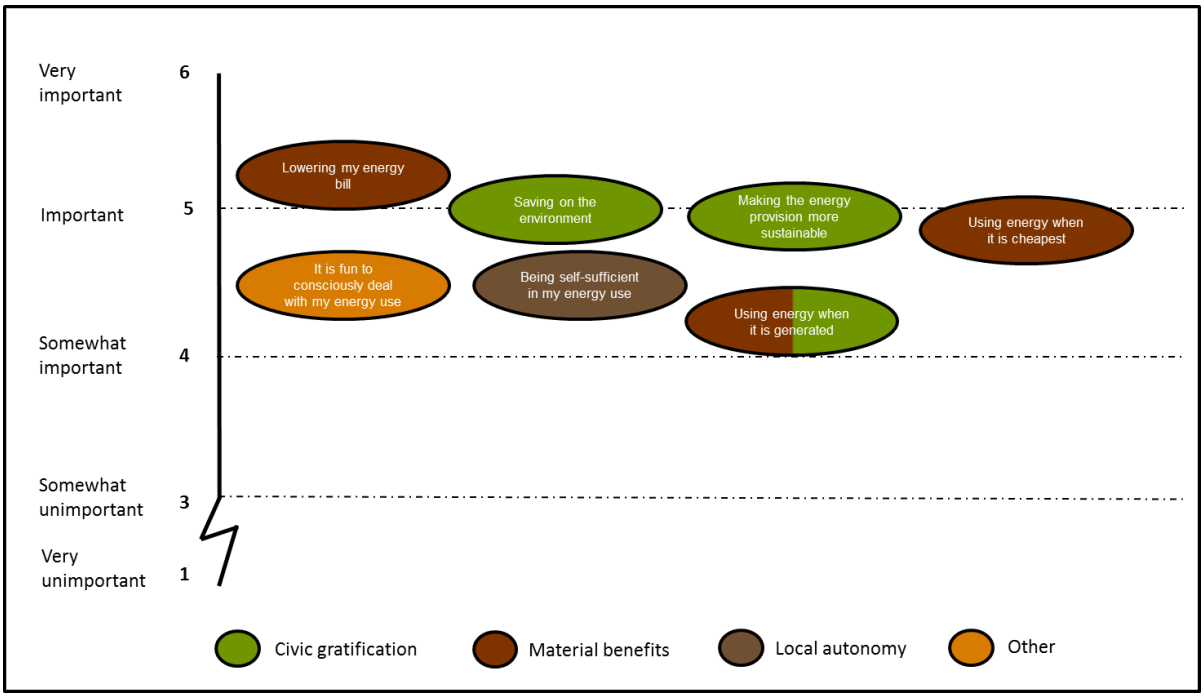

Figure 5-31 The order of importance among meanings within TEP, members

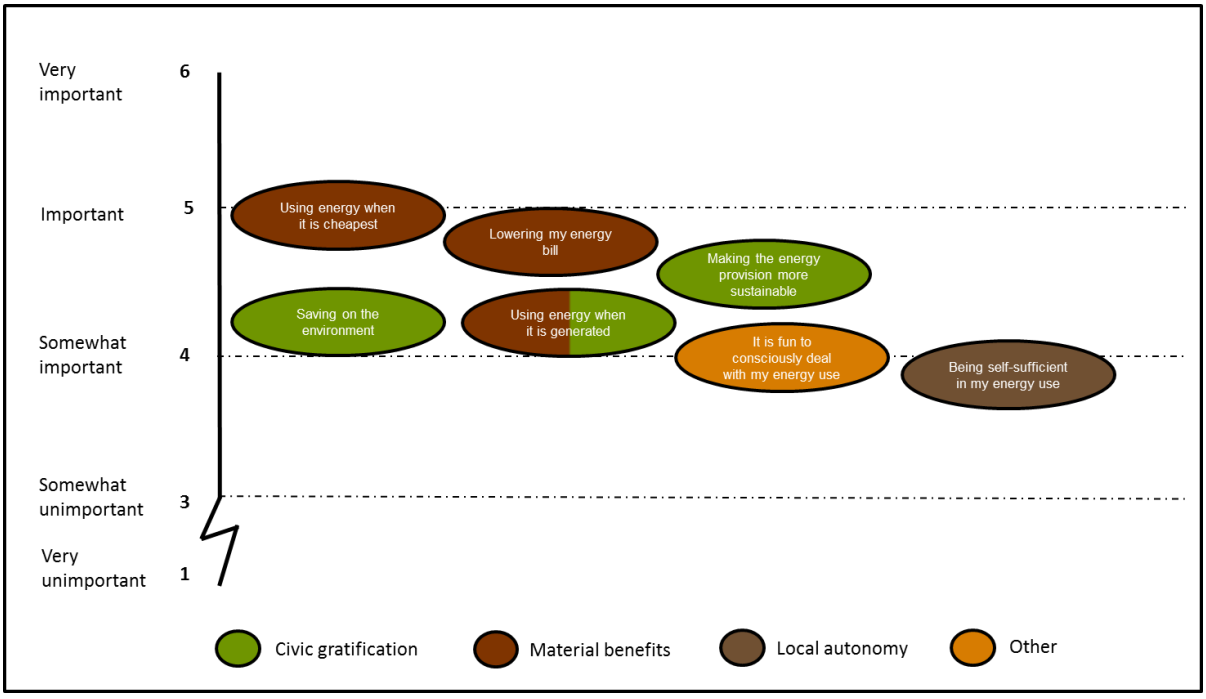

Figure 5-32 The order of importance among meanings within TEP, non-members

Shaping the dimension of meanings

As was already clear from the values in Table 5-6, Figure 5-31 and Figure 5-32 show that all meanings inhibit a degree of importance within TEP. Just as in the motivations to participate in DEH and the practices Renewable Energy Generation (REG), Monitoring Energy Use and Generation (MEUG) and Sharing Information (ShI), it is a combination of meanings that shapes the meanings dimension of the practice. In order to induce the timing of energy

practices to outside peak hours, reference should therefore be made to all types of meanings (i.e. the symbolic resources). The focus should be on meanings referring to direct personal benefits and the benefits that accrue to the environment, since these have shown to be most important. The analyses of REG, MEUG and ShI have shown that DEH has played a role in shaping the dimension of meanings. Therefore it is expected that it can also shape the meanings dimension of this practice. DEH could for example use information evenings about 'being smart with energy' to inform their members about how they could benefit from changing the timing of energy use and how it benefits the environment.

5.4.3 Competences

Competences refer to the knowledge and skills that exist within the practice. Competences, as described in Chapter 2 would comprise of the knowledge and skills needed to time energy practices. Figure 5-27 has shown that many people time their energy practices based on the day/night tariff. The price for electricity at night is lower than during the day, and turning on appliances in the evening [instead of during the day], saves costs (IntNM, IntNM, IntM, IntM). They use the day/night tariff and know that they can lower their energy bill by doing the laundry at night: "We wash and dry with night tariff, consciously because the price of energy is lower" (IntM). Others also know the exact difference between the day/night tariff and calculated the exact advantage of using one kWh of night tariff instead of day tariff (IntM, IntM). Understanding the difference between the price during the day and the price at night and how it can be used is one of the competences within TEP. So, although the day/night tariff itself is a material used in timing energy practices, it also demands understanding of how it can be used to achieve a possible outcome (i.e. one of the meanings). It shows how the three dimensions of a practice are interconnected (Gram-Hanssen, 2010; Shove & Pantzar, 2005).

When the timing of energy practices is based on the renewable energy generation at home, people refer to the time of the day at the energy is generated (IntM, IntNM). "I can better wash during the day, because I deliver energy at that moment anyway" (IntNM). Some people use this knowledge to time energy practices. Interviewees also refer the type of energy practices that can be shifted as one of the competences within TEP. "I think the only type of energy use that can be adjusted in our home is doing the laundry." (IntNM). Knowing which energy practices are flexible, is needed to change the timing of these. Knowledge about grid capacity problems also contributes to the active involvement in timing energy practices (IntM). Members are willing to contribute to the development of the 'smart grid' and aim to balance supply and demand at the level of the household (IntM, IntM).

Shaping the dimension of competences

For the other practices analysed in this research DEH has had a positive contribution in providing the relevant knowledge, especially on Renewable Energy Generation. It is therefore expected that DEH can also contribute to the competences that are relevant for TEP.

Informing members on how they can lower the energy bill by shifting the timing of energy use, explaining how energy practices can be shifted or how the smart meter can contribute to lowering their energy bill could be taken up by DEH.

A shift in the timing of electricity practices implies that daily routines and habits have to be changed. In order for the smart grid to successfully contribute to a time-shift of energy practices to off-peak hours the interrelations between materials, meanings and competences should be the focus. As Gram-Hanssen (2010, p. 160) note: "When habits changed, it was most often because of a change in knowledge and motivation, and these developments often occurred together with a technological rearrangement." Smart technologies (e.g. smart meters, smart washing machines) can induce a change in the timing of energy practices. How these changes in technologies are understood (competences) and the implications it has for the outcome of the practice (meanings) are however equally relevant in the change of a practice. In the context of smart grids, it is thus also about how it is translated into an understanding of how it can be used to shift timing of energy practices and what this shift in timing contributes to.

In the practice Sharing Information, members have shown to be more interested in an information evening when an expert in the field of the topic being discussed would be present. DEH, as an intermediate organisation in the energy system, could use its networks with the incumbent actors, to invite experts from the field. They are however dependent on the willingness of these actors, like energy producers, to cooperate in this. DEH could also make use of its members (i.e. labour) who have a background in the field of energy for these information evenings.

5.4.4 Epilogue Timing of Energy Practices

The day/night tariff and renewable energy generation at home are both playing a role within the materials dimension of Timing of Energy Practices (TEP). The effort it takes to change daily patterns and the reduction of comfort as a result of TEP are constraining factors. The most important meanings within the practice refer to direct personal benefits and the benefits to the environment. All meanings however inhibit a degree of importance within the practice. The competences within TEP comprise of understanding how to use the day/night tariff, knowledge of the timing of energy generation, knowledge about the flexibility of energy practices and knowledge about the challenges of the energy system.

DEH has contributed to TEP by facilitating the procurement of solar panels, but does not have the resources to set the energy prices. Therefore it is expected that DEH will only have a minor role on the materials dimension of TEP in the future. There are only small differences between members and non-members on the dimension of meanings within this practice and the four most important are equal among the two groups. Therefore it cannot be concluded that DEH has shaped the practice on the dimensions of meanings. However, it has been shown in the analysis of the other practices (i.e. REG, MEUG and ShI) that DEH is able to

shape this dimension. In shaping the meanings of TEP in the future, DEH should address all categories of meanings and focus on those that refer to direct personal benefits and the benefits to the environment. On the dimension of competences DEH could use information evenings about 'being smart with energy' to inform their members about how they could benefit from changing the timing of energy use. Inviting an expert from the field would be an added value to these information evenings.

A shift in the timing of electricity practices implies that daily routines and habits have to be changed. Smart technologies can induce a change in the timing of energy practices, but the dimensions of meanings and competences have to change accordingly for the change to occur. Based on the results from this section DEH is expected to be able to play a role on these other two dimensions and the interconnections to the technological developments.

6. Conclusion & Recommendations

6.1 Conclusion

In this research the role of the energy cooperative DEH on four practices that exist on the interface between community energy and smart grids have been analysed: Renewable Energy Generation (REG), Monitoring Energy Use and Generation (MEUG), Sharing Information (ShI) and Timing or Energy Practices (TEP). Each of these practices has been described based on the dimensions of materials, meanings and competences. The role of DEH has been analysed based on the available structural and symbolic resources and its ability to mobilise these to shape the four practices. In this Chapter the research questions as stated in the introduction to this thesis will be answered.

Duurzame Energie Haaren

Duurzame Energie Haaren (DEH) is a sustainable energy cooperative led by people from diverse backgrounds who are involved on a voluntary basis. They are supported by few members that are involved in one of the various working groups. Most members are however, only passively involved. DEH perceives itself as a new player in the energy system, in between the incumbent actors end the end user. DEH relies on membership fees to finance its activities and actively uses its internal external social networks in working towards its mission of becoming energy neutral within the municipality. The collective identity of the DEH is formed by its geographical scope and shared interest in energy. The main motivations of people to participate in DEH have a background in direct personal benefits (material benefits), the benefits that accrue to the local community and wider environment (civic gratification), exchanging knowledge and experience and the desire for self-sufficiency with respect to energy. The main activities of DEH have been the collective procurement of solar panels, information evenings on energy related topics and the participation in the recently started pilot project Samen Slim met Energie (SSmE). Participation in the collective procurement of solar panels have for many members been the vehicle in becoming a member of DEH.

Renewable Energy Generation, Monitoring Energy Use and Generation, Sharing Information and Timing of Energy Use

In order to determine the role of DEH on the selected practices, a characterisation of these practices was made according to the dimensions of materials, meanings and competences. In the materials dimension of Renewable Energy Generation (REG), solar panels, financial resources, the construction of the house and the living environment can all be constraining or enabling factors. Meanings that refer to lowering energy costs and the benefits to the environment are most important. The competences within REG encompass the knowledge about the technical specifications of solar panels, the amount of energy it generates and about the situation in which it is a good investment. In Monitoring Energy Use and Generation (MEUG), the energy bill, energy meter and more appliance-specific measuring devices are used. Corresponding to REG, the meanings that refer to lowering energy costs and benefits to

the environment are most important. Competences in MEUG are the skills of tracking data on energy use and generation and the knowledge needed to understand the energy bill and energy meter. In Sharing Information (ShI), social gatherings, solar panels, knowledge on energy use and generation, the weather situation, and the moment of receiving the energy bill all play a role in the materials dimension. Also in ShI, the most important meanings addressed aspects of direct personal benefits and the benefits to the environment. The dimension of competences was not analysed in this research, but would encompass skills to communicate, explain and describe. In Timing of Energy Practices (TEP), two-rated tariffs, the generation of renewable energy at home and comfort have shown to be enabling and/or constraining factors. Similar to the other practices, meanings referring to the direct personal benefits and the benefits to the environment are most important within the practice. Within the dimension of competences, the understanding of the materials (i.e. two rated tariffs), the energy practices that can be shifted over time and the benefits of this shift in the timing of energy practices can be distinguished. The results of this thesis have shown that the three dimensions within the practices are interconnected and that the four practices are all interrelated.

The role of DEH on Renewable Energy Generation, Monitoring Energy Use and Generation, Sharing Information and Timing of Energy Practices

This research has shown that DEH has played a role on REG, MEUG and ShI mainly through the collective procurement of solar panels and information evenings. The procurement of solar panels has shown to be regarded as a complex process. Using the expertise of some of its members, DEH has facilitated the process by conducting the initial selection of suppliers and explaining some technical specifications. Through these efforts, DEH has facilitated the acquirement of the materials and has provided members with the relevant competences for REG. In addition to REG, solar panels can also be considered a material element within the practices MEUG and ShI. Within MEUG, the data on energy generation is compared to the energy use by those that have solar panels and this information is used to check the energy bill. By facilitating the procurement of solar panels, DEH has played a role in shaping these practices. Within ShI, solar panels have been a topic of discussion and within the TEP, respondents have shown to adjust the timing of energy use to the moment of energy generation. In addition, DEH provides a platform for exchanging knowledge and ideas (ShI) on energy related topics which has shown to be a main motivator to participate in DEH. Within the dimension of meanings members have shown to attach a significantly higher level of importance to the environmental benefits of the practices than non-members. In the collective procurement of solar panels, DEH has stressed the benefits to the environment belonging to solar panels. This might have shaped the meanings of the practices and can explain the differences between members and non-members.

TEP has not been the focus of DEH in its activities so far which implies that DEH has not yet played an active role in the timing of energy use by its members. The (future) role of DEH on

this practice is therefore based on the analysis of the practice, the resources available to DEH and the role DEH has had on the other three practices. On materials DEH is expected to have a minor role, due to the limited resources available to DEH. As the renewable energy generation has shown to be used in the timing of energy practices, the collective procurement of solar panels has indirectly contributed to the materials dimension of TEP. The research has shown that for all practices analysed, meanings stressing direct personal benefits and the benefits to the environment are most important. Therefore, in shaping TEP, DEH should focus on these types of meanings in their activities. On the dimension of competences, DEH could inform their members about how they can contribute to a time shift of energy practices and how 'smart' devices can enable the shift in the timing of energy practices.

A shift in the timing of electricity practices to off-peak hours implies that daily routines and habits have to be changed. Smart technologies can contribute to this by providing real-time information and enabling more complex tariff schemes (Kester et al.,2010). However, the dimensions of meanings and competences have to change accordingly for a change in the timing of energy practices to occur (Gram-Hanssen, 2010). Based on the results of this research, DEH is expected to be able to play a role on these two dimensions and on connecting the innovation with (new) relevant knowledge and (new) meanings of the practice TEG. Inviting an expert from the field to an information evening on this topic would be an added value.

6.2 Recommendations

Based on the conclusions as presented above some recommendations can be given for future research, Enexis, DEH and the continuation of the project SSmE. Some recommendations have already been referred to in the previous Chapters of this research. In this section they are brought together:

- This thesis has been limited to only one energy cooperative, DEH. Research has shown that community energy initiatives differ considerably in, among others, their organisational structure and ambition. Future research could examine other community energy initiatives and analyse how these differences affect the role of community energy initiatives on practices.
- In this research, four practices have been selected that exist on the interface between community energy and smart grids. Insights into the role of an energy cooperative on a time shift of energy practices have been provided in a more general way. The actual time shift of energy practices itself has not been analysed. Future research could investigate the role of an energy cooperative on the timing of, for example, domestic energy practices that actually contribute to the peaks in the electricity grid.
- This research has attempted to integrate the structural and symbolic resources with the three dimensions of a practice. The focus has been on the total pool of resources and how these are mobilised by DEH and shape the practices. Future research could

examine more specifically how each of the resources contributes to shaping the practices.

- In the analysis of the practices has been referred to a possible contribution of SSmE to (a change in) these practices. The monitoring opportunities it provides and the possibilities for sharing information on the platform are expected to change these practices as well as to contribute to a time shift of energy practices. Future research within this project could investigate how the four practices that have been analysed in this research have changed over time.
- This research has focused on the role of the energy cooperative inwards. Except for a short description of the 'wider political framework' as one of the structural resources available to DEH, it has not drawn any attention to the wider environment in which the community energy initiatives operate. A more detailed outline of this could contribute to an understanding of the opportunities and barriers to community energy initiatives and how it shapes their possibilities for mobilising resources. How community energy initiatives interact with other initiatives, grid operators, energy producers and policy makers, could be a topic for a future research project.

Policy recommendations

- This research has shown that timing of energy practices depends on a combination of, matching energy use with generation, cost differences and the level of comfort. Therefore I would advise Enexis to incorporate the generation of renewable energy into the online platform of the pilot project Samen Slim met Energie (SSmE) in addition to the financial incentive. The online platform could also be a place to provide the participants with knowledge about which energy practices can be shifted over time as well as information on the electricity use of specific household appliances.
- Based on the results of this research, I recommend DEH to be specific about the outcomes of their activities in order to recruit new members. The focus should be on how these activities bring direct personal benefits and benefit the environment.
- Previous research on practices has shown that a change in a practice occurs when the technological development is successfully connected to the knowledge of how to use this innovation and (new) motivations within the practice (Gram-Hanssen, 2010). This implies that, for a successful implementation of the smart grid and an effective use of the smart technologies by the end-user, only providing the materials is not enough. Since energy cooperative DEH is seen as a trustful organisation by its members and Enexis is generally mistrusted, I would recommend Enexis to closely collaborate with DEH and other energy cooperatives. These organisations are close to the people and can shape the dimensions of meanings and competences that are vital for a time-shift of energy practices to occur.

7. Discussion

This Chapter reflects on the outcomes of this thesis in the context of the research objective as outlined in the Introduction. It addresses the use of the conceptual framework, the methodology, the limitations and the outcomes of this research.

The use of the Conceptual Framework

The approach taken in this research in which each of the four practices has been analysed separately has resulted in detailed insights. However, the research has shown that the practices have been interrelated and that one activity of energy cooperative Duurzame Energy Haaren (DEH) has affected multiple practices (e.g. the collective procurement of solar panels). A more integrated approach of analysing the practices as a whole of 'smart grid practices', might have improved the understanding of the role of DEH on these practices. It would have enabled more thorough analysis of the available resources and their specific contribution to the practices.

Also the analysis of the practices has been relatively fragmented in this research. In order to analyse and describe the practices, the set-up of the data collection methods and the analysis of the practices have been around the materials, meanings and competences as more or less separate entities. Although reference has been made to the interconnections, the focus has been on the three dimensions as separate elements in the practices. It therefore might have lacked insight on the interconnections between these elements and the role of DEH on the interconnections, which have been emphasized in literature as vital in changing practices (Gram-Hanssen, 2010; Shove & Pantzar, 2005).

With respect to the use of Resource Mobilisation Theory, I regard the framework in which symbolic resources are added to structural resources as useful to analyse the role of DEH. It has enabled me to provide a complete overview of the limits and possibilities of DEH in shaping practices. In addition, I specifically regard the symbolic resources as an added value to the original framework for this research, since it allows to specifically account for non-material values. The results have shown that these symbolic resources, also those that did not refer to direct personal benefits, have been motivators to participate in DEH as well as meanings in the practices. This implies that, in the transition towards a sustainable energy system, not only material but also non-material aspects play a role.

To account for the role of the energy cooperative DEH on practices, an attempt was made to integrate RMT and SPT through linking resources with the dimensions constituting a practice. Preceding the data collection the meanings were conceptualised based on the symbolic resources in RMT. However, a link could not be made from all symbolic resources to relevant meanings within the practices (i.e. community identity or social gratification in the practice Renewable Energy Generation). Similarly, links from the structural resources to any of the dimensions of a practice have not been made. This research has referred to the role of DEH

through its activities, not which resources have affected which dimension of the practice. The focus has thus rather been on how the total pool of resources has shaped the practices. It could be useful though to improve the understanding of the ability of an energy cooperative to shape practices and has been suggested for future research.

Conceptualisation and interpretation of 'meanings'

Meanings have been incorporated in the survey based on a combination of literature and the desire to integrate the symbolic values from Resources Management Theory with meanings dimension of the practices. Not for each of practices, meanings that cover all symbolic resources could however be conceptualised. Therefore, not all resources are presented in the meanings within the survey and included in the statistical analysis. Besides, the resources 'material benefits' and 'civic gratification' have been disproportionately represented in the meanings of the practices as incorporated in the survey. It could have biased the results of this research that shows that the meanings belonging to these two resources are most important within the practices.

In addition, the results have shown that in some cases a meaning could have different implications. "Becoming aware of my energy use", for example, could have a background in 'material benefits' (i.e. insight in energy use to lower the energy bill) or in 'civic gratification' (i.e. insight in energy use to reduce the impact on the environment). The tests for reliability that were used to get more insight in which resource this meaning belongs to, also showed that this meaning could belong to either of these resources. It implies that some meanings were ambiguous and could be interpreted in different ways. More careful definitions of meanings could have given more clarity in these situations and more specific insights on the values inherent to the practices.

Another issue regarding the survey is that respondents were presented with possible meanings belonging to the practice and only had to tick a box of (un)importance. It could be that, when reading the meaning, respondents valued it as important, while they would not have come up with a similar meaning in an open ended question. It is questionable whether respondents would really perceive these meanings as important in the practice or only when they are specifically asked about this meaning.

Analysis of the results

Through participation in the collective procurement of solar panels, a participant automatically became a member of DEH. Therefore, within DEH, a large share of members has become a member through participating in this project. Some of the interviewees that participated in the collective procurement, however, indicated that they did not know whether they were a member or not. Therefore it is likely that some people that are officially a member of DEH (through the collective procurement of solar panels) indicated not to be a member of DEH in the survey. Unfortunately these people could not be tracked down from the survey results and therefore, it is likely that there are some respondents within the group of 37 non-members

that officially are a member. Re-allocating these respondents to the group of members, might have yielded different results.

The results of the research have shown that to members of DEH some meanings are significantly more important than to non-members. It is however debatable whether or not this has been an effect of DEH. It could be that DEH has emphasized these meanings in their activities and thereby shaped the practices. However, it could also be that those people that already held the same values before they became a member, came together in DEH which shows in the meanings of the practices. In that case, DEH cannot be considered as having shaped the practices. The results only show a differences between members and non-members, not where this differences stems from.

Timing of Energy Practices (TEG) has shown to be a practice that has not received wide attention of DEH in its activities so far. The role of DEH on this practices has therefore been based on the available resources of DEH and the role of DEH on the other practices. It is therefore questionable whether the conclusions drawn about the role of DEH on this practice hold true.

Scope and limitations

The results of this research are drawn from one case study and based on the specific resources available at DEH. It is focused on DEH and has not taken other energy cooperatives in the Netherlands into account. Research has shown that there are different types of energy cooperatives (Netbeheer Nederland, 2013; Schwencke, 2012) and also DEH itself indicated that they differ in organisational structure and goals from other energy cooperatives. This implies that the results from this research do not necessarily hold for other energy cooperatives and that other energy cooperatives might have a different 'role' in shaping practices than DEH.

Saturation is reached when no additional insights are gained from the interviews (Guest, Bunce, & Johnson, 2006). For this research interviews were held with five members, four non-members and one board-member. The last interviews with members and non-members still provided new insights which would have argued for more interviews. However, due to time constraints for this research no more interviews were conducted.

This research has used both quantitative and qualitative data from the survey and interviews to analyse the role of DEH on the practices. The survey and interview have been set-up in a constructive manner to avoid bias in the data collection as much as possible. However, the process of research is always shaped by the researcher and therefore subjectivity is inherent to research (Kumar, 2014). Selecting, interpreting and formulating concepts and indicators are always subjective and shaped by the background, skills and experience of the researcher (Kumar, 2014). Similarly, the interpretation of data is also subjective, especially for qualitative methods. First the relative information was filtered by the respondent (i.e. he only

mentions what he regards to be relevant) and then I filter it through interpretation and focus on specific pieces of information that would be relevant for this research. In addition, the fact that this research is carried for Enexis and DEH can have influenced the outcomes of this research. Their future cooperation can have biased the responses in the survey and interviews.

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Appendices

Appendix I List of concepts and indicators

Practice	Concept 1	Question type	Concept 2	Indicator	Data collection method
REG	Materials	Categorical	X	Type of renewable energy generation	Survey, interview
	Materials	open	X	Use of subsidies, business	interview
	Meanings	Categorical	Material benefits	Lowering my energy bill	survey
	Meanings	Categorical	Civic gratification	-Saving on the environment -making the energy provision more sustainable	survey
	Meanings	Categorical	Social gratification	X	X
	Meanings	Categorical	Local autonomy	-being self-sufficient in my energy use -generating energy on a small scale -counterveiling large-scale energy producers	survey
	Meanings	Categorical	Community identity	X	survey
	Meanings	Categorical	Other	it is fun to generate energy myself	survey
	Meanings	open	X	Other, namely	survey
	Competences	Categorical	X	perception of respondents on: - the ability to advise others on the procurement of solar panels - the desire for more information of generating energy at home - knowing how much the solar panels generate	survey
	Collective energy generation	Categorical	X	participation in collective generation: -Yes, namely -No	survey
	Collective energy generation	Categorical	X	preference of form for collective energy generation -with friends -with neighbours in a cooperative -in a nationwide project	survey
MEUG	Materials	Categorical	X	Frequency of monitoring energy generation -Rarely -Yearly -Monthly -Weekly -Several times a week -Daily -Several times a day	survey
	Materials	Categorical	X	sections of the energy bill that are studied: -none -total costs and pre-payments -total use of gas and electricity -split of costs over network costs and taxes -other, namely	survey

	Materials	Cate-gorical	X	Methods of gaining insight in energy use: -energy bill -energy meter -energy use manager -comparing website -other, namely	survey
	Materials	Cate-gorical	X	Frequency of reading energy meter -Never -Yearly -Monthly -Weakly -Daily	survey
	Meanings	Categ-orical	Material benefits	lowering my energy bill	survey
	Meanings	Categ-orical	Civic gratification	saving on the environment -making the energy provision more sustainable	survey
	Meanings	Categ-orical	Social gratification	comparing my energy use to others talking with others about energy use	survey
	Meanings	Categ-orical	Local autonomy	being self-sufficient in my energy use	survey
	Meanings	Categ-orical	Community identity	X	survey
	Meanings	Categ-orical	Other	it is fun to monitor my energy use	survey
	Meanings	open	X	Other, namely	survey
	Compe-tences	Categ-orical	X	Perspective of respondents on: -extent of reviewing energy bill -understanding the energy bill -knowledge on the height of the energy bill -knowledge on how to lower the energy bill -desire to know more about how to lower the energy bill -knowing what the big energy users in the house are -understanding how to read the energy meter	survey
ShI	Materials	Cate-gorical	X	Who data on energy use is shared with: (Nobody, friends, family, neighbours, colleagues, unknowns, other)	survey
	Materials	Cate-gorical	X	whom knowledge and experience about energy use is shared with: (Nobody, friends, family, neighbours, colleagues, unknowns, other)	survey
	Materials	Cate-gorical	X	Typical moments information is shared (open ended questions)	survey
	Meanings	Cate-gorical	Material benefits	lowering my energy bill -getting more insight in my energy use	survey
	Meanings	Cate-gorical	Civic gratification	saving on the environment -making the energy provision more sustainable -helping other to lower their energy bill -making others aware of their energy use	survey
	Meanings	Cate-gorical	Social gratification	working together with others	survey
	Meanings	Cate-gorical	Local autonomy	countervailing large scale energy producers	survey
	Meanings	Cate-gorical	Community identity	X	survey

	Meanings	Cate-gorical	Other	it is fun to talk with others about energy use	survey
	Meanings	open	X	Other, namely	survey
	Compe-tences	X	X	X	X
	Sharing informa-tion in a collective	Cate-gorical	X	Preferred form of sharing data: -competition with friends -together with the energy cooperative -village competition (village against village) -internetform with unknowns	survey
	Sharing informa-tion in a collective	Cate-gorical	X	Preferred form of sharing knowledge and experience -with friends -theme-evening -theme-evening with expert -closed internetforum with people you know -open internetforum with unknowns	survey
TEU	Materials	Cate-gorical	X	adjusting energy use based on day/night tariff	survey
	Materials	Cate-gorical	X	adjusting energy use based on own energy generation	survey
	Meanings	Cate-gorical	Material benefits	lowering my energy bill using energy when it is cheapest	survey
	Meanings	Cate-gorical	Civic gratification	saving on the environment -making the energy provision more sustainable	Survey
	Meanings	Cate-gorical	Social gratification	X	Survey
	Meanings	Cate-gorical	Local autonomy	Being self-sufficient in energy use using energy when it is generated	Survey
	Meanings	Cate-gorical	Community identity	X	Survey
	Meanings	Cate-gorical	Other	it is fun to consciously deal with my energy use	survey
	Meanings	open	X	Other, namely	survey
	Competenc es	X	X	X	X
	Collective TEU	Cate-gorical	X	preferred form of collectively timing of energy use -alone -friends -cooperative -internet	survey

	Concept	Question Type	Concept level 2	Indicator	Data collection method
DEH	symbolic resources	categorical	community identity	X	
	symbolic resources	categorical	material benefits	-cheap procurement of solar panels -lowering my energy bill -becoming aware of my energy use -participation in SSmE	survey
	symbolic resources	categorical	civic gratification	-saving on the environment -strengthening the local society -making others aware of their energy use	survey

	symbolic resources	categorical	social gratification	-friends have persuaded me to become a members -gaining new contacts -working together with others -exchanging knowledge and information	survey
	symbolic resources	categorical	local autonomy	-being self-sufficient in my energy use -counterveiling large-scale energy producers	survey
	Symbolic resources	open	X	Other, namely	survey
	Structural resources	categorical	labour	membership of DEH	interviews, survey
	Structural resources		labour	-characterisation of members -core group, working groups, minimally engaged people background of core group	interview
	Structural resources	categorical	labour	Level of participation in: collective procurement of solar panels -information evenings -collective procurement of energy -collective generation of energy -other	survey
	Structural resources	categorical	labour	participation in SSmE	survey
	Structural resources	categorical	labour	Education level (primary, lower secondary, upper secondary, vocational school, university of applied sciences, university, don't want to tell	survey
	Structural resources	categorical	labour	profession: student, volunteer, housewife, job searcher, employee, employer, independent, retired, other, don't want to tell	survey
	Structural resources	categorical	social networks	perspective towards statement: friends have persuaded me to become a member	survey
	Structural resources	X	social networks	vehicle through which one heard about DEH	interview
	Structural resources	X	social networks	participation in SSmE because friends have persuaded	interview
	Structural resources	categorical	social networks	place of origin: -Biezenmortel -Esch -Haaren -Helvoirt -Other	survey
	Structural resources	X	social networks	contacts outside the cooperative: other community energy initiatives, industry, government, goal of these contacts	interview
	Structural Resources	categorical	financial resources	level of income	survey
	Structural resources	X	financial resources	subsidies, membership fee, in kind resources	interview
	Structural resources	categorical	time	active in other organisations	survey
	Structural resources	X	time	hours spend on DEH: core group, working groups, member	interview

	Structural resources	X	communicatio n	types of media used for announcing developments and activities ways of recruiting members	interview
	Structural resources	X	wider political system	the extent to which they are facilitated or hindered by policy makers, incumbent energy producers, grid operators	interview
	Structural resources	X	wider political system	the role of DEH in the energy system	interview
	Structural resources	X	wider political system	policies, financing schemes	interview
	mobilising resources	X	X	activities organised	interview
	mobilising resources	X	X	recruiting members	interview
	mobilising resources	X	X	professionalisation	interview
	mobilising resources	X	X	limits to financial resources and labour	interview
	mobilising resources	X	REG	activities organised, limits to mobilisation Extent to which it has resulted in members	interview
	mobilising resources	X	MEUP	activities organised, limits to mobilisation	interview
	mobilising resources	X	ShI	activities organised, limits to mobilisation	interview
	mobilising resources	X	TEU	activities organised, limits to mobilisation	interview

Appendix II Survey

Invitation

Beste heer/mevrouw ${m://LastName},

Mijn naam is Carolien Sedee en ik doe namens Wageningen Universiteit onderzoek naar hoe mensen thuis omgaan met energie en de rol die een energiecoöpertie daarin speelt. Het onderzoek is verbonden aan het project "Samen Slim met Energie" en wordt uitgevoerd in samenwerking met de energiecoöperatie Duurzame Energie Haaren (DEH) en Enexis (de beheerder van het gas- en elektriciteitsnetwerk in zuid-, oost- en noord-Nederland).

Het onderzoek is onderdeel van het proefproject "Samen Slime met Energie". Als deelnemer aan dat project zou ik graag uw hulp willen vragen bij dit onderzoek door een vragenlijst in te vullen. De resultaten zullen worden gebruikt om het project goed uit te kunnen voeren.

De vragenlijst
Het invullen van de vragenlijst zal ongeveer 15 minuten in beslag nemen. De vragenlijst wordt automatisch opgeslagen zodat u (indien nodig) kunt afsluiten en op een later moment weer verder kunt gaan. Uw antwoorden worden vertrouwelijk behandeld en geanonimiseerd verwerkt.

Achtergrond van het onderzoek
De groei van het aantal energiecoöperaties en het thuis opwekken van energie zijn twee interessante ontwikkelingen op energiegebied. Onlangs is Duurzame Energie Haaren (DEH) het project "Samen Slim met Energie" gestart met Enexis. Dit onderzoek sluit aan bij dat project en is ook de reden dat dit onderzoek zich uitsluitend op DEH richt. De resultaten zullen gebruikt worden om inzicht te krijgen in hoe een coöperatie kan bijdragen aan een zo optimaal mogelijk gebruik van energie.

Resultaten van het onderzoek
Als u vragen en/of opmerkingen heeft kunt u dit aan het einde van de vragenlijst kenbaar maken. Voor meer informatie over de resultaten van het onderzoek kunt u met mij contact opnemen via carolien.sedee@wur.nl.

Bij voorbaat dank voor uw medewerking.

Met vriendelijke groet,

Carolien Sedee

Enquête: energiegebruik en energiecoöperaties SSmE
Q1.1 Hartelijk dank voor uw deelname aan mijn onderzoek! Klik op [>>] om de vragenlijst te starten.

Q2.1 1. Opwekken van duurzame energie Steeds meer particulieren en bedrijven produceren zelf energie. De volgende vragen gaan over het zelf opwekken van duurzame energie.

Q2.2 Wekt u thuis duurzame energie op?
- ❑ Nee (1)
- ❑ Nee, maar dat ben ik wel van plan, namelijk met ... (2) _____
- ❑ Ja, met zonnepanelen. (3)
- ❑ Ja, anders dan met zonnepanelen, namelijk met ... (4) _____

Q2.3 Waarom wekt u thuis duurzame energie op? (Indien u van plan bent om zelf duurzame energie op te gaan wekken: Waarom wilt u thuis duurzame energie opwekken?)Geef voor elk van onderstaande redenen aan hoe belangrijk deze voor u is bij het zelf opwekken van duurzame energie.

	Zeer belangrijk (6)	Belangrijk (5)	Enigszins belangrijk (4)	Enigszins onbelangrijk (3)	Onbelangrijk (2)	Zeer onbelangrijk (1)
Verlagen van mijn energierekening (1)	❍	❍	❍	❍	❍	❍
Besparen van het milieu (2)	❍	❍	❍	❍	❍	❍
Verduurzamen van de energievoorziening (3)	❍	❍	❍	❍	❍	❍
Zelfvoorzienend zijn in mijn energiegebruik (4)	❍	❍	❍	❍	❍	❍
Op kleine schaal opwekken van energie (5)	❍	❍	❍	❍	❍	❍
Tegenwicht bieden aan de grote energieproducenten (6)	❍	❍	❍	❍	❍	❍
Het is leuk om zelf energie op te wekken (7)	❍	❍	❍	❍	❍	❍

Q2.4 Zijn er nog andere redenen die u motiveren om zelf energie op te wekken? Zo ja, welke?

Q2.5 Waarom wekt u thuis geen duurzame energie op?

Q2.6 De volgende vragen gaan over het opwekken van energie met zonnepanelen. Met welke regelmaat bekijkt u hoeveel energie uw zonnepanelen opwekken? Kies de beste benadering.

- ❍ Zelden tot nooit (1)
- ❍ Jaarlijks (2)
- ❍ Maandelijks (3)
- ❍ Wekelijks (4)
- ❍ Meerdere keren per week (5)
- ❍ Dagelijks (6)
- ❍ Meerdere keren per dag (7)

Q2.7 Welke omstandigheden maken dat u bekijkt hoeveel energie uw zonnepanelen opwekken?

Q2.8 Geef aan in hoeverre u het (on)eens bent met de volgende stellingen:

	Helemaal mee eens (4)	Mee eens (3)	Mee oneens (2)	Helemaal mee oneens (1)	Niet van toepassing (99)
Ik kan anderen advies geven bij de aanschaf van zonnepanelen. (1)	❍	❍	❍	❍	❍
Ik zou graag meer informatie willen over (de mogelijkheden van) het thuis opwekken van duurzame energie. (2)	❍	❍	❍	❍	❍
Ik weet hoeveel mijn zonnepanelen opwekken. (3)	❍	❍	❍	❍	❍

Q2.9 Naast het zelfstandig opwekken van energie zijn er ook steeds meer mogelijkheden voor collectieve opwek. Voorbeelden hiervan zijn het huren van een set zonnepanelen op het dak van een gemeentehuis of het kopen van een aandeel in een windmolen.Maakt u al gebruik van collectieve opwek?

- ❍ Ja, namelijk ... (1) _____
- ❍ Nee. (2)

Q2.10 Als u uit onderstaande vormen van collectieve opwek zou mogen kiezen, voor welke vorm(en) zou u dan open staan?

	Ja (3)	Een beetje (2)	Nee (1)
Samen met vriend(en) of goede bekende(n): bijv. gedeelde zonnepanelen of zonnepanelen op het dak van vrienden. (1)	❍	❍	❍
Samen met buurtgenoten in een lokale coöperatie: bijv. gedeelde zonnepanelen op het dak van een school of buurthuis. (2)	❍	❍	❍
Samen met landgenoten in een grootschaliger energieproject: bijv. deelname aan een windmolenpark of zonnepark elders in Nederland. (3)	❍	❍	❍

Q2.11 Kunt u uw keuze(s) toelichten?

Q3.1 2. Energiegebruik inzichtelijk maken. Er zijn verschillende manieren om inzicht te krijgen in uw energiegebruik. De volgende vragen gaan hierover.

Q3.2 Geef aan in hoeverre u het (on)eens bent met de volgende stellingen:

	Helemaal mee eens (4)	Mee eens (3)	Mee oneens (2)	Helemaal mee oneens (1)
Ik ben geïnteresseerd in mijn energiegebruik. (1)	❍	❍	❍	❍
Ik bestudeer mijn energierekening altijd grondig. (3)	❍	❍	❍	❍
Ik vind mijn energierekening onduidelijk. (2)	❍	❍	❍	❍
Ik ben ervan overtuigd dat ik invloed heb op de hoogte van mijn energierekening. (4)	❍	❍	❍	❍

Q3.3 Welke onderdelen van de energierekening bekijkt u? Er zijn meerdere antwoorden mogelijk.

- ❑ Geen (1)
- ❑ Totale kosten en voorschotbedrag (2)
- ❑ Totale verbruik van gas en elektriciteit (3)
- ❑ Uitsplitsing van kosten over netwerk en belastingen (4)
- ❑ Anders, namelijk ... (5) _____

Q3.4 Er zijn verschillende apparaten beschikbaar waarmee meer inzicht kan worden verkregen in het energiegebruik. Een voorbeeld daarvan is een energieverbruiksmanager (zie afbeelding). Welke instrumenten gebruikt u om meer inzicht te krijgen in uw energiegebruik? Er zijn meerdere antwoorden mogelijk.

- ❑ Energierekening (1)
- ❑ Energierekening (2)
- ❑ Energiemeter in de meterkast (3)
- ❑ Energieverbruiksmanager (4)
- ❑ Vergelijkingswebsite (5)
- ❑ Anders, namelijk ... (6) _____

Q3.5 Met welke regelmaat leest u de meterstanden af? Kies de beste benadering.

- ❍ Nooit (1)
- ❍ Jaarlijks (2)
- ❍ Maandelijks (3)
- ❍ Wekelijks (4)
- ❍ Dagelijks (5)

Q3.6 Waarom wilt u inzicht in uw energiegebruik? Geef voor elk van onderstaande redenen aan hoe belangrijk deze voor u zijn bij het inzichtelijk maken van uw energiegebruik.

	Zeer belangrijk (6)	Belangrijk (5)	Enigszins belangrijk (4)	Enigszins onbelangrijk (3)	Onbelangrijk (2)	Zeer onbelangrijk (1)
Verlagen van mijn energierekening (1)	❍	❍	❍	❍	❍	❍
Besparen van het milieu (2)	❍	❍	❍	❍	❍	❍
Verduurzamen van de energievoorziening (3)	❍	❍	❍	❍	❍	❍
Mijn energiegebruik met anderen vergelijken (4)	❍	❍	❍	❍	❍	❍
Met anderen over energie (-gebruik en -besparing) praten (5)	❍	❍	❍	❍	❍	❍
Zelfvoorzienend zijn in mijn energiegebruik (6)	❍	❍	❍	❍	❍	❍
Het is leuk om mijn energiegebruik in de gaten te houden. (7)	❍	❍	❍	❍	❍	❍

Q3.7 Zijn er voor u nog andere redenen om uw energiegebruik inzichtelijk te maken?

Q3.8 Geef aan in hoeverre u het (on)eens bent met de volgende stellingen:

	Helemaal mee eens (4)	Mee eens (3)	Mee oneens (2)	Helemaal mee oneens (1)
Ik ben bewust bezig met mijn energiegebruik. (1)	❍	❍	❍	❍
Ik heb geen idee hoe hoog mijn energiegebruik is. (2)	❍	❍	❍	❍
Het is voor mij onduidelijk hoe ik mijn energiegebruik kan verlagen. (3)	❍	❍	❍	❍
Ik wil meer weten over hoe ik mijn energiegebruik kan verlagen. (4)	❍	❍	❍	❍
Ik weet wat de grote energiegebruikers in mijn huis zijn. (5)	❍	❍	❍	❍
Het is voor mij onduidelijk wat de gegevens op mijn meter betekenen. (6)	❍	❍	❍	❍

Q4.1 3. Informatie delen De volgende vragen gaan over het delen en vergelijken van gegevens omtrent (het verlagen van) uw energiegebruik.

Q4.2 Ik deel gegevens van mijn energiegebruik (bijv. energierekening en meterstanden) met ...
- ❑ Niemand (1)
- ❑ Vrienden (2)
- ❑ Familie (3)
- ❑ Buren (4)
- ❑ Collega's (5)
- ❑ Onbekenden (6)
- ❑ Anders, namelijk ... (7) _____

Q4.3 Ik deel kennis en ervaringen m.b.t. mijn energiegebruik (bijv. over het verlagen van energiegebruik) met ...
- ❑ Niemand (1)
- ❑ Vrienden (2)
- ❑ Familie (3)
- ❑ Buren (4)
- ❑ Collega's (5)
- ❑ Onbekenden (6)
- ❑ Anders, namelijk (7) _____

Q4.4 Wat zijn typische momenten waarop uw gegevens, kennis en/of ervaringen over uw energiegebruik deelt met anderen?

Q4.5 Waarom deelt u gegevens, kennis en/of ervaringen over uw energiegebruik met anderen? Geef voor elk van onderstaande redenen aan hoe belangrijk deze voor u is bij het delen van informatie over uw energiegebruik.

	Zeer belangrijk (6)	Belangrijk (5)	Enigszins belangrijk (4)	Enigszins onbelangrijk (3)	Onbelangrijk (2)	Zeer onbelangrijk (1)
Verlagen van mijn energierekening (1)	❍	❍	❍	❍	❍	❍
Besparen van het milieu (2)	❍	❍	❍	❍	❍	❍
Verduurzamen van de energievoorziening (3)	❍	❍	❍	❍	❍	❍
Meer inzicht krijgen in mijn eigen energiegebruik (10)	❍	❍	❍	❍	❍	❍
Anderen helpen bij het verlagen van hun energierekening (4)	❍	❍	❍	❍	❍	❍
Anderen bewust maken van hun energiegebruik (5)	❍	❍	❍	❍	❍	❍
Samenwerken met anderen (6)	❍	❍	❍	❍	❍	❍
Tegenwicht bieden aan de grote energieproducenten (8)	❍	❍	❍	❍	❍	❍
Het is leuk om met anderen over energie (-gerelateerde onderwerpen) te praten (9)	❍	❍	❍	❍	❍	❍

Q4.6 Zijn er voor u nog andere redenen om gegevens, kennis en/of ervaringen over uw energiegebruik met anderen te delen?

Q4.7 Samen aan de slag met energiegegevens. Als u gevraagd zou worden om deel te nemen aan onderstaande initiatieven, voor welke zou u dan open staan?

	Ja (3)	Een beetje (2)	Nee (1)
Een competitie met vrienden en bekenden waarin u probeert zoveel mogelijk energie te besparen. (1)	❍	❍	❍
Een coöperatie-initiatief waarin u samen met andere leden bepaalde doelen probeert te behalen. (2)	❍	❍	❍
Een dorpscompetitie waarin u samen met dorpsgenoten opneemt tegen andere dorpen op gebied van energiegebruik. (3)	❍	❍	❍
Een internetforum waar u met onbekenden bepaalde doelen op gebied van energiegebruik kunt nastreven. (4)	❍	❍	❍

Q4.8 Op welke manier zou u kennis en ervaringen over energie-gerelateerde onderwerpen met anderen willen uitwisselen?

	Ja (3)	Een beetje (2)	Nee (1)
Met een klein groepje vrienden/bekenden bij iemand thuis (1)	❍	❍	❍
Op thema-avonden (2)	❍	❍	❍
Op thema-avonden waar een expert uitleg geeft (over een energie-gerelateerd onderwerp) (3)	❍	❍	❍
Op een besloten internetplatform met bekenden (4)	❍	❍	❍
Op een open internetforum met onbekenden (5)	❍	❍	❍

Q5.1 4. Het moment van energiegebruik De volgende vragen gaan over het moment waarop u energie gebruikt en het verschuiven daarvan.

Q5.2 Geef voor elk van onderstaande stellingen aan in hoeverre u het daarmee (on)eens bent.

	Helemaal mee eens (4)	Mee eens (3)	Mee oneens (2)	Helemaal mee oneens (1)
Mijn energiegebruik stem ik af op het dag/nachttarief. (1)	❍	❍	❍	❍
Ik weet hoe hoeveel energie ik op welk moment van de dag gebruik. (2)	❍	❍	❍	❍
Ik pas mijn energiegebruik aan op (mijn eigen) duurzame opwek. (5)	❍	❍	❍	❍

Q5.3 Waarom bent u bezig met het moment waarop u energie gebruikt?Geef voor elk van onderstaande redenen aan hoe belangrijk deze voor u zijn bij het bewust gebruiken van energie op een bepaald moment van de dag.

	Zeer belangrijk (6)	Belangrijk (5)	Enigszins belangrijk (4)	Enigszins onbelangrijk (3)	Onbelangrijk (2)	Zeer onbelangrijk (1)
Verlagen van mijn energierekening (1)	❍	❍	❍	❍	❍	❍
Besparing van het milieu (2)	❍	❍	❍	❍	❍	❍
Verduurzaming van de energievoorziening (4)	❍	❍	❍	❍	❍	❍
Het is leuk om bewust bezig te zijn met mijn energiegebruik (5)	❍	❍	❍	❍	❍	❍
Zelfvoorzienend zijn in mijn energiegebruik (6)	❍	❍	❍	❍	❍	❍
Het gebruiken van energie op het moment dat deze opgewekt wordt (7)	❍	❍	❍	❍	❍	❍
Het gebruiken van energie op het moment dat deze het goedkoopst is (8)	❍	❍	❍	❍	❍	❍

Q5.4 Zijn er nog andere redenen die voor u belangrijk zijn bij het gebruiken van energie op een bepaald moment van de dag?

Q5.5 In welke vorm zou u zich bezig willen houden met het gebruiken van energie op een zo gunstig mogelijk moment van de dag? (bijv. wanneer deze het goedkoopst is of wanneer deze het meest duurzaam is)

	Ja (3)	Een beetje (2)	Nee (1)
Alleen (4)	❍	❍	❍
Met vrienden/bekenden: u gebruikt bijv. energie op het moment dat uw vrienden/bekenden duurzame energie opwekken (1)	❍	❍	❍
Met de coöperatie (2)	❍	❍	❍
Met onbekenden: U probeert bijv. met onbekenden op een internetforum uw energiegebruik zoveel mogelijk te verspreiden. (3)	❍	❍	❍

Q6.1 5. Duurzame Energie Haaren De volgende vragen gaan over de energiecoöperatie Duurzame Energie Haaren (DEH) en het proefproject Samen Slim met Energie.

Q6.2 Bent u lid van DEH?
❍ Ja (1)
❍ Nee (0)

Q6.3 Waarom bent u lid van DEH? Geef voor elk van onderstaande redenen aan hoe belangrijk deze voor u is bij het lid zijn van DEH.

	Zeer belangrijk (6)	Belangrijk (5)	Enigszins belangrijk (4)	Enigszins onbelangrijk (3)	onbelangrijk (2)	Zeer onbelangrijk (1)
Goedkope aanschaf van zonnepanelen (1)	❍	❍	❍	❍	❍	❍
Verlagen van mijn energierekening (2)	❍	❍	❍	❍	❍	❍
Bewust worden van mijn energiegebruik (3)	❍	❍	❍	❍	❍	❍
Anderen bewust maken van hun energiegebruik (4)	❍	❍	❍	❍	❍	❍
Besparing van het milieu (5)	❍	❍	❍	❍	❍	❍
Versterken van de lokale gemeenschap (6)	❍	❍	❍	❍	❍	❍
Deelname aan het project Samen Slim met Energie (7)	❍	❍	❍	❍	❍	❍
Vrienden/bekenden hebben mij overgehaald om lid te worden (8)	❍	❍	❍	❍	❍	❍
Nieuwe contacten opdoen (9)	❍	❍	❍	❍	❍	❍
Samenwerken met anderen (10)	❍	❍	❍	❍	❍	❍
Kennis over duurzame energie en energiegebruik uitwisselen (11)	❍	❍	❍	❍	❍	❍
Zelfvoorzienend zijn in mijn energiegebruik (12)	❍	❍	❍	❍	❍	❍
Tegenwicht bieden aan de grote energiemaatschappijen (13)	❍	❍	❍	❍	❍	❍

Q6.4 Zijn er nog andere redenen die voor u belangrijk zijn bij het lid zijn van DEH? Zo ja, welke?

Q6.5 DEH organiseert verschillende activiteiten voor haar leden. Een voorbeeld daarvan is de collectieve inkoop van zonnepanelen.Op welke manier bent u betrokken bij onderstaande activiteiten van DEH? Indien u niet deelneemt aan de activiteiten en/of niet in de organisatie daarvan zit vult u 'niet van toepassing' in.

	Als lid/deelnemer (1)	Als vrijwilliger in de organisatie (2)	Niet van toepassing (3)
Collectieve inkoop van zonnepanelen (1)	❍	❍	❍
Informatieavonden energiebesparing (2)	❍	❍	❍
Collectieve inkoop van energie (3)	❍	❍	❍
Collectieve opwek van windenergie (4)	❍	❍	❍

Q6.6 Zijn er andere activiteiten van DEH waar u bij betrokken bent? Indien ja, op welke manier bent u daarbij betrokken (lid/deelnemer en/of vrijwilliger in de organisatie/werkgroep)?

Q6.7 Waarom bent u geen lid van DEH?

Q6.8 Gaat u meedoen aan het project 'Samen Slim met Energie' (SSmE)?
- ❍ Ja (1)
- ❍ Nee (0)
- ❍ Weet ik nog niet. (2)

Q6.9 Waar twijfelt u nog over?

Q6.10 Waarom gaat u meedoen aan het project SSmE?Geef voor elk van onderstaande redenen aan hoe belangrijk deze voor u is bij deelname aan het project SSmE.

	Zeer belangrijk (6)	Belangrijk (5)	Enigszins belangrijk (4)	Enigszins onbelangrijk (3)	Onbelangrijk (2)	Zeer onbelangrijk (1)
De slimme meter wordt gratis geïnstalleerd (1)	❍	❍	❍	❍	❍	❍
Meer inzicht in mijn energiegebruik (2)	❍	❍	❍	❍	❍	❍
Gegevens over energiegebruik en -besparing delen met anderen (3)	❍	❍	❍	❍	❍	❍
Samenwerken met anderen op gebied van energie (4)	❍	❍	❍	❍	❍	❍
Ik vind het leuk om deel te nemen aan een innovatief project (5)	❍	❍	❍	❍	❍	❍
Ik wil meedenken over hoe gegevens over het energiegebruik weergegeven moeten worden (6)	❍	❍	❍	❍	❍	❍

Q6.11 Zijn er nog andere redenen die voor u belangrijk zijn om mee te doen aan SSmE?

Q6.12 Waarom gaat u niet meedoen aan het project SSmE?

Q7.1 Gegevens Dat waren de vragen. Tot slot wil ik u vragen om de volgende gegevens in te vullen. Mijn leeftijd is ...

Q7.2 Ik ben een ...
- ❍ Man (1)
- ❍ Vrouw (0)

Q7.3 Ik woon in ...
- ❍ Biezenmortel (1)
- ❍ Esch (2)
- ❍ Helvoirt (3)
- ❍ Haaren (4)
- ❍ Anders, namelijk ... (5) _____

Q7.4 Ik woon in een ...
- ❍ Twee onder een kap (1)
- ❍ Rijtjeshuis (2)
- ❍ Kamer (3)
- ❍ Appartement (4)
- ❍ Vrijstaand huis (5)

Q7.5 Ik woon hier met ..... andere personen.

Q7.6 Waarvan ... kinderen (onder 18 jaar)

Q7.7 Mijn opleidingniveau is ...
- ❍ Basisonderwijs (1)
- ❍ Lager beroeps onderwijs (LBO) (2)
- ❍ Middelbaar Algemeen Voortgezet Onderwijs (MAVO, MULO, ULO) (3)
- ❍ Middelbaar Beroeps Onderwijs (MBO) (4)
- ❍ Hoger Algemeen Voorbereidend Onderwijs (HAVO, VWO, MMS, HBS) (5)
- ❍ Hoger Beroeps Onderwijs (HBO) (6)
- ❍ Wetenschappelijk Onderwijs (WO) (7)
- ❍ Weet ik niet. / Wil ik niet zeggen. (8)

Q7.8 Het jaarlijks bruto inkomen van het huishouden bedraagt ... (modaal inkomen is €33.000)
- ❍ €0 - €15.000 (1)
- ❍ €15.000 - €33.000 (2)
- ❍ €33.000 - €50.000 (3)
- ❍ €50.000 - €100.000 (4)
- ❍ meer dan €100.000 (5)
- ❍ Weet ik niet. / Wil ik niet zeggen. (6)

Q7.9 Ik ben ...
- ❑ student(e) (1)
- ❑ vrijwilliger (2)
- ❑ huisman/huisvrouw (3)
- ❑ werkzoekende (4)
- ❑ werknemer (5)
- ❑ werkgever (6)
- ❑ zelfstandige (7)
- ❑ gepensioneerd (8)
- ❑ anders, namelijk ... (9) _____
- ❑ Wil ik niet zeggen. (10)

Q7.10 Op wat voor manier bent u betrokken bij verenigingen en/of georganiseerde activiteiten op gebied van bijvoorbeeld sport, religie, cultuur, zorg en/of natuur & milieu?
- ❑ Als lid/deelnemer (1)
- ❑ Als vrijwilliger/organisator (2)
- ❑ Niet van toepassing (3)

Q7.11 Kunt u dat toelichten?

Q7.12 Heeft u nog vragen en/of opmerkingen naar aanleiding van de vragen over de verschillende onderdelen van deze enquête ('duurzame opwek van energie', 'energiegebruik inzichtelijk maken', 'informatie delen', 'verschuiven van energiegebruik', 'DEH') of het onderzoek in het algemeen?
Q66 Heeft u interesse om deel te nemen aan een interview en/of groepsdiscussie naar aanleiding van de resultaten van deze vragenlijst? Vul dan uw e-mailadres in op de volgende pagina*. Hartelijk dank voor uw deelname aan het onderzoek! Klik op 'doorgaan' [>>] om de vragenlijst in te leveren. * Wanneer u op 'doorgaan' klikt, wordt u doorgelinkt naar een nieuw webadres. Dit om te voorkomen dat er een koppeling gemaakt wordt tussen uw antwoorden en uw e-mail adres.

Appendix III Interviews

The topic list used for interviews with members and non-members

1. **Introductie**

- Introductie mijzelf
- Introductie onderzoek en relatie tot DEH en Enexis
- Interview duurt ongeveer 1 à 1,5 uur, ok?
- Introductie geïnterviewde
    - Kunt u wat meer over uzelf vertellen?
    - Heeft u een slimme meter?
    - Heeft u zonnepanelen?
    - Doet u mee aan SSmE?

2. **DEH:**

- Waarom bent u lid geworden van DEH? (zie overzicht resources + vragenlijst)
    - Wat was de aanleiding?
    - Waarom was u eerst geen lid?
        - Zonnepanelen, vrienden, leuk initiatief, duurzaamheid, lokaal, kleinschalig, energieneutraal
    - Wat is voor u het meest belangrijk?
    - Welke rol heeft DEH gehad op uw energiegebruik en/of opwek?
        - Bewustwording, nieuwe inzichten, andere prioriteiten
        - Onderscheid lid worden en lid zijn?
- Wat betekent het voor u om lid te zijn van DEH?
    - Wat hoopt u met het lidmaatschap te bereiken?
    - Wat is daarvoor nodig?
    - Lokaal/regionaal, kleinschalig, tegen gevestigde orde
- Labour/time/money
    - Wat is uw rol binnen DEH?
        - Lid, vrijwilliger, werkgroep, ALV, deelname aan activiteiten
    - Aan wat voor activiteiten neemt u deel?
    - Wat zou u eventueel voor DEH kunnen betekenen?
        - Expertise, netwerk, organisatie activiteiten
    - Tijd
        - Hoeveel tijd investeert u / kunt u / wit u investeren in DEH?
        - Relatie tot andere vrije-tijd bestedingen. Is dat een beperkende factor?
- Infrastructures: social networks and communication
    - Hoe/waar heeft u voor het eerst van DEH gehoord / gezien?
        - In welke vorm, wat wist u van DEH voordat u lid werd?
        - Vrienden, lokale krant, werk, poster
- Toekomst van DEH
    - Hoe ziet u de toekomst van DEH?
        - Groei, activiteiten, energieneutraal
    - Wat hoopt u dat DEH voor u kan betekenen?
    - Professionele ontwikkeling van DEH
        - Betaalde medewerkers
        - Samenwerking met energieproducent
    - Mogelijkheden en barrières
        - Waar liggen volgens u mogelijkheden en barrières in de verdere ontwikkeling van de energiecoöperatie?
            - Naar buiten toe: overheid, bedrijfsleven
                - Wider political environment, salderingsregeling, wetgeving
                - Social networks
            - Naar binnen toe: leden/nieuwe leden
                - Infrastructures (material, leidingen etc), social networks, communication

3. **SSME**

- Waarom doet u mee aan SSmE?
    - Zonnepanelen, vrienden, leuk initiatief, duurzaamheid, lokaal, kleinschalig, energieneutraal
    - Doelen van SSmE
- Op welke manier denkt u dat SSmE bijdraagt aan DEH?
    - Behalen doelen, ledenwerving,
- Wat hoopt u uit het project te halen?
    - Wat probeert u met uw deelname aan het project te bereiken?
- Zou u ook deelgenomen hebben aan het project als het los van DEH had gestaan, u de uitnodiging had gekregen van Enexis en u in een groep met onbekenden had gezeten?

4. Duurzame Energie Opwek

- De huidige situatie: zelf energie opwekken
    - Waarom wel/niet?
        - Meanings:
            - Verlagen energierekening, social gratification, civic gratification, local autonomy (zie overzicht)
            - Welke rol spelen ze, ten opzichte van elkaar?
            - Is dat veranderd sinds het lidmaatschap van DEH?
        - Materials
            - Soort dak, terugverdientijd, financiële middelen
        - Competences
            - Kennis over opwek, aanschaf, werking zonnepanelen
    - Hoe zag het traject van de aanschaf van zonnepanelen eruit?
        - Bij wie geïnformeerd, waar gekocht, hoe wist u dat zonnepanelen voor u geschikt waren, regelingen overheid (belastingvoordeel etc)?
        - Welke bijdrage hebben DEH, vrienden/kennissen, adviseurs en anderen daarin geleverd?
- Wanneer bekijkt u hoeveel uw zonnepanelen opwekken?
    - Specifieke situaties, weer
- Collectieve opwek: doet u dit al? Bekend mee?
    - Welke vorm heeft de voorkeur en waarom? Waarom ene wel/niet?
    - Wat zijn de voor/nadelen van de verschillende opties?
        - Eigen zonnepanelen
        - Met buren/vrienden
        - Collectieve opwek lokaal
        - Collectieve inkoopacties / aandelen in grootschalig energieproject
- Welke mogelijkheden liggen er volgens u voor DEH op gebied van (collectieve) duurzame energie opwek?
    - Welke vorm(en) spreken u aan?

5. Energiegebruik inzichtelijk maken

- Op welke manier bent u bezig met (het inzichtelijk maken van) uw energiegebruik?
    - Competences:
        - Op welke manier houdt u uw energiegebruik in de gaten?
            - Meterstanden, energierekening
            - Regelmaat
        - Welke gegevens van uw energierekening geven u het meeste inzicht in uw energiegebruik?
        - Wat zou u nog meer willen weten mbt uw energiegebruik?
    - Materials: Welke apparaten/hulpmiddelen gebruikt u daarvoor?
        - Verbruiksmanagers, websites, energierekening, meterstanden
- Meanings: Waarom wilt u meer inzicht in uw energiegebruik?
- Welke rol zou DEH kunnen spelen voor u in het inzichtelijk maken van energiegebruik?
    - Aan wat voor soort activiteit heeft u behoefte?
    - Voor welke staat u zelf ook open?
    - Wat voor soort initiatieven zouden volgens u niet werken?

6. Energiegebruiksgegevens delen (Sharing Energy Information)

Vergelijkt u uw energiegebruiksgegevens met anderen?

- Indien ja:
    - Met wie?
        - Vrienden, buren, onbekenden, familie, collega's
    - Meanings: Waarom wel/niet? (zie resultaat vragenlijst + resources overzicht)
        - Wat is het doel, wat probeert u er uit te halen?
    - Materials: Wat vergelijkt u / wat bespreekt u?
    - Is er iets wat u mist? Waarover zou u meer willen weten met betrekking tot uw energiegebruik?
    - Hoe denkt u dat DEH hieraan zou kunnen bijdragen?
    - Verschillende vormen van het delen van informatie (buren/vrienden, coöperatie, landelijk)
        - Wat zijn de voor en nadelen hiervan?
        - Waarom ene wel en andere niet? (zie enquête resultaten)
- Indien nee:
    - Waarom niet?
        - Gebrek aan interesse
        - Privacy
    - Zijn er bepaalde omstandigheden/gelegenheden waarbij u wél informatie hierover wilt delen?
    - Geldt dit ook voor tips en trics omtrent het verlagen van uw energiegebruik?

7. Verschuiving van Energiegebruik in de tijd (Time-Shifting of Energy Use)

- Hoe ziet uw energiegebruik er over de dag heen uit? Waar houdt u rekening mee? Hoe bepaalt u wanneer u energie gebruikt?
    - Pure willekeur, wanneer het uitkomt, dag/nacht tarief, eigen zonnepanelen etc.
- In hoeverre is het voor u mogelijk om uw energiegebruik te verschuiven?
    - Waarvan is dat afhankelijk?
        - Wanneer bent u bereid om uw energiegebruik te verschuiven? / voorwaarden
            - Financiële compensatie, eigen gebruik van energie, beter doen dan de buren/vrienden, inzicht in gebruik en opwek, automatisch apparatuur
            - comfort/gemak?
        - Weten waarom het nodig is
- Welke rol zou DEH hierin kunnen spelen?
    - Energie-cafés, SSmE

8. Afsluiting

- Denkt u dat ik nog relevante informatie heb gemist?
- Heeft u nog vragen aan mij?
- Follow-up interview voor vragen die op komen
- Heeft u nog tips/tops voor mijn komende interviews?
- Resultaten onderzoek / contact voor na interview

Interview with a board-member of DEH

1. **Introductie**

- Introductie mijzelf
- Introductie onderzoek en relatie tot DEH en Enexis
- Interview duurt ongeveer 1 à 1,5 uur

2. **DEH en Samen Slim met Energie**

- Hoe is DEH ontstaan?
- Wie zijn er lid van DEH? Wie doen er actief mee? (Labour)
    - Leeftijd, beroep, inkomen, herkomst (dorp)
    - Waarom worden mensen lid?
- Hoe werven jullie leden, wat is daarbij belangrijk? Wat werkt/wat werkt niet?
    - Is het moeilijk om vrijwilligers te krijgen en te binden?
    - Hoe proberen jullie nieuwe leden te bereiken?
    - Deelname van het lokale bedrijfsleven aan activiteiten
        - Financiële bijdrage?
- Sociale netwerken (networks)
    - Binnen DEH
    - Buiten DEH: andere coöperaties, bedrijven, gemeenten, overkoepelende organisaties
- Wat is de rol van het bestuur binnen DEH? (labour)
    - Activiteiten, tijdsbesteding, kennis/expertise
- Wat voor activiteiten worden er georganiseerd en wie komen daar op af?
    - Rol van bestuur en de leden bij deze activiteiten (labour, time)
        - Deelnemer, vrijwilliger
        - Hoeveel tijd besteden leden aan DEH? In hoeverre zijn andere vrijetijdsbestedingen hierbij een beperkende factor?
    - Met welke regelmaat?
- Hoe kijken jullie naar de toekomst: korte en lange termijn doelen
    - Wat zijn de ambities? En hoe willen jullie dat gaan bereiken
        - Aantal leden
        - Uitbreiden van activiteiten
        - Professionalisering
            - Wat voor kennis/expertise/skills mist er binnen DEH?
            - Wat zouden jullie graag willen uitbesteden?
        - Wet en regelgeving
- Welke rol speelt de politiek/huidige energie systeem
    - Hoe belangrijk is wet- en regelgeving?
        - Macht van de energielobby
    - Verenigde Energie Coöperaties Noord-Brabant
    - Hoe blijven jullie op de hoogte hiervan?
    - Wat zijn de meest besproken issues op dit moment?
- Wat is de toekomst van de energiecoöperatie?

3. **Afsluiting**

- Denkt u dat ik nog relevante informatie heb gemist?
- Heeft u nog vragen aan mij?
- Resultaten onderzoek / contact voor na interview

Appendix IV Code names interviewees

Interview No.	Member / Non-member / Board member	Code name
1	DEH member	IntM
2	Non-member	IntNM
3	Non-member	IntNM
4	DEH member	IntM
5	DEH member	IntM
6	DEH member	IntM
7	Non-member	IntNM
8	DEH member	IntM
9	Non-member	IntNM
10	Board member	IntBM

Appendix V List of Codes

meanings - social gratification (1)
meanings - material benefits (10)
meanings - local autonomy (2)
meanings - civic gratification (8)
materials (3)
competences – skills (0)
competences – knowledge (8)
Comfort (7)
Specific activities (17)

DEH - symb - social gratification (9)
DEH - symb - local autonomy (8)
DEH - symb - comm identity (13)
DEH - symb - civic gratification (24)
DEH - struc – time (5)
DEH - struc - social networks (14)
DEH - struc - political environment (0)
DEH - struc – money (5)
DEH - struc - material benefits (31)
DEH - struc – labor (26)
DEH - struc – gemak (5)
DEH - struc – communication (12)
DEH – struc (2)
DEH – SsmE (2)
DEH – professionalisation (10)

ShI – REG (8)
ShI – MEU (6)
ShI - meanings - social gratification (1)
ShI - meanings - material benefits (7)
ShI - meanings - local autonomy (0)
ShI - meanings - civic gratification (1)
ShI – materials (5)
ShI – DEH (8)
ShI - competences – skills (0)
ShI - competences – knowledge (2)
ShI – other (2)

MEU - meanings - social gratification (0)
MEU - meanings – other (3)
MEU - meanings - material benefits (14)
MEU - meanings - local autonomy (2)
MEU - meanings - civic gratification (0)
MEU – materials (16)
MEU – energysaving (2)
MEU – DEH (4)
MEU - competences - skills – REG (6)
MEU - competences – skills (8)
MEU - competences – knowledge (3)
MEU – other (2)

DEH – other (30)

REG - meanings - social gratification (1)
REG - meanings – other (11)
REG - meanings - material benefits (29)
REG - meanings - local autonomy (5)
REG - meanings - civic gratification (26)
REG - materials – other (25)
REG - materials - living environment (6)
REG - materials – DEH (4)
REG - materials – building (11)
REG – DEH (21)
REG - competences – skills (6)
REG - competences – knowledge (23)
REG - collective generation (27)
REG – other (1)

Tim – REG (4)
Tim - meanings - social gratification (0)
Tim - meanings – other (1)
Tim - meanings - material benefits (17)
Tim - meanings - local autonomy (0)
Tim - meanings - civic gratification 2)
Tim – materials (9)
Tim – DEH (2)
Tim - competences – skills (1)
Tim - competences – knowledge (4)
Tim - materials – comfort (9)
Tim – other (0)
SSmE - competences - knowledge (1)
SSmE - competences - skills (0)
SSmE - gemak (1)
SSmE - materials (0)
SSmE - meanings - civic gratification (2)
SSmE - meanings - local autonomy (0)
SSmE - meanings - material benefits (12)
SSmE - meanings - other (2)
SSmE - meanings - social gratification (8)
SSmE - MUE (4)
SSmE - ShI (5)

Appendix VI Reliability test

Reliability tests are conducted to determine the correlation between the variables. The tests generate a value for Cronbach's alpha which is a measure of reliability (Field, 2007). Based on these values can be determined whether or not the aspects can be regarded as measuring the same type of variable. A value between 0.55 and 0.85 is regarded as reliable with a value of 0.7 being the best outcome. A value lower than 0.55 implies a lack of similarity, whereas a value higher than 0.85 implies too much similarity among the variables. The test of reliability are only conducted for categories consisting of three or more variables.

VI – A Duurzame Energie Haaren

Local autonomy

Case Processing Summary

		N	%
Cases	Valid	72	97.3
	Excluded[a]	2	2.7
	Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.687	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Bewust worden van mijn energiegebruik	8.71	5.167	.410	.701
Zelfvoorzienend zijn in mijn energiegebruik	8.97	3.887	.616	.445
Tegenwicht bieden aan de grote energiemaatschappijen	9.40	3.455	.511	.601

Social gratification

Case Processing Summary

		N	%
Cases	Valid	70	94.6
	Excluded[a]	4	5.4
	Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.615	4

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Vrienden/bekenden hebben mij overgehaald om lid te worden	11.49	9.094	-.003	.801
Nieuwe contacten opdoen	10.51	4.688	.650	.304
Samenwerken met anderen	9.80	5.235	.664	.316
Kennis over duurzame energie en energiegebruik uitwisselen	9.09	7.558	.415	.546

Civic gratification

Case Processing Summary

		N	%
Cases	Valid	73	98.6
	Excluded[a]	1	1.4
	Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.739	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Anderen bewust maken van hun energiegebruik	9.67	2.224	.661	.548
Besparing van het milieu	8.70	4.213	.508	.750
Versterken van de lokale gemeenschap	9.36	2.788	.613	.592

Material benefits

Case Processing Summary

		N	%
Cases	Valid	71	95.9
	Excluded[a]	3	4.1
	Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.688	3

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Goedkope aanschaf van zonnepanelen	9.44	3.935	.380	.759
Verlagen van mijn energierekening	9.42	3.047	.694	.321
Bewust worden van mijn energiegebruik	9.20	4.246	.468	.640

VI – B Renewable Energy Generation

Local autonomy

Case Processing Summary

Bent u lid van DEH?			N	%
Nee	Cases	Valid	22	59.5
		Excluded[a]	15	40.5
		Total	37	100.0
Ja	Cases	Valid	65	87.8
		Excluded[a]	9	12.2
		Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Bent u lid van DEH?	Cronbach's Alpha	N of Items
Nee	.773	3
Ja	.729	3

Item-Total Statistics

Bent u lid van DEH?		Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corre-cted Item-Total Correlatio n	Cronba ch's Alpha if Item Deleted
Nee	Tegenwicht bieden aan de grote energieproducenten	9.273	3.160	.783	.482
	Op kleine schaal opwekken van energie	9.182	3.965	.707	.576
	Zelfvoorzienend zijn in mijn energiegebruik	8.455	6.831	.446	.862
Ja	Tegenwicht bieden aan de grote energieproducenten	9.662	2.602	.661	.514
	Op kleine schaal opwekken van energie	8.954	3.857	.565	.631
	Zelfvoorzienend zijn in mijn energiegebruik	8.677	4.441	.479	.728

VI – C Sharing Information

Civic gratification

Bent u lid van DEH?			N	%
Nee	Cases	Valid	20	54.1
		Excluded[a]	17	45.9
		Total	37	100.0
Ja	Cases	Valid	49	66.2
		Excluded[a]	25	33.8
		Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Bent u lid van DEH?	Cronbach's Alpha	N of Items
Nee	.918	4
Ja	.878	4

Item-Total Statistics

Bent u lid van DEH?		Scale Mean if Item Deleted	Scale Variance if Item Deleted	Correct ed Item-Total Correla tion	Cronbach 's Alpha if Item Deleted
Nee	Besparen van het milieu	13.65	10.766	.720	.925
	Verduurzamen van de energievoorziening	13.60	9.305	.843	.883
	Anderen bewust maken van hun energiegebruik	13.80	8.589	.826	.891
	Anderen helpen bij het verlagen van hun energierekening	13.70	8.537	.882	.868
Ja	Besparen van het milieu	14.12	7.943	.788	.823
	Verduurzamen van de energievoorziening	14.14	7.833	.740	.842
	Anderen bewust maken van hun energiegebruik	14.45	8.586	.665	.870
	Anderen helpen bij het verlagen van hun energierekening	14.65	7.606	.756	.835

VI – D Timing of Energy Practices

Material Benefits

Case Processing Summary

Bent u lid van DEH?			N	%
Nee	Cases	Valid	17	45.9
		Excluded[a]	20	54.1
		Total	37	100.0
Ja	Cases	Valid	53	71.6
		Excluded[a]	21	28.4
		Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Bent u lid van DEH?	Cronbach's Alpha	N of Items
Nee	.737	3
Ja	.488	3

Item-Total Statistics

Bent u lid van DEH?		Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Nee	Verlagen van mijn energierekening	9.18	4.154	.759	.375
	Het gebruiken van energie op het moment dat deze opgewekt wordt	9.65	6.243	.509	.709
	Het gebruiken van energie op het moment dat deze het goedkoopst is	8.94	6.934	.455	.764
Ja	Verlagen van mijn energierekening	9.13	3.501	.348	.379
	Het gebruiken van energie op het moment dat deze opgewekt wordt	10.08	2.648	.207	.605
	Het gebruiken van energie op het moment dat deze het goedkoopst is	9.51	2.293	.427	.154

Civic Gratification

Case Processing Summary

Bent u lid van DEH?			N	%
Nee	Cases	Valid	17	45.9
		Excluded	20	54.1
		Total	37	100.0
Ja	Cases	Valid	52	70.3
		Excluded	22	29.7
		Total	74	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Bent u lid van DEH?	Cronbach's Alpha	N of Items
Nee	.799	3
Ja	.716	3

Item-Total Statistics

Bent u lid van DEH?		Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Nee	Besparing van het milieu	8.76	6.316	.666	.708
	Verduurzaming van de energievoorziening	8.47	6.140	.851	.491
	Het gebruiken van energie op het moment dat deze opgewekt wordt	8.76	9.191	.458	.894
Ja	Besparing van het milieu	9.21	3.503	.711	.429
	Verduurzaming van de energievoorziening	9.27	3.377	.681	.448
	Het gebruiken van energie op het moment dat deze opgewekt wordt	9.90	4.167	.294	.940

Appendix VII Mann Whitney Test

The Mann Whitney test is a non-parametric test which can be used to compare data of two independent groups (Field, 2007). In this thesis it is used to compare members versus non-members, for example on the level of importance they assign to the meanings within the practices. The explanation below is a summary from the description in (Field, 2007).

In this test the scores of the respondents are first arranged in ascending order. For each of the scores is indicated to which group they belong to: in this thesis member or non-member. Then each of these scores gets a rank in which tied scores (e.g. 5 respondents assign an importance level of 3 to a certain meaning) get the average of the ranks. The ranks of each groups are summed and the lowest sum is used as the test statistic (U). Together with the mean and standard error of the test statistic, z-scores and significance levels can be calculated. When the 'exact sig. 1-tailed' < 0.05, the difference between members and non-members is significant.

VII – A Preferences towards forms of Collective Energy Generation, members versus non-members

Ranks

	Bent u lid van DEH?	N	Mean Rank	Sum of Ranks
Samen met vriend(en) of goede bekende(n): bijv. gedeelde zonnepanelen of zonnepanelen op het dak van vrienden.	Nee	33	49,00	1617,00
	Ja	67	51,24	3433,00
	Total	100		
Samen met buurtgenoten in een lokale coöperatie: bijv. gedeelde zonnepanelen op het dak van een school of buurthuis.	Nee	35	55,20	1932,00
	Ja	72	53,42	3846,00
	Total	107		
Samen met landgenoten in een grootschaliger energieproject: bijv. deelname aan een windmolenpark of zonnepark elders in Nederland.	Nee	35	47,81	1673,50
	Ja	72	57,01	4104,50
	Total	107		

Test Statistics[a]

	Samen met vriend(en) of goede bekende(n): bijv. gedeelde zonnepanelen of zonnepanelen op het dak van vrienden.	Samen met buurtgenoten in een lokale coöperatie: bijv. gedeelde zonnepanelen op het dak van een school of buurthuis.	Samen met landgenoten in een grootschaliger energieproject: bijv. deelname aan een windmolenpark of zonnepark elders in Nederland.
Mann-Whitney U	1056,000	1218,000	1043,500
Wilcoxon W	1617,000	3846,000	1673,500
Z	-,394	-,305	-1,526
Asymp. Sig. (2-tailed)	,694	,760	,127
Exact Sig. (2-tailed)	,725	,758	,147
Exact Sig. (1-tailed)	**,363**	**,388**	**,072**
Point Probability	,018	,010	,011

a. Grouping Variable: Bent u lid van DEH?

VII – B Competences within Monitoring Energy Use and Generation, members versus non-members

Ranks

Bent u lid van DEH?		N	Mean Rank	Sum of Ranks
Ik vind mijn energierekening onduidelijk	Nee	36	49.42	1779.00
	Ja	73	57.75	4216.00
	Total	109		
Ik heb geen idee hoe hoog mijn energiegebruik is.	Nee	36	53.21	1915.50
	Ja	74	56.61	4189.50
	Total	110		
Het is voor mij onduidelijk hoe ik mijn energiegebruik kan verlagen.	Nee	36	50.83	1830.00
	Ja	74	57.77	4275.00
	Total	110		

Test Statistics[a]

	Ik vind mijn energierekening onduidelijk	Ik heb geen idee hoe hoog mijn energiegebruik is.	Het is voor mij onduidelijk hoe ik mijn energiegebruik kan verlagen.
Mann-Whitney U	1113.000	1249.500	1164.000
Wilcoxon W	1779.000	1915.500	1830.000
Z	-1.429	-.585	-1.190
Asymp. Sig. (2-tailed)	.153	.558	.234
Exact Sig. (2-tailed)	.157	.566	.230
Exact Sig. (1-tailed)	**.079**	**.292**	**.117**
Point Probability	.001	.025	.000

a. Grouping Variable: Bent u lid van DEH?

Appendix VIII Wilcoxon Signed Rank Test

The Wilcoxon signed rank test is a non-parametric test that can be used to compare two related samples for which data of the population distribution is non-normal (Field, 2007; Ott & Longnecker, 2010). Using this test, the scores of members on one variable can be compared to the scores of members to another variable. In this research it was mainly used to determine the significance of the differences between the aspects as reasons to join DEH and meanings within practices. An example question answered by this test is: "do members, on average assign a higher value to one meaning compared to the other meanings?"

The following explanation of the test is a summary from the description as in (Field, 2007). The test first determines the differences between the pairs of measurements (i.e. value of meaning X – value of meaning Y). Those pairs that have a difference of zero are excluded. The remaining pairs are ranked from small to large based on their absolute differences. The smallest difference is ranked as 1, the second smallest as 2 etc. When multiple pairs have the same difference they each receive the average of ranks they span. The calculation of the test statistic is based on the number of positive and negative ranks. When most of the pairs have a positive difference, the sum of negative ranks is used and when most of the pairs have a negative difference, the sum of positive ranks are used to calculate the test statistic. This means that when there is a significant difference between the two variables based on negative ranks, the difference between the variables is positive (i.e. value of meaning X > value of meaning Y). Similarly, when positive differences are used, the difference is negative. Since the order of meanings in the tables is based on the average values assigned to the symbolic resources and meanings, mostly negative ranks are used.

The numbers in the cells show the p-values of the differences variables in the table (i.e. meanings or symbolic resources). The cells above the diagonal are the results for members of DEH, the numbers below the diagonal for non-members. The table is set up in such a way that for members the values represent the significance of the difference between the variable in the top row and the variable in the left column (row – column). For non-members this is the other way around and the values represent the difference between the variable in the left column and the variable in the top row (column – row). Since the order of the variables corresponds to the order of importance the significance levels mostly negative ranks are used. In case positive ranks were used, this is indicated with an '*'. The green cells indicate a significant difference using a one-sided significance level (α) of 0.05, the yellow cells indicate a significant difference using $\alpha = 0.1$, and the orange cells indicate that there is no significant difference between the variables.

Among the numbers of non-members, more p-values are based on negative differences which are indicated by a '*'. This corresponds to the results the statistical analyses which shows that the order of importance of meanings within the practice differs between members and non-members. Therefore, more positive ranks are used for non-members.

VIII – A Relative importance of motivations to participate in Duurzame Energie Haaren

	Saving on the environment	Becoming aware of my energy use	Lowering my energy bill	Cheap procurement of solar panels	Exchanging knowledge and experiences on energy use	Being self-sufficient in my energy use	Strengthening the local community	Making others aware of their energy use	Countervailing large scale energy producers	Working together with others	Gaining new contacts	Friends have persuaded me to become a member
Saving on the environment		0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Becoming aware of my energy use			0.025	0.120	0.017	0.027	0.025	0.000	0.000	0.000	0.000	0.000
Lowering my energy bill				0.259	0.374	0.288	0.224	0.010	0.002	0.000	0.000	0.000
Cheap procurement of solar panels					0.368	0.334	0.400	0.063	0.014	0.001	0.000	0.000
Exchanging knowledge and experiences on energy use						0.392	0.416	0.013	0.014	0.000	0.000	0.000
Being self-sufficient in my energy use							0.486 *	0.036	0.003	0.000	0.000	0.000
Strengthening the local community								0.007	0.014	0.000	0.000	0.000
Making others aware of their energy use									0.319	0.003	0.000	0.000
Countervailing large scale energy producers										0.119	0.000	0.000
Working together with others											0.000	0.000
Gaining new contacts												0.000
Friends have persuaded me to become a member												

VIII – B Relative importance of meanings within Renewable Energy Generation

		Members							
Non-Members		Saving on the environment	Making the energy provision more sustainable	Lowering my energy bill	It is fun to generate energy myself	Being self-sufficient in my energy use	Generating energy on a small scale	Countervai-ling large scale energy producers	Local autonomy
	Saving on the environment		0.398	0.005	0.002	0.001	0.000	0.000	0.000
	Making the energy provision more sustainable	0.313		0.012	0.008	0.004	0.000	0.000	0.000
	Lowe-ring my energy bill	0.484	0.336		0.437	0.377	0.034	0.000	0.001
	It is fun to generate energy myself	0.004	0.001	0.020		0.225	0.004	0.000	0.000
	Being self-sufficient in my energy use	0.404	0.230	0.436	0.017		0.012	0.000	0.000
	Generating energy on a small scale	0.012	0.005	0.021	0.368	0.006		0.000	0.116
	Countervailing large scale energy producers	0.005	0.003	0.017	0.252	0.003	0.373		0.000
	Local autonomy	0.009	0.004	0.035	0.467	0.003	0.194	0.073	

VIII – C Relative importance of meanings within Monitoring Energy Use and Generation

		Members						
Non-members		Saving on the environment	Making the energy provision more sustain-nable	Lowering my energy bill	Being self-sufficient in my energy use	It is fun to monitor my energy use	Talking with others about energy	Compa-ring my energy use to others
	Saving on the environment		0.034	0.015	0.000	0.000	0.000	0.000
	Making the energy provision more sustainable	0.359		0.186	0.002	0.000	0.000	0.000
	Lowering my energy bill	0.036 *	0.012 *		0.012	0.000	0.000	0.000
	Being self-sufficient in my energy use	0.030	0.139	0.001		0.155	0.000	0.000
	It is fun to monitor my energy use	0.040	0.170	0.003	0.406 *		0.000	0.000
	Talking with others about energy	0.000	0.000	0.000	0.000	0.000		0.047
	Comparing my energy use to others	0.000	0.000	0.000	0.003	0.001	0.212 *	

VIII – D Relative importance of meanings within Sharing Information

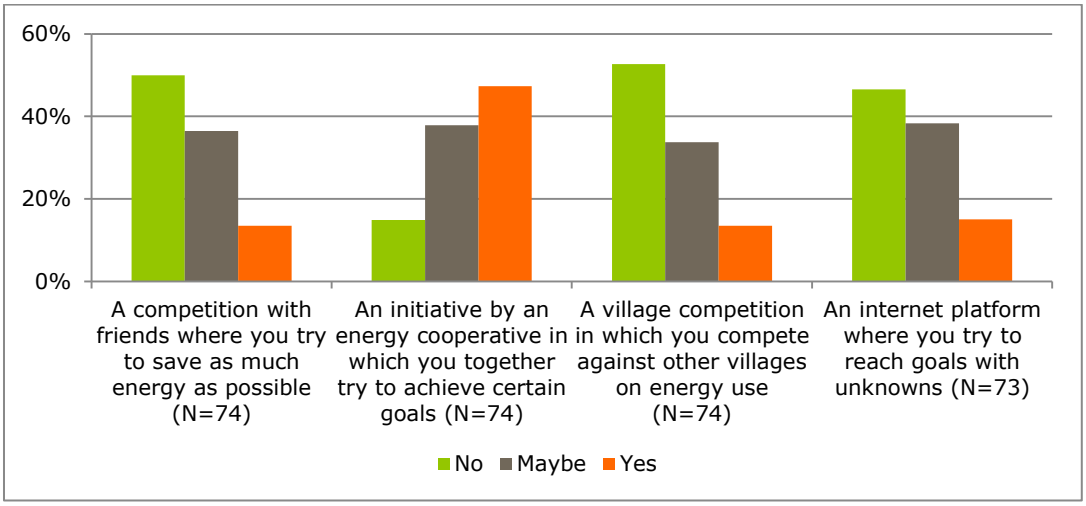
		Members								
Non-members		Saving on the environ-ment	Making the energy provision more sustain-able	Getting more insight in my energy use	Making others aware of their energy use	It is fun to talk with others about energy related subjects	Lowering my energy bill	Helping others to lower their energy bill	Working together with others	Countervailing large scale energy producers
	Saving on the environment		0.500	0.043	0.011	0.002	0.010	0.000	0.000	0.000
	Making the energy provision more sustainable	0.344 *		0.061	0.027	0.004	0.013	0.000	0.000	0.000
	Getting more insight in my energy use	0.232	0.162		0.338	0.108	0.042	0.076	0.005	0.000
	Making others aware of their energy use	0.609	0.391	0.230*		0.132	0.254	0.043	0.001	0.000
	It is fun to talk with others about energy related subjects	0.093	0.051	0.316	0.060		0.472*	0.429*	0.035	0.004
	Lowering my energy bill	0.334 *	0.500	0.090 *	0.304*	0.119*		0.393	0.141	0.004
	Helping others to lower their energy bill	0.363*	0.637	0.125*	0.313*	0.018*	0.500		0.036	0.002
	Working together with others	0.063	0.055	0.500	0.145	0.383*	0.122	0.016		0.048
	Countervailing large scale energy producers	0.013	0.003	0.029	0.013	0.074	0.006	0.003	0.039	

VIII – E Relative importance of meanings within Timing of Energy Practices

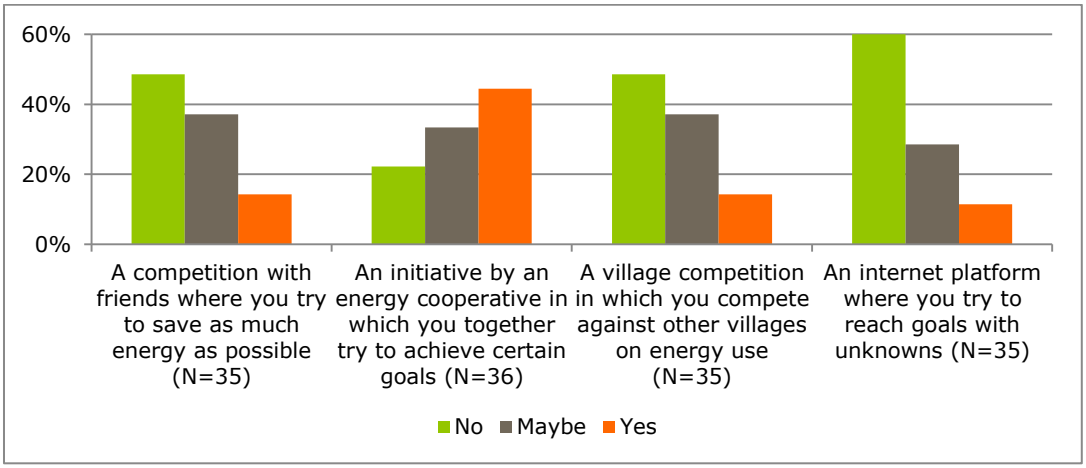
		Members						
Non-Members		Lowe-ring my energy bill	Saving on the environme nt	Making the energy provi-sion more sustaina ble	Using energy when it is cheapest	It is fun to consciousl y deal with my energy use	Being self-sufficient in my energy use	Using energy when it is generated
	Lowering my energy bill		0.179	0.112	0.006	0.000	0.000	0.000
	Saving on the environment	0.120		0.291	0.235	0.001	0.021	0.000
	Making the energy system more sustainable	0.308	0.250 *		0.303	0.007	0.026	0.001
	Using energy when it is cheapest	0.500 *	0.074 *	0.211 *		0.112	0.137	0.006
	It is fun to consciously deal with my energy use	0.068	0.177	0.065	0.040		0.401	0.082
	Being self-sufficient in my energy use	0.010	0.115	0.031	0.004	0.344		0.062
	Using energy when it is generated	0.060	0.381	0.188	0.037	0.433 *	0.125 *	

Appendix IX Extra Figures

IX – A Perspectives towards different forms of Sharing Information,



Members



Non-members