COLLABORATING WITH COMMUNITIES

A STEDIN SERVICE ENABLING LOCAL ENERGY COMMUNITIES TO BECOME THEIR OWN ELECTRICITY SUPPLIER

Master Thesis by **Frans Dijckmeester** - September 2020 **TU Delft**

STEDIN.NET TU Delft

Collaborating with communities
A Stedin service enabling local energy communities to become their own electricity supplier

Master thesis Strategic Product Design

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I would like to dedicate this thesis to all the unknown volunteers who make the energy transition possible in the Netherlands. Keep up the good work and keep building a just energy system!

EXECUTIVE SUMMARY

The energy grid is transitioning from a centrally controlled demand response system to a decentralized supply response system. There are multiple reasons for this, but the main one is the need to transition to a low carbon energy system to tackle climate change and decrease our dependency on non-renewable energy sources. Next to this consumers become *active consumers* (prosumers) and increasingly take control over their local (energy) situation. As a result this transition creates a multitude of challenges and demands a re-design of the energy system.

Stedin, the Netherlands 3rd largest Distribution System Operator (DSO), set out to find a solution to the challenges posed by the energy transition. The concept they came up with was a design for a Layered Energy System (LES). By running two pilots LES is fully developed and almost ready to be made available for the larger public in the form of a re-branding of LES to Lokaal Energy Flexibel (LEF). However, how LEF should be made available remains unknown. So in order for LEF to be launched to a larger public a new service needs to be designed. A service that sets out to communicate the information which is needed to start your own Local Energy Community (LEC) and collaboratively with Stedin and a service provider of choice set up a LEC. Designing this service is the task set out to solve in this project. One other task is determining what the role of Stedin should be in this process of setting up a LEC. The dilemma is Stedin wants to facilitate LECs and the market but on the other hand should not in turn take over responsibilities of the market. The methodology used to solve the aforementioned problem is *service design.*

A concept service design is made that sets out to help communities explore how to set up a LEC. The design is centered around a *community dashboard* that shows the current energy situation within a community. All the data found in this dashboard can then also be used in a *community configurator* to create an ideal design for the local situation and community vision. This design is then communicated to Stedin in the form of a *project sketch*. Stedin can give feedback or a ‘go’ on the project sketch. This ends the explore phase, after which a LEC can turn to the market for materializing the design.

The concept service is communicated with a future service scenario and a service blueprint. Out of this service blueprint the LEF landing page and the community configurator are prototyped and tested with potential users.

After testing the solution and direction proved to be in the right direction. However a ‘dumb’ configurator as tested was found challenging for the typical community leader. This result vouches for a more data driven and automated configurator as proposed in the future service scenario. The thesis is concluded with a roadmap for implementation and advice on how to create an MVP as the first step towards implementing the service design.

Keywords: Local Energy Communities, Layered Energy System, Energy transition, Stedin, Service design, Energy Community Formation, Collaboration, Communication, prosumers,

PREFACE

The energy transitions' complexity and the sheer size has a tantalizing effect on me. The feeling that something big is happening makes me want to chip in with my design skills. This is mainly because I believe transitions come with great responsibility and opportunity, because there is no guarantee that a transition will lead to something better. One of the contributing factors to this interest in the energy transition was a presentation in 2017 at the annual conference *HIER Opgewekt.* It was a presentation about a pilot testing a new model for the energy grid by a Dutch grid operator. Little did I know that the very person giving this presentation would become my company mentor at Stedin more than two years later!
The assignment Stedin and I decided on was to define which role Stedin should take towards Local Energy Communities and determine how this role should be filled-in. An assignment I worked on with great pleasure because it focused on what I like to do: to make new technology available and relevant for end users.

This project was carried out almost completely during the first peak in the Netherlands of the Covid-19 pandemic. But even while social distancing design is a very collaborative effort. This was also the case in this project and therefore I would like to thank a few people. This project would not have been possible without:

- My supervisory team, which consisted of Jotte de Koning (Mentor) and Abhigyan Singh (Chair) from the TU Delft and Bart Smakman and Jan Pellis from Stedin. I would like to thank them sincerely for all the help and input during our meetings that made this project a success;
- All my other colleages at Stedin who helped in this project. Especially Arjen Zuijderduijn and Elma Cosic;
- All the energy community members I interviewed and all the participants in the multiple co-creation sessions that gave their input with great enthusiasm. A special thanks for giving advice at each step for Wijnand Jonkers and Ernst van Zuijlen from the energy community in the making *Ecowijk Mandora (*Houten);
- I also would like to thank the external experts who made time in their busy schedule to talk to me: Stefan Lodewijxck from i.Leco, Tom Westra from Spectral and Job Stuurman from Alliander;
- Lastly I would also like to thank my friends and family for their support, you know who you are!

Enjoy reading.

Frans Dijckmeester
8-9-2019
Rotterdam

GLOSSARY

Abbreviation	Term	Description
LEC	Local Energy Community	A group of people organizing themselves in an energy community limited by a geographic boundary
LES	Layered energy system	The concept developed by Stedin to enable local energy sharing in a Local energy market
LEF	Lokaal Energie Flexibel	The branding of the Layered energy system. This is the name used towards communities when talking about LES
LEM	Local Energy Market	A local market for electricity
Flex	Flexibility	The ability to match energy demand to supply
-	Flexible Assets	Assets that are flexible in when they draw electricity from the grid or the local energy community. Examples are: EVs & batteries
DSO	Distribution System Operator	A network operator of the energy distribution (including electricity but also gas and heat) grid
TSO	Transmission System Operator	The operator of the high voltage electricity and other energy grids. The link between the production and the DSO's grid
-	Energy supplier	The energy supplier delivers electricity and or gas to consumers and is for small consumers the only contact point right now
BRP	Balance responsible party	Balance responsible parties (BRPs) are responsible for maintaining supply and demand on the energy market within their own portfolio
PV	Programma- verantwoordelijke	A market party that buys energy on the wholesale market for energy suppliers
KDO	Kenniscentrum Duurzame Opwek	The department at Stedin responsible for assisting and informing Renewable energy collectives and LECs
KAM	Key Account management	The department at Stedin responsible for managing all larger accounts, including LECs in the future
K&M	Klant & Markt	The division at Stedin under which all departments connecting to customers are placed
-	Service provider	A company that services LECs. This included things like software, hardware and balance responsibility
SBP	Service blueprint	A scheme of a service. It can be seen as the technical drawing of a service
MVP	Minimum viable product	The simplest version product that is ready to be used, with the minimum amount of features satisfy early customers

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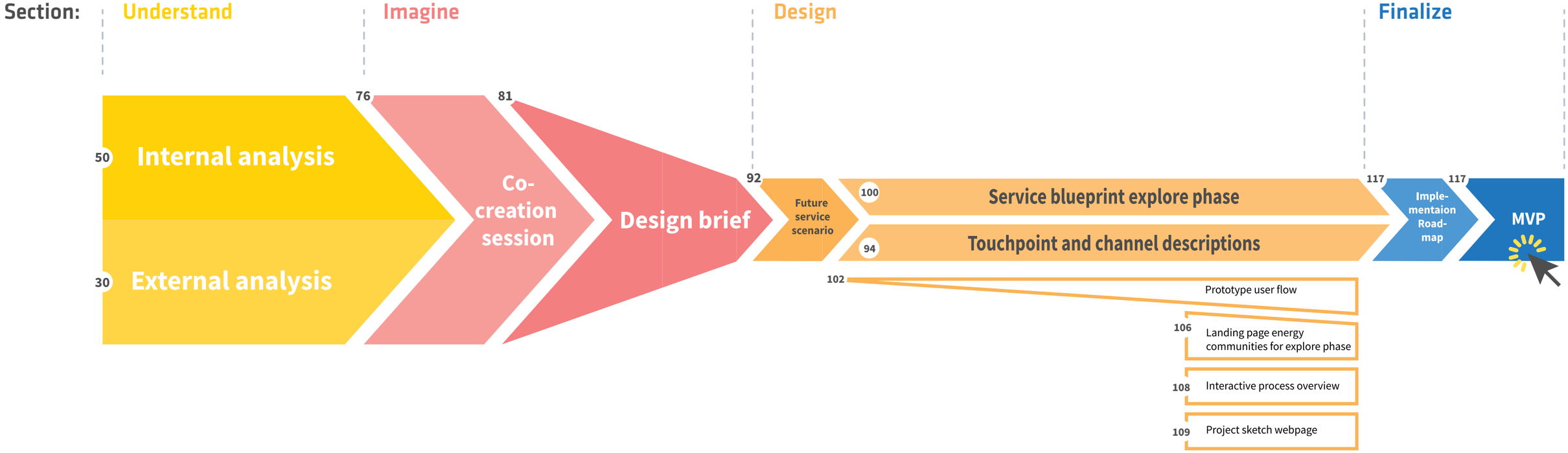
CLICKABLE PROCESS OVERVIEW



Reading guide

This thesis is meant to be read digitally in a suitable PDF viewer like preview or Adobe Acrobat reader. The reason for this is that all references are linked and clickable, even when they don't look like a link. So chapter and appendix references throughout the text can be clicked on taking the reader to the specific section. Also throughout the report there are a few links to larger versions of the images, since some visuals are not meant to be displayed this small. The figure above serves as an index as well and is also clickable!

Large image repository

All large images in this report are shared online in their full resolution. The folder containing all images can be accessed by following this link: https://drive.google.com/drive/folders/1pZBXmziK0lb9rgk179Kb9ZvdBqlQnqPl?usp=sharing, or in the case of someone printing this report by scanning the QR code on the right

1

INTRODUCTION

In this section the project assignment is discussed. Consecutively the decision for a service design approach is made and explained.

1.1

ASSIGNMENT

In this chapter the assignment is discussed. This assignment formed the basis of the project and is taken as the starting point.

1.1.1 Introduction context

In 2030 the Netherlands' target is to generate 70% of the demand for electricity in a renewable way. [1] This means there is just 10 years to complete the biggest transition to have ever happened in the Dutch energy system. On top of this renewable energy is not an on demand energy source. We can tweak a gas plants' output, but we cannot decide when the sun needs to shine. This means Stedin has to make large investments to create an energy grid that is capable of handling these peaks and avoid grid congestion. This will cost a lot of time, effort and money.[4]
In order to make the energy transition towards renewable sources of energy achievable Stedin is looking at ways to make use of the current energy grid as efficiently as possible. A very important aspect in this is 'peak shaving'. This is because an electricity grid is dimensioned based on the expected peak load: reducing the 'peaks' can therefore have a dramatic effect on the investments needed to increase grid capacity.
A method to reduce peaks and congestion is what Stedin calls 'Flexibility, Flex in short'. Flexibility is the ability to actively steer supply and demand on the consumer side.[2] Creating flexibility on a grid can be done in multiple ways: cooling your warehouse a bit more or throttling the charge rate of you electric vehicle.
One of the solutions to create flexibility on the neighborhood level is the concept of a neighborhood operating a Layered Energy System (LES). In the LES concept this neighborhood forms a Local Energy Community[1], LEC in short. An LEC is a group of people, mainly based on geography, that can trade energy between each other. This energy community would have a dynamic electricity price based on the supply and demand of renewable energy within the community, enticing as much local use as possible and creating 'flexibility' in the process. In turn resulting in a lower load on the local and national energy grid and a lowered need to increase energy grid capacity. This results in lowered operating costs for Stedin and as a whole makes the energy transition more affordable. This is why Stedin is actively developing LES: it is a source of the flexibility that is needed in the energy system of the future.
For the energy communities it means a lower electricity bill and bigger return on their investment in renewable energy technology like photovoltaics or energy storage. Especially when the salderingsregeling[2] comes to an end. It also arguably also makes the community more resilient since they are less reliant on external companies providing them their electricity and creates a greater sense of community in a neighborhood. It also gives a neighborhood and its residents a way to contribute to a more sustainable world. Therefore LES has the potential to be a win-win situation when fully developed for energy prosumers and Stedin. However, there are still plenty of challenges to overcome.

Origin of LES and situation right now
Stedin wrote a white paper about a proposition for a *Layered Energy System* in 2017.[29] LES in short. In this white paper a conceptual future energy grid is proposed where energy is shared and sold between members of the community.
Not as a definitive solution, but as a thought provoking piece. To quote Stedin: "This white paper was written with a forward-thinking mindset and should thus not be considered as our definitive viewpoint or the single possible route forward. Instead, it is meant to elicit new ideas among our readers, as an open invitation for further debate."
To validate and further develop a LES a pilot is conducted in Dordrecht in the neighborhood *Hoog-Dalem*. This pilot has a wealth of information to serve as a basis for developing a strategy to scale up and improve LES to other aspiring energy communities.

1.1.2 Problem statement

There are two sequential problems in the begin phase (see Figure 1.1 - 1) of an potential Local Energy Community (LEC):

1. The principle and operating of a 'Layered energy system' (LES) is still perceived as complicated to grasp and difficult to implement for LECs. However, Stedin has currently no formalized channel to communicate knowledge to potential LECs about LES. For the aspiring communities this means they cannot access the information they desire and need about LES to create a plan to implement LES and to communicate this to Stedin. This in turn means potential communities cannot effectively receive guidance from Stedin in setting up their community smart grid (LES). This creates an information dependency loop where progress is slowed down or in the worst case both parties don't get a step further.
2. The situation right now is that projects are only being assisted by Stedin if they are a pilot. All other initiatives get no real help from Stedin. This results in a 'custom' approach per community right now. For LECs that are no pilot of Stedin there is no means to collaborate effectively with them and these LECs are mainly on their own. Therefore the amount of LECs can't increase right now, but Stedin does need to scale the number of LECs to create enough 'Flexibility' in the future.

1.1.3 Scope and solution space

The scope is to design a solution so that: 1) all the potential communities can collaborate and access information & tools to create their LEC and then can transparently inform & involve Stedin about their plan to implement LES and 2) Stedin has a way to then collaborate with communities efficiently that don't meet a learning goal of Stedin and therefore won't get (substantial) assistance. Both parts of the design are focused on the 'begin phase' of the community life cycle. See Figure 1.1 - 1 for a schematic representation of the scope. The main target 'users' would be the community leaders, since they have to cooperate with Stedin.

This leads to the following solution space:

The design for a service (including tools) to enable effective communication and collaboration with potential energy communities with the goal to increase the adoption ease and rate of LES for LECs.

1 The term Local Energy Community is defined as such by stedin. However if this neighborhood is really a community according to definitions in literature depends on other factors than only using LES.

2 The current situation for home owners that generate their own electricity with PV is that prosumers can sell back their surplus electricity to the grid for a discount on their energy bill. This system is currently organized like this by the 'salderingsregeling' law from 2014. This will change in the future: the salderingsregeling will be phased out.

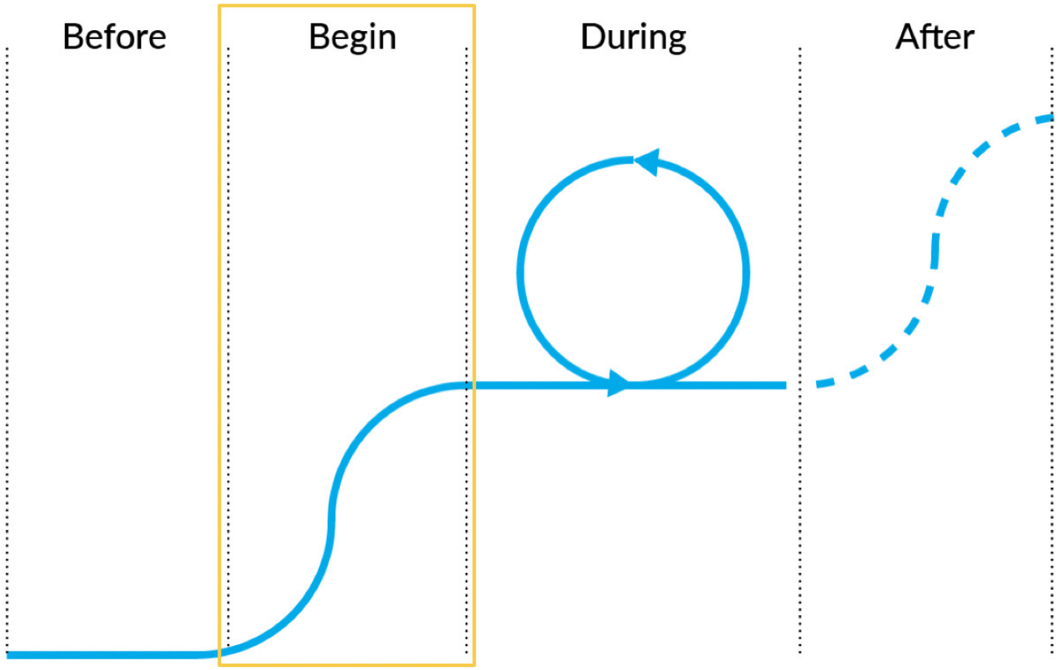


Figure 1.1 - 1: Schematic representation of the scope of the project and the solution space

Image 1.1 - 1: Hoog-Dalem, the first LEF based local energy community

1.2

METHODOLOGY

Service design is expected to be a good methodology for tackling the problem statement this thesis aims to solve. Why this is the case is further explained in this chapter. Lastly a very brief introduction of service design methodology and it's characteristics are given.

1.2.1 Nature of the project and approach

The energy sector as a whole is in a state of transition.[4] A transition from a centralized demand response system to an electricity system that operates based on (renewable) supply response. This transformation is called the energy transition. Under this macro trend there is the smaller trend of cooperative or community energy: people are increasingly becoming involved in the generation of electricity, where they used to be only consumers.

This also means the customer base of Stedin is changing, and is likely to keep changing until the energy transition is completed. Because of this change the services and attitude of Stedin needs to change, preferably proactively.

As a result Stedin's service offering needs to change. This in turn calls for service innovation. In this case this means developing a new service to collaborate and communicate with energy communities, as laid out in chapter 1.1.

This asks for an more hands on practical approach to design. For example, no extensive literature study is performed. The reasoning being that due to the experimental nature of energy communities under development right now in the Netherlands, literature does not provide enough input to design a service as set out in the assignment. Instead primary research in the form of in depth interviews and co-creation are used as tools to innovate Stedin's service offering.

1.2.2 Why service design

Stedin is a large service provider: it provides one of the most essential services in our modern world. These services grew organically evolving slowly as their external context changed. However, the speed of this change has accelerated in the past couple of decades and utility companies have a hard time keeping up.[5] Where a service could grow more organically in the past, nowadays they need to be purposefully designed in order to keep up with their changing environment and higher demands from customers. It ivs therefore not really a far fetch to use 'service design' to shape the service offering of a service provider. However, it should be acknowledged that service design is one of many methods trying to offer guidance in this change process. These methods are not exclusive, they are just suited for different levels of known knowledge. Design is especially useful in the earlier stages of service development, often called the 'fuzzy front end' of design where there are a lot of unknowns. This is certainly the case with the status of energy communities wanting to experiment with energy sharing and local energy markets.

1.2.3 Service design methodology

In the end service design, and especially service innovation, is about trying to answer the question: will our offering make sense in the context of people's lives, and will they find it valuable?[7] The primary concern is to reduce risk by making sure that the value proposition is viable, desirable and feasible. This is the goal of service design.

The main school of thought of service design is that, to quote Lavrans and Reason: "It is essential to understand that services are at the very least, relationships between providers and customers, and more generally, that they are highly complicated networks of relationships between people inside and outside the service organization." This means the end-user should be at the focus, **human-centeredness** being the first characteristic of service design. This leads to the second characteristic of service design, **collaboration**. Recognizing the end-user as co-producer of the service and therefore involving the end-user in different ways in the design process. Thirdly, this also means looking at the organization from the perspective of the end-user. So instead of thinking in the regular departmental 'silos' of an organization, service design looks at a service from a **holistic** viewpoint and aims to tear down said silos to create a unified service experience. Because for end-users gaps in the service experience are also part of the service and can lead to great frustration. Lastly the school of thought in service design is to learn by doing. It is **experimental** in nature to learn as much as possible in a short amount of time and aims to deliver results quickly by using design methods like prototyping. Combining these four into one process requires a great deal of **mental agility**, the last characteristic of service design. See Figure 1.2 - 1 for a schematic overview of the service design thinking and doing mindset.

The process followed is most of the time roughly the double diamond model, developed by the design council in the UK.[6] In my project I also use these four stages, albeit they are called a bit differently. For an overview of the stages of this project see Figure 1.2 - 2.

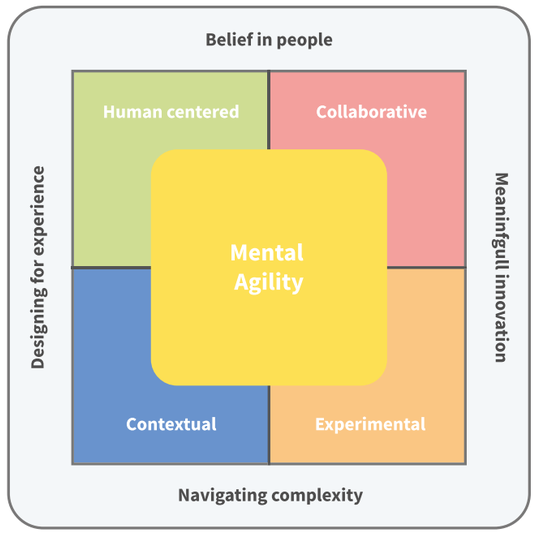


Figure 1.2 - 1: Service design thinking mindset (copyright Livework studio 2019)

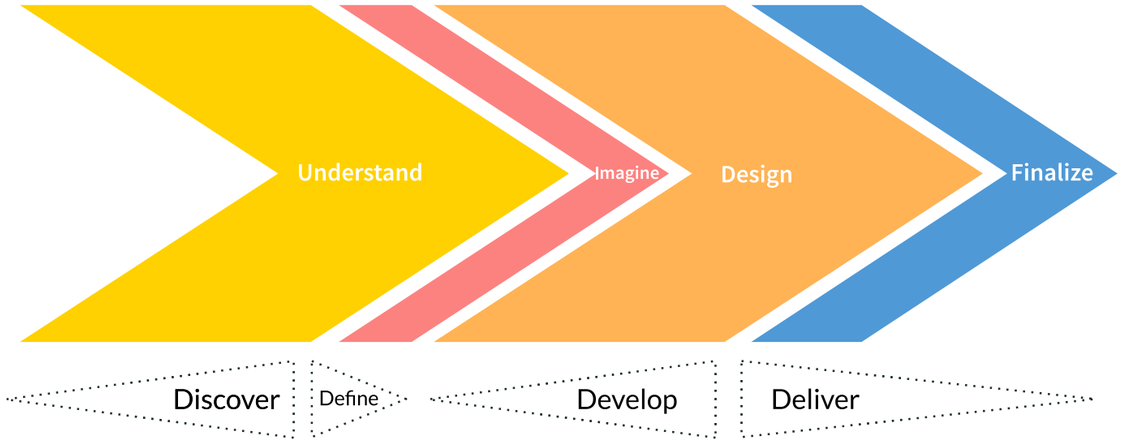
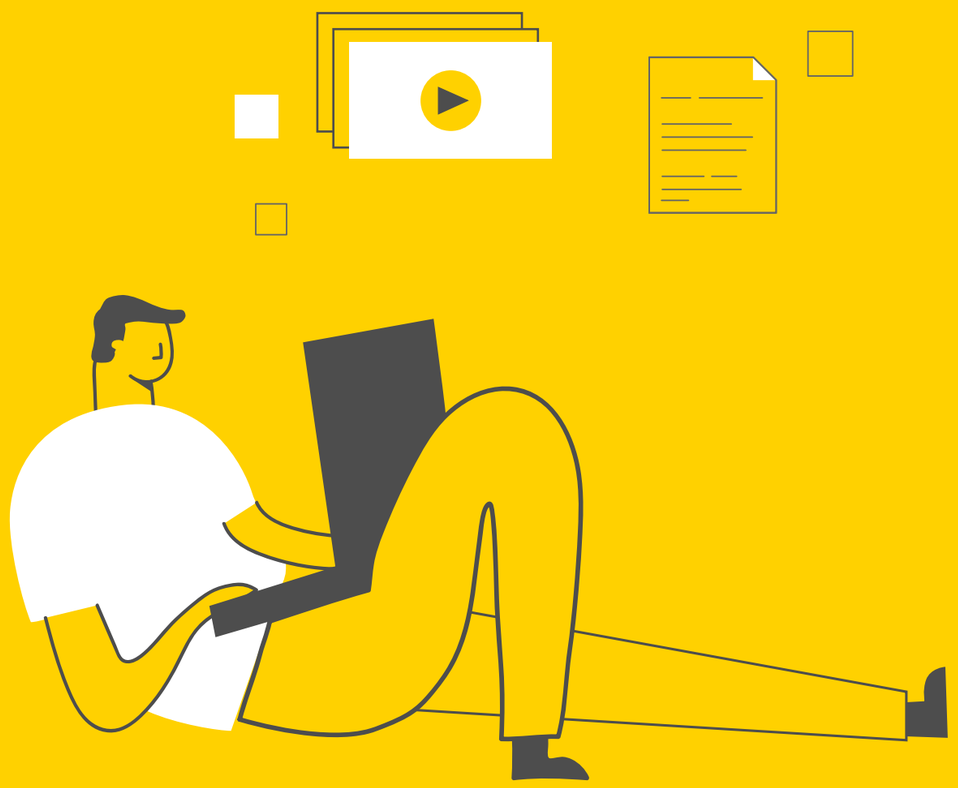


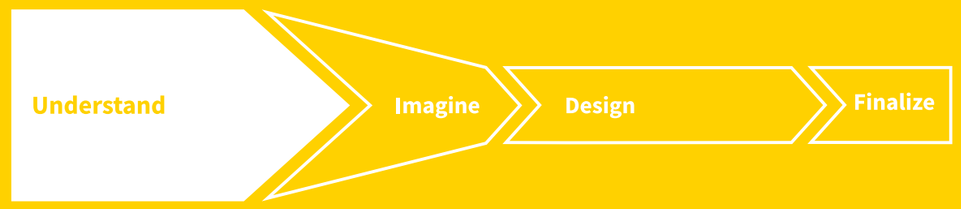
Figure 1.2 - 2: Project set up and relation to the double diamond

2

UNDERSTAND

This section of the report comprises the understand phase of the project. The understand phase is about analyzing the internal and external context. First an overview of the stakeholders and context of a LEC is given. Then per stakeholder the insights from the interviews are given next to a general introduction and discussion. This phase is concluded with developing a set of the guiding principles for LECs and Stedin





2.1

UNDERSTAND PROCESS

This chapter explains which method is chosen to be used to understand the context. This phase is therefore called the *understand* phase. The understand phase is where most of the primary and secondary research is done. The internal analysis consists of stakeholder interviews, a vision workshop and internal documentation. The external analysis in the understand phase is all done through in-depth interviews with (potential) LECs, two service providers and one expert from another DSO.

2.1.1 In-depth interviews with community members

An external analysis is part of almost every design project. The goal is almost always to understand people and their relations. Due to the circumstances of the project and the effectiveness of the method, the choice is made to perform the external analysis through in-depth interviews. They were conducted through video conference.

In-depth interviews are long open-ended interviews that strive to understand a person's perception, values, opinions, needs and behavior in general. Most of the time an interview guide is prepared with themes and a few topics per theme to discuss. This approach was used when conducting the interviews. For the complete interview guide see Appendix A.

In this project the specific goal was to understand what characterizes energy communities and their members. The main research question of the in-depth interviews is: Why different people (and the group they make up) want to form an energy community and what this process of forming an energy community looks like.

Themes covered in in-depth interviews:

- Introduction and the interviewees' link to the energy community;
- Interviewee's knowledge and opinion about renewable energy and sustainability in general;
- Interviewees understanding of knowledge about forming and being in an energy community;
- Interviewee's experience and attitude towards the energy community they are a part of, with a specific focus on the interaction and perception of Stedin.

Criteria

Due to the limited amount of active energy communities also aspiring energy communities are included in the interviews. This group is considered a *potential Energy Community*. However, a criteria was that the leaders of these potential LECs did know about LEF and the *Hoog-Dalem* pilot and expressed interest in the concept. This resulted in a total of 10 residential energy community members that have been interviewed, from which six can be considered community leaders. All (potential) energy communities are located within Stedin's operating area.

Participant recruitment process:

- Selecting energy communities to be interviewed in consultation with the LEF core team that fit the criteria. This was done using a list of all the active energy communities in Stedin's operating area;
- Contacting the selected energy community leaders if they would be willing to be interviewed;
- Conducting in-depth interviews with community leaders from various (potential) energy communities;
- Asking the community leaders if they could ask within their community if members would also be willing to be interviewed;
- Conducting in-depth interviews with community members.

Synthesis of in-depth interviews with community members

The real value of interviews only comes when they are analyzed. In this project this is an ongoing process of reflecting after each interview and also doing a structured analysis after the round of interviews. The method used for synthesis was one relatively standard in qualitative research and service design. The method followed is based on the method in the book service design: from insight to implementation [7] and consist in this project of:

- Creating a coding guide based on the interview guide and enriched with frameworks from scientific literature. See appendix E for the complete coding guide;
- Listening to the interviews while partially transcribing relevant insights. When the quote was transcribed also the interpretation of what was said is written down next to the quote in English, along with a timestamp. When an especially insightful statement was made it was highlighted and logged in a reflection logbook;
- To do the actual coding, all quotes were transferred into a digital whiteboard tool (Miro) as post-its. See Figure 2.1 - 1 for screenshot of all the quotes;
- Each post-it was consecutively coded (tagged) based on the coding guide. When a post-it made an interesting remark that did not fit in the coding guide, a new code was created and added to the coding guide;
- After all the digital post-its were coded, the real synthesis started. Per theme of the coding guide, each code was analyzed by going through all the quotes it held. Insights around this code were written down with example quotes that clarified and substantiated the insights;

Use of the in depth interviews

The above mentioned process resulted in a extensive 'insight' document that serves multiple purposes throughout the project. The two most important being: creating the guiding principles and the customer journey of the current situation.

2.1.2 Stakeholder interviews

Parallel to the in-depth interviews with community members six key stakeholders were interviewed. Of these six, three were internal stakeholders (Stedin

Figure 2.1 - 1: An overview of all the 576 clustered statements

employees) and three external (service partners or an employee of another DSO).

The purpose of these interviews was the same as for the community members: to understand their and their company's needs and opinions. This input can then be used later on to make decisions about the service design and serve as input for the design brief. Next to serving purely a functional goal, there is also the aspect of getting to know Stedin and its employees better. Also, these stakeholders could be part of the service and its implementation and development. Therefore, it is important to involve and consult them as early on as possible.

Internal stakeholders interviewed

Internal stakeholders were interviewed through video conference. Questions were prepared in advance. It also must be noted here that more than three internal stakeholders were consulted, but only these three are included because of their direct impact on the design brief. The other meetings purely served as a means to understand Stedin and get to know some people at the marketing department this project is conducted at. For the complete list of stakeholder meetings see appendix C.

The following Internal stakeholders were chosen to be interviewed:

- Elma Cosic: teamleader Kenniscentrum Duurzame Opwek (knowledge center renewable energy, KDO) which is part of KAM. KDO's current job is to inform and help energy cooperatives;
- Joyce Aalberts: teamleader Key Account Management (KAM);
- Kees-Jan Fernhout: Gebiedsregisseur (regional manager) the point of contact for flexibility and part of KAM.

External stakeholders

To get a complete overview of the context, external stakeholders were interviewed as well. The purpose was the same as with the internal stakeholders: serve as input for the design brief. Due to these stakeholders being external, there was also a specific emphasis on the role that they expected or desired from Stedin towards energy communities and their service providers.

Stakeholders interviewed:

- Tom Westra: the chief commercial officer (CCO) of Spectral. Spectral is one of the leading service providers in the Netherlands for smart grid technology. Their main job is to supply the software and control systems to operate a smart grid;
- Stefan Lodeweyckx: CEO of i.LECO which is a company offering similar products. They cooperated with Stedin in setting up multiple energy community pilots;
- Job Stuurman: program manager market facilitation at Alliander. Stuurman is the point of contact within Alliander for flexibility related topics and therefore also for LECs.

Themes covered in the interview:

- Characterizing energy communities they cooperate with;
- The process of community formation;
- Their expectations for the development of ease of implementation of smart grids and LEMs;
- Their ambition to turn energy community pilots into a standardized a product/service;
- General developments they observe in the energy community sector;
- The different roles and specifically Stedin's desired role towards energy communities.

For the interview guide for external stakeholders see Appendix D.

2.1.3 CX-Vision workshop

Due to the co-creative nature of service design, the decision was made to host a series of three customer experience (CX) vision workshops early on in the project. By making the creation of a CX-vision a collaborative effort, the expectation is that the vision would be embraced better by the LEF core team than when making it independently. The scope of the workshop series was to come up with a CX-vision for the process of setting up an energy community. This workshop served a threefold purpose:

- Firstly, to introduce the LEF core team members to service design. Secondly, it served as a bit of a showcase of co-creation;
- The second and main purpose was to make explicit what the experience of setting up an energy community should become like in the future. This is done through formulating a CX-vision in the form of a short statement;
- Thirdly, the vision workshop was also used as a method to gather additional insights about energy communities and LEF. For this reason all three mini-workshops were recorded and analyzed. This CX-vision then serves as a north star for the project and service experience to be designed.

Overview of workshop set-up and exercises:

Workshop 1 agenda: introduction and ideation

- Introduction to service design and customer centric service innovation;
- Drawing out the rough customer journey of a selection of energy communities within Stedin's operating area (Hoog-Dalem, Groene Mient, Renaissance Eemnes, Amersfoort);
- Introduction to a CX-vision;
- Ideating about possible CX-visions using a two different techniques: envisaging the process of setting up an energy community 5 years from now, empathizing with community members and then thinking of metaphors and analogies for this experience.

Workshop 2 agenda: reviewing the CX vision draft and sharpening Stedin's desired role and attitude towards energy communities

- Recap previous workshop;
- Presenting first preliminary insights from the interviews;
- Presenting the first draft of the LEF CX vision and gathering input to improve the vision;
- A series of statements about Stedin's role towards energy communities to elicit the opinion of the LEF core team on this role.

Workshop 3 agenda: presenting Stedin's proposed role and gathering input on the desired complexity of the service design concept

- Presenting the division of roles between the four key stakeholders: Stedin, energy communities, service providers and a knowledge institute;
- Gathering feedback on the proposed role division;
- Gathering input on the complexity of the service design concept.

2.1.4 Secondary research

Due to the emergent and collaborative approach of the project, as discussed in chapter 1.2, secondary research is done relatively sparsely. For example, no extensive literature study is performed. However a valuable source of secondary knowledge is from internal documents of Stedin. These are mainly used to write the introduction and to get an overview of the already existing knowledge within Stedin.

The literature studied is mainly used in the creation of the coding guide. Creating a coding guide based partially on existing frameworks means the synthesis and resulting output can be considered more likely to be correct. This coding guide is used to analyze the in-depth interviews conducted with energy community members. For the complete coding guide see appendix E.

Topics studied in the literature:

- The process of energy community formation
- Typologies of energy communities and typologies of their members
- Literature about the relations in smart grids
- Motivations and barriers towards renewable energy and energy communities
- Steps communities go through in setting up an energy community and a local energy market

2.1.5 Customer journey

To summarize and communicate the results of the interviews conducted with community members, a customer journey is made. The purpose of this customer journey is twofold: 1) the steps serve also as the horizontal axis of the service blueprint, needed in the co-creation sessions, and 2) the complete customer journey can be used as a frame of reference

when deciding which elements of the co-creation sessions to take forward.

Establishing the steps of the customer journey
There is no clear-cut customer journey energy communities go through, the process is too messy for this right now. However, the desire is there to make this process less messy. So the process needs to be designed. Therefore the steps of the customer journey and their specific order are chosen as an ideal sequence of the steps communities are advised to go through.

Steps taken to establish the steps of the customer journey of a Local Energy Community:

- Starting with the steps an energy cooperative is advised to go through by HierOpgewekt. See Appendix G for these steps;
- Analyzing the interviews: one code was specifically about steps taken by community members;
- Consulting service partners about which steps they see occurring and what the commonalities are between different energy community projects;
- Drafting a proposed customer journey
- Validating the steps during co-creation and with key internal stakeholders.

2.1.6 Guiding principles

This project started out relatively open ended, with the goal of conceptualizing a new service towards energy communities. To do this it is important to gather the needs of all the different stakeholders, as discussed in the previous parts of the method. Once this is done however, the real work starts. In order to take the low level and medium level insights and turn them into higher level insights that answer 'what does it mean' for Stedin, a thorough combination of all the insights gathered in the interviews and CX vision workshop is necessary. The synthesis combining these different sources of the Understand phase are dubbed *guiding principles*.[1] This list, which can be considered a list of guidelines, gives direction and a frame to operate within for Stedin towards energy communities.

These guiding principles are achieved by multiple levels of synthesis. These steps can be seen in Figure 2.1 - 2. The challenge here being the amount of data and sometimes the conflicting nature of the needs of different stakeholders. Another challenge was to not oversimplify while also not making the strategic positioning too extensive and hard to work with. These are the signs of a truly complex case!

The purpose of establishing guiding principles is to have a frame of reference for selecting promising ideas from the co-creation session. These selected ideas will then be used to build the design brief in the imagine phase of the project. Also, these principles might come in handy when Stedin is developing other services in the future.

1 Guiding principles are fundamental justifications for rules and judgments that differ from norms or interpretive schemes, in that they embed self-referential storylines to which team members feel emotionally attached.[8]

Figure 2.1 - 2: Steps taken for creating the guiding principles

Image 2.1 - 1: Groene Mient in the Hague just in time before lock-down. A frontrunner Energy community

2.2

ECOSYSTEM OVERVIEW

On this page in Figure 2.2 - 1 the ecosystem is shown of a Local Energy Community and the different flows are laid out. Each different player of this map will be discussed in the rest of the understand phase.

2.2.1 The ecosystem map

There are three main players in the ecosystem of a Local Energy Community. Firstly there are the communities itself. Secondly you have the DSO of the community and their service provider.
Next to these main players there are regulatory instances, knowledge instances and the energy system itself.[1]
Apart from this the left side of the map are all commercial companies. All instances on the right are governmental or semi-governmental organizations.

What is means for the project

The map is quite complex but graspable. One thing that this map also clearly shows is that there are quite a lot of 'lines' going towards a LEC. This might need to be simplified for future communities, so the service provider can take over multiple roles and just 'service' the community. However communities who want complete control should still have this as a possibility.

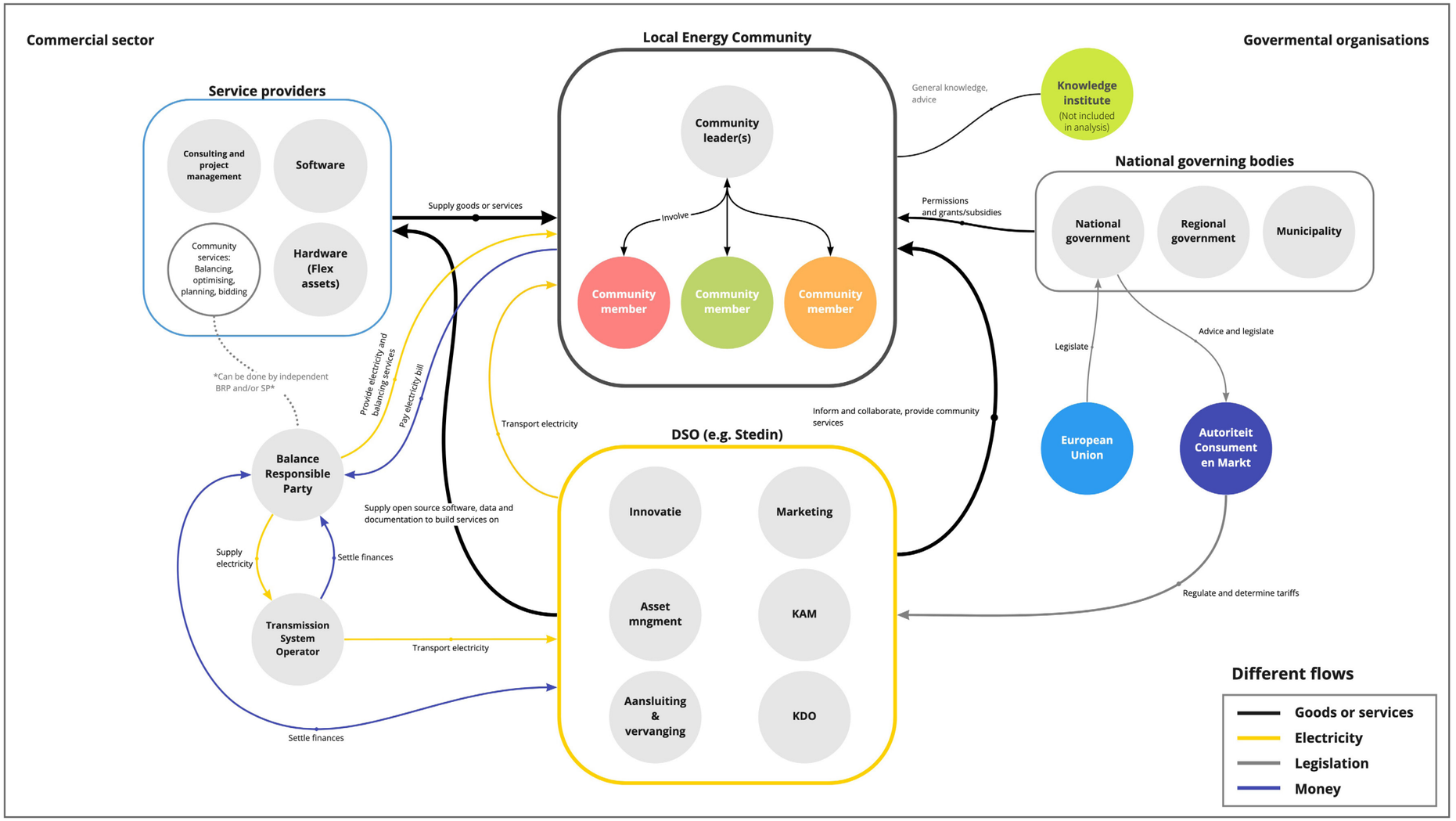


Figure 2.2 - 1: Ecosystem map of a LEC

1 It should be noted that in the energy sector the system is not built up based on companies but on roles. This is because a company can have multiple roles in the electricity system.

2.3

THE ENERGY TRANSITION

In this chapter the energy transition is introduced and flexibility is presented as one of the solutions for the problems the decentralization of the grid creates. Also a framework for dealing with multiple scenarios in the energy transition is presented. Lastly the new Dutch energy Law is discussed, which is set to directly affect energy communities in a positive way. This law can be seen as the Dutch answer to the energy transition; it sets the stage for all parties involved in the energy transition.

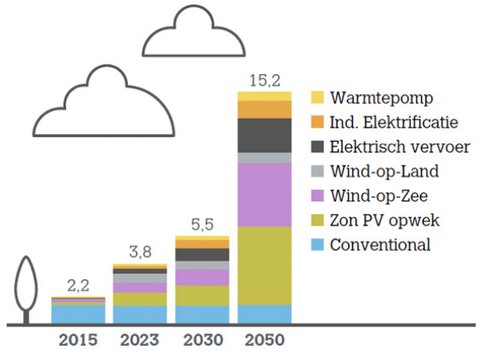
2.3.1 The energy transition in a nutshell

As introduced in paragraph 1.1, there is currently a transition taking place in the energy sector. And this transition is not an if but a when, since it its per ultimo determined by the finiteness of non-renewable energy sources like gas and oil. Since the energy sector is the backbone of our modern industrialized world, this transition has consequences far beyond its own. To create urgency around this transition the goal of the Netherlands is to have at least 70% of the electricity to be generated from renewable sources in 2030. It is expected that variable renewable energy (VRE) from wind and sun will make up most of the electricity mix [9]. While this needs to be achieved, it is expected that also roughly 2 million electric cars (EVs) and 1,5 million more heat pumps (HPs) will be introduced into the electricity system. This is a seismic shift that will happen in the upcoming 10 years. However, these new type of devices that are part of the problem might prove to be our solution as well. This is because they share the same characteristic: they can be flexible in when they draw power. For example, charging your car at 02:00 or 04:00, when the wind is blowing, does not make a difference for the end result: a fully charged car at 07:00. This flexibility might just prove to be the solution in our renewable based future. Therefore grid operators defined flexibility as some sort of commodity that can be offered and exchanged.

The current energy system is based on a electricity grid that is facilitating for the users and the market. Users can be sure, because this is regulated and mandatory by law, of the three market freedoms: freedom of connection capacity, freedom of transaction and freedom of dispatch, also known as the copper plate principle. To guarantee these freedoms it is the job of the DSO to invest in the electricity grid and to meet the transport requirements of the users of the grid and to avoid limitations to transport capacity and congestion.

2.3.2 The disruption of the energy system by renewables

The effects of the energy transition on the energy grid are a cause of worry. All these new assets require an enormous amount of additional electricity to be transported through the electricity grid.



Figuur: Flexbehoefte elektriciteitsmarkt in TWh/jr door variabiliteit in opwek en vraag

Bron: 'alternatieve' scenario uit Flexnet studie, ECN, 2017, en analyse door Het Strategiekantoor

Figure 2.3 - 2: The expected demand growth for flexibility until 2050

When looking at the grid directly this shift to renewables means the system also shifts from centralized generation to decentralized energy generation. From a few thousand active assets to as many as multiple millions. From demand response, the traditional way to balance the grid, to supply response. This all results in that the electricity grid needs to be strongly reinforced. However, in recent years another solution is being explored. Instead of just reinforcing the grid to be able to handle the peak loads, it is also possible to reduce and spread out these peak loads. Avoiding or delaying grid reinforcement along the way.

Flexibility as the solution

Reducing peak loads when the source of electricity is from Variable Renewable Energy sources (VREs) can then only be achieved by shifting demand so that it matches supply. This is what is aptly coined as some sort of commodity: "Flexibility". The definition of flexibility is as follows: "Flexibility is the ability to actively adjust supply and demand in any way possible."[10] This means that the demand for flexibility will grow in line with the growing share of VREs. See Figure 2.3 - 2 for the expected growth in the demand for flexibility.

Just relying on the market to offer this flexibility is however dangerous. What in theory sounds straightforward is in practice very complex. How are you going to 'control' all these millions of batteries, EVs, cooling houses, AC and heat pumps? Therefore

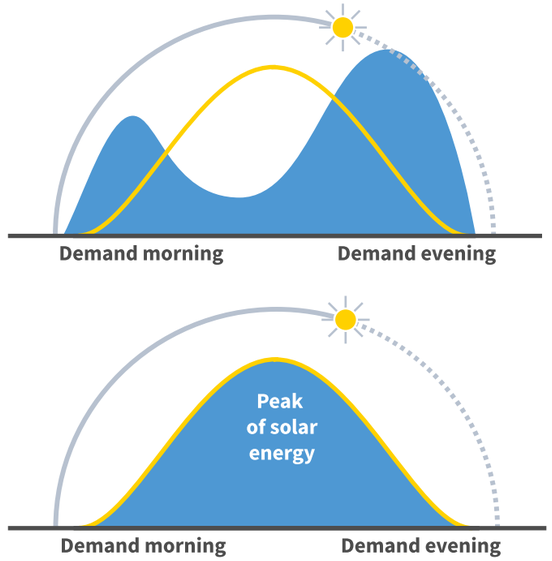


Figure 2.3 - 1: A schematic representation of the situation without flexibility and renewables (top) and the situation with flexibility (bottom). The yellow line is solar energy generation and blue is the demand for electricity.

grid operators are all looking for ways to pro-actively create more flexibility and solve this issue of 'contro' in the energy grid and are willing to pay for this flexibility.

Flexibility in practice

Flexibility can be divided into four categories:

1. Cut off renewable production plants
2. Conversion into other energy carriers like Hydrogen gas
3. Storage of electricity, in batteries for example.
4. Demand response

These four solutions can be applied independent or in combination with each other. However, to apply demand response devices need to be made smart (automated) through Internet of Things (IoT) solutions. To cut off renewable production capacity is evidently the most easy solution but also the least favorable. However in some cases it is the most responsible solution. It is not feasible to route cables with such a high capacity that a very brief seasonal peak can be transported to the main grid.[10]

Next to Stedin, customers of Stedin are also

actively looking for ways to create flexibility and how they can offer this as a solution to congestion.[2]

Four scenario's of the energy transition

When attempting to design for a situation that is yet to develop, it is often helpful to make use of scenarios. In this project therefore it makes sense to explore the possible future scenarios for the energy grid and choose one to design for.

A model for future energy scenarios often used within Stedin and other DSOs are the future energy scenarios presented in the national grid study.[12] This model consists of two axes. The first axis is the level of decentralization, ranging from low to high. *This refers to how close energy supply is to the end consumer*.

The second axis is the speed of decarbonization and refers to *the take up of low carbon solutions driven by policy, economic and technological factors and consumer sentiment* according to the report. See Figure 2.3 - 3 for the resulting four scenarios.

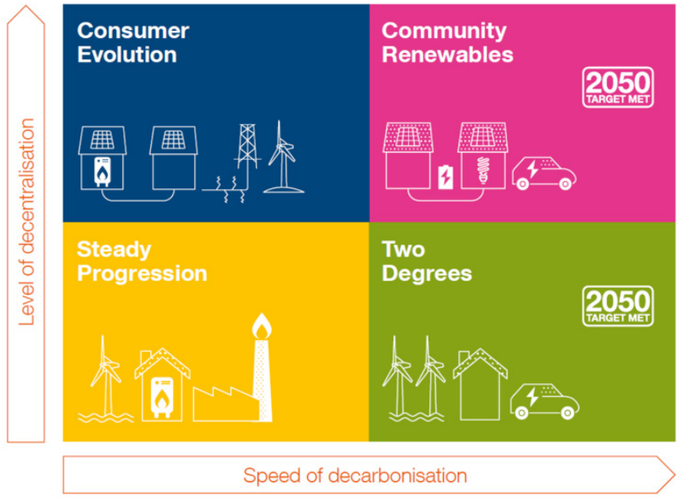
The four scenarios also make clear that only if the speed of decarbonization is high enough the Netherlands is able to reach their 2030 and 2050 climate targets.

The report also states that currently it is not yet clear which of the four scenarios is going to be the main winner in the future energy system, however all four are currently visibly being developed further.

2.3.3 The 'Energiewet 1.0'

How much the energy transition is still a phenomenon that is changing all the time is exemplified by the *energiewet 1.0.[11]* During the time this project was being done the European legislation that would shape energy communities for the years to come was already released. However these are only guidelines for each member state to implement, and not the definite law itself. Therefore it is to be expected that the role and place of Local Energy Communities in the energy system will greatly change in the near future. The main issue being that right now it is illegal for consumers to exchange energy. The expectation is that this *will* become legal. Also the role a DSO can take will or could change, having an effect on the services Stedin can deliver.

As a result it was still a waiting game until the concept law that would ratify these EU agreements of the *clean energy for all package* would be released. Initially the concept law would come out during the summer of 2020, however this deadline was not met by the ministry of Economics and Climate. This meant at first nothing substantial could be said about the new Dutch energy law. However just in time for it to be



Source: National Grid (2019), 'Future Energy Scenarios'

Figure 2.3 - 3: Four scenarios of the energy transition

included in the thesis the *contours* of the new energy law have been released at a webinar that was held the 17th of July 2020. Following this closed consultation round a draft bill will be released at the end of 2020. When this draft is made public it will be followed by a public consultation round after which the law will be voted on in the Dutch parliament.

The objective of the new law

Currently electricity and gas are legislated each by their own law. Also this division will become less strict, and the expectation is that this will continue in the future. This means the intertwining of the gas and electricity law will only increase. Therefore it is justified to make just one law, naming if after what it is instead of the carrier used: the energy law.

The objective is to create one unified and clear frame of reference for all the current *and new* actors in the energy transition. This law also should make the rights and possibilities more clear for so called (pro)sumers. In the words of the law itself: *"It is therefore important that the legislation that applies to this diverse market, is accessible and functional and does not create unnecessary obstacles for the actors operating in the markets and who, with their (innovative) activities, have the potential to bring about the transition."*

The main changes in the law that affect Local Energy Communities

The law is built around main six thematic pillars. These pillars and the main changes can be seen in on the next page. These six pillars are a summary of the contours of the energy law. The Dutch version of this summary can be found in Appendix O.

The main changes relating to energy communities are in pillars 2 and 4. In the second pillar the sharing of data is put forward as essential, and makes up the foundation of the energy system. This can be interpreted as sharing data with LECs as well.

In the fourth pillar the main regulatory changes affecting LECs are presented. Firstly the end customer will become the balance responsible party (BRP), which opens the door for becoming your own energy supplier! Also Energy communities are explicitly mentioned as one of the new market initiatives that need embedding in the new rules. Lastly the exemption rule will become a standard possibility in the law: a supplier license can be deemed not necessary, if there is a license on the primary allocation point. This can be interpreted as a community needing only one license and each household then being exempted of the need for a supplier license.

What it means for the project

It is safe to say that by now it is obvious that we need a transition to renewables. Next to this it also has become clear that the energy transition is such a challenging feat that we need to keep all options open and work on multiple scenarios at once.

Taking this into consideration Local Energy Communities can not be seen as the best or the only solution for solving the challenges posed by the energy transition, however they are a very promising solution and it is therefore justified to explore and develop them further. Especially taking into account that the Dutch and European law paves the way for these new initiatives and explicitly mentions LECs. Coupling this with the social trend of increased consumer and community empowerment and a sharp decrease in the price for renewable energy generation it is clear that energy communities will play a key role in the future energy system.

2.3.4 Summary of changes proposed to be included in the Energy law 1.0

1. Strengthened framework for future system integration

Be prepared for future system integration

- Combine the gas and electricity law into one law; uniformly where possible and clear
- Clarify roles and who is responsible

Improve and clarify legislation

- Bring back structure and internal consistency
- Improve the quality of the law: actualise, corrections, clarifications, definitions.

Strengthen legality

- Re-order existing rules (to a higher level); corrections of system conditions and methods (‘codes’)

2. Energy system data as a necessary and promising fuel

Improving and rationalising smart meter chain

- Continuation of the commenced transition to digital
- Legality: shift of rules (to a higher level)

More high fidelity and frequent data

- Explicit management of data categories, the duty to deliver and expanding the availability of data

Grip on data: data parts as the foundation for the system

- Secure the management of data i.c.w. conditions for exchange, embedding of processes, wider availability, identification, privacy, protection

3. Systems in order and supporting the energy transition

Revision framework structure system operators

- Clarify, up-date, correct

Revision job framework system operators

- Clarify, up-date, correct
- Enrich connection and transportation obligation
- Introduce rules for congestion management
- Change job description of system operators, because of EU package

Revision framework decision making proces tariffs

- Clarify, up-date, correct
- Change on the grounds of process, method, foundations

4. More room for new initiatives of the market

From consumer to active consumer

- Multiple actors on the connection of end customers
- Buyer balancing responsibility, but for households and micro-enterprises the energy supplier as standard (opt-out model)

Embedding of new initiatives from the market

- For active ‘afnemer’, Energy community and aggregator: connect to existing rules
- Supplier license: some exemptions are allowed; but always there should be a license on the primary allocation point

Framework comparison instruments

- Introduction of a certificates system

5. More protection for consumers

New conceptual framework for energy consumers

- New: ‘Household customer’ (Huishoudelijke afnemers, HHA) and ‘Micro-enterprises’ (Micro-ondernemingen, MO); Technical division between large and small customers is let go.

Extension of end-user protection

- End customer: implementation of new EU clauses; safety net regulation expires
- End customer: expansion of contractual protection
- HHA & MO: additional clauses, incl. switch fee; changes permit requirements

Adapt national protection provisions

- Keep current system, change ‘small customers’ to HHA & MO, right of withdrawal also for MO

6. Compliance

ACM is the general regulator for the Energy act

- ACM is appointed as the supervisory and regulatory body for the energy law

The energy act is based on system supervision

- System supervision means that it is assumed that the rules are safeguarded in advance
- Use is made of the own activities of those placed under supervision, which are aimed at systematically increasing their own quality and compliance (the quality assurance system).

2.4

ENERGY COMMUNITIES

This section analyses energy communities. What are they and what motivates them are questions that are answered. For this report the analysis is mainly done through in-depth interviews. This decision is made because service design heavily relies on the identification of (latent) needs, for which literature is less suited, because literature focuses on understanding while in depth interviews focuses on insights.

2.4.1 A community or a cooperative?

In this section the typology and difference between different types of collaboration in civilian initiatives is discussed. In the Netherlands there are a lot of different type of cooperatives. A cooperative is “an autonomous association of persons united voluntarily to meet their common economic, social, and cultural needs and aspirations through a jointly-owned enterprise”[13]. According to this definition all energy communities are a cooperative! This is because if one is to start an energy community, it is necessary to also unite in a legal way. Just relying on social agreements would not be enough. Another definition often used takes a different approach: “A cooperative is an enterprise with the objective of providing individual subjects (households or private households) to collaboratively perform certain economic aspects of those households.”[14]

But what then turns an energy cooperative into an energy community? To determine this let’s look at the definition of an energy community as given by ReScoop, the European federation of citizen energy cooperatives: “An Energy Community is a legal entity where citizens, SMEs and local authorities come together, as final users of energy, to cooperate in the generation, consumption, distribution, storage, supply, aggregation of energy from renewable sources, or offer energy efficiency/demand side management services.”[15]

These three definitions are quite similar. It all comes down to some sort of collaboratively outsourcing an individual goal of a member-unit (a farm, a household etc.). The driving principle behind this is that with increased scale comes increased efficiency. Also, some actions are simply too complicated to be performed individually, like trading electricity on a daily basis to meet your households energy demand. Another key characteristic of cooperatives is that the members have a say in the functioning and rules of the cooperative.

However, for this project we take a narrower definition for an energy community. When in this thesis is talked about an energy community, we mean an energy community that adheres to the LEF principles. For the LEF principles see Appendix H part F.

Therefore the definition of a Local Energy Community used in this thesis is the following:

“A group of households or other enterprises that, bordered by a geographic area, collaboratively operate a local energy market with the goal to increase self consumption and optimize their energy usage in relation to the available energy in their community and in the national energy markets.”

An energy cooperative and an energy community are quite equal in terms of definition and are used interchangeably. The main difference is that a cooperative is defined by the legal form they group of people have, a cooperative. The definition of an energy community leaves the legal form the group takes out of the definition, it only states that it should have a legal status, and therefore defines them based on their activities. Namely, engaging in activities that involve energy. In practice however most energy communities are organized as a cooperative when they become mature. This is formally called a cooperative union (cooperatieve vereniging in Dutch.) [16]

2.4.2 Factors that lead to the emergence of energy communities

The Netherlands has a rich history in regards to civilian cooperatives. So one could argue that the emergence of energy collectives is the reapplication of an older previously existing collaboration form to a new technology.

Therefore it can be reasoned that the emergence of energy cooperatives is merely a technology driven trend appealing to an inherent characteristic of humans: the desire to cooperate and compete. However, this is an incomplete view. There are more factors that have led to the emergence of the community owned energy movement. These different external factors leading to the emergence of energy cooperatives are discussed in the following paragraphs.

Image 2.4 - 1: An image from Stedin illustrating community leaders doing what they like to do: optimizing their local situation

The ‘participatiesamenleving’ (the participation society)
The Netherlands is a democratic socialist country with an elaborate system of governmental care and safeguards for its civilians. This so called ‘welfare state’, introduced after the second world war, built a prosperous society in which almost every citizen was ensured of its most basic rights, proper healthcare, housing and a job. In the ‘90s however politicians and experts started realizing that this model would not be viable in the future. This was mainly driven by neo-liberal thinking and a demographic shift: more people needed care while less people were working. Then the economic crisis and the euro crisis followed. This led to large scale cuts in government spending. Reforms were necessary and the participation society was the highest ranking candidate. This meant a new model was adopted. The gradual transition from a welfare state to a participation society suddenly sped up.
In 2013 the Netherlands officially completed it’s transition. This moment was market with the start of the second government of Dutch prime minister Mark Rutte and the accompanying speech of the Dutch king, Willem Alexander. In this speech the Dutch king said the following:

“We need A society in which all citizens try to keep themselves and their loved ones afloat within their own power - without interference from the state, if this is not strictly necessary. It is undeniable that people in our current network and information society are more empowered and independent than ever before. This, combined with the need to reduce the government deficit, is slowly transforming the traditional welfare state into a participatory society. Everyone who can do this is asked to take responsibility for his or her own life and environment.”*[17]*

This last sentence sums up the governments current attitude and expectations from Dutch citizens. This appeal to ‘do it together’ also still resonates within the echelons of the energy transition. The so called participation society can therefore be seen as one of the leading causes of the participatory nature of the energy transition.

However, the participation society also fits the current mindset of the Netherlands. Therefore it would be too much to attribute the participation society to the Dutch government alone. Citizens in general are becoming more educated and are participating more. It is a co-evolution of a liberal government with it’s citizens, resulting in the do-ocracy.[18] Or to put it more simply, citizens who want to take more control over their environment.

Do-ocracy: new ways for citizens and government to work together[1]

The Dutch climate agreement
The 28th of June 2019 the Dutch national climate agreement was signed. This 250 pages long document is “A package of measures and agreements between companies, civil society organizations and governments to jointly cut in half the emission of of greenhouse gases in the Netherlands in 2030 (in relation to 1990).”[19]

One of the core beliefs of this agreement is that the energy transition is a collaborative and participatory effort. This is echoed by the for this thesis most important target of the agreement: that 50% of all solar and wind on land should be owned by its surrounding. This can be businesses or civilians. This one target is monumental in the sense that it dictates heavily how the energy transition is set-up.

And why is this number included in the climate agreement? The goal is to increase social acceptance of renewables. By keeping the benefits local, the NIMBY [2]principle is turned into ‘Please In My BackYard’. It is also a dire need: without the help of everybody, including civilians, the energy transition is almost impossible.

The net metering scheme
Without batteries most residents would only use between 25%-45% of the renewable energy they generate with their rooftop solar-PV.[21] The main reason is that most people simply aren’t home when their solar panels generate the most electricity. With the historically high price of solar panels this would mean the business case for rooftop solar would be very unfavorable. However this electricity that a household does not use is fed back into the electricity grid and used by other people. Since it is illegal for consumers to sell electricity without a permit a workaround was created: the net metering scheme (in Dutch: salderingsregeling). This scheme allows homeowners who have solar panels to subtract the electricity they feed back into the grid from their yearly electricity consumption. Currently this rate is 100%, and because the costs associated with the scheme are not included this is a very generous scheme. This, combined with the decrease in the price of solar per kWh generated, led to the boom in rooftop solar the Netherlands has seen in the previous decade. It in 2018 alone the amount of residential rooftop solar increased by 27% to 2307MW.[20]

However, this scheme was not intended to be permanent. In 2020 the Dutch government announced that from 2023 onwards the net metering scheme will be phased out. Each year the amount of money you receive for your electricity fed back into the grid will decrease with 9% until 2030. Then in 2031 it will drop to zero. This means homeowners fill need to find other ways in the future to make the business case for rooftop solar positive.

The ‘Postal code rose’ arrangement
The net metering scheme is meant for individual households who invest in rooftop solar. However, a large part households are unable to invest in their own solar panels for a multitude of reasons. These reasons range from living in an apartment without a roof to simply having a tree blocking the sun. To give these households another way to invest in solar panels the Postal code rose agreement is created (Dutch: postcoderoos regeling). This agreement gives an exemption for the energy tax on solar or wind energy that participants generate in a collective renewable energy project.[22] This tax reduction is then subtracted from the participants’ energy bill. This means the solar panels don’t have to be installed on your own roof, but they can be placed on a nearby farm’s roof. The only requirement is that the participants live in the same or a neighboring postal code area from where the solar panels are installed, hence the name postal code rose agreement.

What it means for society
In essence the goal stays the same in a welfare state as in a participation society. Namely to provide all people with the care and material goods they need in the form of public services. The difference is in how this is achieved. In the welfare state a government carries the responsibility. In the participation society the load is shared with the civilians itself.
This principle became evident in the energy transition as well. People are increasingly taking control of their own environment. However, the factors discussed in this section only explain why the circumstances are favorable for energy cooperatives to emerge and why the government is partially relying on its citizens to reach its climate agreement goals.
It only does not explain why people want to start an energy cooperative. So therefore why people *want* to form these energy communities therefore needs to be investigated further in this chapter.

2.4.3 Communities in scientific literature

In this paragraph a closer look is taken at energy communities. What are they, beyond their definition? Who are their members and what motivates them? To answer these questions ten in-depth interviews

1 This comes from a Dutch governmental website. Slight propaganda disclaimer should therefore be noted here.

2 NIMBY refers to the concept of “Not In My BackYard”. It is the phenomenon where people are in favor of renewable energy and the energy transition, but when the windmills or solar panels are installed in their surrounding they suddenly are heavily against it. One of the reasons to object renewables is ‘horizon pollution’ in the case of windmills.

were conducted with (potential) energy community members. The insights from these interviews are presented in this chapter. Also a typology of energy community members is proposed based on an extension of existing literature.

Relevance of most literature

The energy transition is a large topic of study in the academic field. Local Energy communities, smart grids, demand response, virtual power plants: the list goes on. In literature there has been written extensively about energy communities' governance, enabling smart-grid technologies and potential business models. However, due to a lack of real life examples and applications most of the literature remains in the conceptual realm. One explanation for this is that real life energy communities that fit the in this thesis used definition, have yet to be researched, simply because so few are actually up and running. The three main issues with most papers reviewed therefore were: they focussed only on the *Operation* of a Local Energy Community, or the *during phase* of an LEC in their respective life cycle and not the *begin phase.* The second main issue is that the papers are quite often mainly advocating for LECs. They are for example simulations about cost savings and other hypothetical benefits of LECs/Smart grids/Virtual Power Plants.[23] In this report however we passed that stage already: LECs *are* happening. This last issue is that most papers being simulations or models of some sorts provide slim real world relevance or application. For example, it is obviously relevant that if you group prosumers based on their usage profile they are better optimizing the electricity grid. [24] However the paper states nothing about if real life prosumers actually want to be grouped like this. In other words, the clear need from the consumer is often lacking in literature making its real world relevance elusive.

Another example is a paper by Gui & Diesendorf about governance of LECs. [25] This paper talks in depth about different ways of governance but does not explain how to get there. And since this project focusses on how to guide communities through the begin phase of the community lifecycle this paper is again only partially relevant.

However some papers were found to be relevant and very usefull in this project and will be discussed in the following sections.

Drivers for LECs - The case study of Samsø island

One of the few, and arguably the most famous, case studies of renewable energy communities is that of the Samsø island in Denmark.[26] Starting in 1997 the island undertook a ten year long transition towards becoming fully renewable based, setting an example for the whole world. In a case study reviewing why this project did succeed, because at times it almost failed, key factors for success were identified:

- Local traditions and a history of coop projects
- Sense of locality and responsibility
- Community spirit
- Entrepreneurial individuals
- Networks
- Guiding visions and plans

These factors are all internal and are there or not. Arguably quite a few are lacking in the communities interviewed in this project.

Especially the last deciding factor was of importance for this project and is also discovered to be a key for success when interviewing communities. When designing this vision and plans should be included in the design.

Limiting factors for LECs - A Dutch case study

Next to key success factors an other paper tried to find limiting factors for LECs.[27] More specifically, it tried to identify barriers to the introduction of residential demand response. Since LES can be seen as a form of demand response these barriers might confirm findings of the interviews or provide additional insight. The barriers identified are:

General barriers:

- Benefit to consumers uncertain (Customer)
- Uncertainty in forecasting and balancing (Technical)
- Smart meter required (Technical)
- New system required for consumer billing (Technical)
- New system required for allocation and reconciliation (Technical)
- No access to data due to privacy concerns (Customer)
- New demand peaks (Technical)
- Different interests electricity supplier and DSO (Institutional)

Barriers specific to dynamic network tariffs:

- Higher costs for large users (Customer)
- Not allowed by regulation (Regulatory)
- Uncertain income distribution system operator (Institutional)

Barriers specific to dynamic electricity prices:

- Consumers not interested (Customer)

These barriers, mainly the customer ones, sound familiar and are confirmed by insights from the interviews. Also the institutional barriers are again confirmed as an issue. When developing the information services these barriers should be taken as a starting point when informing potential new communities about LEF/LES.

Framework for different types of LEC members and their motivations

A paper by Kotilainen proposed a classification of energy communities' members into three types. [28] The objective of the paper is to better understand the different types of prosumers and how their decision making works. The proposed classification consists of three types of prosumers in smart grids. The engineer, the green user and the value seeker are introduced.

Applying Kotilainen's framework to the interviews

Using the classification framework of Kotilainen the ten interviewed community members are classified. This is done by looking at interesting statements they made during the interview and consecutively determining what their main driving values are for participating in the energy community.

While attempting to classify each interviewee as a type of user it quickly became apparent how well the observations in the interviews matched with the framework. Therefore it is decided to use this framework in this project as well to understand the different types of users.

Some conclusions in regards to the interviews and framework:

- All engineers were community leaders;
- The four community members interviewed were either a green user or a value seeker;
- Each type thought that their main reason for joining the community was also the main reason of all other people who also joined the energy community, *which is an interesting showcase of a form of cognitive bias!*

Engineers (n=6)
Intrinsically motivated/fascinated
Highly interested in technology
Initiator and leader of the project
Expert volunteer
Real innovator
The innovativeness of LECs are the main reason to participate

Green user (n=2)
Intrinsically and extrinsically motivated
Interested in social cohesion and insight (need driven)
Supporter of the project
Not an expert on content level
Early adopter
Social benefits are the main reason to participate

Value seekers (n=2)
Extrinsically motivated
Interested in economic and personal value (reward driven)
Gatekeeper of the project
Pragmatic
Early majority
Economic benefits are the main reason to participate

Figure 2.4 - 1: Different type of Energy community members

2.4.4 Insights about Energy communities from interviews

From the interviews conducted the main needs were synthesized. For the complete overview see Appendix I. Each need has a tag behind it referring to the corresponding insight in Appendix H and about which phase of the customer journey the insight says something.

The insights presented here are selected based on whether they were relevant for the begin phase of the customer journey. See the next page for the list of the selected insights.

Personal level

1. People like to compare themselves to other households and see how efficient they are relative to a representative household of similar size and typology. (3.2) > Map

"I check the software once a month now. To see what is the consumption compared to others houses. Although that also gives a slightly skewed picture, because the houses in [a neighbouring part of town], for example, have a whole have different format. There is not really a tool yet that a similar property can be taken as a comparison."

Community level

2. Energy communities that emerge from the 'bottom-up' don't start with the goal of forming an energy community. Instead they are already a community through another means in all cases. This means the community is already formed by either by having done a collective renewable energy project or having built their houses collectively in a CPO project. (5.1) > Explore
3. Community members really want to contribute and take an active role in developing their community. So thinking that you need to take away as much of the work as possible as a community leader or Stedin/ service partner might have the opposite effect and they become demotivated. Responsibility creates action and ownership. (7.2) > Team-up

"So a number of people I spoke to in the neighborhood where I built those cabinets, there are also interested people who want to be involved. So that's one, communicating from the inner circle what's in it for me."

4. For community members to understand the implications of joining an energy community it is important to give them very specific knowledge about how this will affect their situation. Clearly lay out what is expected from them, and what this will cost and bring them. There is a desire for simple tools to explain the concept of an energy community in a straightforward and simple way(8.2) > Explore
5. Data privacy is an issue of concern for some community members. In order to take this fear away they state it is important to be clear about why it is needed and who is the owner of the data. Preferably the community should have full control over the data that needs to be shared in order for an energy communities' systems to function on a technical level. (8.3) > Design

"Socially, I think that comfort, but also privacy, plays an issue. My neighbor already said oh that is very useful if someone can read that smart meter data: then he can see exactly when I am on vacation."

6. Instead of expecting from community members to get on the knowledge level of the community leaders, the community leaders should get on the level of knowledge of the community members. This in practice means making clear how a community members 'daily life' will change when using LEF tangible and simple to understand. (8.4) > Explore
7. Because right now starting an energy community is still relatively a path 'untrodden', the people starting an energy community must be highly motivated and have at least some organizational and communicative skills and technical knowledge . Otherwise they are not even taking up the challenge at all. This knowledge hurdle is an strong limiting for the scalability and adoption of energy communities. (9.1) > Explore

"For now the information where we get that from is from the working group members themselves. E. works in renewable energy, I work as a supporter myself. J. himself works at Alliander, so he has information."

8. Other initiatives in the renewable energy sector (energy communities and cooperatives specifically) can be a valuable source of knowledge. Learning from each other and sharing best practices is a crucial in speeding up the development of energy communities. (12.2) > Explore
9. Communities want to keep their electricity 'local' and in the community. (15.2) > Design

Community Stedin level

10. Community members sometimes prefer to hear the details of the community energy project (setting up an energy community) from Stedin directly instead of hearing it through the community leaders. (18.2) > Design

"But still, if I envision something like this [LEF], then you would rather want information from the organization itself. Because that is the party you are going to do business with. And then I'd rather sort wanting supporting information from the [their local community], that will help. But the first information would have to come from the organization itself."

11. The current channels Stedin has in place are insufficient for the energy communities' needs. They want specialized knowledge they can only get from the LEF team, but reaching them through the regular channels is a challenge. (18.4) > Explore
12. A personal 'link' within Stedin is desired by communities, for all sorts of reasons. The most important being sharing knowledge and answering their specific questions that can't be answered by the website or general communication channels. (18.7) > Explore
13. Finding an 'entrance' into Stedin can be challenging for communities. They don't really know where to go right now. The regular channels are not up for the job. And only once they have connections within Stedin they feel like they can get further with their community energy project. (However, it is acknowledged by the same interviewees that this is improving.) (20.3) > Explore

"It has been a difficult process to come to business with Stedin. But my last impression is that good steps have been taken lately. It has become a lot more positive."

14. Communities believe they are really helping Stedin with their energy community initiatives by stabilizing the grid, and therefore also expect help from Stedin. (20.4) > General
15. Community leaders acknowledge Stedin has the power to have a positive impact on society, and hope that Stedin does take this opportunity. (19.6) > General

Sector level

16. Starting your own energy community is a very complex affair. Potential energy communities (communities who are still in the process of setting up an energy community or have not started at all) don't have the knowledge themselves and need an outside expert source for this. This source can be Stedin but also a service provider. (22.1) > Explore

"Conceptually, this is not that simple to explain at all. So you still need something to do that properly. And I think you need

professional assistance with that."

17. To create momentum around an innovation you need to attract and empower the right people in the right phase. For example, forcing the early majority to innovate takes a lot of time, and skipping the innovators upsets them and creates resent. (23.1) > Team-up
18. The bigger energy transition players (governments, DSOs) should be mindful of not putting too much on the plate of communities as well without helping the community: this creates resentment. So while communities should be able to organize themselves and do work themselves (which is actually beneficiary to the result of a community project as seen in an other theme) this should be done in cooperation with the bigger players (like Stedin and communities). (23.2) > Team-up
19. The democratization of the energy grid and keeping the benefits local is important for energy communities. They are skeptical of private companies, because they are expecting them to be always after (their) profits. Stedin is different: since it is a semi-public institution they are seen as more trustworthy and more likely to act in the benefit of the community. (24.2) > General
20. By making energy production decentralized communities are taking over the role of energy producers. This possibly threatens their business and they could try to slow down energy communities. In order to be able to stand up to energy producers energy communities expect Stedin to voice their interest on a national level. (24.1) > General

What it means for the project

The main takeaway after analyzing Local Energy Communities is that there are people willing to form a local energy community. However doing this is still a very difficult task because of the immaturity of the technology necessary to form a Local Energy Market. This confirms the problem statement in the assignment. The insight also confirm that the limiting factor is not community formation but collaboration with parties a willing LEC is dependent on.

Furthermore, most insights seem to be around the explore phase and begin phase as a whole, design and team-up being in the synthesis as well.

Probably the reason for this being that all energy communities interviewed are not yet further then the design phase. It should be considered therefore to focus on the explore phase further in this project.

2.5

THE COMMUNITY LIFE-CYCLE

To summarize and communicate the interviews a visual representation of the interviews is made in the shape of a customer journey map. To do this first the steps of the customer journey needed to be synthesized from the interviews, since the process of setting up a LEC is currently not yet following a structured order. The order of the steps in the customer journey were validated repeatedly.

2.5.1 The steps of the life cycle

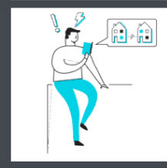
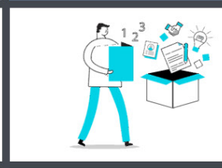
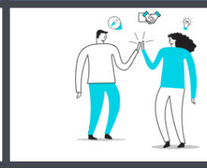
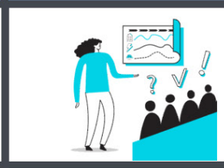
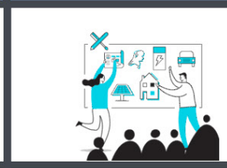
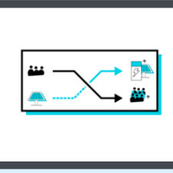
After the interviews the steps of the customer journey were established according to the process laid out in chapter 2.1. The resulting steps can be seen in Figure 2.5 - 1. The hierarchy first starts with the four general steps of a customer life cycle: before, begin, during and after. After that the nine phases of setting up your own LEC are established.

This structure for the process of setting up an energy community is of course not always the same for group of people who set out to form a LEC. However these steps are more some sort of advice: they are designed in this specific order on purpose. This is because following these steps in the specific order seen in Figure 2.5 - 1 are expected to give the highest chance of success. Another remark about the steps of the customer journey is that they are going to change in the future as LES and service providers further develop the software needed to set up your own LEC.

2.5.2 The customer journey map

Figure 2.5 - 2 on the next spread summarizes the in-depth interviews with community members. First the goals of each type of community member are laid out in each step with a quote that illustrates this goal.
The two lines are included to respectively represent the attitude of the community members and the 'learning' journey the community leader goes through. This learning line is included because starting a LEC can be quite a challenging feat.
Lastly the customer journey map discusses what is expected of Stedin in each step.

Figure 2.5 - 1: Steps of the community life cycle

	BEFORE	BEGIN				DURING			AFTER
	Aware	Explore	Team up	Map	Design	Develop	Materialize	Operate	Transform
Illustration of Step									
Engineer goals	Become aware of the possibility of setting up a local energy market	Finding out about all the possibilities for a local energy market (LEM) in his or her community from multiple sources	Teaming up with a reliable service partner and project partner. Motivating the community to sign up without obligation	Together with the service provider you start mapping the energy balance within the community and performing a feasibility check	Create a final design for the local energy market that is supported by the community as a whole and is technically feasible	You give the green light to the installers and suppliers to start building/installing the hardware and software	The EC infrastructure is put in place. You inform the members of the progress of LEM and celebrate the LEM going live	Monitor the performance and keep the members involved in the energy cooperative. Optionally also expanding and improve the community	You leave the energy community or it is updated and transformed, making the community go back to designing
Quote	*How can we get a better match between consumption and generation? - E*	*Find out whether there is a demand for leading customers such as ours for a product that is always have 100% green electricity every hour of the day. - E*	*The combination of engineering and business is necessary. You can understand the business but not the technology. If you only do technology it doesn't work well.- H*	*We initially took up the project with our neighbourhood to monitor energy consumption. To see if we can still improve our efficiency somewhere. - W*	*What I think, I think that if we send less energy to the grid we should also have reduced costs. So Stedin has to make an effort for that. - H*	*I am very curious how it will work. Whether we are willing to let someone else control our energy profile. - E*	*If only people do it themselves. Because if they don't want to, you can be so motivated as an energy community, but then you are pulling a dead horse. - H*	*And how that will turn out in the coming years, I have no idea. But when I look at how many people view their energy consumption in the app, everyone is always motivated. - H*	
Green user goals		Learn about the social and other benefits for him/her and the community	Understand the impact on his/her situation and the community. What are the benefits, what is the investment, downsides.	Find out how much energy you and the community use and what can be improved	Make sure the design embodies the right community values and improves sustainability and you can communicate your input	Helping the community leader realise the community design. Have the opportunity to give input	Knowing what he/or she needs to change in behaviour and what practicalities to arrange	Feedback on the performance of the LEM and what the community benefits are. Information on how much money you save	How to leave the community without too much hassle and guilt
Quote		*But then again I am not the kind of person who will set up such a community myself. - A*	*After all, doing it together, getting it together is the reason. - A*	*No I don't need to know exactly how it works, because my head is also full of other things. - JR*	*And share a vision. Everyone sitting here has a thing for sustainability. Otherwise you can't sit here I guess. - G*	*I'm not really afraid of data and stuff. I am not so paranoia or something. So you know they can check all that. This is it and they can have it. - JR*	*If I get the feeling that I get tapped on my fingers when I switch on my washing machine at 8 o'clock in the evening, and that should have been 5 o'clock, then it is not going well. - JR*	*But when it is finished, everyone goes into their own house. And then there can be the danger that the collective goal will disappear a bit and that it will become more individual again. - JR*	
Value seeker goals			Learn about what value it will bring	Find out about possibilities to use less energy. Information so he or she can optimise their personal energy situation	Make sure their input is heard and personal situation is improved in economic terms before agreeing with the design		Get support in installing the hardware and software.	Get clear feedback on the benefits, get feedback on how he or she can optimise and improve the business as usual	Look for better opportunities and when they arise change from community or back to a regular utility company
Quote			*What is expected of me in that. What will it cost me. And that actually means that I can create a picture, this is interesting yes or no. - JR*	*I really enjoy seeing what do we use and how much have we earned back. And you really see that you earn back more than you consume all summer. That just makes me happy. - JR*	*Just like a subsidy from a heat pump. You get a tool that provides more insight into your energy consumption. That that must be the greatest motivator. - J*		*And maybe also make money later. That would off course also be nice. - J*	*Check the software once a month now. To see what is the consumption compared to other houses. - J*	

Community motivation/ attitude/ involvement

Explanation of involvement	The community members are unaware	Expectations are formed, the idea is embraced by a few. The majority is skeptical.	A larger group, mainly green users, gets interested and become interested	The insight delivered by a clear overview of you(r community) energy usage amazes. Some value seekers join.	The design phase takes much longer than anticipated and people become impatient	The slowness turn into disinterest. Some drop out, others help the leaders out where possible	If the community manages to push on until materialisation they are proud and motivated	Amazement fades, the workload drops and the community spirit might fade as well	People leave or get sidetracked, or motivated to start something new/change something

Learning by community leader

Expectation of Stedin	Share results of pilots for potential energy community members as a means of inspiration, carry out the LEF philosophy	Communicate to energy communities what is possible on the Stedin grid in terms of energy community and Local energy Market design. This means giving acces to documentation and plenty of example cases.	Give communities clear responsibilities that they are capable of to handle. This is done in a collaborative way, not just by pushing responsibilities away from Stedin.	Give acces to data or simplify the mapping process. Create tools where community members can compare their own household usage to other households in the community or other communities.	Check the plans and enable energy communities to share the knowledge and best practices they gather during their journey to start an energy community with other communities and Stedin.	Protect and accelerate the democratisation of the energy grid and allowing/enabling energy communities to keep their benefits local.	Give the community the ownership of the data, however Stedin keeps acces to purchase flexibility and monitor the safety of the grid.	Provide incentives to make the local market a better option then the national electricity spot market	Make forming an energy community easy as in line with EU regulation, which tells to remove unjustified regulatory and administrative barriers to energy communities
Quote	*Well in this example, Stedin's role would be to provide the LEF technology. And also to provide the documentation and the story why this is important for the energy transition and also want to share this with the locals [the cooperatives].*	*It would be good if somebody comes to explain in detail what exactly that Hoog-Dalem is. Then you can explore if it is applicable in a neighbourhood as ours - WS*	*And further from the partners we work with. Greenchoice we get a lot of information, wedrive solar as a partner we get information from there ... I hope to have Stedin as a partner in the long term, if that LEF system becomes public. - WJ*	*Spectral neatly puts everything in a database. They will create a user interface there. With a GUI of what the residents can see and what they can see of the collective. - WB*	*It works really well if you can offer something to active initiatives, that is, it looks a bit like what you want. Talk to them. - G*	*Really focused on information about smart grids? Yes, then I honestly find Stedin as a grid operator should do that. I would much prefer that this role is taken up by the network operator, that there is an independent role there. Then what happens now is many energy suppliers take a role in it, and then there is again a commercial story attached to it. - WJ*	*And when you talk about the energy transition, it does help to make a lot of extensive and detailed information available. And unfortunately this also means that you have to have people who can help users with that, I think. - AH*	*What I think, I think that if we send less energy into the grid, we also have a lower cost. So Stedin must make an effort to achieve this. - HW*	

Figure 2.5 - 2: Customer journey map - For a large scale image click on the link

2.6

STEDIN COMPANY ANALYSIS

In this chapter Stedin is analyzed, with a special focus on how they are dealing with energy communities right now and the legislation that determines what Stedin can or can't do. Especially this legislation heavily influences the design. Therefore the 'network codes' are examined in subsection in more detail.

2.6.1 Stedin company

Stedin is the third largest distribution system operator (DSO) in the Netherlands. Their 2,2 million customers rely day and night on their infrastructure and services. Their service area encompasses South-Holland, Utrecht, parts of North-Holland and Groningen. The service Stedin provides is of vital importance to all businesses in its service area: it quite literally powers everything they do!
Stedin is actually a new name for an old company. Stedin came into existence when the distribution network had to be split from Eneco. Before this Stedin was called Eneco Netbeheer B.V. This split was one of the last steps of the privatization of the energy sector. This sector had previously largely been a state owned endeavour. This split started in 2011 and was finished in January 2017 when Eneco and Stedin cut all legal ties.

2.6.2 Stedin strategy

Since the split with Eneco Stedin had to become an independent organization. This means the organization has parts that are very old and some that are very new. For example, the whole department 'Customer & Market' is new. Before this Eneco took this responsibility. Other areas of the company like Asset management' have been there from the start. With this split and the 'birth' of Stedin in its current shape a new strategy, mission and vision were necessary. In this paragraph the current strategy of Stedin is explained.

Stedin company mission and mission statement

Stedin's company mission is

'Working together on a living environment full of new energy' [1]

This mission resonates strongly with this objective of this project. Working together: Stedin acknowledges that they have to collaborate with their customers in order to be successful. Living environment full of new energy: this is an ambiguous statement. It refers to both that we need renewable energy to safeguard our future and that we, Stedin and its partners/customers, need new energy to realize this transition.

1 From the Dutch mission statement: samen werk maken van een leefwereld vol nieuwe energie.

This is explained in Stedin's mission statement:
"More than 2,2 million customers count on us. Day and night. That we, as Stedin Group, through our grid ensure that they have energy throughout the year. We are proud that our grid belong to the most reliable energy grid in the world. Because energy is indispensable in the world we live in today. It is very self-evident to us that there is always energy available. We use energy for everything all the time and we keep using more of it. At home, on the road and at our jobs. Because we want future generations to also have energy available all the time we all transition towards clean energy. From sources that are not finite en don't exhaust or pollute our planet. This requires large scale adaptations of the energy grid, or better said, energy system. New technologies help us with this. Just as good collaboration between all people and organizations involved in our energy supply. If we roll up our sleeves, all together and with renewed energy, we will get it done. Government, municipalities, businesses, customers and us. Because only then energy will be as self-evident as it is today."

This mission statement reinforces the message Stedin is carrying out: it will take all our effort, together, to achieve our goal of an energy system that is fully renewable. It also points out that it is an effort customer also are involved in, together.

Stedin company Vision & Strategy

The strategy of Stedin was released during a few 'Strategy kickstarters' mid 2018. This is in line with the split of Eneco and Stedin forming its own (renewed) identity, brand and company culture.

Company vision

"Making the energy transition possible by focusing on core tasks for (future) grid management with excellent service to customers"

Company Strategy

There are big challenges ahead for Stedin. To be able to tackle them a clear strategy for what Stedin does and won't do is necessary. The three focal points of Stedin therefore for the upcoming five years are:

1. Better grid management
2. Making the energy transition possible: by innovating and working closely with partners, we want to make the energy transition possible.
3. Sustainable business operations

For each focal point has KPI's and concrete tasks to make the focal point actionable. The second focal point is the most relevant for this project, since the goal of LEF is to directly contribute to making the energy transition possible.

One of the action points for the second focal point is "making grid information available: to facilitate stakeholders (business and municipalities).

What Stedin won't do

Stedin is hesitant in with carrying out commercial (non-regulated) activities. They will only do this if the activity is proven to deliver value for better grid management, there is a void in the market and Stedin Group is uniquely positioned for this activity. In other words: Stedin will look critically at what they do and (in the foreseeable future) won't do (anymore).

2.6.3 The legal and societal responsibility of a DSO

Stedin has a monopoly. Everybody that wants to transport electricity has to use the distribution network of a DSO. In order to still safeguard the interest of the users of Stedin's electricity grid, which is virtually everyone in its service area, they are heavily regulated by the Autoriteit Consument en Markt (ACM, authority consumer and market). The ACM yearly determines the prices Stedin can charge for its services.

Because of their position as a monopoly Stedin can't offer commercial activities that are not directly linked to good and safe grid management or the market could also facilitate. This has large implications for the LEF concept, which is discussed in chapter 2.7. For example, Stedin can't offer the software to create your own local energy market for a premium: this is something a private software company could do and is therefore illegal for Stedin because it will lead to a disruption of the free market.

This is sometimes contradicted by the fact that

Stedin has a societal purpose instead of a commercial one. They want to deliver the energy transition for the lowest societal costs, so they should actively look for solutions to keep the electricity grid as efficient as possible, without doing commercial activities. To solve this Stedin often collaborates in pilots where the work they do is done ‘free of charge’ as to not do commercial work. In these pilots a project group is formed with multiple companies or social institutions work together.

But what when a technology developed in a pilot, like LEF, needs to be shared with the outside world and be made publicly available? This is a difficult task, which is one of the main ‘nuts to crack’ in this thesis. Stedin can’t speak out a preference for a member of a pilot group, but they also want to make the public aware of new opportunities.

In the LEF project this is also the case. There is a technology created and tested in pilot form together with a technology company and other project partners. Now this technology needs to be made available to the larger public. Because of Stedin’s legal limitations they can’t set up energy communities for a group of people that are interested in this, because this is the job of a service provider.

2.6.4 To reinforce or to become smart

Currently DSOs are facing a very difficult and complicated question. As a result of the energy transition the demand for electricity will grow and the peaks on the electricity grid will get larger. When this has happened in the past there has always been only one solution to choose from: reinforce the grid. However, experts saw a long time ago that this approach would be way too costly when the electricity supply is dependent on renewable energy. They started developing other solutions to make the energy transition feasible, the Layered energy system being one of them. But more on this in chapter 7.5.

The other solution to grid reinforcement is to make the grid more efficient. Use the available capacity better, and the cable needn’t be thicker, at least that is the idea. The main principle behind making the grid more efficient is peak shaving. Peak shaving is when you lower your maximum demand in kW of your grid connection. You can still transport roughly the same amount of energy this way, it is only less immediate. See figure Figure 2.6 - 2 of a schematic representation of peak shaving. The area under the curve is in both instances the same, but just more spread out in the yellow version resulting in a lowered ‘peak’. In some instances, even when you practice peak shaving, the grid simply can’t handle the loads anymore. This means the grid is ‘congested’ in that area. The demand and supply of electricity can’t be transported safely to the grid connections. In this case grid reinforcement is still necessary, or the total load on the electricity grid will need to be decreased. Stedin is currently betting on both solutions.

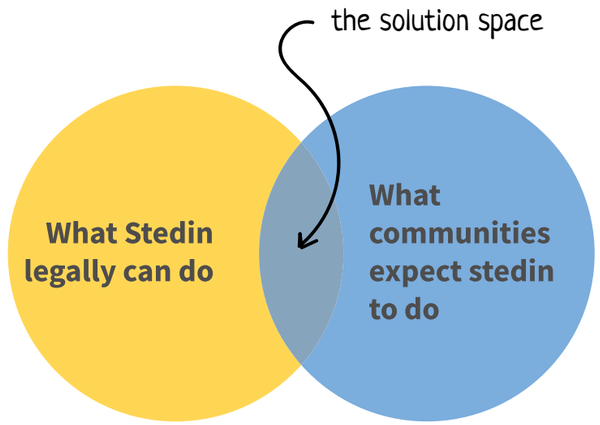


Figure 2.6 - 1: Illustration of the solution space for this project as a result of the legal framework Stedin

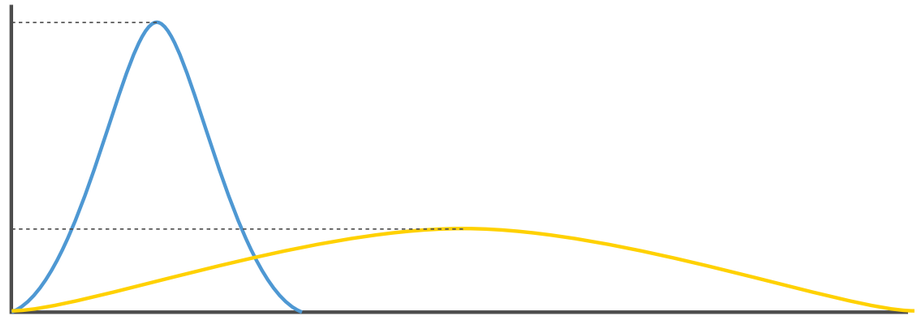


Figure 2.6 - 2: Illustration of the difference between a high instantaneous peak or a more spread out electricity demand. The x-axis represents electricity demand and the y-axis time

2.6.5 The transition from a Distribution Network Operator to a Distributed System Operator

Currently one of the strategic initiatives of Stedin is to transition it’s organization from a traditional Distribution Network Operator to a Distributed System Operator. This means that Stedin will shift how they control the grid to a more direct control over the energy system. Currently the system management tasks of Stedin only include balancing their own low-medium voltage grid while TenneT balances the national high-voltage grid.

When transitioning to a System Operator (SISO in short) the duties of Stedin will be expanded to active system management. Active system management means taking up: congestion management, performing DA-ID grid safety analyses and adding additional Grid-Market interactions.

On a grid level the transition to SISO also entails a few fundamental changes. Currently the copper place principle is in place (See chapter 2.3). This principle will need to be abandoned partially, meaning some parts of the Netherlands will have a ‘thinner’ copper plate (less capacity on a connection) or will have to wait for their copper plate to be ‘thickened’ (increasing the capacity of a connection). The second change on the grid level is the end of the flat fee capacity tariff. Currently everybody who has a connection pays a price relative to the capacity they have. Then for each kWh this connection uses a commission if paid to Stedin. However this tariff scheme is also under pressure and is likely to change in the near future. This means you will get a variable price for the kWh you use based on the capacity of your connection. How this pricing scheme will be set up is still to be determined, but it might become similar to how you use data on your smartphone: you have 10GB for a month and if you have used it all you pay a premium or buy more data.

2.6.6 Stedin and how they deal and have dealt with civilian collectives

Before Stedin split from Eneco only their mechanics were really in direct contact with their customers, most things were done by Eneco’s marketing and customer service departments. As previously mentioned, Stedin didn’t even have their own marketing department. One striking anecdote illustrating that the operating of the company was not very customer centric before they split is that they used to refer to their customers not as what they are, customers, but as ‘connections’. Also due to the fact that Stedin is a monopolist they weren’t forced to be customer centric as for example other Telecom companies are. If you are dissatisfied with the service you get at your cell phone carrier you just switch after your contract ends. But this is different for Stedin: their customer can’t leave. This has led to increasingly dissatisfied customer in the past. Why should the lead time for an larger grid connection take 12-18 weeks when my internet connection is up and running in a week customers, rightfully, wondered.

Another complicating matter for the customer interaction is the way you as a customer pay Stedin. You actually don’t pay directly to your local DSO in the Netherlands. The DSO measures how much electricity or gas you use through their smart meter, checks who your electricity supplier is, sends the amount of

used kWh to the electricity provider concerned, and the electricity provider then continues to bill you for your usage. The electricity provider then pays the DSO the respective transport cost. The reason behind this intricate system is that this way the customer has freedom of choice for their electricity supplier: something that the law 'Independent grid operation' mandated.[2] This payment scheme means that for an average customer their local DSO is practically invisible until something goes wrong. Or to put it like this: as a DSO it is hard to do it right, also because you are not forced to.
Realizing this Stedin has increasingly made very hard efforts to organize them self in a more customer centric way. This is echoed by their strategy and customer values: Clear, close-by, do. Also improving the quality of their services is one of the main challenges identified by the organization, next to other big ones like the increased workload as a result of the energy transition. The marketing department is the main standard-bearer for customer centricity and improving the customer experience of all Stedin channels and touch-points.

2.6.7 Stedin's channels and their capabilities

Stedin has a few main front-end channels. The challenge is to get these channels aligned. Being a bit of a 'traditional' service provider the organization is quite siloed and so are the channels. However improving this is a main focal point of Stedin, resulting in the implementation of a new CRM system.

The main channels of Stedin are:

- Stedin.net website
- The Customer Contact Centre (Klant Contact Centrum, KCC)
- The Knowledge Centre Renewable energy generation (Kenniscentrum Duurzame Opwek, KDO)
- Service desk market parties (servicedesk marktpartijen)
- Key account management (KAM)
- Placement and replacement (Aanleg & Vervanging, A&V)
- Asset management (AM)
- Malfunction and maintenance (Storing & Onderhoud, S&O)

These channels are all accessible in different ways. Mainly by phone and e-mail, either direct or indirectly. It should be acknowledged that here that Stedin's services are heavily reliant on people. Only specific operations that occur very frequently. This are processes mainly concerning all the domestic connections.

Channels a LEC would come into contact with
The instructions for all departments that receive questions about energy sharing or Energy communities right now are all directed to the LEF core team. However when the amount of LECs will grow this needs to change and other more dedicated channels should take over some of the work from the LEF core team. The channels that could take over part of this work will be discussed here.

Channels in the 'Klant' department
The KCC
The Customer Contact centre is the starting point for most people contacting Stedin. Their main job is to solve as much of the issues and answer most general questions. If they can't directly help a customer they direct the customer forward within Stedin or start looking for the answer themself. However they can not (yet) be tasked with also knowing a lot about LECs. Therefore their main role would be to direct questions about LECs further to the KDO or LEF core team.

The KDO
This channel is the main place to go for people who are involved in community energy projects. They perform jobs like registering residential solar installations in the dedicated systems. They are also a valuable source of knowledge for everything about subsidies for renewable energy generation. Since their expertise is more closely related to LECs it makes sense to involve them in delivering services to LECS.

KAM
This department is the main channel for all larger customers who demand a more personal and direct relation with Stedin. Their responsibilities are quite varied, ranging from advising municipalities in creating their Regional Energy Strategy to maintaining a relation with Stedin's largest customers.
The team of regional managers fall under KAM and have been involved in Energy Community pilots. It could therefore be expected that they will also play a role in delivering service to LECs in the future.

Other departments
A&V
When you need something changed about your grid connection this is the place to be within Stedin. A&V is responsible for the connections of Stedin and maintaining all the data of these connections and other assets. If a LEC would need their grid connection changed or need data about the grid they would be dependent on A&V for this.

AM
Key within Stedin is Asset Management. This department is responsible for all the assets Stedin operates. Next to this they are also responsible for designing the energy system so that it is ready for the energy transition and Stedin can be the enabler and not a limiting factor in the energy transition. They would be interested in Energy Communities because they could be a new tool to aid AM in problem solving. To manage all the Assets of Stedin they need reliable and complete data about the energy system. This is data a LEC would potentially need as well to create their plans.

The role of the marketing department
The marketing department is not a direct frontstage channel like for example KAM or the KDO. However they are responsible for the website and all the customer journeys within Stedin. Next to this they are also responsible for all communication material going out to customers. Marketing works closely with other departments to advice in communication to customers. This makes them the place within Stedin to push for increased customer centricity. Product owners are also part of the marketing department. One of these product owners is responsible for the theme Flexibility. This theme contains Local Energy Communities as well. Because of this the marketing department is also expected to shape the service offering to LECs.

What it means for the project

Stedin is very clear about a few things in their strategy: they need to collaborate with stakeholders and they need to make information about the grid available. Because in the energy transition all activities need to be aligned between all stakeholders. Stedin however doesn't talk about making grid information available to customers directly. This 'extension' of the strategy will be taken in this project however.

Lastly it is important that the case is made how LEF and the accompanying service design will contribute to better grid management, that there is an unmet need and Stedin is uniquely positioned to deliver this activity (service in this case).

However after analyzing Stedin it is safe to say that there is room to develop new services for LECs. The main boundary condition for how far these services are allowed to help LECs is that the services should be something *only Stedin can deliver to LEC*s and they should preferably be a favor and not a monetized service. Both because then this could disturb the market, and because LECs are actually doing a DSO a favor once the technology matures and flexibility becomes available.

Another argument for investing in LECs is that right now there is simply not really a market or sector around them, so investments in services for LECs should not be seen as a threat for service providers but as an opportunity. However this means Stedin should not offer *all* the services a LEC needs because this would leave no room for service providers to have a viable business.

2 The law Independent grid Operation (Dutch: Wet Onafhankelijk Netbeheer, WON) mandated that each customer had the right to choose a electricity supplier and that the DSOs could not charge more money for the transportation costs when you switched as a customer, as was previously the case.

2.7

LES AS A SOLUTION

As discussed in chapter 2.3 the energy system is in need of a solution for the problems that are arising as a consequence of the transition to renewables. One of the solutions proposed by Stedin is the Layered Energy System. This technology is at the center of this thesis: since the assignments objective is to make LES available for the larger public. Therefore a whole chapter is dedicated to explaining what LES is and where it stands right now as a service to LECs.

This chapter discusses in depth what a Layered Energy System (LES) is, why it was developed, how it works in detail and how LES operates from the perspective of different users. The main source of knowledge about LES is the second edition of the LES white-paper.[1] After the more technical discussion of LES in the beginning of this chapter the current situation is discussed near the end. The experience of LES and struggles LECs face today are discussed at the end of this chapter.

2.7.1 The LES concept explained in detail

To start off the description of what LES is it is best to directly quote white-paper: “The basic principle of LES is that the aggregation and optimisation of distributed consumption, production and flexibility is to be based on a market mechanism.” This means it is different from other smart grid solutions, because most of the time these are based on a central control system. A LEC is determined by a geographic area, making if different then a general Energy Community (EC). To increase the predictability and manage congestion effectively the LEC setup is based on the grid topology.

Origin of LES and why it is necessary

As discussed in previous chapters the energy transition means we as a society face big challenges. This needs new thinking and new, radically different, solutions. LES is intended as one of these possible solutions for the problems faced today and in the future. With writing the LES white-paper Stedin set out to design an energy system that consists of multiple layers (hence the name) and in which *the local level plays a leading role.*

Today it is easier than ever to produce your own energy. It is also easier than ever before to know what energy markets are doing, and therefore optimise your own (or community) smart energy system. However at the same time we also don’t want to give up the comfort and safety of the currently reliable energy system as we know it. Uniting these factors

1 The les whitepaper can be downloaded from Stedin’s website by following this link: https://www.stedin.net/over-stedin/~/media/files/stedin/projecten/layered-energy-system-white-paper.pdf?la=nl-nl [29]

“This white paper was written with a forward-thinking mindset and should thus not be considered as our definitive viewpoint or the single possible route forward. Instead, it is meant to elicit new ideas among our readers, as an open invitation for further debate and co-creation. In doing so, we can learn and make this system evolve into a meaningful part of our energy future.” *-Stedin*

without compromising one of the two is the most important benefit of LES. LES provides a way to have the best of both worlds. It enables households and enterprises to interact with and even provide energy to each other. On the other hand, LES gives market players access to distributed flexibility.

How does a LES operate

The layered energy system is a system where Local Energy Communities (LECs) each form their own Local Energy Market (LEM). This is a bit like virtually moving your grid connection around the whole community, instead of everyone having their own grid connection. For the DSO this means a simplified system, because they can trust the community to balance itself inside their LEM. However Stedin still has to keep an eye out for safety so they can not completely leave the community to trade on their own terms, but more on this later. When households trade within their LEM this can be done for free: the seller and buyer prices are symmetrical.

It is however to be expected that most LECs can’t provide them self with all the energy they need all the time. So therefore the LEM also has an open connection to the wholesale energy market to buy extra energy when needed. However when buying energy from outside their LEM this is subject to a premium so there is an incentive to optimize self-consumption.

Advantages of LES

A LES has some clear benefits as a result of the design. The most important one being that the use of locally generated electricity is stimulated. In technical terms this is called: increasing community self-consumption. This makes it completely different from the current situation with the Net-metering scheme. Here there is no incentive (at least until 2023) to use your own energy as much as possible, except maybe the added psychological benefit of ‘using your own energy’. Another added benefit is the increased feeling of ‘community’, however this might scare away some more individualistic neighborhoods. So when communicating about LES there needs to be a clear decision made for whether to market it as a ‘niche sustainable community thing’, or a service more for the general public.

This increase in community self-consumption also means unnecessary investments into the grid can be avoided and transmission losses are reduced.

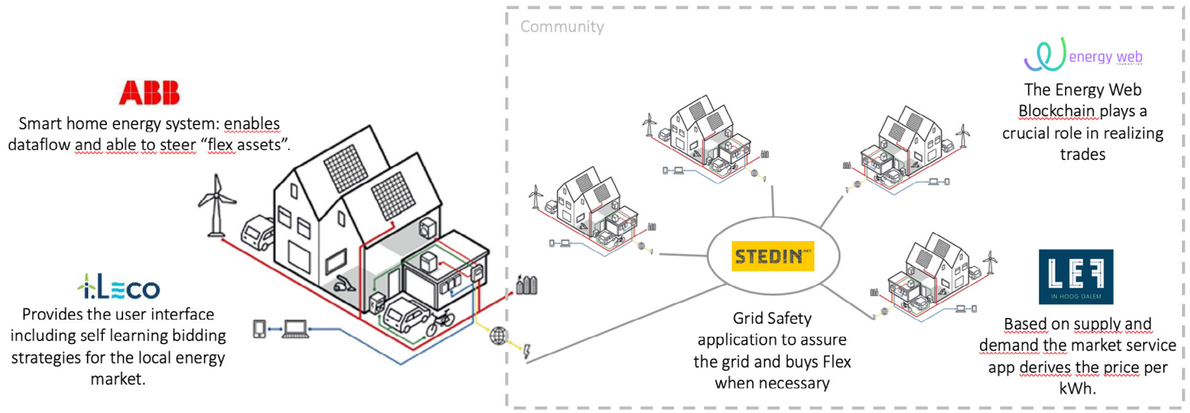


Figure 2.7 - 1: Schematic representation of a Local energy community based on LES

Other benefits are, to quote the LES white-paper:

- Anyone can participate, with or without solar panels and with or without the possibility to offer flexibility;
- There is no obligation to join a LEM, since everybody is still free and able to choose a supplier like everybody does right now in the existing supplier model;
- Everybody can participate in a local market with their own chosen service provider. This avoids a community being dependent for their energy supply on one service provider;
- Stimulation measures like subsidies or feed-in premiums will be evenly distributed over all participants and thus opening up the benefits of the energy transition to everyone;
- It prevents the disappearance of flexibility behind minimised connections. This is called partial grid defection[1] and is a doom scenario for grid and system operators;
- The last and most straightforward benefit is that the cost of energy will be less than or equal to what it is now.

What is a local energy market in a LES and how does it work?

The current centralized system is ill-equipped to deal with the changing circumstances of the energy system. More on this can be read in chapter 2.3. A scenario where each individual connection optimizes their own energy usage can also lead to grid defection, as explained in the previous section. To explain why this is the case it is first necessary to understand which dimensions make up an energy system. The energy system basically consists of three dimensions (or axis): transport (capacity), volume (energy) and system operation (balancing). Solutions for the problems posed by the energy transition often increase the performance of one dimension, but at the cost of the performance of another axis. In the white paper a solution is proposed in the form of a 'best of all three worlds.' To quote the white paper to explain LES:

"...an alternative is creating a local market with symmetrical prices for prosumers, so the consumption or in-feed patterns of a prosumer will depend on the price, which in turn is a result of abundance and scarcity. When energy is abundant, prices are low and, for example, solar energy will be used directly or stored rather than added to the market. Wholesale producers can participate in the local market as well, though their supply is subject to an increase in costs compared to locally produced energy in order to provide incentives for local use before external supply, see Figure 2.7 - 2. It is important to note, however, that scarcity on the overall system level could occur at the same time as congestion at a local level. Therefore, implementation scenarios should consider energy and available capacity for all layers of the system."

This model is also scalable and modular. This means that multiple local markets can exist next to each other and in theory supply each other. Also when needed by the TSO or DSO imbalance or redispatch[2] capacity can be directly accessed by those parties. This means the flexibility is available for the player willing to pay the most.

So to summarize: A Local Energy Market according to the LES concept is simply that: a local market with its own local energy price. Nested in between the individual user and the wholesale market. It is better at stabilizing the energy grid on a local and national level because it does not push flexibility out of the market and offers a reduced price for electricity. As the cherry on the cake, because of the higher price a LEC pays for

1 What is grid defection? To quote the white paper on this: "The difference between selling and buying is large enough to make the business case for your own private energy storage in your own house attractive. This may buffer the amount of distributed infeed and thus prevent grid reinforcements, but this flexibility is pushed out of the system and cannot be used for balancing or congestion management with causes elsewhere, for example wind farms at sea. TSOs and regional grid operators alike consider this effect very undesirable."

2 Redispatch means that the transmission system operator (TSO) request to adjust the active power feed-in from power plants to avoid or resolve occurring congestion. This measure can be implemented both within the grid area and between different grid areas. By lowering the active power feed-in of one or more power plants while at the same time increasing the active power feed-in of one or more other power plants, the total active power feed-in remains virtually unchanged, but the congestion is removed.[30]

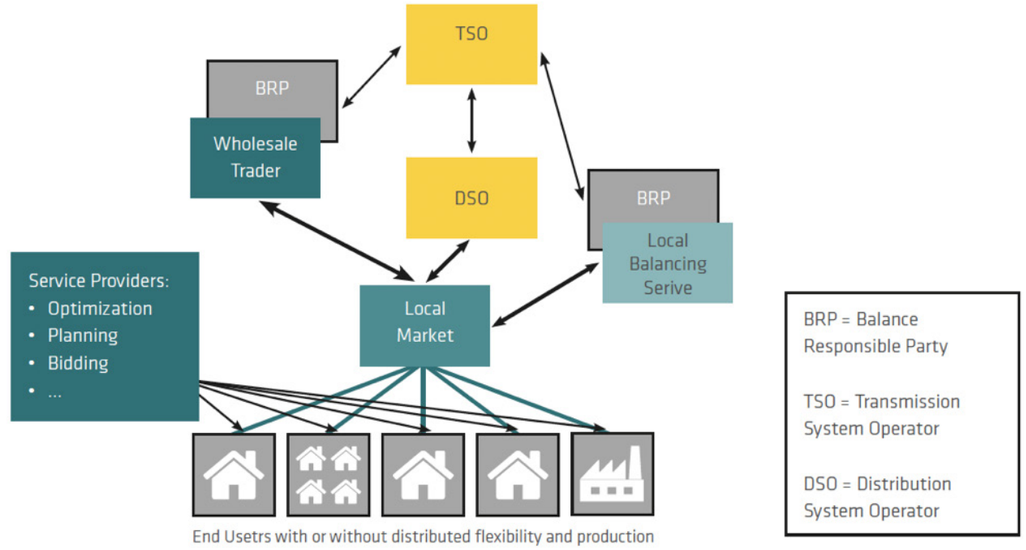


Figure 2.7 - 2: Schematic representation of a LEM, its users and other players acting on the LEM

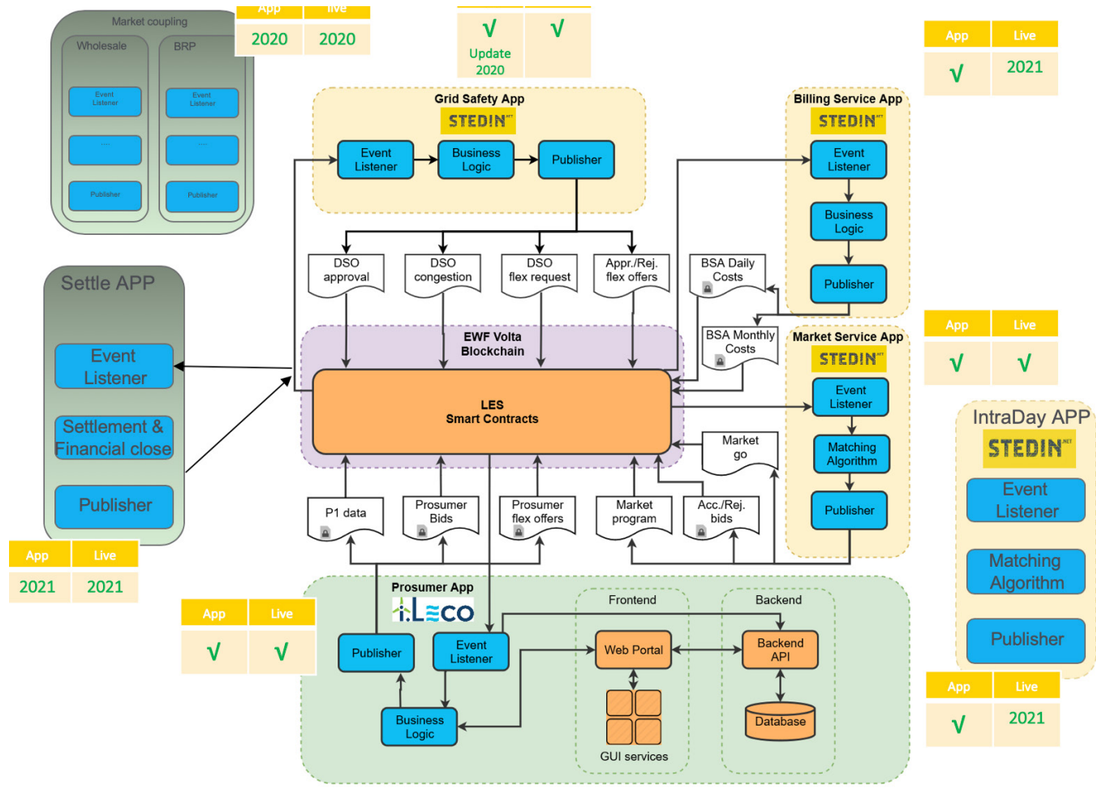


Figure 2.7 - 3: Overview of all the apps needed to operate a LEM based on LES. The apps with the Stedin logo are Stedin's responsibility.

electricity bought from the wholesale market there is a clear incentive to invest in community owned energy production when this is not yet available in the LEC. This improves the equal spread of the benefits from the energy transition.

The technology of LES

The white paper only explains the concept. However to be able to communicate to LECs how using LES impacts their life it is worthwhile to also understand how a LES based LEM functions on a practical level. Therefore in this section the technology and set-up of LES are discussed.

To enable a LEM to exist based on LES a variety of Services needed to be offered. Some of these will be offered by a service provider while others will be offered by Stedin.

In Figure 2.7 - 3 a schematic overview of all the LES apps is given and when they are expected to be ready.

2.7.2 The business case and market model of LES

The LES market model is based on the USEF (Universal Smart Energy Framework). This framework was developed by multiple stakeholders from the European Union to accommodate flexibility in our energy system. Taking this framework a step further and designed a market model that could, to quote the white paper:

- Accommodate the customer's wish to produce and consume local;
- Make use of the modern (information) technologies available;
- Enable the end consumer to make his own decisions, but provide incentives to stay connected with the system;
- Keep distributed flexibility accessible for purposes on a higher market level, such as balancing by TSOs;
- Provide regional grid operators with a means to service the connected End Users in a most cost-effective way and facilitate the transition at the same time;
- Distribute the benefits of the energy transition over all those that want to participate.

A LEM based on the LES concept is open for (wholesale) market participants to bid into the local market. However the transactions within the community have a priority. This priority is created by adding an extra cost to any supply from outside of the LEM. Also, as mentioned earlier, the prices for local production and use are identical. These two factors are the most important rules LES is created around. The local market mechanism follows the market phases as used in the wholesale energy markets and as described for distributed flexibility trade by USEF. The market runs in 15 minute intervals, just like the national wholesale energy market. It is of course not expected of individuals to start trading electricity every 15 minutes if they want to turn on their lights. This would make us go back to the early days of electricity where you had to drop a coin into your fuse box. Instead this trading is done automatically by the software provided by a service provider. This is possible because as a household your usage is automatically forecast based on historic usage and for example weather forecasts. Combining this forecast with a basic set of rules each household sets for themself (i.e. comfort or the cheapest electricity) the LEM is able to create a price.

The Social part of LES

The white paper and pilots mainly focused on the technical and business side of the concept. The paper does not talk in detail about the desirability of a concept like LES from an end user perspective. However, Stedin's innovation department did present the concept and the results of the pilot at the yearly HierOpgewekt event, and it was received well here. Also the appearance of energy communities without the help of Stedin, like the Groene Mient and Ecowijk Mandora suggest there is a need for a concept like LES. These initiatives however are the real 'innovators' and are not representative of the general public. However according to the adoption model of Rogers [15] this might not be a problem, since these innovators can contribute to making the experience of LES better and shift the public opinion towards acceptance of a new energy system.

However the LEF principles are explicit about benefits for communities like increase social cohesion and self determination.

2.7.3 LES in practice: LEF

LES is already more than a concept. Stedin undertook two pilots to take the concept further and develop all the necessary apps, market models, user stories and a modular system based on blockchain technology.

When communicating about LES Stedin has rebranded LES to a more accesible 'Lokaal Energie Flexibel', LEF in short. LEF can be seen as the branding and real life version of LES, which is just the concept of a Local Energy Market.

Hoog-Dalem

Every concept needs a testing ground to be developed further. The neighborhood in the municipality of Gorinchem called Hoog-Dalem has been this testing ground for LES. Here the real life application of LES is made possible by developing together with ABB, i.Leco, Energy21 all the technology discussed earlier. The experience of this pilot is included in the external analysis by interviewing a resident of Hoog-Dalem who also participates in the pilot.

The state of technology right now

Developing all the software needed to safely create a Local Energy Market is a very challenging feat. Stedin has been developing this software package together with i.Leco. Quite some of the apps that can be seen in Figure 2.7 - 3. However some apps are not yet successfully developed. The main one being the billing service app. This app is necessary for settling the balance between all the participants of the LEM. Because of this the current version of LEF in Hoog-Dalem is not trading with real money and the market remains a virtual market. How community members interact with their local market is live though. A screenshot of this 'prosumer app' can be seen in Image 2.7 - 1.

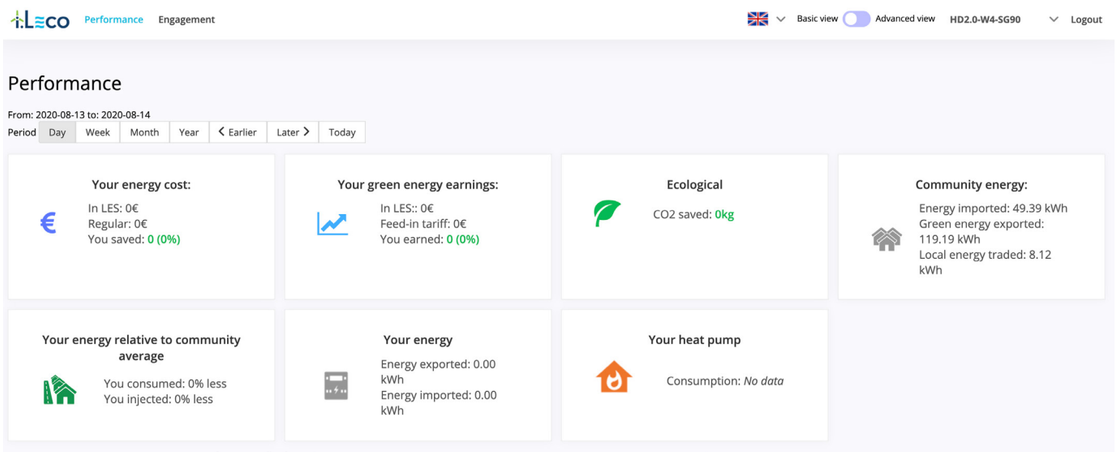


Image 2.7 - 1: Screenshot of the i.Leco prosumer app

The future of LEF

The ambition is to make a HelloWorld package for service providers or LECs that have technology savvy members. This HelloWorld package contains all the documentation needed to set up your local version of LEF. Some of the apps will be made open source and also included in the HW package. However Stedin is not really allowed to offer all the software for free, since service providers can offer this.

What it means for the project

LES is already more then a concept. It is being tested and developed right now. Although it is very exiting to work with new technology this offers difficulties as well. More precisely, will the software be ready when we launch the service that helps people explore the possibility of setting up their own LEC. This dependency should not lead to waiting even longer to develop the service needed to start using LEF. Because one thing is certain, if Stedin stops moving LEF will never become available to a larger public. Also considering all the investments into LEF Stedin has already made it would be a missed opportunity to not extend the service offering of Stedin further. So that it becomes easier, or even possible at all at this stage, to start using LEF as an Energy Community.

2.8

SERVICE PROVIDERS

This chapter discusses the role of the service provider. Service provider is an umbrella term for all the organizations that deliver services needed to an energy community or a DSO to operate that they don't provider themself because they can't, don't want to or are legally not allowed to. Service providers are discussed in detail because in order to successfully deliver the service a LEC goes through service providers are essential. Therefore they are interviewed and analyzed as part of this project.

2.8.1 The role of a service provider

In theory Stedin could offer all the services to a community who want to form a LEC. Only this is legally not allowed, since elements of the services and hard and software needed to form a LEC can be developed and offered by the 'market'. As seen in chapter 2.6 Stedin will only deliver services they are uniquely positioned for to deliver. This means most services need to be delivered by service providers instead of Stedin. This makes the service to become a LEC as a whole is delivered by multiple organizations. This is actually very often the case. For example, when visiting a hospital to receive treatment you are driven there by a cab, you receive treatment from the hospital and finally a third player, your insurer, bills you etc. So a complete service journey most of the time is made up of smaller elements that need to be joined together to deliver a complete service, like receiving treatment or setting up a LEC.

To understand what a service provider provides to a LEC with it is easiest to look at the LES software package. Here you see the difference between which app is under the control of who.

The software Stedin will supply for LECs (For free and/or opensource)

The grid safety app (GSA)

This app makes sure the energy community operating on Stedins grid can't do anything that might compromise the safety of the grid. This is related to Stedin's core business: controlling and safeguarding the grid. Right now everything is controlled until your front door. Stedin is willing to give to communities part of this control. Stedin gives communities the control between each other. But in order to do this while still doing their core job of keeping the grid safe, the grid safety app needs to monitor and sit in between the participants in the community.

Billing service app

Settling the credits between the members of the energy community. This app is currently not live yet, the development has proven challenging and is left to i.LECO for now. This app will also be open source.

Market service app

This app is the connection between a LEC and the wholesale energy market. Since a LEC will become their own energy supplier, but might have moments where they can't meet their own electricity demand, they will need to buy this energy from other communities or the wholesale market.

A service provider on the other hand can provide consumers with:

- The prosumer app (a dashboard for each household and the community)
- The connection between the assets of the community member and the LEM. This is necessary to offer flexibility and optimize energy usage to supply.

2.8.2 Example service providers

In the previous section the technical role is explained of a service provider. But do these companies already exist? What do they offer and what have they already delivered? To answer this question we first analyze three existing service providers in the Netherlands.

i.Leco

This Belgian software company has been the main partner of Stedin in the Hoog-Dalem pilots. They developed also a few of the Apps Stedin will have under control in the future like the Grid Safety App. They are also involved in the Eemnes Renaissance H2020 project. This service provider is technically quite far ahead of the competition, however their products are not yet easily used by your average consumer. For example, in terms of UX the dashboard from the prosumer app can be simplified quite a bit.

Spectral

Spectral is the most advanced service provider for energy communities right now in the Netherlands. They are arguably leading the industry. They started out developing software to improve the efficiency of commercial renewable generation plants. Their most innovative software is their Spectral Energy Control System (SECS). This can be tailored to control wind farms or to aggregate fleets of distributed devices in microgrids.
Their most impressive residential energy community project is SchoonSchip in Amsterdam. Here a cluster of 47 houseboats together form a micro-grid. Spectral developed the complete software package needed to integrally control all the residents' heat pumps and batteries. The first results of this project are impressive: the peak load on the grid was reduced to 50kW. This proves that the systems spectral developed have the potential to optimize the energy grid by increasing self consumption

Hanzenet

Hanzenet developed their Hanzebox and a blockchain based energy trading platform. They are a smaller service provider based in Groningen. Because this is out of Stedin's service area they are not collaborating in any projects at this moment.

2.8.3 Insights from interviews with service providers

Spectral and i.Leco were both interviewed to gain a better understanding of how they see the role of Stedin (and DSOs in general) in the future. The main insights are presented below, for the complete list of insights see Appendix H.

Tom - Spectral

- The values of communities are really about local empowerment, wanting to take control about their environment and owning their own data (data privacy);
- Every energy community has roughly these same values, however still every community is a custom built job;
- The service providers job is really on the development and engineering. Less so on the community organizing and communication aspect;
- Making a sound business case is still very tough. Most parties rely on grants or subsidies. So the sector is still playing the waiting game until the business case becomes positive.;
- The energy community sector needs to become mature and able to support itself. Spectral finds it a good thing that Stedin is taking a proactive role, but acknowledges that they should step out and leave it to the market at a certain point. Where

this point lies is still unknown;

- The role of Stedin should be to inform the communities and new neighborhoods as early on as possible that setting up an energy community or smart grid is a possibility. This means the market grows and Stedin has the possibility to steer towards a favourable community grid system design. So the focus is more on informing at the early stages of ambition forming;
- The business case is still very fragile for most communities. Especially with the salderingsregeling. You really need 3-5 years to get from innovators to the early adopters;
- He acknowledges that the DSOs are being forced to change by changing external circumstances;
- The main role of stedin should be to start the dialog with the communities as early on as possible to guide them in the right direction and to get them to form the right connections to accelerate the process and move them towards the implementation.

Stefan - i.LECO

- Just like Spectral their ambition is that within 3-5 years joining a LEC should be as easy as switching from your energy suppliers;
- Sees a bit of an internal struggle within Stedin. The progressive group versus the more conservative people. He finds it important that in order for Stedin to get further they should start pulling in the same direction;
- i.LECO foresees and wants that Stedin just takes their current role as a DSO and interpret it in a modern way. So keeping the grid stable, but adding the modern tools like the Grid Safety App to operate smart grids on top of the current grid. And also having positive market incentives coming from the GSA;
- Is against making everything open source, because nothing is for free;
- Their goal is to become a product company and making setting up an energy community/LEM a standardized product as much as possible;
- The expectation is that until the business case becomes favourable over the regular electricity tariffs you will only keep the early movers and it will remain a slow and sluggish process to form energy communities;
- This tipping point should be in a year or 2, after that he expects that the regulations will become easier as well. Right now the community sector is still in the early development phase;
- LES will become very important in the future grid, so it is important that Stedin keeps making noise around the topic. But it might take 5-10 years before energy communities become big enough so that they can start having an impact on the national level, so in the early phase it will be used to solve smaller localized problems.

What it means for the project

The role of the DSO stays the same with LES, only the interpretation will be different. The DSOs current role is to make the energy grid as efficient and facilitate the exchange of energy. This means their task description also needs to be extended to offering the apps discussed in this chapter: this is simply the future of data driven efficient system operation. Or to put it more simple: DSOs will offer start offering not only the physical infrastructure but will also need to offer the digital infrastructure, in the form of data made available through Apps and APIs, needed to make the grid smart.

Service providers' role on the other hand will be to provide the main interface for energy communities to interact with their smart energy systems. However, one issue then remains: how do you start an energy community? Since in this process an LEC is heavily dependent on data from Stedin to know what is possible and favorable: this information dependency needs to be overcome.

Image 2.8 - 1: Ecowijk mandora in Houten, one of the communities consulted

2.9

BRINGING IT TOGETHER

In this chapter the understand phase is concluded, which is done by creating ten guiding principles. Next to this also a few criteria from each subsequent chapter are summarized. For the process of creating these guiding principles the method chapter at the beginning of this section.

2.9.1 Guiding principles for designing for LECs

As discussed in chapter 2.1, the goal of the understand phase was to synthesize all the interviews with community members and in/external stakeholders into one set of criteria. Each of these statements has a reference underneath them. This reference points the reader towards Appendix H, where the list with all insights is available to read.
In this paragraph ten guiding principles for designing for LECs are presented. The objective of these guiding principles is to serve as what their name intends: guiding in the design or operation of the LEF service offering. They will also be used to create the service design and evaluate it.

1. Enable Local Energy Communities operating a LEM to exist

This first one is a bit obvious, but it came back from multiple sources. Stedin is expected to do what is necessary for local energy markets in line with the LEF principles to exist on a technical level. This is the least Stedin is expected to do for the innovators, since most of the innovators are already a community and very aware of the need to transition towards renewables. In practice means cooperating with energy communities in facilitating energy transfers within the community and providing access to all suitable markets in a non-discriminatory manner.

Source of themes: Community member interviews (1.5, 3.9), Vision workshop (7), service providers(22, 34), KAM (43), Internal documentation LEF (59)

2. Communicate to potential energy communities the information and data they need

Energy community leaders need information about what is possible on the Stedin grid an what is learnt during previous pilots. Next to this there is a clear desire for data about their local situation to enable them to craft a story towards their members. This information doesn't need to be made public, it can be only accessible by the community leader.

Source of themes: Community member interviews (2.8, 2.10, 2.17, 3.3, 3.4, 3.5, 3.6), Vision workshop (8), KAM (44)

3. Effectively collaborate with communities and Stedin

Effective collaboration means giving clear direction to community leaders where and who they need to contact for what within Stedin, but ideally providing one point of contact in the organization. It also means customers want Stedin to get on their level and not the other way around. Lastly it is about giving clear expectations and an equal distribution of roles, workload and responsibility: it should be a team effort. This means helping potential energy communities in reaching a clear plan that is feasible on the Stedin grid.

Source of themes: Community members interviews (1.1, 2.6, 3.3, 3.4, 3.5), Vision workshop (5, 6, 16), KAM (38, 39, 40, 40, 41, 42), Decision tree meetings (47, 48, 49)

4. Enable community leaders to inform and convince potential members

This cluster is referring to the desire that community leaders want the backing of Stedin towards their community. This enables them to be more believable. This also means that they desire simple tools that could communicate to these community members how their situation would change and benefit from joining the community. A different approach to this would be to offer interesting services that energy community leaders can then offer to their community, for example insight into their energy usage and ways to lower this or use their renewables more efficiently.

Source of themes: Community member interviews (1.2, 1.3, 1.4, 2.7, 2.1, 3.1, 3.2, 4.1)

5. Spread and protect energy democracy

This means protecting communities from system lock-ins and safeguarding energy community 'sovereignty'. So leaving it to the market in certain areas, while also drawing clear boundaries. It also means that energy communities should be allowed to keep the benefits of renewable electricity local and energy communities to prosper and take up more control. To sum it up this means simply that energy communities should be able to perform all four activities possible on the grid: produce, store, consume, purchase and sell energy within the community or in relation to the grid.

Source of themes: Community member interviews (2.19, 3.10, 4.4, 4.5), vision workshop (10, 11, 12, 14, 16), service providers (24, 27, 35)

6. Help communities to form good partnerships

In order to form good partnerships energy communities need to have a clear picture of what is possible. If this is achieved, they also need insight into the track record of different service providers. Making the choice for a service provider that is aligned with the goals of an energy community can greatly benefit the project later on, but is hard to realize if a potential energy community does not clearly know yet what their goals are. Also simply matchmaking is necessary, there is not one repository.

Source of themes: Community member interviews (2.14, 2.15, 2.16), vision workshop (10), service providers (24)

7. Assure the embodiment of the LEF values into energy community designs

Only making sure energy democracy is allowed is not enough to make energy democracy also embodied in the community by design. For this it is important that the LEF values are actively carried out, possibly even enforced, by Stedin. This means that the community needs to be able to own their own data, mainly for privacy reasons. The community also needs to still be connected through the medium voltage grid, which means communities can't be autarkic. The free choice of joining and leaving an energy community for the members should also be safeguarded.

Source of themes: Internal documentation LEF (57, 58, 60, 61), community member interviews (2.9), legislation EU (68.1, 68.2)

8. Make the business case of LEF viable

For energy communities to prosper a few things need to change. The business case is not positive right now, but is expected to become so in the future. But for this Stedin needs to innovate the current tariff model and allow a location/distance factor to be part of the transport cost. For this there needs to be lobbied, also within Stedin itself. It also means compensating energy communities fairly for their effort done towards stabilizing the grid and avoiding grid reinforcement.

Source of themes: Community member interviews (1.5, 3.9), Vision workshop (7), service providers(22, 34), KAM (43), Internal documentation LEF (59)

9. Generate and share knowledge between all four key stakeholders*

To enable learning from each other and mainly from pilots is crucial. Also being open about what doesn't work, knowledge need to be spread between the different players. To make this happen knowledge need to be open and accessible. It needs This includes also between energy communities, where Stedin could serve as the gateway for this knowledge. However before this will happen, energy communities first need to know about each other's existence. Providing this overview is something Stedin is well equipped for. In order to generate knowledge it also is essential that communities have access to good data about their situation and can easily record new data.

Source of themes: Community member interviews (2.5, 2.12, 2.13, 2.20, 4.2), Vision workshop (19)
* Stedin, energy communities, service partners, knowledge institutes

10. Make forming a Local Energy Community hassle free without disturbing the market

There is a fine line between being too passive and disturbing the market. Service providers ask for Stedin to step out at a certain point when maturity is achieved in the LEC sector, while EU regulation asks for Stedin to remove all the unjustified administrative barriers to LECs. On the other hand, these same service partners also really desire from Stedin that they keep making noise around the possibility of starting an energy community and to keep developing LES. This means actively scaling the amount of communities in the future, which Stedin itself might also see happening.

Source of themes: service providers (32, 36), Legislation EU (69), Vision workshop (14)

2.9.2 List of requirements

The following summary of criteria were found to be the most important for the design. For the complete list of requirements see Appendix N. The criteria presented here are more over arching criteria for the design, but in the full list also more specific criteria on the information and detailing of the design are included. These criteria together with the ten guiding principles will serve as the main means of evaluating the design.

Criteria from Stedin & LES Team

- Contribute to better grid management now or in the future. It should be in line with Stedin's core business. (Stedin strategy)
- Something Stedin is uniquely positioned to make available (Stedin strategy)
- Full fill the duty to deliver and expand the availability of data (Energiewet 1.0)
- Standardize what is reasonably possible (KAM)
- Allow direct contact with Stedin for specific questions. (K&M strategy)
- Allow the amount of LECs to scale easier to create flexibility. (LES team)
- Keep track of communities' plans from the start. (LES team)

Criteria from energy communities

- Give LEC leaders one place for simple information about LES and LEMs to explore the possibilities when starting out
- Clearly lay out what steps are to be taken, is expected from LEC leaders, and what LES will cost and bring their community
- Give community leaders very specific knowledge about how LES will affect their, and their communities', situation. Managing expectations like what will it cost them and what will it bring them is key
- Improve energy democracy and keep the benefits of the energy transition local
- Transparently collaborate with Stedin.
- Take communities seriously: they might not be experts, they are motivated and should be treated accordingly
- There are three general topics of knowledge about energy communities: the social aspect, the technical aspect and the economic aspect. All three should be addressed when informing community leaders and knowledge about all three should be available

Implications for the project

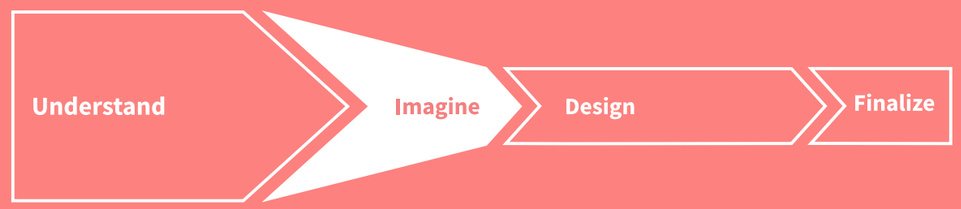
The goal initially was to synthesis clear cut criteria from the analysis. The reasoning being here that by clustering different types of insights a clear overview of what is expected of Stedin would emerge. This would then be called a 'strategic positioning' of Stedin towards LECs. However when assessing what came out of the synthesis the clusters were more a sort of guiding principles. Therefore the decision is made to consider them as such. These guiding principles can be used to guide the future development of LES, but their main purpose is to guide the design process.

Another conclusion that can be drawn from the inability to synthesize the understand phase into concrete criteria is that there is simply no clear answer yet as to what Stedin's role should be towards LECs. Taking this conclusion a step further: because of the energy sector being in transition nobody really has the answer yet as to what future scenario we are actually designing for. This reinforces the notion that it is key to just start designing and building *something:* because only then we'll start learning and finally get somewhere! Luckily this is what the next three sections are all about.

3

IMAGINE

In this section the co-creation session results are discussed. Based on the outcome of the two rounds of co-creation the design brief is then made. Lastly a scope for the design phase is also determined and presented in this chapter.



3.1

IMAGINE PROCESS

This chapter explains the steps taken in the imagine phase of this project. Imagine is mainly about researching latent needs through co-creation with end users and turning this into the design brief.

3.1.1 Why co-creation

One important aspect of this project is that it is really about innovation and not incremental improvement. However, most methods in service design are aimed at carefully analyzing the current situation and based on this find small improvements to iterate on the status quo. This created a challenge: how to improve something that is not there yet? To provide a solution for this lack of a preexisting service a different approach is used in this project. Instead of neatly analyzing all the results of the Understand phase and then proposing improvements, as normal 'painpont research' prescribes, a conjoint research and design approach is used. This is aptly named: design research.

This means co-creating together with end users on an empty canvas, without having a clear design direction yet. The rationale behind this is that based on the ideas that arise during co-creation, something sensible can be said about what it is exactly that should be designed. The people involved in co-creating are namely the experts of their own experience and more precisely: what is lacking in that experience. Also, having an overview of what could be possible in terms of a service, can serve as a substitute for the already existing service that is lacking when creating a new service (i.e. service innovation).

This design research is done through two co-creation sessions. And by filtering what comes out of these co-creation sessions based on the strategic positioning the design brief is established. This design brief then gives direction in the next phase where the actual designing starts.

3.1.2 Co-creating touch points

Co-creation is a great tool to break down silos in companies and bring together a company and their customers. It also avoids the phenomenon of 'not invented here' by involving end users early on in the design process.
The main purpose of the two workshops is to find the biggest needs from end users and to investigate if the current channels will be sufficient or if channels need to be added or extended.

Two sessions were held, each with a slightly different structure. For the detailed workshop agenda see appendix F.

Activities only done in workshop 1:

- Introduction of what a service blueprint is
- Validate the service blueprint steps (and therefore also of the customer journey) by letting them be reviewed by the participants
- Creating custom how-to's based on gaps in the service blueprint
- Plotting the highest ranking ideas on the empty service blueprint template

Activities done in both workshops:

- Ideate based on how-to's
- Vote for best idea under every how-to

Activities only done in workshop 2:

- Choose from premade how-to's
- A second round of ideation
- Plotting the highest ranking ideas on a c-box (instead of service blueprint) to create a ranking

For the sessions a mix of internal and external possible users was invited. The overview of the participants and their relation to the project can be seen in Table 3.1 - 1.

3.1.3 Constructing the design brief

The design brief is a summary of the ideas that remained after selecting the highest ranking ideas from the co-creation sessions. The purpose of the design brief is to give clear directions for the service design in the design phase of the project.
The design brief is made by taking the ideas of the co-creation session and giving these ideas a score with the criteria from the strategic positioning. The ideas with a score higher than five points were then chosen and re-formulated into the design brief.

The reasoning here being that the criteria made sure that only the right ideas would end up in the design brief.

Relation	**Workshop 1**	**Workshop 2**
Community leader	Ernst van Zuijlen	Willie Berentsen
KDO representative	Kevin Hamburg	Elma Cosic, Kees-Jan Fernhoudt
Innovation Representative	Jan Pellis	Arjen Zuijderduijn
Marketing representative	Bart Smakman	-

Table 3.1 - 1: Table of participants

3.2

CO-CREATION OUTCOME

After two rounds of co-creation with eight different participants, 15 ideas were selected as the most fitting during a voting round in each session. These selected ideas were then plotted on the service blueprint. For the filled in service blueprint with these 15 ideas, see this link.

The service blueprint consists of on the x-axis: the customer journey, and on the y-axis: the channels of the service ecosystem. So by combining the channels (see paragraph 2.5) and the customer journey, an empty service blueprint was created to be used in the co-creation session as a blank 'canvas'. See the link on this page for the blueprint template.

Image 3.2 - 1: Co-creation intelligent lockdown mode. One laptop for talking, one laptop for the workshop materials. The post its are just there to create the atmosphere of a creative session but unfortunately we just stuck with digital post-its for now.

The following list of 'high-ranking ideas' is based on which ideas the participants considered having the most potential. The selection was done using a c-box which can be seen in Appendix J.

The high ranking ideas according to the co-creation participants were as follows:

Aware

- An association of communities that share results with each other. They also give a webinar (presentation/ meeting) on a regular basis for newly interested community leaders;

Explore

- Providing the sustainable, social and financial benefits of joining and energy community ;
- Making an overview of energy communities within the Stedin operating area, showing their characteristics, motivation and goals, how and with who they cooperate and their execution;
- Show a general example of a business case and how it is constructed. Also give examples of responsibilities and compliance;
- Provide a clear template of a project draft that the community leaders can fill in. This can be in the LEF environment or on the Stedin website;

Team-up

- Further develop the LEF dashboard, so that it is also interesting for the starting community and gives them good insight. There are different simulation environments. These could be shared with the energy communities;
- Formalize/document the expectations, roles and responsibilities. Make you ambitions clear and formulate your research goals/community goals;

Map

- A community environment on Stedin.net with access to open data, which is not available for everyone but only the community leaders. They can either access only generalized data of their community area, or from people who have already signed up;

Design

- Clearly lay out the governance for creating the design. Create clear moments for input, but also make it fun and tangible/concrete. Continually involve people: what is in it for me and them?

The main insights gathered during the co-creation session

- The ideas that were ranked as having a high impact and a high ease of implementation were heavily concentrated around the 'explore' phase, indicating the biggest need for a service from Stedin is focused on this area
- The ideas having a high impact can all be shared/made accessible digitally, while also quite a few ideas in later steps can only be realized digitally. This resulted in adding the new touchpoint 'LEF sub-website' in the service blueprint
- The touchpoint 'LEF Appstore' was added as well, since some ideas could be considered apps. However, these ideas and the idea of an app store itself were not ranked very high. Therefore this touchpoint has a low priority
- Most ideas seem to be centered around collaboration (getting feedback on your plans) and communication (access to data), confirming the design brief

3.3

CONSTRUCTING THE DESIGN BRIEF

In this chapter the missing parts of the design brief are constructed. These missing parts are the interaction vision, design goal and manifestation. To construct the design goal, the 15 ideas selected as most promising during the co-creation session are taken as a starting point. These ideas are then grouped and rephrased into needs. These needs are the basis of the design brief. More on this can be read in paragraph 3.1.3.

3.3.1 Establishing the interaction vision

To better understand how the design should feel, a series of workshops was held with the LEF core team. At first this might sound a bit strange: why should the developers determine how the interaction should be instead of the customer?
The reasoning behind this was twofold. Firstly, it is very important that the user is heard, but just so the developers and product owners of LEF should be heard! Secondly, they have been involved very closely to the pilots and can therefore be regarded as knowledgeable about the subject.

The goal of the workshop was to come to an agreement on what the Customer Experience of setting up a LEC should be like, from Stedin's perspective.

After three hour long sessions the following CX vision was decided upon:
"Clear and effortless communication between community leaders and Stedin enables collaboration and makes forming an energy community feel as if you're playing a new board game for the first time together as a group."

3.3.2 Establishing the design goal

To understand which ideas will serve energy communities best and therefore should get priority, a scoring is done based on the guiding principles developed as a conclusion of the *understand phase*.

Each idea was referenced to each guiding principle in a matrix. If the idea contributed to the guiding principle it was given a point. This gave each idea a score from 0 to a maximum of 10. Only ideas scoring a six or higher were considered good enough to be included in the design brief. It should be noted that the selection of the participants and based on the guiding principles vary. However, the guiding principles were deemed to be much better grounded than an on the spot decision.

This led to the following selection

1. Perform a grid scan with a KDO expert to determine what would be the boundaries of the energy community based on Stedin's grid, and what configuration would be possible (8/10)
2. Check your postal code and area to see how relevant your neighborhood could be right now or in the future for tackling congestion and offer flex. (Kind of like *het openingsbod* for the heat transition) (8/10)
3. Show a general example of a business case and how it is constructed. Also give examples of responsibilities and compliance (7/10)
4. Create a community environment on Stedin.net with access to open data, which is not available for everyone but only the community leaders. They can either access only generalized data of their community area, or from people who have already signed up. (7/10)
5. Check quality assurance: Using LEF as a mark of quality for energy communities and possibly other stakeholders. Make the requirements, process and benefits clear forefront. (7/10)
6. Provide a clear template of a project draft that the community leaders can fill in. This can be in the LEF environment and on the Stedin website. (6/10)
7. Offer an elaborate template the community members can fill in. With that they pre fill the whole community design. (Like RVO). This is then each part is shared automatically with all the relevant departments of Stedin. (6/10)
8. Create an association of communities that share results with each other. They also give a webinar (presentation/meeting) on a regular basis for newly interested community leaders. (6/10) [1]

Clustering and unpacking into needs

Tools & knowledge services to learn >> **1 & 2**
A community leader needs to learn and understand a lot of new things. Having these neatly structured in one place and explained in a simple way can speed up and make it easier to implement a LEM.

Explore the possible configurations >> **3**
Every community is different, but the basics remain the same. In order to explore what is possible, the community leader should find out what his community wants and then be able to combine this with what is actually possible. A LEM configuration consists mainly of the geographical boundary, the chosen business case, the software design and the investment in flex assets.
Communicate through an online environment >> **4**
The results from the co-creation session show that when the ideas are plotted on the service blueprint template, they are mainly digital touchpoints. Just like this idea about a 'data portal'. This somewhat justifies the choice of an online environment. It is also more in line with Stedin's capabilities to develop and maintain an environment than a physical starter kit would be. However, that it should be an online environment is somewhat of an assumption, so this choice needs to be validated in the design phase.

Understand the process of setting up an LEC >> **5**
The community leaders want to know what the process of setting up an energy community looks like, so they can judge if it is something that suits them and their community. Starting with false expectations should be avoided.

Summarize your ideas into a project sketch >> **6, 7**
The project sketch is what summarizes the exploration process, structures it and makes sure all the information the community needs is there in order to continue.

3.3.3 Manifestation

How the design will be communicated is decided on at a later stage within the project and followed an iterative approach. However for completeness it is already included in this chapter and in the design brief. The original plan was to create a service blueprint and then prototype a few key touchpoints. This plan is largely followed. The only addition is that a future service scenario is also created to communicate the vision better.

1 Idea eight is discarded, since it is outside of Stedin's right to play.

3.4

DESIGN BRIEF

In this chapter all the different parts of the design brief are collected and explained.
A design brief consists of the problem statement, an interaction vision, a design goal and the manifestation.

Gauging the quality of the design brief
The process that is followed is one where the user was put in the center: all steps and decisions made were based as much as possible on things said and done during either interviews or co-creation. Therefore, it is important to see if this design brief actually holds up! To do this we look back at the solution space formulated at the beginning of the project and see if this design brief fits.

Solution space from the initial project set-up
The design for a service (including tools) to enable effective communication and collaboration with potential energy communities with the goal to increase the adoption ease and rate of LES for LECs.

When putting the solution space and design brief side by side it becomes clear that the brief fits this solution space, while also giving more direction and detail as to what the service needs to provide and for who it is meant. Therefore it is safe to say that continuing with this design brief will yield a design that is desirable.

THE DESIGN BRIEF

Problem statement
The principle and operating of a LES is still perceived as complicated to grasp and difficult to implement for LECs. However, Stedin has currently no formalized channel to communicate knowledge to potential LECs about LES. For the potential energy communities this means they cannot access the information they desire and require about LES, to create a plan to implement LES and to communicate this to Stedin.
Source: resulting from interviews with community members

Interaction vision
Clear and effortless communication between community leaders and Stedin enables collaboration and makes forming an energy community feel as if you're playing a new board game for the first time together as a group.
Source: resulting from the vision workshop series with the LEF core team

Design goal
Design a central place removes the knowledge hurdle for LEC leaders when starting a LEM, communicate the customer journey of setting up a LES based LEM and provide LEC leaders with tools to explore the possible configurations of their LEC. The leaders of the LEC should also be enabled to create a project sketch and discuss this sketch with Stedin.
Source: resulting from a series of 2 co-creation session with energy community members and key Stedin stakeholders (KAM, KDO, Innovatie, marketing)

Manifestation
A service blueprint to detail the services provided to energy communities. From this service blueprint two key touch points will be prototyped and tested with community members:

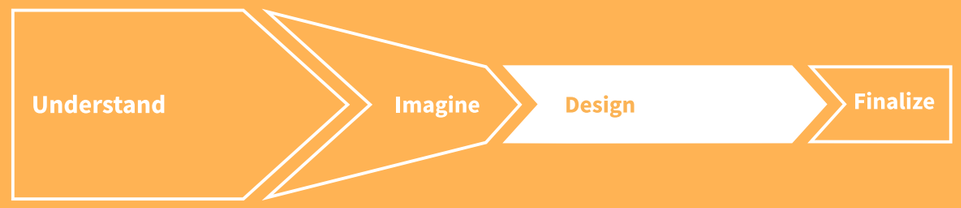
- The landing page for interested individuals, including an overview of the necessary knowledge and steps
- A tool where an energy community can create a first project plan to communicate this to Stedin.

Source: Decision made based on what would be the easiest and first step to implement, like an MVP

4

DESIGN

In this section the design is explained. The complete service design is communicated through four different artefacts: the future service scenario, touchpoint and channel descriptions, the explore phase service blueprint and the prototype. Each artefact serves a different purpose, but combined these artefacts should give enough guidance when implementing the LEF explorer service.



4.1

DESIGN PROCESS

This chapter explains the process taken in the design phase of this project. In the design phase a design is made for the service offering of Stedin, towards potential Local Energy Communities. The starting point of this phase is the design brief.

4.1.1 Service design

It should be noted here at the beginning of the design phase that service design and regular product design differ in a few areas. The most important one being that service design is much more about designing with the organization in mind. Service design is basically about designing how an organization should operate. Also, service design is more about orchestrating these small bits into one coherent functioning service.
A service that leaves enough room for individual employees to do their job, how they see fit and still contribute to the overarching objective of the service. Which in this case enables and helps an LEC to come into existence. This leads to a service design being the sum of its parts, rather than being just one big part, like is more often the case in product design.

As a result of this, the design phase is set-up as a 'T' shape. The top part of the T, the '_' represents the service blueprint. This service blueprint has multiple dimensions: the customer journey or life-cycle (depending to which level you zoom in), the time pacing of the service elements, the channels and touch-points itself. The "|" of the T represents the focus of the project. This focus is on the explore phase, as explained in chapter 3.3. Within this explore phase, there is a concept service design made in the form of a service blueprint. Parts of this blueprint are prototyped and tested.

To summarize, the service blueprint is the framework on which the service design is structured. During the designing of the explore phase multiple new elements of the service proposition are added to the current offering of Stedin. A few of these have then been selected to be prototyped and tested.

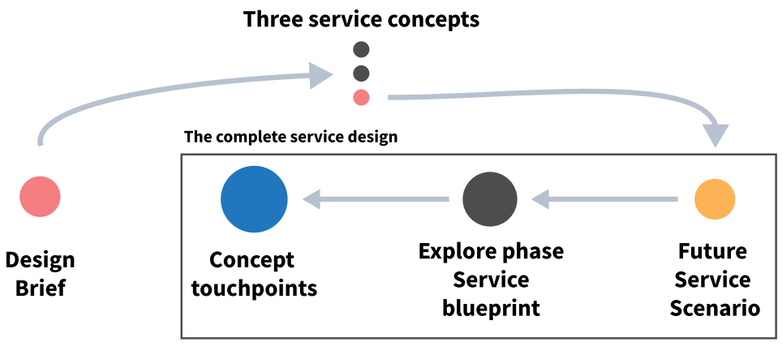


Figure 4.1 - 1: Sequence of designing each artefact

4.1.2 The process

The process of the design phase overlapped with the 'Develop' phase of the double diamond. In this project the design phase was set up as follows:

- An initial brainstorm on each separate part of the design brief with Industrial design students;
- Creating a user scenario for four different type of users (Woco's, Communities, municipality, …) to design and determine the steps inside the explore phase;
- An ideation phase, which consists of gathering all separate ideas from the co-creation session and the brainstorm and consecutively turning this into different concept service blueprints. This resulted in three concept service blueprints that each had a varying level of complexity;
- Create a 'future service scenario' based on the chosen concept, user stories, co-creation and brainstorm;
- Creating a detailed and feasible service blueprint for the explore phase that builds up to the future service scenario;
- Sketching elements of this service blueprint;
- Making prototypes of the sketched ideas;
- Parallel making a overarching service blueprint of the whole community lifecycle;

The sequence in which each part of the complete service design is made can be seen in Figure 4.1 - 1. The idea behind this was to directly answer the design brief first as a conceptual design that answers the design brief best, then working backwards to what Stedin could start with today. The idea is that the products and services will then add up to realize the vision, instead of when this process is followed the other way around.

Besides, this a significant amount of time was spent on stakeholder management, mainly done in the form of presentations at team meetings. This is done because the value of the design would greatly rely on how well the design is received and adopted within Stedin.

4.1.3 Why this method

Great ideas come cheap, the design and implementation is what is expensive. This means a large part of innovation is simply just putting in the work to make concepts and visions become reality.
A good design is also always a trade-off between: the potential community members' needs, Stedin's strategic organizational objectives and whether Stedin can actually deliver these innovative solutions as can be seen in Figure 4.1 - 2. With this in mind the method of designing at multiple complexity levels (Horizons) set out in this chapter is decided on. This method should also contribute to one of the project goals, which is to achieve a really feasible design, while also still inspiring and translating the needs of community members into a good design. The expectation is that it will put this projects outcome somewhat close to the innovation sweetspot!

Figure 4.1 - 2: The innovation Sweet spot, copyright Livework Studio

4.2

IDEATION

The design for how the ideal experience is communicated with a future service scenario. This scenario serves as a 'north star' for the product and service offering of Stedin towards energy communities. This ideal solution is designed first. In this chapter the process of designing the future service scenario is first explained before the scenario is presented.

4.2.1 Key factors

After the internal and external analysis, the following factors were the most influential for determining what we want the LEF explore service to be like:

- Stedin's role towards energy communities should be to help them to explore what is possible on the Stedin grid. Furthermore, communities want help with creating an initial plan, which a potential energy community can take to a service provider. Stedin's role is *not* to offer commercial products or services directly to energy communities, they only advise and collaborate with them so they can get going;
- The future users don't care only about sustainability like the pioneers currently experimenting with LEF. The future users also care about the business case and won't form an energy community when the business case is still negative;
- The two biggest financial motivators to start to use LEF are: The need to keep their utility bill low when electrifying their home and the phase-out of the net-metering scheme;
- Insight into a resident's own energy usage is very interesting to them and can serve as a hook to get them on the platform/join a community;
- Stedin's desire to keep building and improving on the community dashboard they already started developing;
- Reaching a future where the energy system is democratized and decentralized is only possible if Stedin becomes transparent and collaborates with these new active citizens, by providing them information and data about the grid;
- A service provider will provide the software for LECs. They in turn make their software with the help of Stedin's open source support (supportive apps like the GSA and other software with accompanying documentation);
- The designed service should make use of the already developed 'decision tree' and ideally link into it.

4.2.2 Establishing the steps of the Explore customer journey

In order to create a service blueprint that details the 'explore phase' and at the same time understand this explore phase better four user stories were created. These user stories are based on the four types of users that could use LEF in the future.
For an overview of these four types of users see and the stories see Appendix L.
After these user stories were written out they were split up in different steps. By comparing the four different stories and their respective steps, the following eight steps of the explore phase were determined:

1. **Realizing**
The community leader learns about the first steps he could or should take, what is all involved in starting a local energy community and how to start.
2. **Seeking**
Seeking multiple sources of knowledge after becoming interested. Finding out how to solve the problem. Stedin can be one of the sources.
3. **Discovering**
The first interaction with Stedin (or second if 'realizing' is assisted by Stedin.) The offering is quickly and easily communicated without shying away the interested community leader.
4. **Learning**
Learning about energy communities and everything related in a clear and concise way.
5. **Ideating**
Making the knowledge relevant for their community and their situation. Using tools from Stedin a plan is made.
6. **Resonating**
Getting input from within the community and seeing whether people are interested. This can be done multiple times until a consensus is reached together with a clear community goal.
7. **Finalizing**
Creating a plan to summarize the explore phase. An initial project outline (including business case, community wishes, basic technical design) is summarized in a project Sketch.
8. **Communicating**
Sharing the project sketch with Stedin and making sure it is feasible. In this phase you also receive feedback from Stedin.

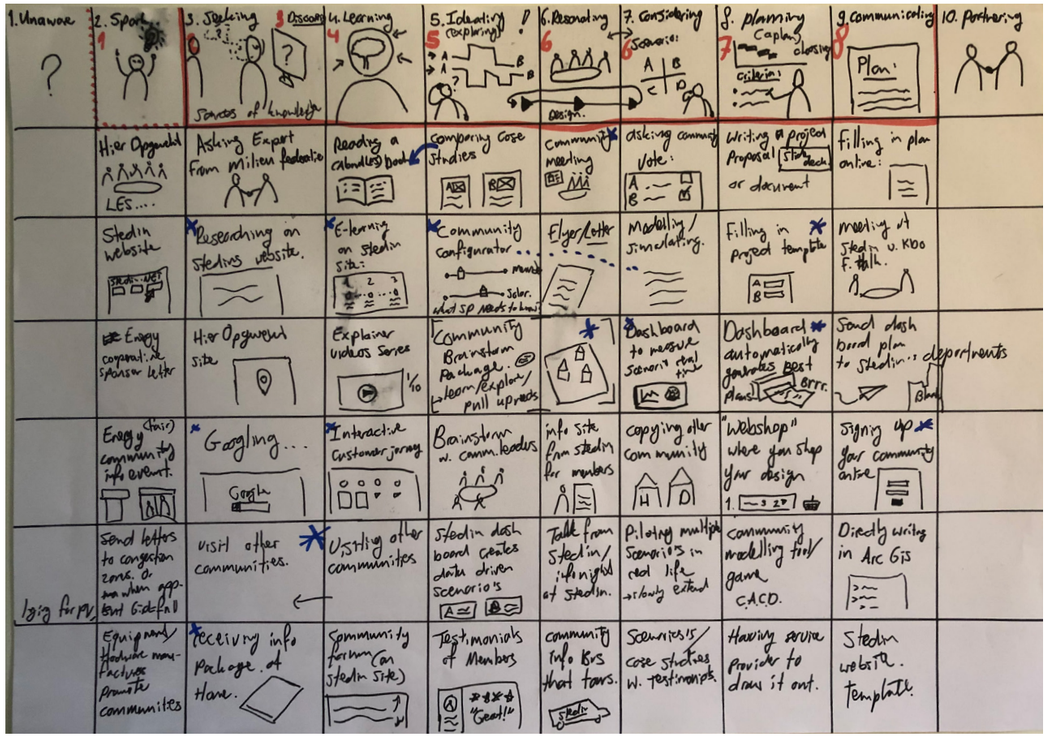


Image 4.2 - 1: Morphological summary of all ideas gathered during the various explorative design activities

4.2.3 Designing the LEF explore service

Designing the ideal service scenario was an ongoing iterative process. It started after the design brief was made first as an exploratory exercise, in the form of sketching on paper what the ideal solution would look like. For this ideal situation all the previous ideas gathered during the co-creation sessions and brainstorm were reconsidered. The separate ideas of the exploratory exercises can be seen in Appendix J (co-creation) and Appendix K (brainstorm). These ideas were summarized on a morphological map which can be seen in Image 4.2 - 1. After the morphological map was created, the next step was to prioritize which idea best solved the step of the explore customer journey. This was done based on the criteria and guiding principles established during the understand phase. The selected ideas are market with a blue '*' in the morphological summary.
After all these individual ideas were gathered, they were joined together in three preliminary service concepts. These three concepts varied widely in complexity. This was done on purpose to check which level of complexity was desirable for Stedin.

The first concept took Stedin's current organization and it's capabilities as a starting point. The main train of thought behind this concept was that stedin should be able to implement this concept right now.

The second concept revolved around a more 'DIY' community concept where the emphasis is on communities helping each other.

The third concept was the 'fully integrated data and transparency concept.' The basis being here that Stedin uses the data they have about a community to the fullest and giving tailored advice.

During a meeting with the two main stakeholders from the LEF core team, it is decided that the third concept resonated the best with the LEF teams' goals and vision. This concept can be seen in on the next page in Figure 4.2 - 1. The other two concepts can be seen by following this link.

The third concept in detail

Concept 3, the most futuristic one of the three, is chosen as the basis for the future service scenario. The concept is based on two factors, next to the factors at the start of this chapter:

- Building on the already developed 'community dashboard' so that it does not only provide information about the *current* situation but the users can also enter parameters to put in *their desired situation*. By doing this a community automatically creates a project sketch.
- The reasoning that if Stedin already has most of the data someone would need to shape their plan for a LEC they can also create this plan *for* the community.

With this in mind the service concept visible in Figure 4.2 - 1 is designed.

Stedin community Dashboard

To better understand and monitor all the LECs within Stedin's operating area a community dashboard is developed by Stedin. This dashboard currently only shows the *aggregated data from a community*. A screenshot of the dashboard can be seen in Image 4.2 - 1. The dashboard can be used to track existing communities and is therefore right now only meant for a LEC that is already (almost) up and running. Therefore it does not help a community to start out. In the design certain changes to the community dashboard are proposed.

Image 4.2 - 1: Screenshot of the current prototype of the Stedin community dashboard taken as a starting point for the design

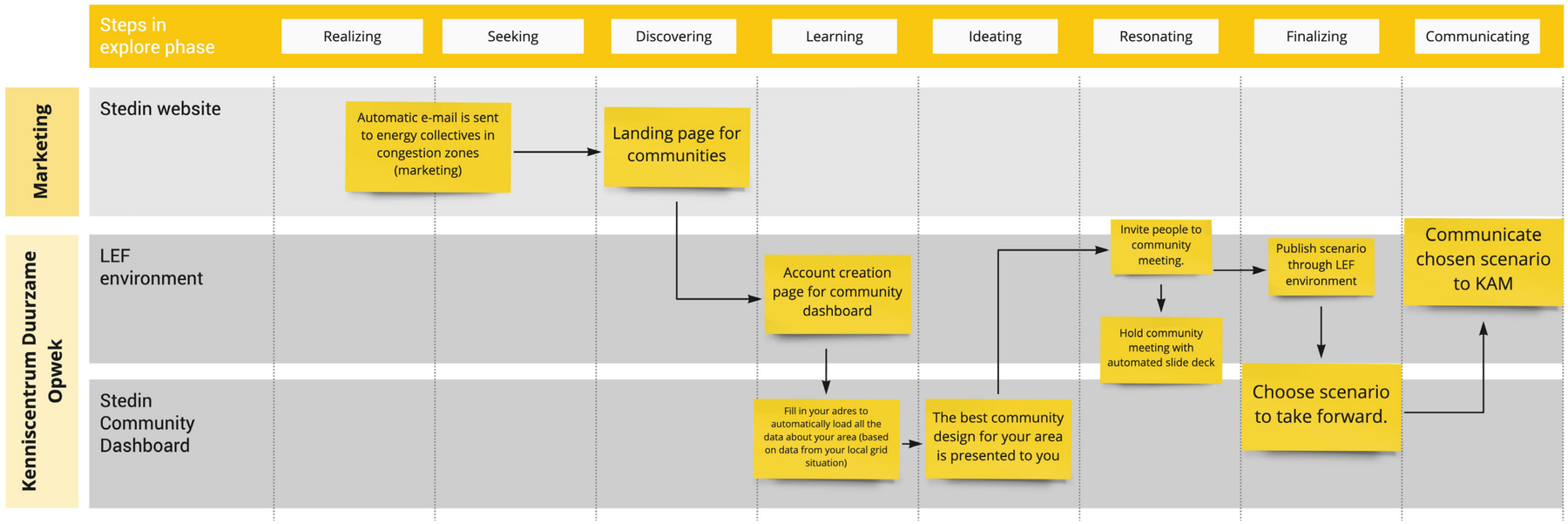


Figure 4.2 - 1: Service concept that was chosen by the LEF team to be taken forward

4.3

THE LEF EXPLORER SERVICE

This chapter presents the complete service design based on the understand and imagine phase of this project. First, the future service scenario which communicates the experience of the service design is explained. Then the complete service blueprint is presented: this service blueprint details the structure and content of the service design. After this, all key touchpoints are described in detail. The service design is called ‘LEF explorer’ as a whole and consists of multiple different sub-services. It should be noted here that LEF is the complete service: and the LEF explorer is the addition made in this project to this service. The service design consists of a few different artefacts, which can be seen on the next page. In the next chapter the prototype is showcased.

4.3.1 Description of the service

In this paragraph the service is introduced.

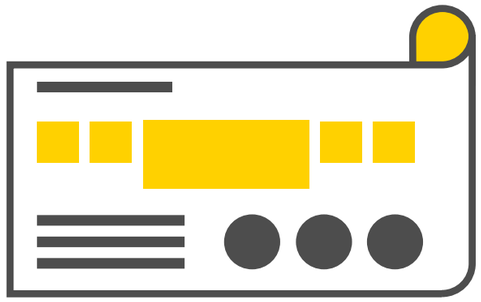
The service is focused on kick-starting new energy communities in the first step of the community life-cycle: the explore phase.

The main goal is to simplify the process of coming to an initial plan: the project sketch. This was the main issue and need resulting from the co-creation sessions. Stedin can only help if a community has a plan, and the community can’t really make a plan without help. Therefore the service aims to smooth this collaboration between communities and Stedin. After this, a community can reach out to a service provider and really start working on the community design. During the design of the service, the design brief and guiding principles were used as a guideline.

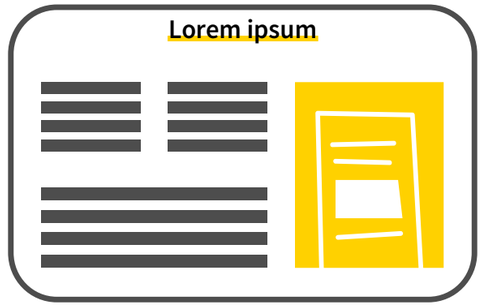
Key features of the design:

- Allow communities to start learning about LEF and local energy communities;
- Give access to key data Stedin has about the grid situation, like renewable energy generation, that right now is not accessible for prosumers;
- Give an overview of the process that a community needs to go through in order to realize their Local Energy Community based on the LEF concept;
- Guide communities in the process of creating their project sketch, so they can get advice from Stedin on their plans. This allows Stedin to ensure the embodiment of the LEF values.

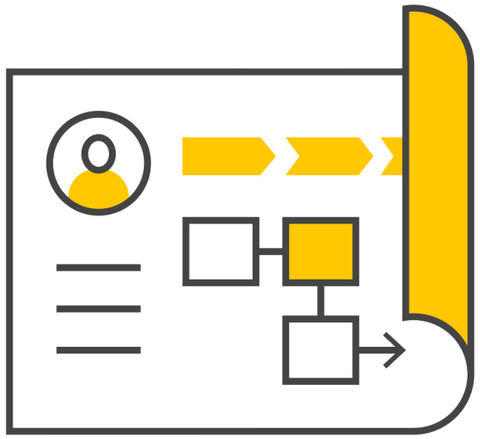
The ‘LEF explorer’ service design for communities consists of...



1. Future service scenario
This artefact is made to communicate the ideal experience of the process of setting up an LEC. The reason being that the service blueprint alone is not very telling in terms of a desired experience.



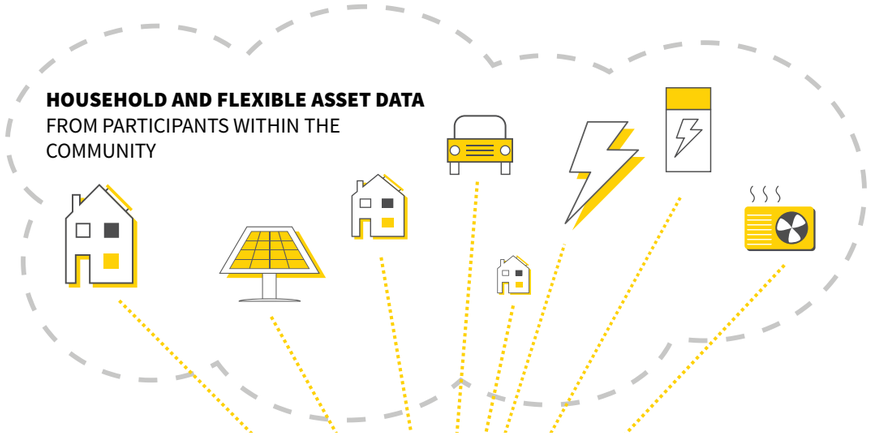
2. Touchpoint and channel descriptions
The nine most important touchpoints are described in detail with an illustration. Also each channel is described so it is clear to Stedin how the design is intended to function.

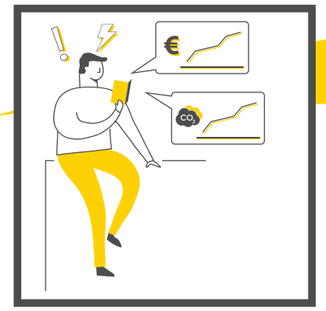


3. Service blueprint
The service blueprint explains how all the touchpoints relate to each other. Also they show a certain time pacing, as each touchpoint has a horizon attached for when the touchpoint is intended to be implemented.

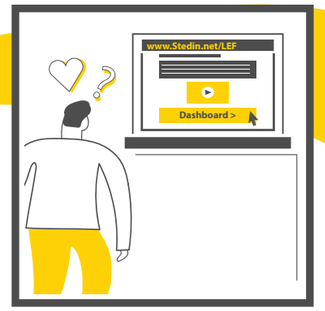
4. Prototype
To test certain assumptions and to take the first step towards implementation, a prototype is made of a part of the service blueprint. The goal here is to make a part of the service blueprint tangible and to test if the first step is desirable for potential energy communities.

4.3.2 The future service scenario

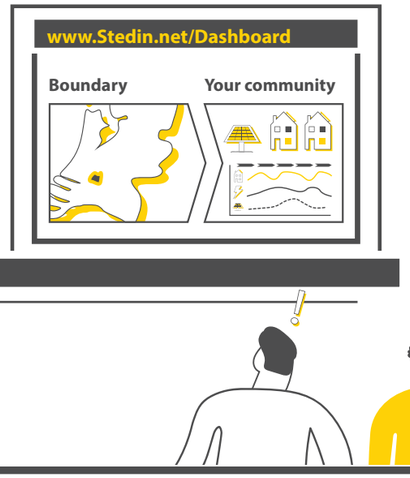




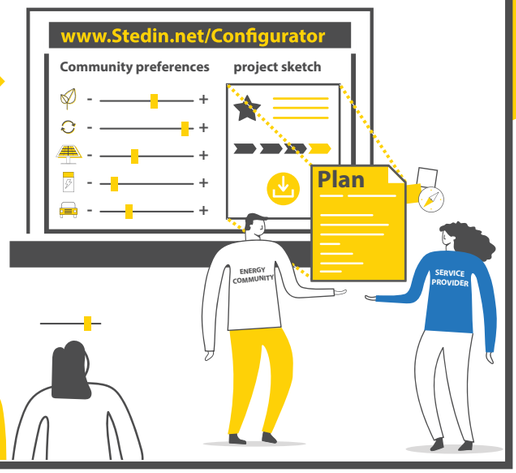
REALIZE SOMETHING NEEDS TO CHANGE ABOUT YOUR SITUATION



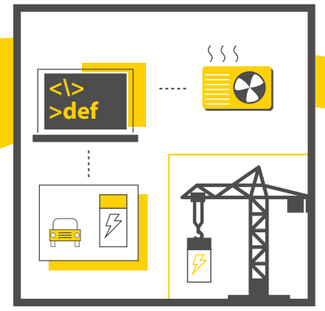
DISCOVER THE LEF DASHBOARD AS A POSSIBLE SOLUTION



THE DASHBOARD SHOWS ALL THE DATA IN A CERTAIN AREA IF EACH MEMBER GIVES PERMISSION AND SIGNS UP



THE COMMUNITY ITERATES THEIR PLANS UNTILL THEY AND STEDIN ARE HAPPY WITH THE PLAN, AND THEN HAND IT OFF TO A SERVICE PROVIDER

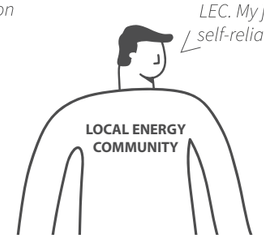


THE SERVICE PROVIDER PUTS ALL THE HARD AND SOFTWARE IN PLACE

THE ENERGY COMMUNITY AND LOCAL MARKET GO LIVE!

RESPONSIBILITY AND JOB TO BE DONE

"It is my responsibility to help Local Energy Communities explore the possibilities on my grid. My job to be done is to enable the energy transition by creating implicit flexibility and allowing LECs to exist."



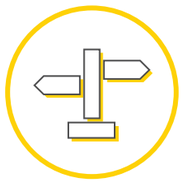
"It is my responsibility to inform my community and take them along in the creation of a plan for setting up a LEC. My job to be done is to become self-reliant and ready for the future."

"It is my responsibility to assist in improving and executing the communities' plan. My job to be done is to realize a well functioning local energy market together with the LEC."

KEY INSIGHTS

Stedin is a 'neutral' and trustworthy party.

Insight into your own Data is very Attractive for Community members



Taking on a service provider before you have a plan is undesirable

Responsibility creates action and ownership.

In theory Stedin can gather all the data necessary to create a plan for a Local Energy Market

4.3.3 The touchpoints of the designed service

In this paragraph the touchpoints of the service design are explained.

Different types of touchpoints

The service blueprint consists of 16 frontstage touchpoints and 6 backstage touchpoints. Of these 16 touchpoints the customer interacts with, there are three categories of touchpoints:

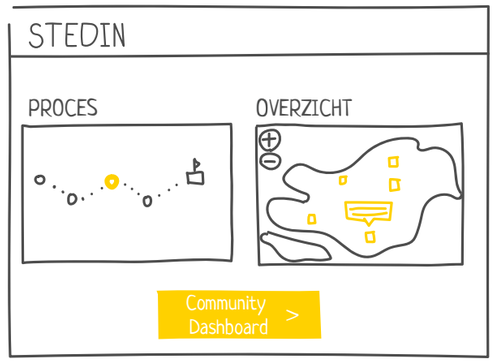
- Knowledge communication touchpoints: one directional knowledge going from Stedin to the community
- Collaboration touchpoints: a digital or in person touchpoint with the purpose of determining and sharpening their plans. This in turn enables Stedin to know what a community is up to and convey the principles of the Strategic positioning to the community. These collaboration touchpoints that are digital are considered 'exploration tools'
- Functional touchpoints: the link between multiple touchpoints that are purely functional

On the following pages the 9 most important touchpoints are discussed. Of each touchpoint the purpose is given (why is it necessary), the objective (what should the touchpoint achieve) followed by a short description. Next to this the step of the Customer journey, the type and in which horizon the touchpoint is estimated to be implemented are given.

LEF Environment homepage

Purpose
To provide information and overview of the services provided to communities

Objective
To get the community to further explore their local situation and possibilities



Description

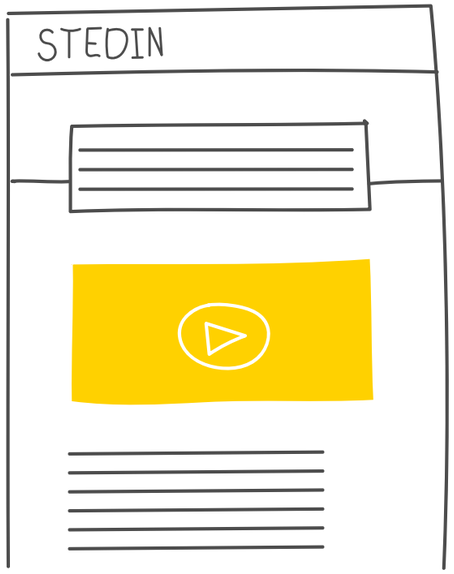
A homepage with all the links and tools to access once the energy community has signed up.

Type Functional **Step in CJ** *Discovering* **Horizon** **H1** *H2 H3*

The LEF landing page

Purpose
The place to start the explore phase and make an individual interested

Objective
When interested in LEF to sign up for the LEF environment



Description

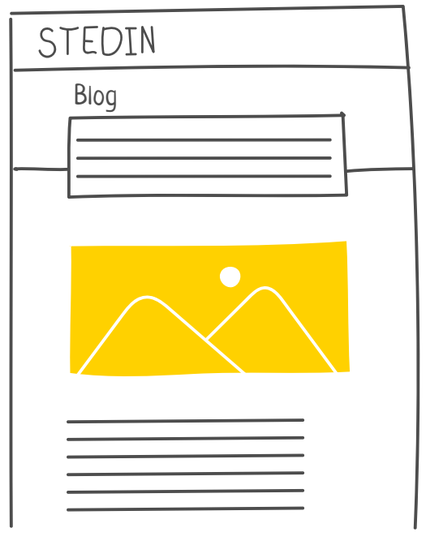
When visiting Stedin's website looking for information about LEF they are directed to the LEF landing page. Here simple information is shared about the concept, the process, the benefits and the possibilities.

Type Communication **Step in CJ** *Seeking* **Horizon** **H1** *H2 H3*

Blog with background information

Purpose
Throughout the explore service the users need additional information. This is all gathered in one place: the blog of LEF

Objective
Providing in-depth and accessible information on LEF so that most questions can be answered without help from the KDO.



Description

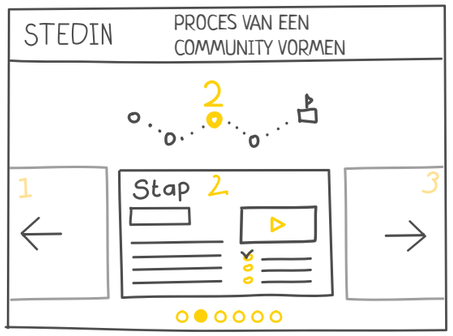
This is the main source of knowledge for LECs starting out. The idea is that this blog is expanded bit by bit, article by article. It includes case studies, simple how-to's, reviews of service providers and articles about any other knowledge topic that can be relevant for community leaders. It is curated by the marketing department or the KDO in collaboration with HierOpgewekt. In the future the page or articles could be merged or moved to HierOpgewekt.

Type Communication **Step in CJ** *Seeking* **Horizon** **H1** H2 H3

Interactive process overview

Purpose
Communicating the process (complete customer journey and life-cycle) of setting up an EC.

Objective
Make the community leader aware of what it takes to set up an EC.



Description

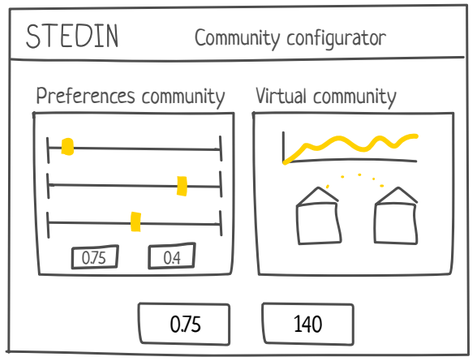
An interactive customer life-cycle on the web. The communities have to sign up and then continue. When clicking on steps there is a link with more information (on the blog) and best practices.

Type Communication **Step in CJ** *Learning* **Horizon** **H1** *H2 H3*

Online energy community configurator

Purpose
Enable the potential LEC to ideate multiple scenarios and configurations of an energy community

Objective
Get the energy community to decide on one first design and summarize this in a project sketch



Description

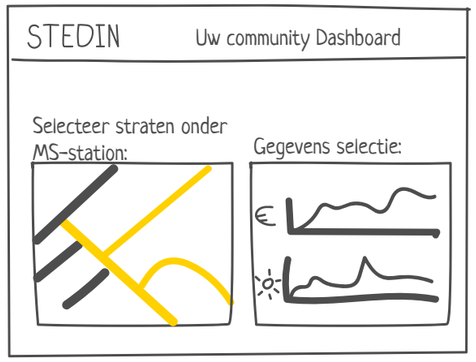
Online you can configure your LEM by adding a few parameters and information about your local situation. It extends the dashboard which focuses on the 'current situation' and extend it with the plans of the energy community (like storage, solar, etc.)

Type Collaboration **Step in CJ** *Ideating* **Horizon** H1 **H2** H3

Community dashboard

Purpose
Enabling the ECL to explore and gain insight into their local situation.

Objective
Keep the community engaged while developing their plans.



Description

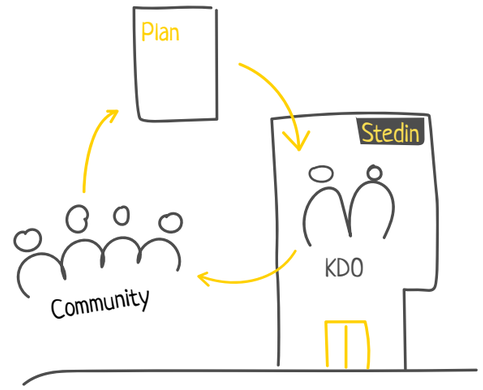
The community dashboard is a page that is the 'hook' for interested communities. They can see information Stedin has about their neighborhood, set a boundary and create a model potential energy community. They enrich this by inputting extra information gathered through interviews and filling in extra information from the project sketch template, they can export a project sketch to discuss with the KDO.

Type Collaboration **Step in CJ** *Learning* **Horizon** H1 **H2** *H3*

Review project sketch for validity

Purpose
Review the sketch (by KDO) and check it for feasibility, viability and desirability

Objective
Communicate the advice to the 'gebiedsregisseur'



Description

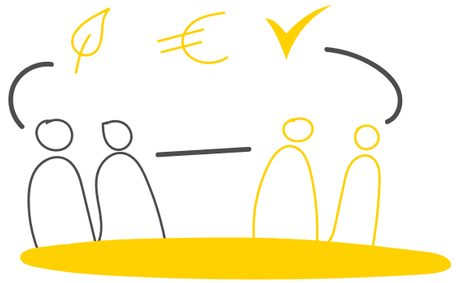
The completed project sketch gets sent to the KDO for review. It is reviewed and logged in CRM for the gebiedsregisseur and KDO to take to the 'advice meeting community'.

Type Collaboration **Step in CJ** *Finalizing* **Horizon** **H1** H2 H3

Advice meeting community

Purpose
Create mutual understanding between Stedin and LEC of the plan outlined in the project sketch

Objective
Relay Stedin's feedback for the community together with their *Gebiedsregisseur*



Description

With someone from KAM and/or KDO you have an in person intake meeting about your project sketch. This is the last step of the explore customer journey. After this step the 'decision tree' developed by the marketing department takes over. The LEC is monitored by KDO and starts looking for a service provider.

Type Communication **Step in CJ** *Communicating* **Horizon** **H1** H2 H3

Active energy community map

Purpose
Create one place for energy community leaders to get a clear overview of all the communities that are active

Objective
Link LECs with each other so they can exchange information, best practices and other useful tips. Also serves as inspiration.

Description

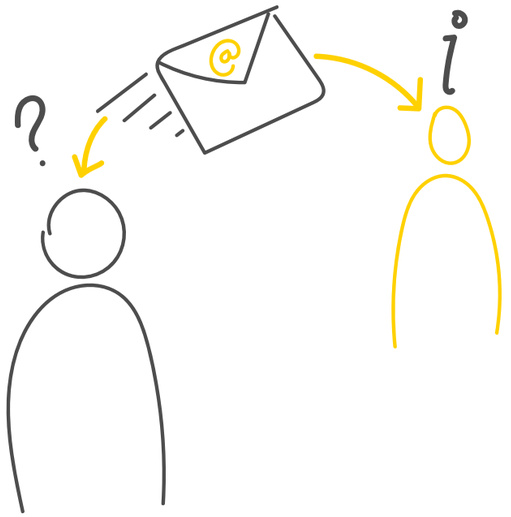
Local Energy Communities can here be found by other aspiring LECs. It is simply an overview of Stedin's operating area on which all initiatives are plotted. Optionally renewable energy cooperatives could also be included as an overlay. When clicking on an initiative on the right an overview is given of which phase the community is in, their contact information and their 'profile' i.e. are they becoming fully self sufficient or simply optimizing costs.

Type Communication **Step in CJ** *Learning* **Horizon** **H1** H2 H3

Intermediate advice and help

Purpose
For situation specific questions that can't be fended of with the other knowledge communication services

Objective
Get the community back on track when filling in their project sketch.



Description

This is the regular channel for all questions that arise during the explore phase. The KDO recently switched all their communication to e-mail because most of the questions they can't answer straight away and therefore require to be answered by e-mail anyway. This touchpoint will be one of the first to be put in place after the landing page.

Type Communication **Step in CJ** *Ideating* **Horizon** **H1** H2 H3

4.3.4 The service blueprint

In this section the service blueprint (SBP) is presented and explained. For a high-resolution version click on the link icon on the bottom right of the blueprint.

Firstly the channels are discussed. Then the different 'tags' (the colored rectangles) are explained.

Channels of the service blueprint

The three main 'front-end' channels are: Marketing, Het Kenniscentrum Duurzame Opwek (KDO) and the 'regional managers (gebiedsregisseurs)'. They represent the three ways to interact through with Stedin.[1]

The three main back-end channels are Asset management, the Innovation department and the CRM system of Stedin. See chapter 2.6 for an overview of the channels and what they do. The resulting service blueprint can be seen in figure Figure 4.3 - 1.

The channels in detail

Based on the design brief and exploration, three digital channels (the yellow 'swimming lanes in the SBP) are included in the design.

Stedin website

Accessing the basic information is done through Stedin's website. Recently, the website was transferred to a new site-core, offering much more flexibility and possibility to design new tools on the website. For the LEF customer service the purpose of the website is to peak interested individuals' curiosity about LEF. If they become interested, they can go one step further and sign-up for the LEF environment.

LEF Environment

This channel is the main portal into all the knowledge about LEF. It lives on the website, but can be regarded as a separate channel. Someone who wants to access this information has to make an account first, which is done on the website.

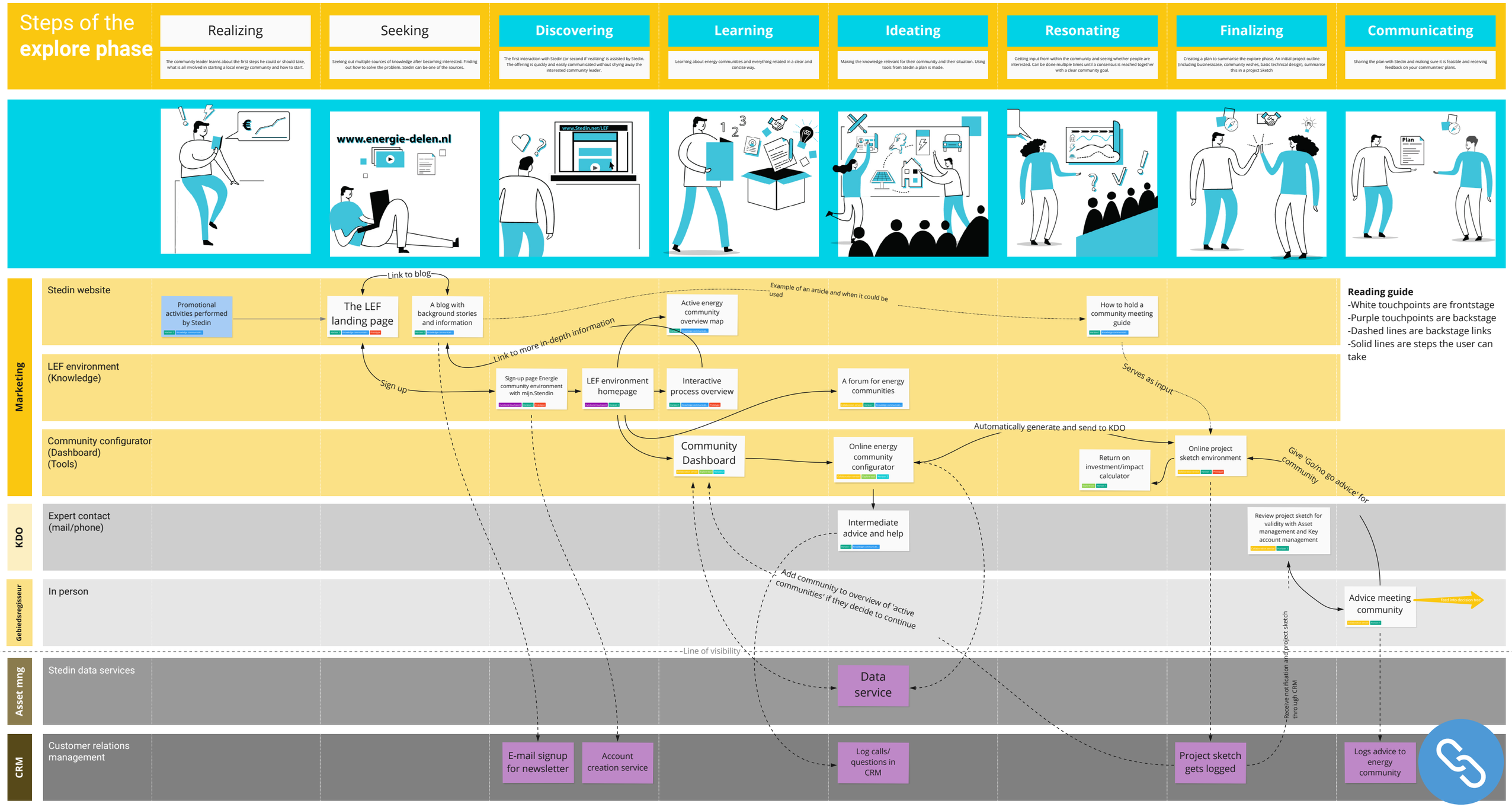
1 It should be noted here that currently the innovation department has a more front stage role, but these are all pilot projects. The goal is to phase this division out and make the customer contact the task of the department 'Klant', under which the previously mentioned divisions are positioned.

Community configurator
In order to access all the tools and communicate with Stedin, the third layer of the customer service is the community configurator. This consists of different tools and the community dashboard.

In person channels
There are two light gray channels dedicated for in person communication with Stedin. This is done initially by the KDO, until an LEC has created a project sketch successfully. Then the gebiedsregisseur takes over and has an advice meeting with the community. In the future both KDO and gebiedsregisseurs could perform this advice meeting together or independent.

Backstage channels
There are also two backstage channels. One is the CRM system that logs all the contact and plans of the community. Lastly, there is asset management. This department is responsible for providing the data that is necessary for the dashboard and community configurator to function. This data service is of key importance. When these services would be able to function greatly depends on Stedin;s investments in it's data lake, IoT sensoring and back-end data infrastructure in general. However, since these services are also critical for other operations of Stedin like forecasting and managing its assets, it can be expected to become possible in the future to have a data service that can feed the dashboard and community configurator.

Figure 4.3 - 1: Service blueprint of the 'LEF explorer service'



4.4

EXPLORE SERVICE PROTOTYPE

In order to validate the service design and to take the first step towards implementation a prototype of the explore service is created next to the service design. This prototype is not a prototype of the complete service blueprint, but rather a 'first step.'

4.4.1 Which touchpoints to prototype

In this paragraph each touchpoint that is prototyped is described and why it is included in the prototype. In a later paragraph the designs are discussed in detail.

The decision for these touchpoints is made on a few arguments. The most important argument is that these touchpoints validate key assumptions about the knowledge and tone of voice used to communicate to the (potential) LEC. The second argument is that these touchpoints would be the first to be implemented, so by having a tested design for them already makes the implementation much simpler and gives Stedin a 'flying start'. For the test set-up and assumptions to be validated see chapter 5.2.

Touchpoints included in the prototype:

LEF landing page

This touchpoint is low hanging fruit. There simply needs to come a webpage about LEF on the Stedin website. This would be the most obvious first step to take. A landing page is also part of the service blueprint and therefore it is directly transferable to a later version of the LEF explorer service.

Sign-up page for the newsletter

This is a functional touchpoint. It is included in the prototype mainly because it is necessary. This page can later be used as the sign-up page for the LEF Dashboard.

2 newsletters: the first and fourth one

These newsletters are the links to the interactive process overview and the project sketch. They are not designed in full detail, since they are mainly the link with the previously mentioned touchpoints.

Interactive process overview

A interactive process overview is included to validate the community life-cycle and the assumption that community members are helped with a clear overview of the process. It's main purpose is giving more information about what's involved in setting up your own LEC.

Online project sketch environment

Lastly this touchpoint is included to better understand which degree of independence can be expected of community leaders. Can they fill in a template without much assistance? Or is this too hard for most community leaders? If the latter is the case, this would argue in favor of the LEF explorer service design. Since

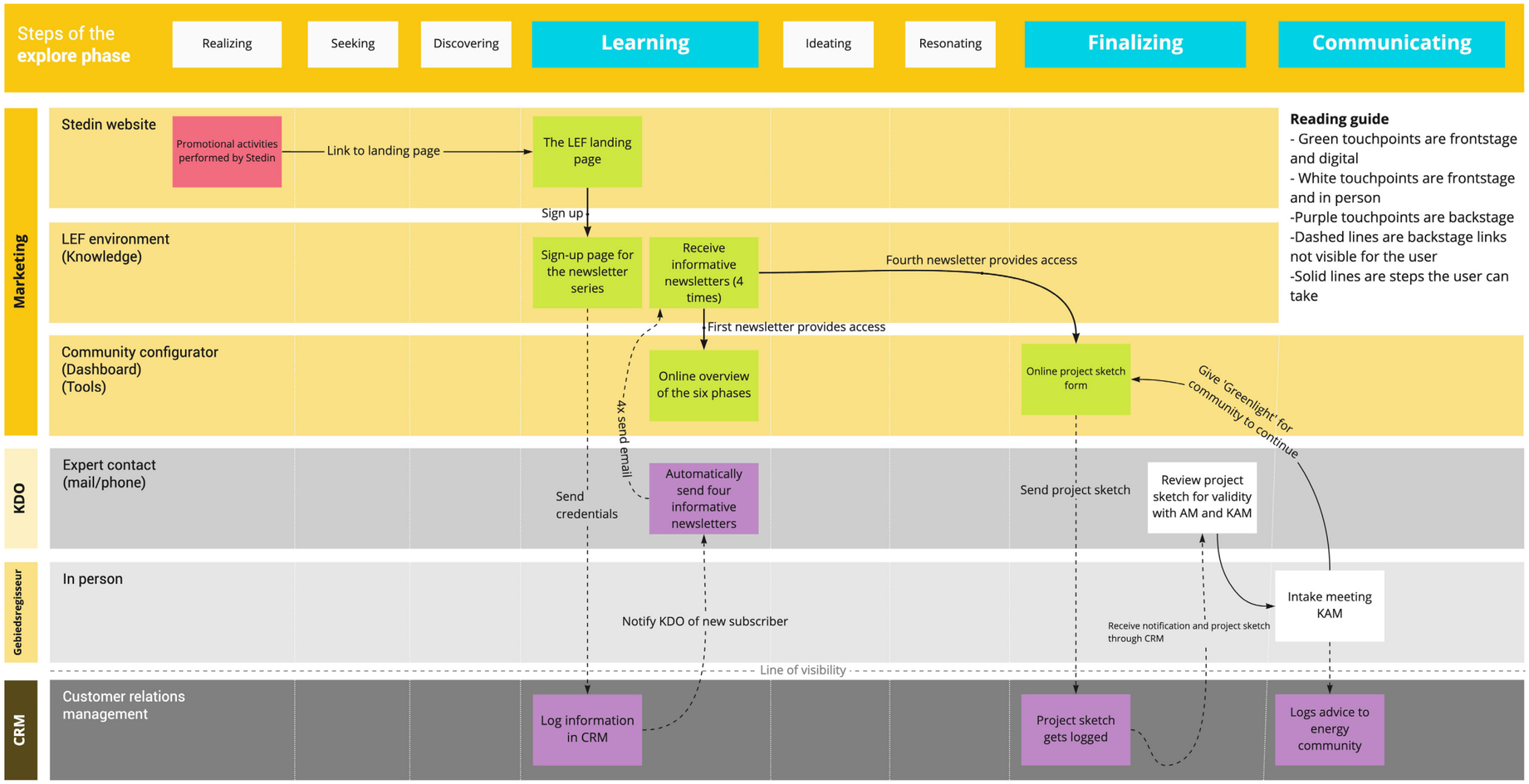


Figure 4.4 - 1: User journey of prototype

here most of the work asked from the community leader is automated.

4.4.2 The relation to the other elements of the service design

The prototype of the LEF explorer service stands a bit apart from the rest of the service design. This is because the decision is made to not directly turn certain elements of the service blueprint into a prototype but instead create a separate ‘mini service blueprint’ for the prototype. This is called a user journey and can be seen in Figure 4.4 - 1.

This is done on purpose. Because directly aiming for implementing the complete service design would be too big of a leap. As a result, the prototype is designed so that it can be implemented straight away while also still contributing to the complete service design. There are two main reasons for this. Firstly, in this way we can assume that what works well in the prototype would also work well in the service design, validating the service design. Secondly, the content of the touchpoints can be turned into touchpoints of the service design. Let’s give an example: the information in the newsletter in the prototype can be turned into blog posts on the blog touchpoint.

4.4.3 Creating the prototype

The prototype is made in an iterative way, meaning the prototype presented in this chapter is the third version. The second version was tested with users. The last version is not tested with end users, however it is improved based on user feedback given on the second version of the prototype.

The prototype itself is made in Sketch and turned into a clickable version with InVision. An overview of the Sketch artboards can be seen in Image 4.4 - 1.

Viewing the prototype

For the complete prototype press the icon on the right. The prototype can be viewed online in a browser of choice. This prototype is clickable. To navigate it click somewhere random on the page. It is then highlighted where you can click *by a blue square.* It only appears when someone clicks outside of a interactive element. Also the bar at the bottom of the webpage can be used for navigating through the prototype.

Password is: Stedin1641

Image 4.4 - 1: Screenshot of the Sketch artboards making up the prototype

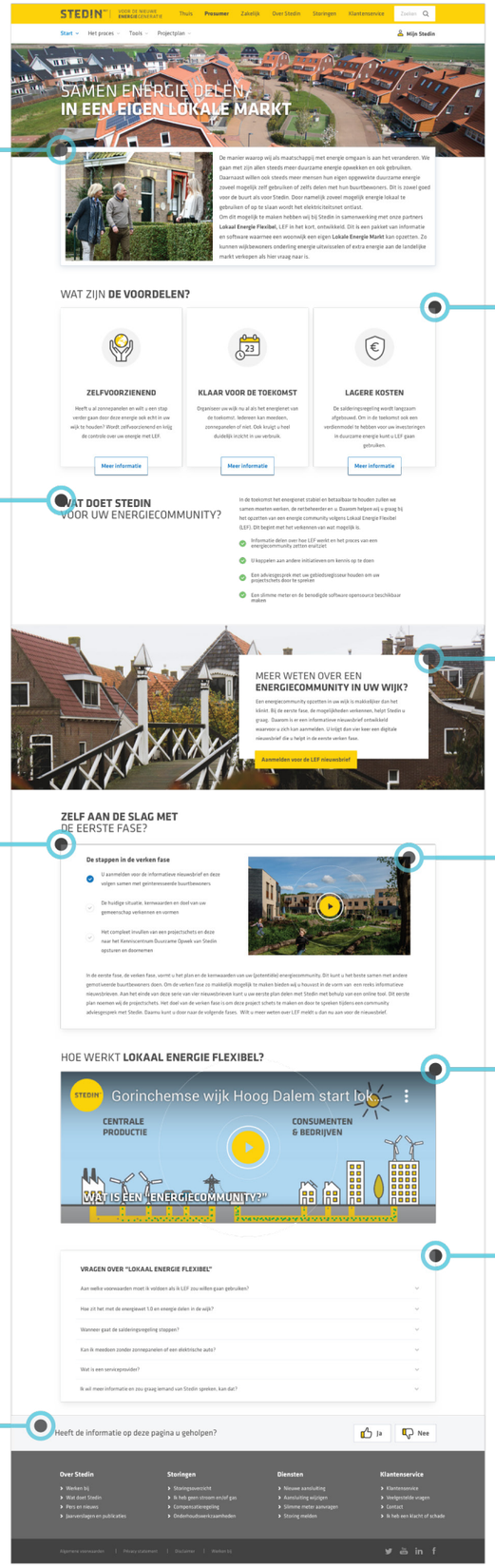
4.4.4 Landing page (v2)

The introduction of the landingpage. It very briefly explains the context of LEF and what it does: enabling you to set up a local energy market (LEM). This introduction should instill a feeling of curiosity.

This part explains what Stedin offers and helps ECs with. One of the insights of the interviews was that a clear division of roles is essential for good collaboration. Therefore this is clearly communicated to the visitor at an early stage.

The goal of the landing page is also to provide basic insight into the first step of setting up an energy community. First an overview of the steps is given, after which a more detailed explanation is given.

The visitor is asked if the information on this page helped him or her. This is used to determine if the page is clear enought.



The benefits of LEF are briefly explained with the option for more information. There are more benefits, but the main three are highlighted. These are based on the interviews conducted.

Here the most important element of the page comes into view. The objective of the landing page is to get the visitor to sign up for an informative newsletter if they are interested in LEF. It is highlighted with an image to make it stand out and draw attention.

A video is embedded with a short 'video case study' explaining how an other initiative undertook this specific phase. In this case the video is about the explore phase.

An animation explaining how LEF works and what an energy community is. The goal is mainly to inform the visitor and allow them to gauge if LEF is what they are looking for.

It is customary for Stedin to place a FAQ at the bottom of an information page to cath the straightforward questions and reduce pressure on the Customer contact centre.

4.4.5 Newsletter sign-up page

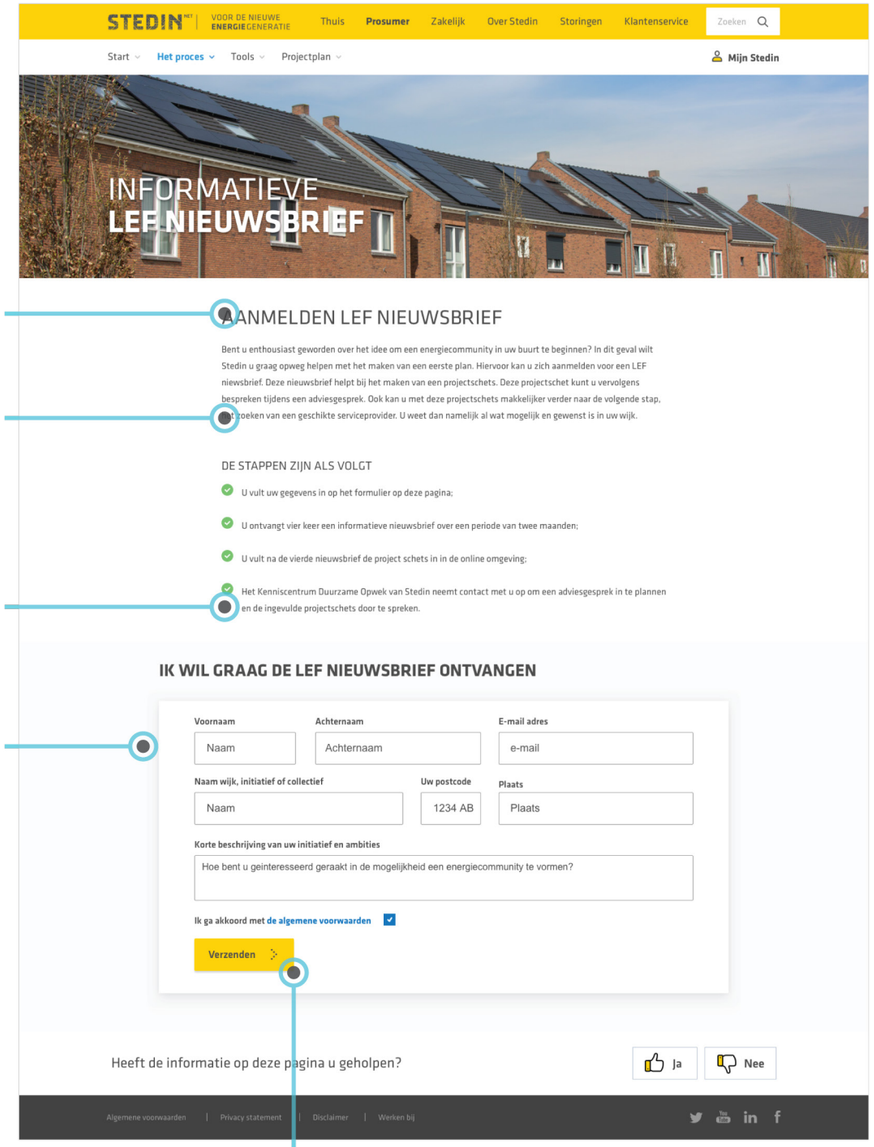
The title with a call to action and the purpose of the page

Again the purpose and working of the newsletter is repeated. The goal, filling in a project sketch, is also repeated to make the message stick.

The steps of the explore service are explained to the visitor in a clear and concise summation.

Basic information is requested form the visitor. In order to filter out people who are just curious but have no intention to really start a LEC some more information about their initive is asked. This is so the KDO could reach out to promising potential communities who get stuck.

Once all information is filled in the visitor can send out the form and sign up for the newsletter.

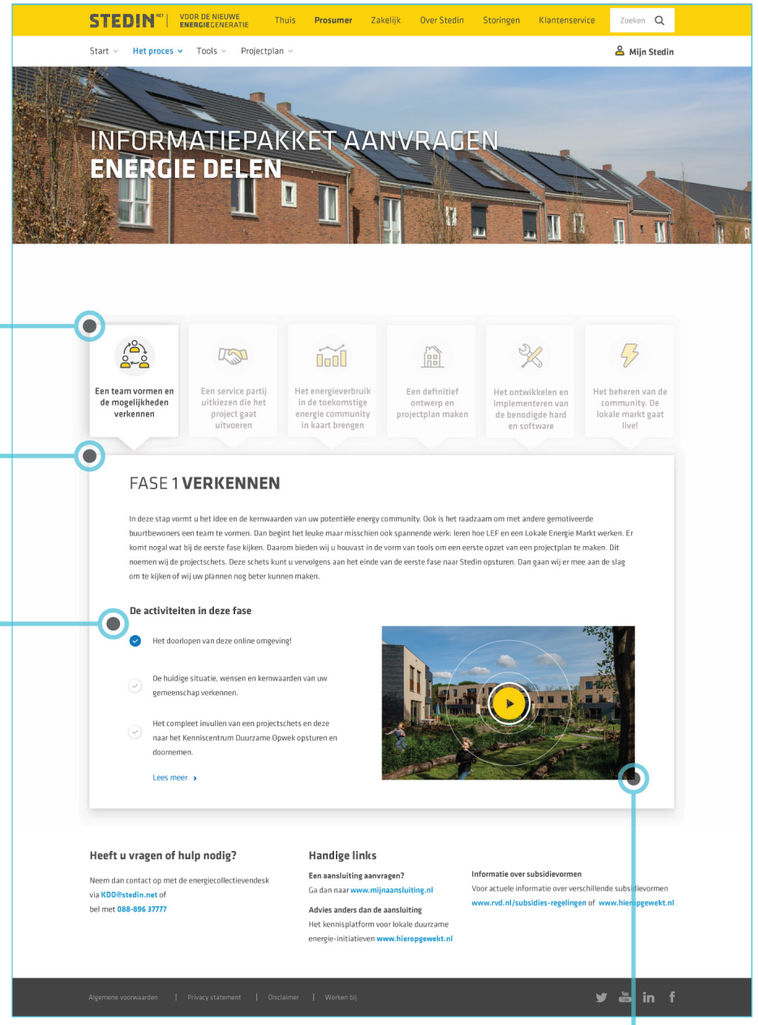


4.4.6 Interactive process overview

The six phases are similar to the ladingpage. The icons are used as a reference point.

Here the phase is explained in detail. This description is based on a mix of advice from the interviews and experts.

The three most important steps are highlighted to create a comprehensive overview and serve as a checklist. Underneath there is a link to more information on the LEF blog.



A video showing how an other EC undertook this step. The video is more inspirational than informative. It is meant to motivate the visitor/EC and give a feeling of 'I could do this'.

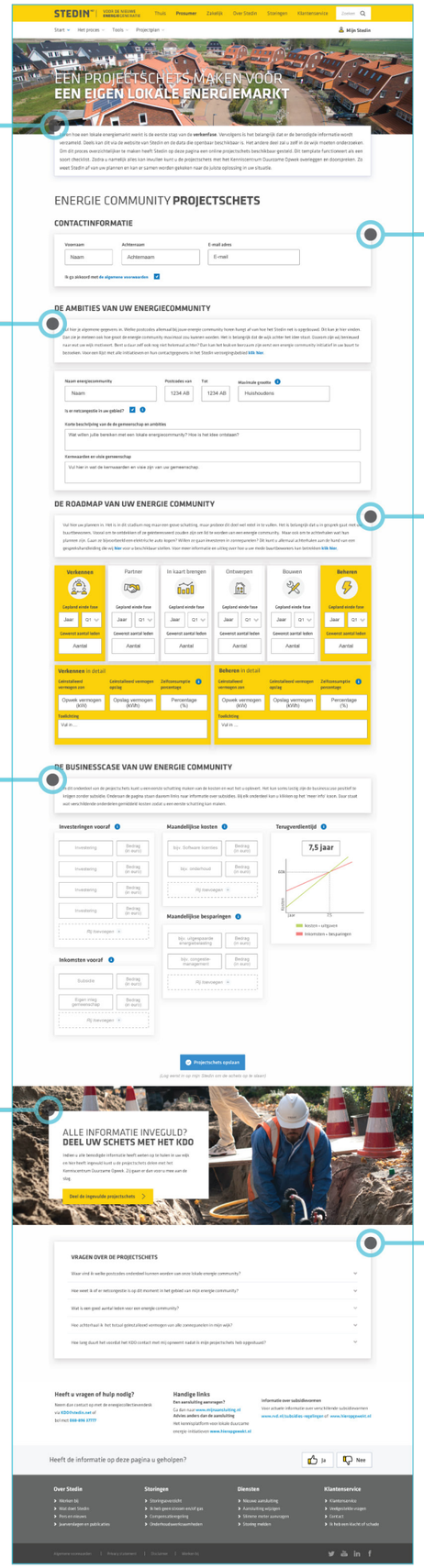
4.4.7 Project sketch

The introduction of the page. It explains the goal of the project sketch: to send a complete sketch to the KDO. Secondly it explains that the projectsketch serves as a checklist for everything the EC needs to consider at this stage.

Here the ambitions of the EC are made explicit. This is the social element of the EC. It is important for an energy community to have a shared goal and be aligned internally. Therefore the user is asked to fill this in. Also a short description of the neighborhood is asked.

The last of the three main elements of the sketch is the financial part: the businesscase. This is an interactive element that automatically calculates whether a project is feasible from a financial perspective. By pressing the blue 'i' more information and average costs are presented.

If everything is filled in the next step, and objective of this page, is to send the project sketch to the KDO. Visitor submits it by pressing the button below.



The first part is about simple contact information. In the future this hopefully would not be necessary with the use of a Stedin 'Mijnomgeving'.

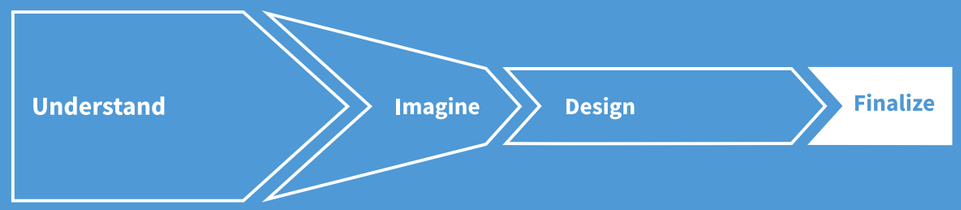
Here the technical ambitions and current situation are filled in. Since this is based on an assumption, there should also be given an explanation how this assumption was made. The structure follows the steps of the landingpage.

Just like at the landing page a FAQ is added to answer the first questions.

5

FINALIZE

This section is about validating the design. Validation is done by testing with potential users. After validation, the design is discussed and recommendations for implementation are given. Lastly, the project is reflected upon by the author.



5.1

FINALIZE PROCESS

The last part of this project is to iterate the LEF explorer service design and attempt to validate the decisions that shaped the design. How and why this is done for this project will be explained in this chapter.

5.1.1 What to learn

Innovation is almost synonymous with continuous learning. The last part of this project can therefore be seen as a more focused learning exercise. However, there are some key differences between doing in-depth interviews and testing a design with a future user.

The main difference is the insights shift from understanding what happens and why, to a deeper understanding of how people actually behave. This is possible because when interacting with a design, participants are actually doing something, whereas in interviews they are just *saying* they do something. Whether what they say might often not be true. [7]

The objectives of the Finalize phase of this project are the following:

- Checking key assumptions about the design and the users;
- Finding small improvements for the design, like unclear sentences;
- Creating an even better understanding of what community leaders actually want;
- Checking if the current direction of the design is desirable.

Activities of iterate & finalize phase

The activities in this phase consist mainly of the following:

- Creating a test guide;
- Internal validation with four key stakeholders;
- External validation with 5 potential users (community leaders);
- Finalizing all the documentation;
- Iterating and finalizing the elements of the complete proposed service design;
- Iterating the prototype based on testing and internal validation.

In total 9 people, both internal and external, have tested the prototype. This amount of participants should give enough input to draw a few first conclusions. For an overview of all the tests see Appendix M.

Participant selection for testing

The objective of the participant selection was to have al large spread in 'upfront knowledge', ranging from participants who didn't know anything about LEF, to community leaders that already worked with LEF. This resulted in testing with 2 'regular people', one participant who is active in their local energy cooperative but not yet involved in setting up an LEC and two participants who are already attempting to form an LEC.

Testing & set-up

Each test was set up in the same way: the participants were given a 'story' and asked to imagine that the situation in this story applied to their current house and neighborhood. With this context in mind they were then shown the LEF landing page. Their objective was simply to visit the web-page as if they would discover it while searching for information about sharing energy within their neighborhood. The participants were also asked to think out loud while going through the various pages.

The link to the LEF landing page prototype was only given at the start of the test and each participant visited the test on their own device.

The user story and landing page used in testing can be seen in Appendix P and Appendix Q. The design presented in the design section of this thesis is not the design used in testing. Instead it is the iterated design based on testing.

The story given at the start of the test

'You have solar panels on your roof already. However you want to become even more self-sufficient. You remember a talk you had with a friend about how they are setting up a local energy market in their neighborhood to become more sustainable while keeping their energy bill low. You are interested to see if this would also be possible in your neighborhood and start looking on-line for information. You find the LEF landing page and start reading…"

Discussion, implementation and recommendations

The goal of the last part of the finalize phase is to lay out the best way to start implementing the LEF explorer service.

To reach this goal, a roadmap is created to implement an MVP of the concept service. Also advice on what an MVP should look like is incorporated in the roadmap. For a successful implementation, it is important that all parties involved are given a chance to give their input during validation.

Iterating the design

The project plan included one iteration after testing. Together with the LEF core team, the results of testing were discussed during the 'green light meeting'. Here the decision was made to improve the prototype and adjust it so it *fits* well with the MVP recommended. So basically the prototype is updated once more to better reflect the intended MVP, as proposed in chapter 5.3. This means the step to an MVP is easier for Stedin once this project is finished.

List of improvements made to the final prototype based on testing:

- The largest change to the landing page was to take out the complete process overview again. This process overview was NOT included in the first version of the landing page. In the second version used for testing, the complete process overview was included. However this was proven to be off putting and overwhelming. Therefore, the decision is made to only show the first explore phase in detail in the last iteration;
- Move the 'what doest Stedin do for your community' section to the top;
- Move the animation about 'What is LEF' to the bottom;
- Move the call to action higher, this is where we want to direct people;
- Include an e-mail series to time pace and 'layer' the communication more. The complete information in one go was too much for the participants;
- Make the interactive process overview visible on a separate webpage;
- Taking out spelling errors, changing wording, re-formulating sentences. Mainly around hard and software: this was a bit scary for participants.

5.2
VALIDATION

When starting out with a design project you set up a structure on a meta level and 'take the plunge' in the hope something good on a content level (a service in this case) will come out. Therefore in this chapter the validity of the design is discussed. In order to be able to do this a selection of internal and external reviews of the design are performed.

5.2.1 Internal validation

The internal validation is done to gauge the quality of the design. There are two parts to validating the design internally: firstly, to simply to gauge key stakeholders' reaction while walking them through the design. Secondly, to directly and indirectly review the criteria from Stedin.

General impressions

When showing the design to internal stakeholders (see Appendix M for the overview and individual results) they were pleasantly surprised. Since all internal stakeholders took part in the design through participating in one of the co-creation sessions, they were knowledgeable of the project scope and process. The design is seen as fitting and feasible for Stedin to implement. Especially the KDO is pleased with the outcome and sees it as part of their job to play a key role in the delivery of the service to LECs. Also the future vision is seen as logical, however the feasibility in the near term is deemed challenging.

Internal consensus on the direction

During the marketing departments bi-weekly meeting and a specially designated meeting with the KDO the design is presented to the key internal stakeholders. Here the design was received positive as well. People understood where it came from. Probably the main reason for this is that they were taken along in the process and the design aimed for ease of implementation. Also the high feasibility meant the concept is graspable.

The main point of critique is that on one hand the amount of communities can't become too large, since the KDO could not manage this. But on the other hand the managers of K&M are clear that there should be added value for Stedin if LEF is to be deemed a success. But this in turn requires a sizable amount of energy communities. Therefore the aim should probably be to create organic growth at first untill the service offering becomes easy enough that the pressure on the KDOs customer support becomes lower.

However, the consensus is that the design should be implemented by all parties. LEF has been in the making for so long, that Stedin is really ready, almost impatient, for the next step: making LEF public!

5.2.2 External validation

The external validation is done per criteria. After this a general conclusion is drawn for both internal and external validation

Give LEC leaders one place for simple information about LES and LEMs to explore the possibilities when starting out.

This criteria is met, but has its downsides. The landing page might be too much for the casual visitor. The aim was to offer a complete overview, however this might be overwhelming. Especially the whole process is seen as a bit of a stretch to comprehend when first learning about LEF. For example, one of the test participants exclaimed a loud 'pfew' sound while scanning the process, after which he stated this is a lot to do. His next question was: do I have to do all of this alone?

Clearly lay out what steps are to be taken, is expected from LEC leaders, and what LES will cost and bring their community.

This criteria is realized, but in a too 'crammed' manner. The steps on the landing page are quite extensive. One participant asked for a check-list, which speaks in favor of a separate process overview from the landing page like in the service blueprint.

Give community leaders very specific knowledge about how LES will affect their, and their communities', situation. Managing expectations like what will it cost them and what will it bring them is key.

This is the main criteria that needs to be improved. Partially this is not yet possible: LEF is still being developed and this means that some things are still unknown. What is known already should be clearly communicated, preferably in a separate process page for 'community members'.

That this criteria is not yet fully met by the prototype was proven by the fact that questions arose like: what does this do to the value of my house? Do I need to sacrifice room in my house to technical devices? Do I need to drill holes to route cables?

Improve energy democracy and keep the benefits of the energy transition local.

A tougher criteria to judge from the test. It can be assumed that the design will contribute to this indirectly.

Transparently collaborate with Stedin.

One of the participants was pleasantly surprised by the possibility to get an advice meeting. They have had to deal with Stedin when trying to get their own initiative off the ground, and stated that an advice meeting would have made life so much easier for them. Is also shows that people really appreciate direct contact within the organization.

The project sketch also shows that it is possible to collaborate with Stedin, even though it is a bit complicated to complete. The participants understood the message that they need to get their plans in order first before they would be able to get advice from Stedin.

Take communities seriously: they might not be experts, they are motivated and should be treated accordingly.

The participants felt taken seriously when asked about this. The test also confirms what came out of the interviews: it is a fine line between putting too much on the plate of communities and treating them as not capable. Where this balance lies differs for all the participants of the test, making it even more challenging to design correctly for this. The balance seems to be in the right direction for the landing page; participants feel not scared off and do feel taken seriously, mainly by the possibility of having an advice meeting.

All three information 'pillars' (economical, social, technological) should be addressed when informing community leaders and knowledge about all three should be available.

The landing page just scratches the surface of all the knowledge needed to set up your own LEC. So, in following iterations of the design this needs to be expanded upon.

Conclusion

The test setup (prototype) brought a few key things to light. The most important being that internally at Stedin there is a real desire to implement an MVP of the design, thereby validating the design. This is mainly due to LEF being developed and tested where anticipation is omnipresent. Secondly, the test brought to light that LEF is still complicated to explain. An MVP that builds upon the prototype needs to be 'layered' more, releasing bits of knowledge and information more gradual than in the test. A landing page alone will not do the job. However the information in the landing page is verified to be striking the right tone, it just needs to be spread out over multiple channels like in the Service blueprint.

5.3

RECOMMENDATIONS

5.3.1 Implementation steps and advice

In this chapter the design of an MVP is laid out for Stedin. The goal of this MVP would be to validate the service blueprint further. It is very likely that once this MVP is up and running, the service blueprint designed in this project will change. Therefore the decision is made to not make a complete implementation roadmap for the whole service blueprint.

Based on the learnings from testing the prototype the advice is to make an MVP according to the following points:

- The landing page is iterated multiple times during this project. The final version (V3) can be directly implemented with some minor reviews and adjustments.
- The project sketch should be improved, made simpler and turned into a PDF that the KDO can share. The cost part mainly needs to be simplified. In the pdf an example project sketch should be included.
- An information package will be added. This makes the landing page more 'light' to read and doesn't scare away too much. The content of the first design of the landing page should be split up between an information package and the final landing page (version 3). This information package will take the form of an newsletter, communicated through an automated and time paced e-mail. Signing up is done through the landing page.

To give direction for the design and development of an MVP, a roadmap is made. This roadmap can be seen in Figure 5.3 - 1. It details the teams involved and works towards HierOpgewekt as some sort of deadline, since Stedin expressed the desire to release the MVP here.

5.3.2 Further development

This project was the first attempt at designing the customer service for energy communities offered by Stedin. Therefore it is expected to need further development. After all, this project aimed to design the service offering and not yet to develop the service. After carrying out this project a few initial directions for further development are pointed out here.

>> The service blueprint needs to be extended beyond just LEF.

After discussing the prototype with the marketing department and KDO, it became clear that the holistic view taken for this project might not have been holistic enough. The whole customer journey at the KDO would need to be integrated with LEF, since LEF is not a product on itself but closely relies and builds upon on the installation of solar panels in neighborhoods. It would be favorable to inform collectives who are undertaking a community solar project of the other opportunities. For this the whole service blueprint needs to be extended and integrated.

>>The service offering to Service providers needs to be designed and improved.

This project focuses on the service offering for communities. However, another important actor for realizing LECs is the service provider. The service offering for service providers needs to be developed and aligned with the service offering for communities, if LEF is to become a success.

Stedin is already aware of this and was already taking steps in developing this service offering. There are plans to develop an open source environment for service providers and to create a HelloWorld package that includes all the documentation to start working and developing with the software in the open source environment.

Creating an MVP and starting on the two recommendations here should be sufficient to successfully make LEF widely available for a larger public. After that, the rest of the service blueprint should be evaluated and implemented if the MVP further confirms the need for a service as designed in this project.

Image 5.3 - 1: Testing the concept

Secondly, during this project it became clear that service design in the private sector is quite different then when you do it in a tightly regulated environment of a DSO. These differences could be explored more closely to see which methods works best. Initial thoughts on this are given in chapter 5.5.
Lastly, the literature seems to have room for case studies about the process of *setting up* a local energy community.

5.3.3 Further research

So some interesting directions for further research are presented here.

Firstly a framework of the multiple levels of flexibility could be a topic for research. A framework reaching from turning on your own dishwasher when the sun is shining to having a fully automated Local energy community. This could serve as a conceptual framework for designing for *implicit flexibility.*

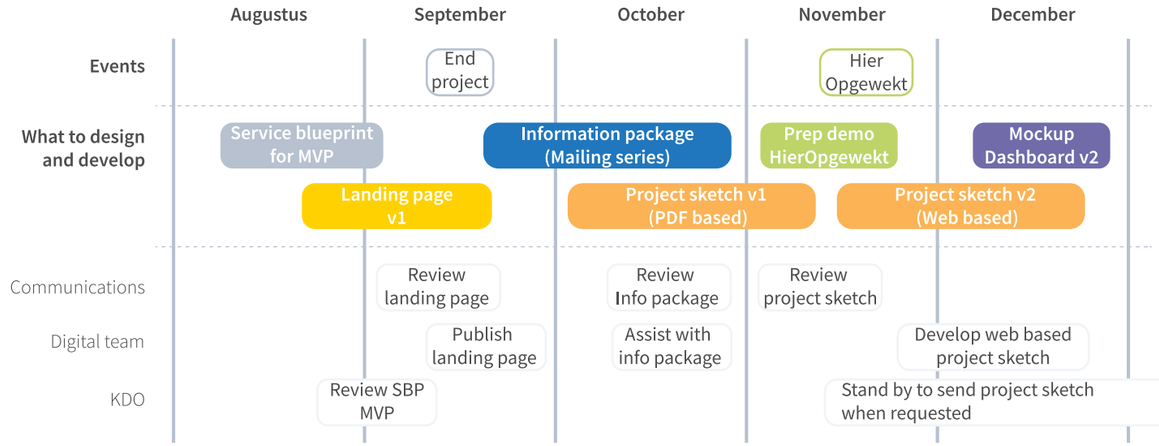


Figure 5.3 - 1: MVP development and implementation roadmap

5.4

DISCUSSION

The design is validated successfully and will most likely be implemented after this project in the form of an MVP. In this chapter we take a critical look at the design as a whole, by looking back at the design brief. Each element of the design brief is discussed separately.

5.4.1 Problem statement

>> The principle and operating of a LES is still perceived as complicated to grasp and difficult to implement for LECs. However, Stedin has currently no formalized channel to communicate knowledge to potential LECs about LES. For the potential energy communities this means they cannot access the information they desire and need about LES to create a plan to implement LES and to communicate this to Stedin.

This problem statement was definitely correct. Testing revealed that even after reading the landing page the concept was unclear. Testing also revealed that solving this problem is quite a large challenge and that it will take a lot of refinement to get the concept of LEF so simple and straightforward that everybody who is interested and motivated can start their own LEC. However, this was not the goal of the project. The goal was to facilitate the innovators. Testing revealed that for this group filling in the project sketch would be possible, although still complicated. The fact that the 'innovators' that participated in the test could fill in the project sketch proved that the problem statement is solved for this small group of front runners. However, this is arguably more because of their preexisting knowledge and experience on the topic than the information given by the landing page. This is solved with a proposed information package as discussed in chapter 5.3.

5.4.2 Interaction vision

>> Clear and effortless communication between community leaders and Stedin enables collaboration and makes forming an energy community feel as if you're playing a new board game for the first time together as a group.

Whether this interaction vision is met is not explicitly tested. The future service scenario was only tested internally and not with potential users. One key element of the service design is to give feedback on the data to the community members through a dashboard.. Based on anecdotal evidence from Ecowijk Mandora[1] a feeling of 'doing it together' can be created by feeding information back into the community about usage. When determining next steps based on these insights as a community this could feel as if you are playing a 'game' together.

1 The residents were given information about their energy usage by a project group in the form of presentations and community meetings

5.4.3 Design goal

>> Design a central place that takes away the knowledge hurdle for LEC leaders for starting a LEM, communicate the customer journey of setting up a LES based LEM and provide LEC leaders with tools to explore the possible configurations of their LEC. The LEC leaders should also be enabled to create a project sketch and discuss this sketch with Stedin.

This design goal was executed quite literally and is the red thread through the service design. It is quite surprising how much the final service design resembles the design goal. This is of course a good thing. But one remark should be made considering this resemblance: that in retrospect less time could have been spent on exploration during the design phase. However, spending less time on exploration of different solutions could have made the design process less convincing overall, for surprising ideas might have been overlooked.

Taking this all into account the design goal is met partially and as much as was possible within the time available. Yet, more work is needed to fully reach the design goal, especially on taking away the knowledge hurdle for LEC leaders. All other elements of the design goal are met almost completely by the service design, especially when the future service scenario is considered.

5.4.4 Manifestation

>> A service blueprint to detail the services provided to energy communities. From this service blueprint two key touch points will be prototyped and tested with community members:

- *The landing page for interested individuals including an overview of the necessary knowledge and steps*
- *A tool where an energy community can create a first project plan to communicate this to Stedin.*

This as a whole is a concept service design and will be accompanied by a report and implementation roadmap.

The manifestation chosen was a trade off of what was desirable for Stedin (very hands on, MVP like) and what is desirable in a graduation project (visionary, conceptual, innovative). This leads to the manifestation being a bit 'in the middle' of the two. As a result the design does satisfy both, but neither completely. Considering a graduation project is carried out individually and within quite a short time-frame, it is not feasible to completely satisfy both sides. Therefore, this means the final service design is not completely ready to be implemented straight away.

5.4.5 Rating on guiding principles

In this paragraph the design and prototype are discussed on how well they fulfill the guiding principles. The prototype is discussed separately to see where the most improvements would be necessary in the future. It also gives an indication as to what extent the MVP lacks when compared to the 'ideal' solution. However this gap between the two is not a bad thing, you have to start somewhere.

1. Enable Local Energy Communities operating a LEM to exist

Design: The design definitely meets this principle for the explore phase. For the later phases this depends more on the open source service to service providers from Stedin's part. Because only then a mature sector of service providers can develop. Also this is more done by the LEF software.

Prototype: It does so on a basic level: it tackles the first step in allowing LECs to exist. However, it does not facilitate the complete life-cycle, but this is also out of scope for the prototype.

2. Communicate to potential energy communities the information and data they need

Design: This criteria would be met 100% if the future service scenario would become reality. This guiding principle was also the most important one when designing, so solving it is a very good thing. Transparency is the way to go.

Prototype: The prototype meets this requirement less well. Since most community leaders need to gather the data about their current situation them self. With the use of the current open data from Stedin, this criteria can be met with some satisfaction.

3. Effectively collaborate with communities and Stedin
Design: Collaborating effectively is definitely possible with the service design. This collaboration is automated and very easy. When needed, the data is given automatically and without much prior knowledge a plan can be made based on a communities' vision and wishes.

Prototype: This criteria is also quite well met in the prototype. The community can request an advice meeting, a project sketch template is given. So, motivated communities have an accessible, democratic and direct way to access Stedin! This was definitely not the case before this project, so this will be a great improvement.

4. Enable community leaders to inform and convince potential members
Design: The dashboard that gives direct information into the energy usage of your community is really an answer to this criteria. This information will involve members in a playful and informal way without any strings attached.

Prototype: In the prototype this convincing is still mostly up to the community leader. No direct tools to inform and inspire their following are given. However indirectly the LEF info pages do give 'stuff to discuss and talk about', so it is met somewhat.

5. Spread and protect energy democracy
Design: How well this principle is met remains difficult to judge. This is certainly improved by using LES. Yet, this is not really increased by the Design. It is also really dependent on legislation and service providers: if these don't develop into a healthy ecosystem lock-ins might still happen and then an LEM is actually a step backward.

Prototype: Same story for the prototype. It does add indirectly to energy democracy.

6. Help communities to form good partnerships
Design: This is done reasonably well. Communities are linked and contact information is provided. However service providers are not given direction on which service provider to choose, because Stedin is legally not allowed to do so. However this need is therefore left unmet and needs to be solved in the future. Stedin could go to an external party or make a place for community reviews of service providers.

Prototype: This is not fully met by the prototype. Example communities are given in the process overview, somewhat solving this need.

7. Assure the embodiment of LEF values into energy community designs
Design: Definitely met quite well. Although, this is also not the job of the LEF explorer service. This principle is mainly achieved by how LEF is designed.

Prototype: Same as the design.

8. Make the business case of LEF viable
Design: This is challenging to solve and will remain like this for the foreseeable future. It also is dependent on external factors that Stedin can only indirectly control through public affairs. It mainly depends on how the sector and energy laws will evolve. By offering good and transparent advice for free it becomes more likely that people will undertake a community energy project so it somewhat serves this principle.

Prototype: Same story as the design. It does not add directly since it is out of the control of the design and prototype.

9. Generate and share knowledge between all four key stakeholders
Design: This is solved by proposing a forum and a blog. However, the learning needs to be embedded better and more thought needs to go into how innovation can be kept up to speed. This principle is the main blind spot of the design unfortunately. The reason for this is because the design is focused externally, and learning is more an internal affair.

Prototype: Learning and sharing new knowledge is something the prototype is not really well equipped for either. But this is not a major issue for the time being if LEF is still relatively small and direct contact with communities is still feasible.

10. Make forming an Local energy community hassle free without disturbing the market
Design: Hassle free as much as is possible is definitely part of the design. Automating data and plan creation greatly add to the ease of use. Also not having to pay for the service makes it accessible. It also does not disturb the market, but rather powers the market: by allowing communities to easily create their own plan to take to a service provider, the process of project setup and development is made much easier than the current situation where gathering data from Stedin is a challenging feat, to say the least. This will only lead to more business for service providers therefore. Potentially disturbing the market in a good way!

Prototype: It is a step in the good direction if you look at this principle and the prototype. So no real high score here, but this has already improved a lot compared to the current situation.

Conclusion

The design seems to embody most of the guiding principles quite well. Especially the decision to take the route of radical transparency and ease of access to data proposed in the future vision scenario make the design as a whole score well on most guiding principles. If I can give Stedin one advice at the end of this project, it would be to really invest in this transparency which enables collaboration. The reasoning for this is simple: the energy sector is being democratized, and in order for people become active participants in the energy system Stedin needs to collaborate and make data open. Luckily this is being recognized within Stedin as well.

Guiding principle	Design	Proto-type
1. Enable Local Energy Communities operating a LEM to exist	8	6
2. Communicate to potential energy communities the information and data they need	10	6
3. Effectively collaborate with communities and Stedin	9	8
4. Enable community leaders to inform and convince potential members	9	5
5. Spread and protect energy democracy	?	6
6. Help communities to form good partnerships	7,5	4
7. Assure the embodiment of LEF values into energy community designs	8	7
8. Make the business case of LEF viable	5	5
9. Generate and share knowledge between all four key stakeholders*	7	5
10. Make forming an Local energy community hassle free without disturbing the market	8	6

Table 5.4 - 1: Raking the prototype and design on how well they meet the guiding principles on a scale of 1 to 10

5.5

REFLECTION

In this chapter some reflections are gathered, that have been observed during this project. Firstly, the biggest challenges are highlighted and reflected upon. Secondly, a few key learnings is reflected upon. Lastly, due to this thesis being written in the unprecedented circumstances of a pandemic, there is also reflected on how this affected the project and process.

5.5.1 General reflections

Even tough the circumstances of this project have been challenging, I greatly enjoyed working on this project for Stedin. The open nature of the company combined with the knowledge available made it a joy to work on this thesis! Also being in the 'machine room' of the energy transition is greatly inspiring. If you would rely on the news only for your view on the world it is easy to become a bit cynical. But if you base your world view also partially on what you see at Stedin, and in the sector, it becomes much brighter! Because if you look well you see so many people working towards the same goal of transitioning to renewable energy sources. As a result of this, I am definitely going to try to find a job or create my own in this sector. Service design for sustainability is something that I personally believe can add good things to the world. However I have to learn and keep developing myself more. Because if I learned one thing, it is how much there still is to learn! It really feels at times as if this project was more an 'introduction' into my professional life than the end of my master. Exciting stuff.

5.5.2 Biggest challenges

When starting this project a few challenges could be foreseen. The main one being the very early stage smart grid technologies are currently still in, and the missing 'foundations' to design on as a result of this. However the two biggest challenges were unforeseen.

>> A distribution system operator like Stedin is so tightly regulated innovation is more an act of carefully making design decisions so the final result falls within the regulatory framework of a DSO then of creating innovative solutions.

When starting out this project the anticipation was to design something advanced and innovative. Plenty of opportunities came by to design a fancy data driven, completely integrated, platform for energy communities. However, due to limitations imposed by multiple factors, like uncertainty about how the energy transition will pan out, made the real challenge in the end making these far out and great ideas more simple and accessible for Stedin. Translating a vision into a product they could start building straight away. Innovation is not a sprint, it is a marathon full of long and tedious work.

>> Due to service designs holistic view and lack of preexisting service it became tough to push through to the user level

The nature of the project made it quite a challenge to 'go into detail'. So many things were unknown and needed to be 'defined' (like the roles of different stakeholders), that it became quite a challenge to get to the content and final product level.
I recognize that this is also one of the main issues innovation in a large organization faces in general: so it was to be expected that it would become a challenge. However in the project did reach the necessary 'content level' and I am pleased with the balance struck: a high level over arching service blueprint with tangible touchpoints.
However the 'meeting culture' sometimes slows things down. Stedin should really consider investing in a place where innovation can be 'let wild' and people are allowed to just experiment. This would have made the project much easier. However integrating it into the Business as usual after innovating in an incubator for example is always tough as well. So in the end there is not easy solution I believe... And we should be happy with the steps that are going to be taken during implementation!

5.5.3 Key learnings

>> Trust the process that you have set out when you are designing products or services for a sector that is undergoing a transition.

During this project the degree of uncertainty was relatively high. The energy transition means the sector and consumers I am designing for are in a state of flux. This made it very easy to keep pondering how to tackle a job or what the next step should be due to the uncertainty of how it all will play out. When taking the time to ponder the result was most of the time the same as the original project outline, which was made at the beginning of the project and updated at the mid-term. It is important to keep checking whether you are going in the right direction, but when designing for a service to be used after a transition don't ponder too much. You can't know what is going to happen anyway, so just make sure you keep moving.

>> Service design for the energy sector is quite a different feat than service design for the public sector.

I underestimated the challenge of navigating a changing regulatory and legal environment. To add to this the energy transition is still 'crystallizing' at multiple levels, form law all the way down to public opinion. This made it at times very hard to find out what is the 'truth' and design for that. For example, questions that at first sight seemed simple,could became complicated quickly. Questions like are we as Stedin going to make our data public and accessible for the end user? This seems obvious: why not if it can help existing initiatives? But the reality is much more complicated. GDPR comes into play, data regulations, and the fact that Stedin simply sometimes also does not know the answer makes simple matters sometimes quite complicated.

5.5.4 Reflections on doing a graduation project remotely

>> The fact that you are reading this report is a testament to how far the information age has come and shows that it is perfectly doable to execute a graduation project (and possibly a design project in general) 100% remotely

It is a truly unique feat that with the help of modern communication tools it is made possible to collaborate, receive feedback, co-create, have meetings, argue and laugh with other human beings all in front of your laptop and without ever seeing them in person. Think of it what you will, 100% remote collaboration is now proven to be possible. 'The floodgates' are opened by covid-19. I personally hope that we will find a new normal that takes the best of both in person contact and remote working. Modern communication methods should bring us closer together and not just serve as a tool for large corporations to increase their bottom line at the cost of our mental health. But I digress.

>> Expect your productivity to be more volatile

Working from home made my productivity more volatile. Having the structure of a company makes sure you work even when you are not really feeling like, but at home there is no 'work' atmosphere to take you along. Procrastination and 'sprints' were something of the past, mainly during my bachelor, times. Unfortunately the advent of working from home brought them back for me.

>> Collaborating on a project takes more time than when you share the same workplace
The simple fact that you have less interaction with your colleagues makes that project management takes more time. You have to plan updates instead of talking things overv loosely during lunch.

>> Keep meetings short and to the point
Two hours of co-creation through teams easily feels as if you have done a whole afternoon of in person co-creation. Also the quality and quantity of the work is simply less high then when working in person. Adjust for this by aiming for a larger amount of small workshops.

Image 5.5 - 1: The author in his corona office

REFERENCES

[1] Ministerie van Economische Zaken en Klimaat. (2020, 30 januari). Rijksoverheid stimuleert duurzame energie. Geraadpleegd op 10 april 2020, van https://www.rijksoverheid.nl/onderwerpen/duurzame-energie/meer-duurzame-energie-in-de-toekomst

[2] Stedin Netbeheer B.V., & Pellis, J. (2018). Position paper flexibiliteit. Geraadpleegd van https://www.stedin.net/over-stedin/pers-en-media/persberichten/position-paper-flexibiliteit-de-fase-van-toepassing-breekt-aan

[3] HierOpgewekt, & Schwenke, A. M. (2020). Lokale Energiemonitor (2019). HIER Opgewekt & RVO. Geraadpleegd van https://www.hieropgewekt.nl/uploads/inline/Lokale%20Energiemonitor%202019_DEF_feb2020_2.pdf

[4] Ministerie van Economische Zaken en Klimaat. (2016). Energierapport - Transistie naar Duuzaam. Rijksoverheid. Geraadpleegd van https://www.rijksoverheid.nl/documenten/rapporten/2016/01/18/energierapport-transitie-naar-duurzaam

[5]McKinsey. (2018). The digital utility. Retrieved from https://www.mckinsey.com/~/media/McKinsey/Industries/Electric%20Power%20and%20Natural%20Gas/Our%20Insights/The%20Digital%20Utility/The%20Digital%20Utility.ashx

[6] What is the framework for innovation? Design Council's evolved Double Diamond. (2019, 10 september). Geraadpleegd op 6 april 2020, van https://www.designcouncil.org.uk/news-opinion/what-framework-innovation-design-councils-evolved-double-diamond

[7] Polaine, A., Løvlie, L., & Reason, B. (2013). Service Design: From Insight to Implementation (1st editie). New York, United States: Rosenfeld Media.

[8] Oliver, D., & Roos, J. (2005). Decision-Making in High-Velocity Environments: The Importance of Guiding Principles. Organization Studies, 26(6), 889–913. https://doi.org/10.1177/0170840605054609

[9] TNO, & Sijm, J. (2017). Demand and supply of flexibility in the power system of the Netherlands, 2015-2050. Geraadpleegd van https://www.tno.nl/media/12358/e17053-flexnet-demand-and-supply-of-flexibility-in-the-power-system-of-the-netherlands-2015-2050-summary.pdf

[10] Internal presentation 'Flexibiliteit, klanten belonen voor optimalisatie van het elektriciteitsnet'. Stedin, 7-2020.

[11] Ministerie van Economische zaken en Klimaat. (2020). Contouren Energiewet 1.0. Geraadpleegd van https://energeia-binary-external-prod.imgix.net/aD-K2ISTAgq74BwfRdM7pTvuBCo.pdf?dl=Contouren+Energiewet+%28werkdocument+17+juli+2020%29.pdf

[12] NationalGridEso. (2019). Future Energy Scenarios. Geraadpleegd van https://www.nationalgrideso.com/sites/eso/files/documents/fes-2019.pdf

[13] Engelaar, M. E. (2000). Organisatie en financiering van de Coöperatie. Nijmegen, Nederland: Ars Aequi Libri.

[14] Cooperative identity, values & principles | ICA. (z.d.). Geraadpleegd op 6 augustus 2020, van https://www.ica.coop/en/cooperatives/cooperative-identity

[15] Energy community definition. (z.d.). Geraadpleegd op 6 augustus 2020, van https://www.rescoop.eu/definitions

[16] Rechtsvormen en statuten. (2019, 19 juli). Geraadpleegd op 6 augustus 2020, van https://www.hieropgewekt.nl/kennisdossiers/rechtsvormen-en-statuten

[17] Troonrede 2013. (2014, 16 september). Geraadpleegd op 6 mei 2020, van https://www.rijksoverheid.nl/documenten/toespraken/2013/09/17/troonrede-2013

[18]Ministerie van Binnenlandse Zaken en Koninkrijksrelaties. (2014, July 24). Citizen participation. Retrieved September 8, 2020, from https://www.government.nl/topics/active-citizens/citizen-participation

[19] Het kabinet Rutte III. (2019). Klimaatakkoord. Geraadpleegd van https://www.klimaatakkoord.nl/binaries/klimaatakkoord/documenten/publicaties/2019/06/28/klimaatakkoord/klimaatakkoord.pdf

[20]Centraal Bureau voor de Statistiek. (2019, 26 april). Vermogen zonnepanelen meer dan de helft toegenomen. Geraadpleegd op 6 juli 2020, van https://www.cbs.nl/nl-nl/nieuws/2019/17/vermogen-zonnepanelen-meer-dan-de-helft-toegenomen

[21] McKenna, E., Pless, J., & Darby, S. J. (2018). Solar photovoltaic self-consumption in the UK residential sector: New estimates from a smart grid demonstration project. Energy Policy, 118, 482–491. https://doi.org/10.1016/j.enpol.2018.04.006

[22] Wat houdt de PCR-regeling precies in? (2017, 9 augustus). Geraadpleegd op 26 mei 2020, van https://www.postcoderoosregeling.nl/wat-houdt-de-pcr-regeling-precies-in/

[23] Mamounakis, I., Efthymiopoulos, N., Makris, P., Vergados, D. J., Tsaousoglou, G., & Varvarigos, E. M. (2019b). A novel pricing scheme for managing virtual energy communities and promoting behavioral change towards energy efficiency. Electric Power Systems Research, 167, 130–137. https://doi.org/10.1016/j.epsr.2018.10.028

[24] Rathnayaka, A. J. D., Potdar, V. M., Dillon, T., Hussain, O., & Kuruppu, S. (2014). Goal-Oriented Prosumer Community Groups for the Smart Grid. IEEE Technology and Society Magazine, 33(1), 41–48. https://doi.org/10.1109/mts.2014.2301859

[25] Gui, E. M., Diesendorf, M., & MacGill, I. (2017). Distributed energy infrastructure paradigm: Community microgrids in a new institutional economics context. Renewable and Sustainable Energy Reviews, 72, 1355–1365. https://doi.org/10.1016/j.rser.2016.10.047

[26] Sperling, K. (2017b). How does a pioneer community energy project succeed in practice? The case of the Samsø Renewable Energy Island. Renewable and Sustainable Energy Reviews, 71, 884–897. https://doi.org/10.1016/j.rser.2016.12.116

[27] Weck, M. H. J., van Hooff, J., & van Sark, W. G. J. H. M. (2016). Review of barriers to the introduction of residential demand response: a case study in the Netherlands. International Journal of Energy Research, 41(6), 790–816. https://doi.org/10.1002/er.3683

[28] Kotilainen, K., Sommarberg, M., Järventausta, P., & Aalto, P. (2016). Prosumer centric digital energy ecosystem framework. Proceedings of the 8th International Conference on Management of Digital EcoSystems - MEDES, 99–100. https://doi.org/10.1145/3012071.3012080

[29] Stedin, Pellis, J., & Dorresteijn, M. (2018). Layered Energy System. Stedin & Energy 21. Geraadpleegd van https://www.stedin.net/over-stedin/~/media/files/stedin/projecten/layered-energy-system-white-paper.pdf?la=nl-nl

[30] Definition redispatch, 50Herts - Ella group, 50hertz.com > Grid > System control > Redispatch. (z.d.). Geraadpleegd op 8 augustus 2020, van https://www.50hertz.com/en/Grid/Systemcontrol/Redispatch#:%7E:text=Redispatch%20means%20that%20the%20transmission,and%20between%20different%20grid%20areas.&text=Otherwise%2C%20there%20is%20a%-20danger%20of%20power%20outages

[31] Europese Commissie. (2020, 12 maart). Clean energy for all Europeans package - Energy European Commission. Geraadpleegd op 14 april 2020, van https://ec.europa.eu/energy/topics/energy-strategy/clean-energy-all-europeans_en

[32] Directoraat-generaal Energie (Europese Commissie). (2019). Clean energy for all Europeans (MJ-03-19-092-EN-N). https://doi.org/10.2833/9937

6

APPENDIX

APPENDIX A - INTERVIEW SETUP (NL) ENERGY COMMUNITIES

Hoofdvraag:
Deze interviewgids heeft het doel te begrijpen waarom en hoe verschillende mensen (en de groep waar zij van uitmaken) een energie community willen vormen en hoe dit proces er uitziet.

Onderliggende kennisgebieden (Totaal 60 min)

0. Introductie (5)
1. Hun huis en huishouden (5)
2. Houding/ervaring en kennis over Duurzaamheid en duurzame energie (10 min)
3. Houding/ervaring ten opzichte van hun (energie) community en woonwijk (15)
4. Behoefte aan kennis, ondersteuning en begrip over het vormen van een energie community

a. Variant voor gemiddeld actieve leden (10)
b. Variant voor 'kartrekkers' binnen een community (20)

5. Afsluiting (5)

Oefeningen:

- Teken je community als een systeem: wie staat waar? Waar sta jij? Wie zijn de partners? Waar staat Stedin? (Met zichzelf in het midden als stip)
- Journey: hoe ziet jullie process er tot nu toe uit? (Ik teken mee) > Nadenken als huiswerk/sensitizer

Note: Door het uitvoeren van de interviews via Skype is het niet gelukt deze oefeningen door de interviewees te laten doen, in plaats daarvan zijn ze waar mogelijk uitgevraagd.

Interview gids
Deze gids heeft meerdere onderdelen. Deze interviewgids heeft het doel te begrijpen waarom en hoe verschillende mensen een energie community (willen) vormen. Alle onderdelen vallen onder de hoofdvraag. Elk onderdeel heeft een aantal subvragen en 'probe' vragen. Ook is per onderdeel uitgeschreven wat het doel is en hoe lang het onderdeel kan duren. Bij twee onderdelen zit ook een oefening.

0. Introductie (5 min)

- Ik ben onafhankelijk van Stedin, ik doe een project voor Stedin maar wordt alleen beoordeeld door de TU. Daarnaast heb ik al verschillende mensen in duurzame wijken geïnterviewd en al verschillende situaties gezien.
- Alles wat je zegt is anoniem en blijft dat.
- Als je geen zin hebt om antwoord te geven hoeft dit natuurlijk niet.
- Het interview duurt ongeveer 60 minuten/ 80 minuten als community leider (nvt.: en er zitten ook een/twee kleine oefeningen in.)
- Akkoord vragen en laten tekenen Consent form (digitaal/fysiek)

1. Introduce yourself (5 min)
Doel: algemene kennismaking en geïnterviewde op zijn gemak stellen. Een algemeen profiel kunnen maken van de geïnterviewde en het huishouden.

- Zou je jezelf voor willen stellen?
- Hoe lang wonen jij/jullie hier?
- Wat is jullie gezinssituatie?

2. Houding/ervaring en kennis over duurzaamheid en duurzame energie (15 min)
Doel: Een profiel maken van hoe duurzaam de geïnterviewde zichzelf vindt en ook relatief gezien is. Ook de beweegredenen achterhalen over waarom deze behoefte er is om te verduurzamen.

- Wat betekent duurzaam zijn voor jou?
- Hoe belangrijk is een duurzaam huishouden zijn voor jou?
- Welke investeringen hebben jullie gedaan om je huis te verduurzamen en waarom?
- (Wat vind je van mensen die duurzaamheid niet belangrijk vinden?)
- Stel, je zou 10.000 euro krijgen om volledig naar eigen inzicht te mogen investeren in het verduurzamen van je huis: waar zou dit over een jaar naartoe zijn gegaan?

3. Houding/ervaring ten opzichte van hun (energie) community of woonwijk (20 min)
Doel: Wat is de staat en hun rol binnen de community/toekomstige community op dit moment, wat gaat er goed, wat gaat er minder? Daarnaast een beeld krijgen van hoe is hun community tot stand gekomen en waarom zijn ze er bij gegaan en actief geworden. Ook een blik op de toekomst werpen: waar zou je de community graag zien binnen 2-5 jaar?

Oefeningen: in dit deel ook 1 oefening.

Community algemeen:

- Wat voor rol speel je op dit moment binnen de wijk en wat vind je hier van?
- Met welke ambities ben je ooit bij de community/coöperatie gegaan?
- Wat is je ervaring van de community tot nu toe? Hoe komt dit?
- Wat gaat er goed en wat minder?

Oefening 1: Invullen klantreis community > Uitvragen als interview via skype wordt gedaan

- Welke fase van het opzetten van een community zijn jullie nu?
- Als je de verhaallijn van jouw ervaring met de energie community zou moeten tekenen vanaf het moment dat je er nog niet van afwist tot nu. Hoe zou dat dan er uitzien?
- Wanneer wist je voor het eerst van het plan af of ontstond het plan?
- Welke stappen zijn te onderscheiden?
- Waren jullie al verenigd in enige vorm? (VvE, coöperatie, bewonersvereniging?)
- Hoe gaat de toekomst er uitzien voor de community? Welke stappen gaan jullie nemen?
- Hoe ziet de community er uit over 3 jaar?

Verdieping Klantreis community:

- Wat waren de hoogtepunten?
- Wat waren de dieptepunten?
- Wat waren de momenten dat stedin zich van zijn beste kant liet zien?
- Wat waren de momenten dat stedin zich van zijn minst goede kant liet zien?

4a. Algemeen lid: Kennis, ondersteuning en begrip over het vormen van een energie community (10 min)
Doel: het begrijpen van wat een algemeen lid voor informatie heeft nodig gehad en wat het niveau van begrip is dat gewenst is. Daarnaast ook zicht krijgen in hoeverre een community lid onderscheid maakt tussen informatie door de community zelf verstrekt en misschien vanuit Stedin.

- Wat is jouw omschrijving van een energie community?
- Op basis van journey: welke stap heb je extra informatie gezocht en waarom?
- Via welke kanalen heb je dit gedaan?
- Hoe was de informatievoorziening geregeld vanuit de leiding van de community?
- En vanuit Stedin? Heb je hier gebruik van gemaakt?
- Tot welk niveau wil je allemaal weten hoe het LEF systeem werkt?

4b. Kartrekker: Kennis ondersteuning en begrip over het vormen van een energie community (20 min)
Doel: Inzicht krijgen in hoe ze tot nu toe hun informatie en netwerk hebben verkregen. Ook begrijpen wanneer en in welke rol ze in contact met Stedin zijn gekomen zodat er een beeld gevormd kan worden van hoe Stedin op dit moment wordt ervaren door community leden.

- Wat is jouw definitie van een energie community?
- Hoe zou je jouw energie community omschrijven?
- Wat zijn/waren jouw (oorspronkelijke) drijfveren om een energie community te vormen?
- Op basis van journey: welke stap heb je extra informatie gezocht en waarom? (andere kleur pen!)
- Via welke kanalen en bronnen heb je dit gedaan?
- Hoe was de informatievoorziening geregeld vanuit vanuit Stedin?
- Wat ging hier goed? Wat kon hier beter?
- Met welke kanalen heb je allemaal contact gehad van Stedin?
- Wat zou je graag anders zien?
- Hoe zou het proces er idealiter uitzien?
- Als Stedin een dienst zou aanbieden aan mensen zoals jij (community leaders), hoe zou je dan willen dat deze dienst er uitziet?

Oefening 2: Systeem tekenen

- Hoe ziet jouw community en energie systeem er uit? Zou je dit willen tekenen?
- Welke relaties gaan er goed of minder goed?
- Welke informatie zou je nog extra willen hebben?

5. Afsluiting (5 min)
Doel: de deelnemer goed laten weggaan, vragen of ik iets gemist heb.

- Als je mij was, is er dan nog iets wat je had gevraagd?
- Ben je toevallig op nieuwe inzichten gekomen door dit gesprek?
- Zou je eventueel mee willen doen aan een co-creatie sessie eind april?
- Heb je eventueel nog 1 a 2 andere deelnemers aan de pilot die ik zou kunnen interviewen? (Om het perspectief te hebben van een gemiddeld betrokken community lid)

APPENDIX B - INTERVIEW GUIDE COMMERCIAL ENERGY COMMUNITIES

Hoofdvraag:
Deze interviewgids heeft het doel te begrijpen waarom en hoe verschillende bedrijven (en de groep bedrijven waar zij van uitmaken) een energie community willen vormen.

Onderliggende kennisgebieden (Totaal 45 min)

0. Introductie (5)

1. Profiel bedrijf (5)
   a. Wat voor bedrijf is het?
2. Houding/ervaring en kennis over Duurzaamheid en duurzame energie (5 min)
   a. Wat hebben jullie allemaal ondernomen om het bedrijf te verduurzamen en wat zijn de beweegredenen hierachter?
3. Houding/ervaring ten opzichte van hun (energie) community (10)
   a. Wat is de hoofdzakelijke reden om een energy community te willen gaan vormen?
   b. Hoe is het proces om een energie community op te starten verlopen?
   c. Wat waren hier de hoogtepunten en pijnpunten bij?
   d. Zijn er verschillende belangen bij de verschillende deelnemers en wat is daar hun motivatie achter?
4. Behoefte aan kennis, ondersteuning en begrip over het vormen van een energie community (15)
   a. Hoe is het contact met Stedin verlopen? (hoogtepunten, pijnpunten)
   b. Welke partijen waren hier nog meer bij betrokken?
   c. Hoe ging verliep/verloopt de communicatie met deze partijen?
   d. Wat voor informatie en kennis hebben jullie allemaal in huis moeten halen om een energy community te vormen, en waar hebben jullie dit vandaan gehaald?
   e. Wat zou er beter kunnen als een vergelijkbare partij een een vergelijkbaar proces gaat doorlopen?
5. Afsluiting (5)
   a. Mogelijk nog uitdiepen verschillen tussen bedrijven en residentiële energy communities.
   b. Overige vragen

APPENDIX C - STAKEHOLDER MEETING OVERVIEW

Name/Meeting	Company, deparment	Job title	Date + time	Duration	Reason for meeting	Outcome/Next steps	General reflection
Bart Smakman	Stedin, Marketing	P. owner Flexibility	3-2	60	Introduction to electricity market and market players. Mini lecture on Stedins role in the power supply in the Netherlands	No follow up/descicions made	Explained the monopoly position of Stedin. This is why they haven't been as nice to customers in the past. Also explained why they talk about roles in the electricity sector. A company can have multuiple roles, so good to keep this disctinction. The level of collaboration in the energy sector is extremely high, which makes it a very slow sector: it can take 1.5 years for small adjustments to get through.
Bart, Arjen, Jan	Stedin	multiple	3-2	120	LES sprint meeting. Explaining LES current situation	Contacts received of multiple interesting parties	The Hello world package is introduced. The goal of this package is a bit unclear for me at the moment and how does it fit in with my project? The LES apps need to be developed quite a bit further in order to become a real product.
Bi-weekly 'Klantinitiatieven FLEX'	Stedin	multiple. Innovatie, Klant	4-3	60	Bi-weekly meeting about the current energy community/Flexibility initiatives. Interesting for me to see the current situation and the developments communities go through	Gained better insight into current initiatives	Current projects are all at different stages and have different tasks to perform at the moment. Is unclear what the process is exactly: this is also determined by the project leader/community leader. There is a lot happening in this area, cool to see all the initiatives and be in this place where really new stuff is being piloted and developed.
Arjen	Stedin, Innovatie	Project leader Flex	4-3	60	Getting to know each other, introduction into the innovation department and Arjens job and flexibility in general	Meetings inplannen met gebiedsregisseurs (Eelco, Kees-Jan)	Good to get to know the different teammembers. Also shows how big of an organisation Stedin really is and how far we LES still has to go. Innovating a system is a tough cookie.
Ronald Clasquin	Stedin, Marketing	Customer	5-3	30	Getting to know the Stedin way of making a customer Journey. Also getting a bit more familiar with the Marketing department.	Looking at Stedins current portfolio of customer journeys. To be provided by Ronald. Also, meeting with Karin.	The marketing department is quite te voice of the customer within Stedin. They are arguably the most customer centric organisation and play a bit the devils advocate at times, arguing with the more technical departments to make sure the voice of the customer is heard in the technical departments.
Beslisboom meeting	Stedin	LEF team	11-3	60	Meeting to expand on the decision tree.	Insert my project planning into the general planning of LEF	Very nice to see that this deciscion tree is being developed. I feel like therefore it is the right time to have me on a assignment like I am on. The descicion tree could be kind of the version 0.1 of my project and the service. I kind of need to expand on it.
Eelco Vink	Stedin, KAM	Gebiedsregisseur	10-3	30	Getting to know a gebiedsregisseur, what their job is, how they interact with communities	Longer interview is desired	The job of a 'gebiedsregisseur' is to bring Stedins interest to the outside world, and keep the developments/innovations in the sector to Stedin. They are a relatively new type of job. Just as marketing and KDO. So you can really see the results of Stedins change towards becoming more customer focussed beceause of this.
bi-weekly 'Klantinitiatieven FLEX'	Stedin, Marketing, Innovatie	LEF team	18-3	60	Updating on the community initiatives.	-	Again, a lot is happening. But the route a new community of community that is in development is is taking with Stedin is a very long one. Also, the routes they travel trough Stedin differ greatly between the communities. Bit undemocratic.
Beslisboom meeting	Stedin	LEF team	18-3	60	Updating the descicion tree	-	The entry criteria for a pilot are still unclear. Also there is no formalized channel for a new community to go to to sign up or something. Also: pilots without specific goals or project proposals are a bit 'disregarded' at first. The status of the LEF product at the moment is just a .zip file with a lot of documentation?
Joep ter Avest	Stedin, Marketing	P. owner renewable energy	20-3	30	Understanding what his role is in the marketing department, getting to know marketing department better.	Longer interview is desired, should meet also with the digital team of Stedin (Mark/Sjoerd)	Beter picture of how the marketing department is structured, with the multiple teams that make up marketing. For example customer communications, product managers. Better understanding of the departments and how they talk with customers.
Jeroen Kuijpers	Stedin, Marketing	Manager Marketing	20-3	30	Getting to know the department manager	Plan a short update meeting around every four weeks	Customers have operational needs. Also they have needs from Stedins side in the form of help and enabling the energy transition. This is clear. Also Stedin has a big interest in getting to know about plans that concern the grid as early as possible! This is a important need as well.
Beslisboom meeting	Stedin	LEF team	25-3	60	Improving on the decision tree, getting it ready to present to KAM	-	In terms of a real product 'shell' of LEF there is not a lot yet. There is the knowledge but it is spread out too much and not really easily accessible. It just feels like the interface and pacing for the Energy communities is missing. The tech is there.
Jan Pellis	Stedin, Innovatie	Innovator (flex)	25-3	60	Getting more general introduction of the Flex subject. Asking questions about the technical side of Flex	-	Good talk. Have a clearer understanding of the subject flexbility and where it came into the picture of Stedin. The need to start writing things down and organizing knowlegde is getting bigger.
Kees-Jan Fernhout	Stedin, KAM						-
Elma Cosic, Joyce Aalberts	Stedin, KAM (KDO)	Specialist KDO; Teamleider	7-4	45	Getting a better understanding of what the 'Kenniscentrum Duurzame Opwek' (KDO short) does. Also giving an introduction into my project and getting familiar.	Inviting them for the co-creation session end of april	Good meeting. Was a bit challenging because this meeting is really about stakeholder management. There is quite a big change the KDO is the best department to 'land' my proposed service. Therefore it is vital to incorporate them into my project and let them join in co-creation. We share a same vision for customer experience within Stedin was my feeling. So that is a good sign. The only downside is that this is not carried company wide.... So this is somethign I should watch out for or see as an opportunity!!
bi-weekly 'Klantinitiatieven FLEX'	Stedin, Marketing, Innovatie	LEF team + Kees-Jan	15-4	60	Bi-weekly meeting about the current energy community/Flexibility initiatives. Interesting for me to see the current situation and the developments communities go through		The confusion about the KAM department organogram is also present in innovation. Another insight is that in the project in Eemnes i.Leco does most of the communication. So, a possible point of reflection is then: do I design for the community, or design for the tech partner to design for the community? A document was drafted that by Jan to agree on this cooperation. Can I possibliy view this document?
Tom Westra	Spectral	CMO	20-4	60	Getting an outside in perspective on the developments the services for energy communities go through. Also getting the opinion of the 'sector' on what Stedins right to play is, is vital for the project.	Update on progress later, send final report	A good meeting. Was quite confirming of the direction of the project. Also good to hear they also don't know that much yet: things are just simply unclear. But what is clear is that they are a market leader. The expectation is that the role for stedin is more on an informing level and facilitating with apps and access.
Stefan Luyckx	i.LECO	CEO	21-4	30	Getting an outside in perspective on the developments the services for energy communities go through. Also getting the opinion of the 'sector' on what Stedins right to play is, is vital for the project.	Update on progress later, send final report	A short and good meeting. They don't foresee a market with too much opensource software. There need to be parts that are controlled by Stedin (GSA), parts open source, and parts in the hands of tech partners (i.LECO). So the current situation of LES is kind of the way to go according to Stefan. He foresees that communities are important. Not really to create flexibility, but in the sense that they serve as a testing ground to get to the next phase, where the flexibility starts to actually add up and count!
Job Stuurman	Alliander	Innovatie, marktbewerking	21-4	60	Finding out what the perspective is of the grid operators. What they are developing, what can Stedin do together? Etc.	-	He has a good overview of the whole market and clearly points out that energy communities are only one of the many solutions and scenarios possible. This only complicates matters further. But, it points the real picture. The market platform Alliander is developing is Entrance. He gave some good pointers towards literature on scenarios of energy communities.
Arjen Zuijderduijn	Stedin	Innovatie, projectleider Flex	7-5	60	Introducing him to the steps of the lifecycle and getting feedback on the lifecycle. Seeing if it resonates with his experience from working with energy communities	The lifecycle is good. The 9 bigger steps are present and make sense	A few point/remarks: it makes sense. However the communities right now do follow the steps, only not always in the specific order that they are portrayed.
Presentation marketing	Marketing, Stedin	-	8-6	90	Updating the marketing department on progress made in my project. Giving the results from understand phase	-	Was challenging to do through teams, not a lot of feedback received. Time was short (only 15 minutes for my talk) and no time for questions.
Workshop entry/exit criteria	LEF core team	Multiple (innov., marketing, KAM)	9-6	120	Together with Arjen Zuijderduijn from the innovation department we felt the need to make the entry and exit criteria more explicit for when a product leaves. innovation and goes towards the business side of Stedin (Klant & Markt wss)	Discussing the next day about the outcom	The outcome was quite clear: the need for stedin is different then the need for the communities. Stedin desires a more holistic service blueprint. The community more a specific knowledge product (in line with the design brief). So a bit of both? Lets see.
Meeting impl. Flex	LEF core team	Multiple (innov., marketing, KAM)	10-6	60	Regular meeting. To keep on top of the developments happening inside energy communities.	The Into the Woods 'haalbaarheidsstudie is a good starting point for a template	Good meeting. The workshop was received a bit mixed. Good insights generated (like the need for alignment of the products, the product development phases etc.)
Jeroen Kuijpers	Marketing, Stedin	Marketing manager	10-6	45	Checking in, explaining my progress.	Make a better case for why Stedin shoul invest in this. Help in prioritization (create a roadmap and time pacing).	Good meeting. Was a bit more critical: which was nice. Helped out, was on top of it quite quickly.

APPENDIX D - INTERVIEW GUIDE TECH PARTNERS (SERVICE PROVIDERS)

Mijn opdracht in een zin: het vormgeven van de klantreis van een potentiële energie community, die het LES concept wil gaan toepassen in zijn of haar wijk(de community). De twee pijlers hiervan zijn samenwerken met Stedin en het beschikbaar maken van kennis en tools.

De hoofdvraag dus voor mij op dit moment: inzicht in hoe het proces van het opzetten van een energie community er nu en in de toekomst uitziet. Zowel op technisch, als op sociaal en economisch vlak.
De logische vervolgvraag is dan: wat is binnen dit proces van het opstarten van een dergelijke energie community Stedins rol, en welke handvatten moet en kan Stedin bieden aan deze energie communities?
Om deze reden ben ik dus erg benieuwd naar hoe een partner/bedrijf hier tegenaan kijkt!

Subonderwerpen:

Karakterisering van energy communities die een smart grid willen opzetten

- Wat karakteriseert de communities waar jullie als bedrijf mee samenwerken?
- Wat zijn de verschillende drijfveren voor het toepassen en experimenteren met smart-grids die jullie terug zien bij je 'klanten'? Wat is de meest voorkomende?

Het proces van een energie community vormen

- Hoe ziet dit proces er nu globaal uit?
- Welke deelstappen zijn er te onderscheiden binnen het opzetten van een energie community?

Ontwikkeling van 'ease of implementation' van smart grid technologie

- In welke mate denk je dat het helemaal door de community zelf opzetten van een smart grid mogelijk is, met name op technisch vlak? (Nu en bijvoorbeeld over 3 jaar)
- Wat is je visie of van je bedrijf voor de gebruikerservaring van het opzetten van een energie community en smart grid? Bijvoorbeeld: Is de ambitie dat het uiteindelijk een plug & play systeem wordt? (bijv. even simpel als het opzetten van een wifi netwerk thuis?)

Ambitie van bedrijf om pilots om te vormen tot standaard product

- Op dit moment werken je veel samen in pilot verband met verschillende initiatieven. Wat is ambitie om dit in de toekomst op te gaan schalen? (Door bijvoorbeeld meer standaard producten en diensten te leveren)
- Zie je dit ook terug in de vorm van een marktvraag? Zo ja/nee binnen welke termijn? Kortom: is de behoefte er vanuit communities om een smart grid te gaan opzetten?

Algemene ontwikkelingen in de smart grid/energy community sector?

- Hoe is het landschap van community smart grids verandert door de jaren heen?
- Hoe is de kennisdeling tussen marktpartijen (DSOs, energieleveranciers, private partijen etc.)? En hoe tussen communities?
- Wat is verwachting over hoe belangrijk energie communities zullen worden binnen 3-5 of zelfs 10 jaar?

Rollen bij het opstarten van een energie community

- Wat zie je als de rol van Stedin en 'Stedin's right to play' bij de ontwikkeling van energie communities?
- En wat de rol van jouw onderneming?
- Wie of wat zou hét (neutrale) kennisinstituut moeten zijn voor energie communities? Zou dit er moeten zijn?

APPENDIX E - CODING GUIDE ENERGY COMMUNITIES

Note: for interviewees that are not member of a community, but are member of a collective, community = collective.

The goal of this qualitative study is to gather insights into the experiences, desires, motivations and needs of the people forming or potentially wanting to form an energy community.

1. Motivational type of participant to participate in a community project:

1.1. How did they become active:

→ by moving to the area, by participating in a earlier project, started the community themself.

1.2. Why did they become active:

→ personal curiosity, economic motive, wanting to actively improve their community/surrounding, social pressure, wanting to fit in.

1.3. How was this experience:

→ positive, negative, rewarding, turbulent, extensive/long

1.4. What are character traits of the participant did they tell/show about themselves?

→ Trusting, following/leading, skeptical/dogmatic or others

→ Personality general

1.5. What is the classification of type of participant:

→ The Engineer, The Green User or The Value Seeker [1]

→ Do they possibly have multiple roles at once?

→ Is there a possible fourth or even fifth role?

1.6. Attitude towards renewable energy

→ Renewable at what cost?

→ What tradeofs

1.7. Intrinsic motivation is essential to movement/things happening

→ Doing it yourself/having ownership

2. The process of community forming

2.1. How did the community start out, and with what people:

→ Started themselves, motivated from outside by third party, grant/subsidy, new legislation,

2.2. What were the shared goals of this community and was there a shared vision?

→ Making the neighborhood more sustainable, creating job opportunities, increasing social cohesion, improving the neighborhood in general.

2.3. How did this shared vision come into place

→ Social evolution/heritage, the core team/founders of community,

2.4. What were the highlights/lowlights in the formation of the community?

→ Project lost its pace, unovercomable hurdles, technical challenges, economic challenges,

→ Project completed, breakthroughs, new partnerships formed, collaborative efforts realized,

2.5. What are the different distinguishable steps in this life cycle of a community?

→ An idea is born, core team formation, drafting a project plan, building social support, forming partnerships, involving residents, scaling up the community, finding contractors, starting to execute plan, monitoring of build, etc.

→ Validate/expand on 'Hieropgewekt'[3] Steps: they match, they differ, additional steps.

2.6. Look for External & Internal contextual conditions of community energy project [2]

→ Internal: community spirit, local traditions/cooperative history, sense of locality and responsibility, entrepreneurial individuals, Networks, guiding visions & plans

→ External: Governmental tech. support, gov. process support, expert assistance, Guiding visions and plans (in form of legislation mainly)

2.7. Benefits of a shared goal

→ Creates awareness

2.8. expressing community feeling & manifestation of feeling

→ Tight, nonexistent

→ Community dynamics

2.9. Motivation for starting a community project

2.10. Opinion about other communities/sector as a whole/

→ Relations other communities

2.11. Abilities of the community & leaders

2.12. Community benefits

2.13. Limit to community aspect

2.14. Lean way of developing

2.15. Acknowledging social aspect (is essential): only talking about technicalities won't attract the non-engineers

2.16. Motivating the community by involving them and creating ownership

3. The desire for knowledge and communication

3.1. What type of knowledge did the interviewee have a desire for

→ Technical knowledge: systems, software, hardware (Feasibility)

→ Economic knowledge: funding, grants, subsidies (Viability)

→ Social knowledge: formation, creating community support (Desirability)

3.2. ... and how did he/she go about finding that knowledge/services?

→ Internet/public accessible knowledge, service providers, university, Stedin, knowledge institution (hieropgewekt or similar).

3.3. What knowledge was provided by Stedin

→ Grid info, subsidies, LEF info, Whitepaper,

3.4. What are the drivers behind the desire of knowledge?

→ Understanding, building trust, making sense of the world, problem solving etc.

3.5. What level of detailed of knowledge about LEF was a desire for?

→ Highly detailed knowledge vs. only about the benefits for the interviewee?

→ Was the knowledge understandable?

→ Downsides of LEF?

3.6. Who did the interviewee trust and requested knowledge from?

→ Stedin, community leaders, hieropgewekt/knowledge institutions, service partners, other communities

3.7. How is the knowledge communicated perceived?

→ Understandable? Too complex?

3.8. Moments of 'truth' in communication

→ Too slow, pace dropped, very good information

3.9. Internal communication and relations of community
3.10. Communication methods/preferences general
→ ideas about communication
3.11. Desire to share knowledge, being part of helping ‘technology’ & society forward

4. Relation community and Stedin
4.1. When did Stedin come into the picture of the community lifecycle?
→ How far were the ‘project proposals/community designs’ made explicit and was the community aspect up and running?
4.2. Which channels did they interact through, with who in with Stedin and in which phase?
→ Media: Phone, e-mail, website (forms), chatbot, MijnStedin, Whatsapp, social media (fb, insta, twitter), Livechat, website, in-person
→ With who: Gebiedsregisseur, Kenniscentrum Duurzame opwek, Asset management, Klantcontactcentrum, Innovatie,
→ In which phase: See 2.5
4.3. And how did the community/community leader experience this relation/touchpoint?
→ Positive, negative, slow, fast, efficient, inefficient etc.
4.4. What is the perceived image of Stedin?
→ Trustworthy, face-less, transparent, open, neutral player, without a financial motive, teamplayer,
4.5. Benefits for Stedin from community
→ Flexibility, learning, etc.
4.6. Desired relation with Stedin
→ How and what to communicate

5. Collaborating with Stedin
5.1. How did the interviewee’s community collaborate with Stedin?
→ Not, resource level, pilot level, project lead,
5.2. How is this collaboration perceived?
→ Difficult, easy, hard to find where to go and who to contact
5.3. Through which channel is collaborated at which stage of the community formation and how is this experienced
5.4. What were the ‘moments of truth’ in this collaboration?
→ Project agreement signed, grant given, subsidy received, pilot up and running, meeting with someone at Stedin.
5.5. Desired attitude of Stedin (role of Stedin)
→ Tone of collaboration: Facilitating, guiding, collaborating, passive, proactive.
→ How to collaborate
5.6. Desired attitude of ‘other’
5.7. Desired Role of Stedin

6. Interacting with energy systems
6.1. Using/interacting energy system
6.2. Building/designing own energy system
6.3. Feeling/opinion about energy system
6.4. Prediction about future energy systems

APPENDIX F - CO-CREATION SESSION WORKSHOP FLOW

Activity name	Description	Duration (min)	Start time	end time	Format	materials	Notes
Prepare	Set up everything necessary. Start meeting and organize browser/laptop, mute all distractions	30	13:30	**14:00**	Only facilitator	laptop, good wifi, water bottle, note sheet, screen recorder	Notify housemates of the workshop
Virtual 'Walk in'	Waiting for everybody to get ready, test communication devices, some time for acclimatizing	5	14:00	**14:05**	Plenary	Teams meeting, laptop, wifi	People tend to be 'just in time' for meetings, so a bit of a runway should make things more relaxed
Introduction	Introduce everybody in the group	10	14:05	**14:15**	Plenary	Teams meeting	Make sure people don't talk too long
Introductionary slides	Give an introduction of the project, overview of the agenda (without times), explain the goal of the workshop	10	14:15	**14:25**	Presentation	Introductionary slides	Start sharing screen over MS Teams **+ start recording of call after permission**
Introduct service blueprint & Identify gaps	The participants go through the customer journey steps and highlight gaps in the service towards community leaders.	15	14:25	**14:40**	Plenary in a shared google sheets	Google sheets, cheatsheet for criteria in slides	It will take some time to get used to the format of the service blueprint.
Choose step of customer journey	Each person chooses Two gaps from the 'How-to' row and go round plenary to ask why they did choose those specific ones	10	14:40	**14:50**	Plenary in sheet	Blueprint template	They can't choose the same 'gap'. The host also chooses a gap. So we need to end up 10 gaps to ideate on.
Copy according how-to to ideation sheet	Each person starts with the how to he chose, copy it to the ideation document,	5	14:50	**14:55**	Individual	Ideation sheet in google Sheets	Every person copies the how-to themselves. Color of cell will disappear
Ideate on first round how-to's	Going to the right with **ideation**	10	14:55	**15:05**	5*1,5 minutes	Timer on phone necessary!	
Vote for best idea per row round 1	Vote for which idea they find best. To be done by checking a check-box to the left of the post-it	5	15:05	**15:10**	Individual	Unhide voting boxes	Vote once on each 'How-to' Row per person.
PAUZE		5	15:10	**15:15**			
Copy according how-to to ideation sheet	Each person starts with the second how to he chose, copy it to the ideation document,	5	15:15	**15:20**	Individual	Ideation sheet in google Sheets	Every person copies the how-to themselves. Color of cell will disappear
Ideate on first round how-to's	Going to the right with **ideation**	10	15:20	**15:30**	5*1,5 minutes	Timer on phone necessary!	
Vote for best idea per row round 1	Vote for which idea they find best. To be done by checking a check-box to the left of the post-it	5	15:30	**15:35**	Individual	Unhide voting boxes	Vote once on each 'How-to' Row per person.
PAUZE	Copy how to's to c-box!	5	15:35	**15:40**			Put all How'to's on a matrix
C-box	C-box exercise: placing the ideas on the matrix and giving them a priority ranking	20	15:40	**16:00**			
Extra: reflect on how it went	What went well? Do we have an outcome that is usefull?	10	16:00	**16:10**	Plenary	-	Ask specific questions directed towards a person if there is no real discussion/feedback.

APPENDIX G - STEPS AN RENEWABLE ENERGY COOPERATIVE IS ADVISED TO TAKE

The Dutch knowledge institution for locally generated renewable electricity they developed an e-learning about starting your own energy cooperative. The expectation is that the process of setting up an energy cooperative is fairly similar to the process of setting up an energy community. To see whether this is true we will analyse the interviews to see the similarities and differences.

The five phases and substeps:

1. Exploring: In this phase you shape your idea. You look for help form the right people, explore possible locations for your solar installation. You look for financial funding, inform interested people and parties and prepare the establishment of your energy cooperative.

a. Form a versatile projectteam
b. Explore the possibilities
c. Explore the businesscase
d. Communicate your plans
e. Prepare the establishment of the cooperative

2. Designing: In this phase you start with designing your solar 'plant' (system). You make key decisions in your business case, establish the cooperative at the notary, prepare the necessary agreements, draft a communication plan and start with recruiting members.

a. Do you need external advice?
b. Establish the cooperative
c. Make a technical design of the installation
d. Finalize the business case
e. Prepare the agreements
f. Draft a communication plan
g. Recruit members for the cooperative

3. Developing: In this phase you finalize the enrollment of your participants, you set up administrative structure, you finalize the permits and ratify the signed agreements with the location owner and the members. Next to that you give the green light to the installers and suppliers to start building.

a. Finalize the registration of the members
b. Request the SDE+ subsidy
c. Set up the administrative duties
d. Finalize the financing
e. Confirm the project agreements
f. Confirm the orders to the suppliers

4. Materializing: In this phase the solar plant is built and the grid connection is prepared. You inform the members of the progress of the construction. You also make the necessary payments, notify your grid operator (DSO) of the renewable energy generation installation going live and celebrate the opening!

a. Install the solar panels
b. Communicate the progress
c. Do the administration and paperwork
d. Celebrate the opening!

5. Exploiting: In the last phase you make sure the necessary maintenance and management is done, you do the books and keep the member administration up-to-date, you monitor the energy production and keep the members involved in the energy cooperative.

a. Inform the members about the production and exploitation
b. Do the necessary maintenance to the installation
c. Do the books of the cooperative
d. Keep track of the member administration
e. Invest in the cooperative

APPENDIX H - STRATEGIC POSITIONING INSIGHTS

A. Insights about energy communities and it's members from interviews

1. Personal level

1.1. Changing your mind and becoming aware of the need to transition towards a renewable based electricity system takes time and happens by letting people learn and change their own opinions and by not forcing opinions on someone. (2.10)

1.2. Having solar panels makes residents of the house more mindful of when they use their electric appliances. They try do use them when the sun is shining. So, people are already changing their behaviour so they optimize the electricity grid. (3.1)

1.3. People like to compare themselves to other households and see how efficient they are relative to a representative household of similar size and typology. (3.2)

1.4. Insight into your electricity usage and generation is something that is and stays fun to monitor. Because people see that they are 'earning' money when the sun is shining. This effect stays interesting for a surprisingly long amount of time, even for people who are not the typical 'community engineers'. (3.3)

1.5. Allowing other parties (like Stedin) to control your flexible appliances (like your car, heat pump) is something that is not yet embraced by everybody. A step by step approach is proposed: first doing it yourself, and then later allowing the energy supplier to do this. (3.4)

1.6. It is expected by communities that as a member of an energy community that you can set your 'comfort' zone yourself, semi-independently from the community. i.e. how much control you want to hand over to create flexibility. (4.4)

2. Community level

2.1. The communities acknowledge that in order to become more effective they could also partner up with parties who use more electricity during the day (have a different usage timing) then a neighbourhood, like a school for example. (4.3)

2.2. Communities realize that in order to become more sustainable they have to shift their energy usage towards a behaviour pattern that is steered by the amount of renewable energy that is available. (4.5)

2.3. Energy communities that emerge from the 'bottom-up' don't start with the goal of forming an energy community. Instead they are already connected through another means in all cases. This means the community is already formed by either by having done a collective renewable energy project or having built their houses collectively in a CPO project. (5.1)

2.4. Projects can be started by different parties, so bottom up or top down is both possible. But for a project to gain traction the community needs to be ready and willing to participate. In other words: the spark can come from outside a potential community, but the community needs to be willing in order to make it 'light-up'. (5.2)

2.5. Energy communities want to be contributors to society. This can be done on a knowledge level, for example by being a pilot or testing ground and sharing data. But also on a economic level: they don't want to be an additional financial burden on society. Or at least limit this. (6.3)

2.6. Community members really want to contribute. So thinking that you need to take away as much of the work as possible as a community leader or Stedin/service partner might have the opposite effect and they become demotivated. Responsibility creates action and ownership. (7.2)
2.7. Community meetings are a proven method for creating a support base for a community project, like setting up an energy community. Therefore this form of communication needs to be used to its full potential. (8.1)
2.8. For community members to understand the implications of joining an energy community it is important to give them very specific knowledge about how this will affect their situation. Clearly lay out what is expected from them, and what this will cost and bring them. (8.2)
2.9. Data privacy is an issue of concern for some community members. In order to take this fear away they state it is important to be clear about why it is needed and who is the owner of the data. Preferably the community should have full control over the data that needs to be shared in order for an energy communities' systems to function on a technical level. (8.3)
2.10. Instead of expecting from community members to get on the knowledge level of the community leaders, the community leaders should get on the level of knowledge from the community members. Therefore making bits of how a community members' 'daily life' will be tangible and simple to understand should be the goal for community leaders. (8.4)
2.11. Because right now starting an energy community is still relatively a path 'untrodden', the people starting an energy community need to be highly skilled already. Otherwise they are not even taking up the challenge at all. This knowledge hurdle is an strong limiting for the scalability and adoption of energy communities. (9.1)
2.12. Not everything is fully crystalized and therefore there are a lot of unknowns about where the energy community field is moving towards. In order to still progress in this situation where there is limited knowledge an iterative way of working is adopted by most community leaders and developers. This process consists of the lean cycle build, measure and then learn. This is done at personal level, all the way to sector level. (12.1)
2.13. Other initiatives in the renewable energy sector (energy communities and cooperatives specifically) can be a valuable source of knowledge. Learning from each other and sharing best practises is a crucial in speeding up the development of energy communities. (12.2)
2.14. Project partners are a vital source of knowledge for most community leaders. (12.3)
2.15. Knowledge is conjointly generated between the community and the service partners. (12.5)
2.16. A service partner is essential to pull of the project of starting an energy community. (12.6)
2.17. Access to good data is essential for community leaders to allow them to craft their story to convince people to join the community or to develop the community further. This data is mainly focussed around community members' electricity usage and what is possible on the Stedin grid in terms of Grid capacity. (13.1)
2.18. Sometimes you just need an expert explaining to you how LEF works (13.2)
2.19. Communities want to keep their electricity 'local' and in the community. (15.2)
2.20. Communities also want to share knowledge with each other and Stedin. They want to contribute. (so the need to get knowledge from other communities has a reciprocal need!) (16.1)

3. Community Stedin level
3.1. Community members sometimes prefer to hear the details of the community energy project (setting up an energy community) from Stedin directly instead of hearing it through the community leaders. (18.2)
3.2. There is a desire for simple tools to explain the concept of an energy community in a straightforward and simple way. For example animations and information packages could already be very useful for a community member. (18.3)
3.3. The current channels Stedin has in place are insufficient for the energy communities' needs. They want specialized knowledge they can only get from the LEF team, but reaching them through the regular channels is a challenge. (18.4)

3.4. The existing media used by Stedin are considered good enough by community members, so they can be used for communities as well. (18.5)
3.5. A personal 'link' within Stedin is desired by communities, for all sorts of reasons. The most important being sharing knowledge and answering their specific questions that can't be answered by the website or general communication channels. (18.7)
3.6. Stedin is expected to be a source of information by communities.
3.7. Communities expect Stedin to allow them and to facilitate them with (parts) of the technology and information needed to create smart grids. They also expect Stedin to actively carry out this story and help the community tell the story to their 'supporters'. In short, stedin is the facilitator, and the community the executioner and responsible party. (19.4)
3.8. Finding an 'entrance' into Stedin can be challenging for communities. They don't really know where to go right now. The regular channels are not up for the job. and only once they have connections within Stedin they feel like they can get further with their community energy project. (However, it is acknowledged by the same interviewees that this is improving.) (20.3)
3.9. Communities believe they are really helping Stedin with their energy community initiatives, and therefore also expect help from Stedin. (20.4)
3.10. Communities acknowledge Stedin has the power to have a positive impact on society, and hope that Stedin does take this opportunity. (19.6)

4. Sector level
4.1. Starting your own energy community is a very complex affair. Aspiring energy communities (communities who are still in the process of setting up an energy community or have not started at all) don't have the knowledge themselves and need an outside expert source for this. This source can be Stedin but also a service provider. (22.1)
4.2. To create momentum around an innovation you need to attract and empower the right people in the right phase. For example, forcing the early majority to innovate takes a lot of time, and skipping the innovators upsets them and creates resent. (23.1)
4.3. The bigger energy transition players (governments, DSOs) should be mindful of not putting too much on the plate of communities as well without helping the community: this creates resentment. So while communities should be able to organize themselves and do work themselves (which is actually beneficiary to the result of a community project as seen in an other theme) this should be done in cooperation with the bigger players (like Stedin and communities). (23.2)
4.4. The democratisation of the energy grid and keeping the benefits local is important for energy communities. They are sceptical of the utility companies, because they are expecting them to be always after (their) profits. Stedin is different: since it is a semi-public institution they are seen as more trustworthy and more likely to act in the benefit of the community. (24.2)
4.5. By making energy production decentralized communities are taking over the role of energy producers. This threatens their business and they could try to slow down energy communities. In order to be able to stand up to energy producers energy communities expect Stedin to voice their interest on a national level. (24.1)

B. Vision workshop
fter a series of three vision workshops the following CX-vision statement is formulated:

"Clear and effortless communication between community leaders and Stedin enables collaboration and makes forming an energy community a breeze. This community 'journey' feels as if you're playing a new (Stedin) board game together as a group (where everybody wins)."

Insights:

5. Close collaboration with communities will remain necessary in the first development phases of LEF, but the goal is to allow communities to do more and more themself.
6. Asset management does not see LEF communities as a standard solution.
7. Asset management is also interested in the controllable nature of the energy communities in a future with millions of PV plants.
8. Stedin took as a 'point of departure' the customer: LEF will only get big when customers start buying Flex assets.
9. The community is owned by the community. It is from the customers itself.
10. Stedin won't be the most complete source of information, however Stedin does want to actively carry out their preference and interest for the development of the energy community sector.
11. Stedin will actively carry out the LEF philosophy
12. Stedin informs communities about what is possible on the Stedin grid
13. Stedin offers the connectivity (in terms of APIs) to the grid for communities and their service partners.
14. Stedin is slowly transforming from just informing to a more 'inspiring and activating role'
15. Stedin can be a neutral party in the electricity sector, kind of like a customers association.
16. Not only monetary stimulus should play a role. The LEF values of keeping electricity local should also be a factor to motivate communities.
17. The LEF basic package is only on how to start the community, how to trade within the community.
18. There should be no unnecessary services or over engineered services to communities. I.e. not buying a food processor when the workload is still manageable by a chef with just a knife.
19. Stedin wants to keep learning from current and future initiatives, methods for this should be part of the services offered.

C. Expert interviews technology partners (Service providers)

Tom Westra - Spectral

20. The values of communities are really about local empowerment, wanting to take control about their environment and owning their own data (data privacy).
21. Every community has roughly these same values, however still every community is a custom built job.
22. The service providers job is really on the development and engineering. Less so on the community organizing and communication aspect.
23. Making a sound business case is still very tough. Most parties rely on grants or subsidies. So the sector is still playing the waiting game until the business case becomes positive.
24. The energy community sector needs to become mature and able to support itself. Spectral finds it a good thing that Stedin is taking a proactive role, but acknowledges that they should step out and leave it to the market at a certain point. Where this point lies is still unknown.
25. The role of Stedin should be to inform the communities and new neighborhoods as early on as possible that setting up an energy community or smart grid is a possibility. This means the market grows and Stedin has the possibility to steer towards a favourable community grid system design. So the focus is more on informing at the early stages of ambition forming.
26. The business case is still very fragile for most communities. Especially with the salderingsregeling. You really need 3-5 years to get from innovators to the early adopters.
27. He acknowledges that the DSOs are being forced to change by changing external circumstances.
28. The main role of stedin should be to start the dialog with the communities as early on as possible to guide them in the right direction and to get them to form the right connections to accelerate the process and move them towards the implementation.

Stefan - i.LECO

29. Just like Stefan their ambition is that within 3-5 years it should be as easy as switching from your energy suppliers, it should be just as easy to switch from energy supplier to a local energy community as your electricity provider. But that is far from happening.
30. Sees a bit of an internal struggle within Stedin. The progressive group versus the more conservative people. He finds it important that in order for Stedin to get further they should start pulling in the same direction.
31. Train the 'gebiedsregisseurs' to make sure they can properly advice the aspiring communities.
32. i.LECO foresees and wants that Stedin just takes their current role as a DSO and interpret it in a modern way. So keeping the grid stable, but adding the modern tools like the Grid Safety App to operate smart grids on top of the current grid. And also having positive market incentives coming from the GSA.
33. Is against making everything open source, because nothing is for free.
34. Their goal is to become a product company and making setting up an energy community/LEM a standardized product as much as possible.
35. The expectation is that until the business case becomes favorable over the regular electricity tariffs you will only keep the early movers and it will remain a slow and sluggish process to form energy communities.
36. This tipping point should be in a year or 2, after that he expects that the regulations will become easier as well. Right now the community sector is still in the early development phase.
37. LES will become very important in the future grid, so it is important that Stedin keeps making noise around the topic. But it might take 5-10 years before energy communities become big enough so that they can start having an impact on the national level, so in the early phase it will be used to solve smaller localized problems.

D. Internal stakeholder meetings

KDO

38. The KDO is a new department within Stedin that is there for the bigger community driven renewable energy projects.
39. The departments really are still quite siloed. When some for example calls the KDO and they go to another department for a different stage in their project, the KDO can't follow the progress of the customer and their cooperative.
40. Customers go 'roaming' within Stedin when they want to get something done. Because they don't really know where to go with their question, and the front office can't really help them.
41. Customers want personal contact with Stedin and they want Stedin to get on their level and think with them.
42. Customers have to deal with Stedin, since they have the monopoly.

KAM

43. It needs to be very clear what the goal is of the energy communities in order to land on the plate of the 'gebiedsregisseurs. What are we trying to reach? Why? When? How? As long as that is not certain they have to be hesitant.
44. The theme 'Flexibility' is not top priority right now for the 'gebiedsregisseurs'. They are responsible for a lot and since flexibility/energy communities is still not fully mature it is not top priority.
45. They don't have the time and knowledge to deal with communities right now. They need to be able to cover 80% of the questions through information on the Stedin website or other channels. The last 20% in terms of checks the 'gebiedsregisseurs' could do.
46. A platform for communities could work, they should not reinvent the wheel again and again.
47. In the CRM system you should be able to flag if a customer is interested in forming a community in their area.

E. Decision tree meeting series insights

48. Stedin wants to be involved from an early stage [define later based on lifecycle], so they can anticipate what will happen on the electricity grid.

49. When an aspiring community first comes into contact with Stedin it is first determined where they stand. If they have a specific plan about sharing electricity (in terms of amounts of kW), have a service party supporting them in developing the model and software and have some proof that people want to participate: then there is a possibility of cooperating with Stedin.

50. Right now Stedin is not actively recruiting communities or promoting LEF. They take a reactive approach, so the community has to take the initiative.

51. There is a clear need from KAM to get sharpened propositions.

52. The apps needed for LEF are still heavily in development. So the white paper vision is not fully realized yet.

53. The initiatives currently are being tracked by an excel sheet and status updates are being processed in there.

F. Resources about LEF and Flexibility from Stedin

Software from Stedin

Stedin is currently a grid operator which in energy sector jargon is called a Distribution Systems Operator, DSO in short. This means their main job is to control the energy grid. This role is staying the same, however the way Stedin will do this is going to change. (see part about changing circumstances)

The software Stedin will supply for energie communities (free? Paid? Opensource?) is:

- The grid safety app (GSA): This app makes sure the energy community operating on Stedins grid can't do anything that might compromise the safety of the grid. This is related to Stedins core business: controlling and safeguarding the grid. Right now everything is controlled until your front door. Stedin is willing to give to communities part of this control. Stedin gives communities the control between each other. But in order to do this while still doing their core job of keeping the grid safe, the grid safety app needs to monitor and sit in between the participants in the community.
- Billing service app: settling the credits between the members of the energy community. This app is currently not live yet, the development has proven challenging and is left to i.LECO for now. This app will also be open source.
- Market service app:
- IntraDay app:

LEF core goals (source: LEF en LES de basis)

54. Lowered system operation costs
54.1. avoiding congestion and lowering grid costs
54.2. lowered grid losses
54.3. a larger amount of available flexibility for all markets
54.4. incentives for lowered costs are possible as well
55. Customer empowerment
55.1. free choice of energy supplier, you should not be locked-in the energy community
55.2. transparency
55.3. facilitating local communities and creating/strengthening a sense of community
56. Accelerating the energy transition
56.1. facilitating the customer need of local decentralized renewable energy
56.2. creating an incentive to invest where needed
56.3. avoiding energy poverty (where the people who can invest in renewable energy get all the benefits of the energy transition)
57. Scalability
57.1. fit in the current market model
57.2. be repeatable by using standards and modularity
57.3. controlling decentralized complexity
57.4. safe

Energy community boundary conditions

58. The pro- or consumer has a free choice of whether to participate in the community or not and who connects him to the local market. Services in and towards the energy community operate based on an open model so that competition is possible. (contribute to: 2a, 2c, 1c)

59. The network operator has access to the local market to retrieve market information (data) to execute the grid safety analysis and to buy explicit flexibility when congestion is an issue. (4c, 1a)

60. Local transactions have a (financial) benefit; this leads to an incentive to increase self-consumption and a lowered peak demand. (4c, 1a, 2c, 3c)

61. The community has a geographic boundary or an option to create a geographically linked subset to which LES can be applied. (4c, 1a)

62. The network to which the participants of the community are connected is managed by the network operator and connected to the medium voltage and high voltage grid (no autarky). (4c, 1a, 4d)

Design principles LES

63. The local market is the local energy supplier and therefore also the balance responsible party (BRP). (2b, 2c)

64. Balance responsibility (BRP) and trading is a service to the local market. (2a, 2b, 1c)

65. Aggregation and a connection to the local market and other unburdening is a service for the prosumer. (2a, 4)

66. There is one entity that acts in the name of the local market. Activities can be outsourced (unburdened), it can be the job of a local energy cooperative or done by a cooperative of local parties. (2b, 2c, 4)

67. Aggregation between the community members is not part of the local market and aggregation enters the market as one player. (2a, 2b, 1a)

68. APIs to connect to the local market are open towards prosumers and wholesale market functionalities. (4, 2a)

G. Legislation from the EU

In the end of 2018 the EU parliament and the European council reached a compromise about the last parts of the package 'Clean energy for all Europeans'. The package was announced in 2016 and comprises eight individual regulations and guidelines that propose increased targets for 2030. It mainly is about new mechanisms for energy consumption reduction, using renewable energy and the energy market in general. After the being integrated into european law each member state has 1-2 years to transpose the new directives into national law.

These new rules are expected to bring great benefits for consumers, from and economic perspective but also an environmental perspective.[31] This law is an important milestone for the EU in its goal of achieving carbon neutrality by 2050.

In this package one of pillars is More rights for consumers. According to [31] these new rules make it easier for individuals to produce, store or sell their own energy, and strengthen consumer rights with more transparency on bills and greater choice flexibility. Estimates suggest that by 2030 energy communitites could own 17% of installed wind capacity and 21% of solar, according to the clean energy for all package.[32]

What energy communities can do

69. Member States shall ensure that renewable energy communities are entitled to:

69.1. produce, consume, store and sell renewable energy, including through renewable power purchase agreements;

69.2. share, within the renewable energy community, renewable energy that is produced by the production units owned by that renewable energy community, subject to the other requirements laid down in this Article and to maintaining the rights and obligations of the renewable energy community members as customers;

69.3. access all suitable energy markets both directly or through aggregation in a non-discriminatory manner.

So-called "enabling framework" 4. Member States shall provide an enabling framework to promote and facilitate the development of renewable energy communities. The framework shall ensure, inter alia, that:

70. unjustified regulatory and administrative barriers to renewable energy communities are removed;

71. renewable energy communities that supply energy or provide aggregation or other commercial energy services are subject to the provisions relevant for such activities;

72. the relevant distribution system operator cooperates with renewable energy communities to facilitate energy transfers within renewable energy communities;

73. renewable energy communities are subject to fair, proportionate and transparent procedures, including registration and licensing, and cost reflective network charges, as well as relevant charges, levies and taxes, ensuring that they contribute, in an adequate, fair and balanced way, to the overall cost sharing of the system in line with a transparent cost-benefit analysis of distributed energy sources developed by the national competent authorities;

74. renewable energy communities are not subject to a discriminatory treatment with regard to their activities, rights and obligations as final customers, producers, suppliers, distribution system operators, or as other market participants;

75. the participation in the renewable energy communities is accessible to all consumers, including those in low income or vulnerable households;

76. tools to facilitate access to finance and information are available;

77. regulatory and capacity-building support is provided to public authorities in enabling and setting up renewable energy communities, and in helping authorities to participate directly;

78. rules to secure the equal and non-discriminatory treatment of consumers that participate in the renewable energy community.

Definition (16) 'renewable energy community' means a legal entity:

79. which, in accordance with the applicable national law, is based on open and voluntary participation, is autonomous, and is effectively controlled by shareholders or members that are located in the proximity of the renewable energy projects that are owned and developed by that legal entity;

80. the shareholders or members of which are natural persons, SMEs or local authorities, including municipalities;

81. the primary purpose of which is to provide environmental, economic or social community benefits for its shareholders or members or for the local areas where it operates, rather than financial profits

APPENDIX I - THEMES AND INSIGHTS FROM INTERVIEWS WITH COMMUNITY MEMBERS

Interview synthesis

This appendix summarizes all the themes found in the analysis of the interviews conducted with community members. In total 10 community members were interviewed spread out over 6 communities. For comparison also one energy community in a businesspark was interviewed, however this interview is not included in the findings here. Of these 6 separate communities there were two not in the process of setting up an community but had an elevated interest in the concept, three in the process of setting up an energy community and one community was up and running.

Personal level

1. Characteristics of people starting an energy community

1.1. Almost without exception the people starting an energy community have very relevant knowledge from their professional career that enables them and gives them the confidence to start an energy community. In other words: community starters can be considered 'expert volunteers'. They are volunteers, but this does not mean they don't know what they are doing.

Exemplary quotes

1.1.1. Zelf heb ik in 1981 alweer heb ik afgestudeerd op energiebesparing. Onder het motto minder aan, meer uit heb ik daar afgestudeerd. [He is also an 'expert volunteer' because of his background already.] (WB 21:38)

1.1.2. Mijn achtergrond is voor in de energie. Heb denk ik 30-35 jaar in de windenergie gewerkt. Doe ik nog steeds overigens, op een lage schaal. [Has very relevant knowledge already, worked in renewable wind] (E, 2:22)

1.1.3. Naast wat ik in de wijk doe werk ik bij de natuur milieu federatie utrecht. Dat is een provinciale stichting. En mijn rol is daar om energie coöperaties, dus eigenlijk een beetje de energie communities in de buurt in utrecht te begeleiden. [Has professional experience as well because of his job] (WJ, 8:07)

1.1.4. Laat ik het zo zeggen. ik kom natuurlijk uit de techniek. Ben afgestudeerd elektrotechniek en bedrijfskunde [Is an engineer. Has a background in electrical engineering and business administration] (H, 9:32)

1.2. An intrinsic curiosity for the energy transition combined with a feeling that societal aspects need to change is the biggest contributing factor to a person's motivation to start an energy community.

Exemplary quotes

1.2.1. Ja, het was mijn nieuwsgierigheid. [de reden om mee te doen aan hoog Dalem] In mijn vak is nieuwsgierigheid een groot goed. [Intrinsically motivated to participate, his curiosity made him join the Hoog-Dalem pilot.] (J 4:40)

1.2.2. Ik wilde eigenlijk ook meer inzicht hebben in wat gebeurt er met mijn energie. Waarom komt er elektriciteit uit mijn stopcontact als ik daar een stekker in steek. [Curiosity about renewable energy made him participate.] (J 4:50)

1.2.3. Toen ik bij die bank wegging heb ik voor mezelf vastgesteld dat dit [de energietransitie] een gebied is waarin ik mij echt wel wil verdiepen. Omdat aan de ene kant, en dat is wel echt een stukje intrinsieke motivatie, vind ik dat we die planeet netjes achter moeten laten voor zei die na ons komen. Maar aan de andere kant vind ik het ook gewoon een heel interessant proces. [The mix of a sense of responsibility and a strong feeling of curiosity creates the interest in the energy transition.] (A 6:48)

1.2.4. Het heeft technische uitdagingen, het heeft economische uitdagingen, het heeft sociaal psychologische uitdagingen. Dus het is een heel veelomvattend gebeuren die energietransitie. En dat vind ik gewoon interessant.

[Again, the three layered context is shown and strengthened by Aart. He agrees this view.] (A 7:01)
1.2.5. Het is voornamelijk interesse. En ik vind ook dat we als maatschappij meer die kant op moeten. Het financiële aspect is ook belangrijk, maar dat is niet de belangrijkste drijfveer. [He talks about the three motivators within sustainable people.] (W 11:30)
1.2.6. Ik ben er zo ingerold. Het technische aspect vind ik gewoon erg interessant. Om die reden ben ik gewoon mee gaan doen. Daarnaast is het niet alleen maar techniek, ik vind het ook belangrijk dat het gewoon gedaan wordt. [Motivation being discussed again] (W 16:45)
1.2.7. Dus er zit bij alle drie de types ook een stuk intrinsieke motivatie? Klopt! [All three types share have intrinsic motivation] (H 26:34)

1.3. A person starting an energy community possesses a healthy dose of an entrepreneurial drive and pioneering spirit, characterized by not being limited by fear of failure

Exemplary quotes
1.3.1. Ik ben zelfstandig ondernemer, ik heb een onderzoeksbureau. [Is an entrepreneur according to himself.] (J 1:47)
1.3.2. Ook wel technische interesse, en ook wel echt duurzaamheidsambities. Ik zou dat hier gewoon als demonstratie object inzetten. [Again, a mix of interest in the technical aspects of electrifying his house and social interst move him towards being a 'pioneer'.] (A 25:50)
1.3.3. Vindt het niet erg om een early adopter te zijn, dat heb ik met die autos (elektrische) ook al gehad. [He sees and acts like an early adopter.] (A 26:30)
1.3.4. Dat is ook typisch het voorbeeld van mijn rol. Ik ben altijd op zoek naar daken, en toevallig komt dit dan zo ter sprake en gaan we eens kijken of dit mogelijk is. [Entrepreneurial spirit of Wim is exemplified] (22:10)
1.3.5. En daar is wel een tweede motivatie gekomen. Is dat ik gezien heb wat nu de mogelijkheden zijn, technisch is het allemaal mogelijk om een duurzame samenleving te hebben. Maar het is een maatschappelijk vraagstuk. En daar komen heel veel dingen bij kijken. Maar daar komen heel veel sociale punten bij. Juridische, financiële, en dat vind ik interessant om daar deel aan te zijn. [Is intrinsically motivated. Enjoys it and finds it fascinating, the problems intrigue him.] (WJ 13:01)

1.4. Someone who would start an energy community is someone who is not afraid of change or even enjoys change, and really is convinced of the urgency to change.

Exemplary quotes
1.4.1. Ik sta altijd open voor verandering. ik ben in principe iemand van verandering. Ik ben niet van beheren. Heb mijn hele leven altijd in verandertrajecten gezeten. [Is a person of change.] (H 12:48)
1.4.2. Op de winkel passen daar haal ik mijn plezier niet uit. [Doesn't like managing] (H 13:19)
1.4.3. Om te kijken hoe kunnen we zorgen dat we die stappen zetten. Om de energietransitie op te pakken. Om het mogelijk te maken. Het is niet dat we aan iets werken wat onmogelijk is. Maar wat wel een uitdaging is. Omdat we het systeem zoals we het nu hebben om moeten zetten. [Acknowledges the problem, and sees the need of systemic change.] (WJ 13:13)
1.4.4. Wat ik eigenlijk al jarenlang vind is dat we onnodig energie gebruiken. Dus zo ben ik er mee gestart [is convinced we use too much electricity, already for a long time] (H 10:18)

2. Motivation for becoming active in an energy community
People becoming active in an energy community is most of the time a matter of 'sort of just falling into it' because of personal values and a 'getting things done' mentality

2.1. People can be motivated to join an energy community because of three types of motivations: economic, social or technical. When these three combined add up to a certain 'threshold' a person makes the decision to become active. This means people can be working towards the same goal for quite different reasons.

Exemplary quotes
2.1.1. Maar het economische aspect is niet de drijfveer voor de meeste gezinnen. [Economic are not the most important] (W 41:35)
2.1.2. Onze conclusie is [vanuit verminderde opbrengst postcoderoos zoutloods] dat er echt verschillende motivaties zijn. Er is een groep mensen die doodgewoon op de financiële businesscase er in zitten. De tweede categorie is toch meer duurzaamheid gemotiveerd. En die mensen zitten er dus in, op mijn dak kan het gewoon niet of het is erg lelijk. Dus dit is een prima oplossing om de facto hetzelfde te bereiken. En groepen die zeggen 'oh ja, dat geld, ik moet het wel terugkrijgen. Maar die IRR maakt me niet zoveel uit.' [People have different motives. Every person has a different type of value strengths in them. Everybody embodies a] (A 29:30)
2.1.3. Dat is dan heel vaak de schommel waar je in zit. De een gaat altijd voor duurzaamheid en het milieu. De ander gaat meer voor het sociale belang. Dat wisselt elkaar per persoon af, dus dat geeft altijd weer voeding voor discussies. Dat is soms leuk maar dat vind ik soms ook wel irritant. [There is a compromise between being fully sustainable and more social:] (J 22:33)

2.2. Most community members describe their process of becoming an active member as a process of 'just falling into it'. They have a certain predisposition to become active because of personal values and necessary resources like time.

Exemplary quotes
2.2.1. Je rolt van het ene in het ander. [freinforming the above] (A 10:49)
2.3. People joining and energy community are already predisposed to do so and therefore joining an energy community or not is heavily influenced as well by a person's intrinsic motivation and interest in energy communities and sustainability in general
2.3.1. Als mensen niet het intrinsieke gevoel hebben, ik wil anders wonen. Dan gebeurt er niets. Je kan wel iets doen om dat intrinsieke gevoel te beïnvloeden. [You can't intrinsically motivate people according to Gert, but you can steer it a little] (G 10:53)
2.3.2. Ik weet gewoon nog de eerste keer dat ik me besefte, dat was ergens in de jaren 70 ofzo, toen was de eerste stroom van rapporten. De wereld vergaat. Dan moet ik maar proberen dat zo goed mogelijk te redden. [First time she got aware of the need to change things came quite early on already.] (A 7:23)

2.4. When someone does not see themself as a early adopter or posses an intrinsic motivation he or she might still join an energy community. However he/she is very unlikely to be the person starting one.

Exemplary quotes
2.4.1. Daarin zijn wij meer volgers dan voorlopers. Ik zit in de voorgroep van de middenmoot. [He is not on the forefront of change or adoption of new ways of doing.] (16:21)
2.4.2. Maar ik ben dan ook weer niet zo'n iemand die dan zelf zo'n community gaat opzetten. Maar er zitten wel een paar mensen tussen die dat dan juist wel weer doen. [Sees herself not as a community former but there are definitely people in the groene regentes who are.] (29:04)

2.4.3. Ik ben echt een leek hoor. Wat dat betreft hoop ik dat je met mij verder kan. [Thinks it is about the technical side, and sees her as not technical. However still part of an energy community] (A 2:17)

2.5. Curiosity can fade over time, especially when no new additions/features are given to the community members curiosity won't be enough to keep them involved and interested in the long term. However, to motivate the members to become active curiosity is very important.

Exemplary quotes

2.5.1. Wat er wordt gevraagd is toch wel mee te doen met de het stukje marktwerking testen. Maar door de complexiteit van het product gaat het enthousiasme wel achteruit. [Complexity and a failure to make the product and pilot relevant means people will lose interest over time.] (JK 21:07)

3. Attitude towards renewable energy

What matters the most of a community member determines their attitude towards renewable energy, resulting in their level of motivation to become sustainable.

3.1. Living comfortable and sustainable is the goal for most people, in that order. So if they have the money, they rather spend more to be both sustainable and maintain the same level of comfort. Sustainability, comfort, affordability. You can only have 2.

Exemplary quotes

3.1.1. Mijn belangrijkste motivatie is comfort in huis. Daarna komt geld. Daarna pas duurzaamheid. [Sustainability is not the highest priority.] (J 7:20)

3.1.2. Ik wil het ook gewoon warm in huis hebben. Als ik dat mij dan geld kost heb ik het er voor over. Ik heb nu niet het idee dat ik nu de kachel een graad minder warm zet. [Curiosity and financial incentives are a driver just as big or bigger then sustainability to participate.] (J 8:13)

3.1.3. Heel reëel is er misschien maar eentje die absoluut aan dit project mee wilt doen vanwege de duurzaamheid. [Sustainability is not a driver to participate.] (J 33:21)

3.1.4. Je moet mensen aan het begin van een pilot enthousiast maken door te laten zien wat het hun scheelt qua kosten. Voor je investering terugkomt. Het economische ding is eigenlijk het belangrijkste voor de meeste mensen in Nederland. [Financial incentives are what keep a LEF system interesting for longer after the curiosity has worn off.] (J 49:20)

3.1.5. Zit meer richting de duurzaamheid. zo klein mogelijk krijgen van die footprint. Maar ook niet dat ik daar zo extreem in ben dat de kosten helemaal onbelangrijk zijn. Kijk, het moet wel een beetje een realistisch en betaalbaar zijn. [Talks about his value hierarchy: sustainability but not at all costs.] (W 12:15)

3.1.6. Ja, ik ben vegetariër. Maar ik eet zo nu en dan heerlijk vlees. En ik ben duurzaam, maar ik ga twee keer in de week lekker in bad. [The 'sustainable, but at not at the cost of quality of living' mentality is apparent here as well. sustainable, but rather spend more to also be sustainable in comfort.] (G 12:30)

3.2. Transitioning towards a renewable energy based electricity system is important for people active in energy communities, but they don't want to put everything on the line to achieve this goal

Exemplary quotes

3.2.1. En zo zitten de mensen die meedoen in onze collectieve, de zonnedaken, die zitten er over het algemeen wel zo in. die willen natuurlijk wel dat hun investering op een nette manier wordt ingezet. En dat het een redelijk rendement oplevert. Maar in de basis willen ze gewoon meedoen, ze vinden het leuk om mee te doen. [People participating in a community solar project don't do it because they want high financial gains. The finances need to be of a certain standard. If that is there then they just want to participate for the sake of participating] (W 12:37)

3.2.2. Ik ben niet een onwijze milieufreak in die zin. [Doesn't see herself as over the top sustainable] (J 24:27)

3.2.3. Ik wil ook gewoon lekker kunnen leven, maar ik let wel op het verbruik [Tries to strike a balance between comfort and being a bit sparse with electricity.] (J 24:57)

3.3. People active in energy communities acknowledge the need to transition towards a renewable based electricity system

Exemplary quotes

3.3.1. Ik vind het goed dat er goede alternatieven zijn voor kolencentrales. Daarbij is het goed dat er gekeken wordt naar wind en zon. [Acknowledges the need for renewable energy. Sees the need to look into solar and wind energy.] (4:07)

3.4. Changing your mind and becoming aware of the need to transition towards a renewable based electricity system takes time and happens by letting people learn and change their own opinions and by not forcing opinions on someone

3.4.1. Dat komt een beetje door onze community, ik dacht daar verder vroege nooit over na. Maar sinds ik hier woon. Ik zit wel in de werkgroep Watt, dus wij kijken wel naar het energieverbruik in de wijk. Hoe kun je bewuster omgaan met energie. [Is involved in the community on a different level. He became also more aware of the need to be more sustainable.] (G 13:36)

3.4.2. Dat is ook niet het model van de energiecoaches. Je moet niet de boer op en onwillige mensen op deze manier proberen te overtuigen. Dat is gewoon, dit is gewoon echt een adviesmodel. Mensen moeten wel een vraag hebben. [The energy coaches are just focussed on advice, and not a sales model.] (A 16:39)

4. Energy system interaction

All the different elements of a home or community energy system together create an experience and interaction for a member of the community.

4.1. Having solar panels makes residents of the house more mindful of when they use their electric appliances. They try do use them when the sun is shining. So, people are already changing their behaviour so they optimize the electricity grid.

Exemplary quotes

4.1.1. Mijn concept is wel, wat we nu proberen bijvoorbeeld, is nu vandaag zetten we de afwasmachine aan als de zon schijnt. Mijn vrouw doet nu de was omdat de zon schijnt. proberen wel de energie die er is nu te gebruiken, en daar waar mogelijk niet het net op te sturen. [Is aware of the curve and triest to actively flatten it already: they are aware of their energy usage and live already more in sync with the supply of renewable energy.] (G 13:16)

4.1.2. Sterker nog, als de zon schijnt. Net zoals afgelopen dagen dat is het altijd mooi weer, dan denk ik oh ik doe de wasmachine even aan. Dat werkt op de een of andere manier. Ik voel me vervelender om de wasmachine te draaien als het grauw weer is. Als de zon schijnt dan denk ik oké dan draai ik even een wasje. Ergens in je hoofd werkt dat op een hele prettige manier door. Dat maakt ook dat je meer bewust bent over hoe je met energie omgaat. Het is een heel mooi concept dat je het terug kan verdienen. [She adjusts her behaviour towards that of nature: doing the washing when the sun is shining. This feels good and is enjoyable.] (JR 29:30)

4.2. People like to compare themselves to other households and see how efficient they are relative to a representative household of similar size and typology.

Exemplary quotes

4.2.1. Kijk een keer per maand in de software nu. Om te kijken wat is nou het verbruik ten opzichte van andere huizen. Al geeft dat ook wel een beetje een scheef beeld, omdat de huizen bijvoorbeeld in ruigenhoek een hele andere indeling hebben. Er is nog niet echt een tool dat een soortgelijke woning als vergelijking kan worden genomen. [You need to be able to compare your electricity usage to relevant comparable houses.] (JK 46:41)

4.3. Insight into your electricity usage and generation is something that is and stays fun to monitor. Because people see that they are 'earning' money when the sun is shining. This effect stays interesting for a surprisingly long amount of time, even for people who are not the typical 'community engineers'.

Exemplary quotes

4.3.1. Vanaf april mei zie je ook echt, op de app ik hou die app ook altijd in te gaten, ik vind het heel leuk om het ook echt te zien. Van wat verbruiken we nou en hoeveel hebben we terugverdiend. En je ziet dan ook echt dat je de hele zomer meer terugverdient dan je verbruikt. Daar wordt ik ook gewoon wel blij van. Het is heel simpel om naar te kijken, maar het doet wel iets met je hoofd en je bewustzijn. Je gaat er toch meer bij stilstaan. En je gaat er ook voor zorgen dat als je al wat hoger zit [in je verbruik] je niet nog hoger gaat komen. [She uses the app a lot, financial motives do play a role. Earning money back is something that makes her happy.] (JR 26:55)

4.3.2. Die mensen nu al met een app. Daarop kunnen ze zien wat ze hebben verbruikt, en terugleveren. Dat is op dit moment de situatie. [What are they doing right now.] (6:20)

4.3.3. Het gaat niet alleen over de markt opzetten. maar ook samen besparen. En hoe dat uitpakt in de komende jaren, ik heb geen idee. Maar als ik kijk naar hoeveel mensen hun energieverbruik bekijken in de app dan is iedereen altijd gemotiveerd. [It really is about creating awareness and more than LEF. And also Hans does not know how things are going to play out in the future.] (HW 29:43)

4.3.4. De gaming zit er dan ook een beetje in. Dus ja, ik gebruik zelf als jaren zonnepanelen. En het is nog steeds elke dag aantrekkelijk om op die app te kijken wat je opbrengst is. [It is a appealing piece of data: looking at your usage and generation] (HW 7:28)

4.4. Allowing other parties to control your flexible appliances (like your car, heat pump) is something that is not yet embraced by everybody. A step by step approach is proposed: first doing it yourself, and then later allowing the energy supplier to do this.

Exemplary quotes

4.4.1. Klinkt heel leuk, want we kregen van Greenchoice laatst de vraag. Je kan bijvoorbeeld ook voorstellen dat over 10 het heel hard gaat waaien. Nu hebben we stroom te kort, dus als je pas over 10u die warmtepomp gaat aanzetten. Mogen wij dat dan doen? Of wil je dat we je een seintje geven dat je het zelf kan doen? [Greenchoice was asking them about offering flexibility: do they want control themselves, or do they want to give it away?] (E 32:24)

4.4.2. Ik denk dat veel dingen goed te regelen zijn. Maar ik vind dat de route die greenchoice heeft: ofwel wij bouwen zo'n kastje in en gaan op afstand uitlezen. Ofwel we sturen een signaaltje, op het ogenblik is het heel goedkoop. Je kan nu de warmtepomp aanzetten, of hem nu uitzetten. Dat zijn natuurlijk twee manieren waarbij je de controle in eigen hand houdt. En dan kan je op een gegeven moment zeggen, nu vind ik het wel mooi geweest, automatiseer het maar voor mij. Zo moet je het geleidelijk gaan doorvoeren. [Step by step approach is detailed by Ernst. First nudging, then controlling when people get a bit tired of it.] (E 43:07)

4.5. Next to having an efficient home, your behaviour is also very important in being renewable.

Exemplary quotes

4.5.1. We leven ook zuinig. Dat is natuurlijk ook een punt. Je kan het alleen over de techniek hebben, maar daarna gaat het ook over hoe je er mee omgaat. [It is not only about the technique, is also about behaviour.] (WJ 40:33)

5. (Community) Energy system building

How and why individuals or communities build and configure their energy systems in a specific way

5.1. Measuring is an important step in being able to create a community energy system/smart grid.

Exemplary quotes

5.1.1. Dan onze eigen realtime metingen van onze heavy users. Dat zijn onze verwarmingstoestellen en de bruto productie van de PV. [What they are measuring: big users and direct measurement/real time.] (WB 31:29)

5.1.2. Spectral zet alles netjes in een databank. Die maakt daar een user interface bij, en volgende week zullen we die ook bij het partneroverleg introduceren. Met de eerste GUI van wat de bewoners kunnen zien en wat ze van het collectief kunnen zien. [Spectral logs data and builds the GUI.] (WB 32:02)

5.2. The pioneers are 'hacking' their electrical devices (heatpump in this case) to be more efficient and use electricity when it is available

Exemplary quotes

5.2.1. Wat we ook zijn gaan proberen is om de warmtepompen die 's nachts tussen 12 en 1 aan slaan om dan warm water te gaan maken, of we die voor de gek kunnen houden om die voor de gek te kunnen gaan houden. en die midden op de dag aan te gaan laten slaan. Omdat we dan veel zonneproductie hebben. Dus eigenlijk de eerste stap om een microgrid aan te gaan. [Small steps taken by themself with surprisingly simple measures: just changing the clock 12 hours ahead so they start during the day.] (E 7:39)

5.3. The communities acknowledge that in order to become more effective they could also partner up with parties who use more electricity during the day (have a different usage timing) then a neighborhood, like a school for example.

Exemplary quotes

5.3.1. Hiernaast staat een school. En we hebben natuurlijk al eens eerder gezegd, als je dat microgrid nou eens iets groter maakt, en je neemt zo'n bedrijf en zo'n school mee. Dan krijg je natuurlijk een heel ander verbruikspatroon. Want als zij dicht gaan, gaat de wijk weer open. En als de scholen leeg staan. [The possibility of working together with was really their idea from the start, and it would have a lot of benefits] (E 28:05)

5.4. It is expected that as a member of an energy community that you can set your 'comfort' zone yourself. i.e. how much control you want to hand over to create flexibility

Exemplary quotes

5.4.1. Dachten met Stedin en Greenchoice er bij, dan is dat wel een volgende stap. En dan moet je wel met een algoritme zijn wat bijna zelflerend of optimaliserend werkt. Dat altijd zorgt dat ik als klant de beste prestatie krijgt: bijv meeste groene stroom, of de laagste prijs. Of het meeste comfort. Je zal waarschijnlijk verschillende producten en diensten kunnen kiezen die je dan weer kan instellen. [They want to possibly take the next steps

and start working with heating pumps in a smart grid. Conceptualising different experiences.] (E 41:03)

5.5. Communities realize that in order to become more sustainable they have to shift their energy usage towards a behaviour pattern that is steered by the amount of renewable energy that is available.

Exemplary quotes

5.5.1. Het zou nog slimmer zijn als we dat in de toekomst zon gestuurd kunnen doen. Dus dat zijn stappen die al gezet worden. We hebben nog vergelijken tussen woningen gedaan. Sluipverbruik tussen woningen. Ook kleine foutjes er uit kunnen halen: power optimizers plaatsen etc. [They checked other issues as well. Really digging into their energy usage.] (WJ 27:22)

Community level

6. The process of energy community formation

The what phases are there when a group or a motivated individual needs to go through in order to realize the formation of an energy community.

6.1. Energy communities that emerge from the 'bottom-up' don't start with the goal of forming an energy community. Instead they are already connected through another means in all cases. These means are either by having done a collective renewable energy project or having built their houses collectively in a CPO project.

Exemplary quotes

6.1.1. het heeft een beetje ruimte gekregen toen de bouwcrisis er was. [CPO/groene mient manier van bouwen] En het heeft natuurlijk ook ruimte gekregen door het gemeentelijk beleid. Toen de gemeente met de grond bleef zitten [in de bouwcrisis] gaven ze het aan particulieren weg. [The crisis in the 'bouw' is one of the reasons the project is made possible.] (WB 44:40)

6.1.2. Van de mensen die vanaf het begin betrokken waren werd er vooral, is er gezocht naar geïnteresseerden. En op een gegeven moment is er gaandeweg, zijn er genoeg geïnteresseerden bij elkaar gekomen die het aandurfden. [First step: finding the people who want to do it with you.] (J 8:43)

6.1.3. De opdrachtgever is de gemeente Eemnes. Wij hebben ingeschreven vanuit een Europees project. [Started not by community, but by EU project] (H 4:02)

6.1.4. Het ontwikkeltraject vindt op dit moment nog plaats. Dus het is vorig jaar gestart, alleen wij waren toen nog niet betrokken (als coöperatie). [The cooperative /social community part only came into the project later.] (H 5:07)

6.1.5. Heel gevarieerd. We hebben een sessie gehouden op het gemeentehuis. Toen hebben we gevraagd of mensen mee wilde doen met een groepsproject. Daar zijn 60-70 op af gekomen en hebben we voor 50 deelname gerealiseerd. [Standard process used to recruit people] (H 6:13)

6.2. Projects can be started by different parties, so bottom up or top down is both possible. But for a project to gain traction the community needs to be ready and willing to participate. In other words: the spark can come from outside a potential community, but the community needs to be willing in order to make it 'light-up'.

6.3. The measuring phase is a new phase in the process of setting up an energy community when compared with the process of setting up

Exemplary quotes

6.3.1. Hebben inmiddels van de 25 huishoudens de goedkeuringsformulieren om de data van de slimme warmtepomp en de slimme meter af te gaan lezen. Maar dat is ook voor greenchoice. [They are starting by reading, just as Willie, first step measuring. Also people signed forms to accord the collection of the data] (E 8:21)

7. The shared vision in communities

A group of people need to be aligned and willing in order to reach the goals set out.

7.1. Focussed around improving their surrounding in line with their values, which are sustainability but this also means personal sustainability and therefore not blindly investing in renewables.

7.2. Decision making is done based on complete agreement by all community members in bottom up initiatives

Exemplary quotes

7.2.1. We gaan niet stemmen, maar dat je naar een oplossing kiest waar iedereen zich in kan vinden. Maar dat niemand overwegend bezwaar heeft. [Their decision model is one of consent.] (E 43:56)

7.3. Energy communities want to be contributors to society. This can be done on a knowledge level, for example by being a pilot or testing ground and sharing data. But also on a economic level: they don't want to be an additional financial burden on society. Or at least limit this.

7.3.1. Wij hebben geen verzwaring probleem. Want wij zijn op twee unieke hoofdkabels aangesloten. Maar wij hebben wel een bezwaringsprobleem. [They are showcasing that they don't need grid reinforcement as a neighborhood. But Willies reason for wanting to experiment is partly feeling guilty about using too much of the grid? Interesting reasoning.] (WB 33:06)

7.3.2. Op een dergelijke wijze dat er zo min mogelijk maatschappelijke kosten gemaakt worden. We moeten het niet zwaar maken maar slim maken. [He believes by implementing a smart grid they can save society a lot of money.] (WB 24:54)

8. Ownership makes things happen

A balanced distribution of ownership is an essential part of a healthy, active and successful energy community.

8.1. As discussed, a community can be started bottom up or top down. But at a point it has to be embraced by the community and the community needs to start feeling a sense of ownership in order for the project to be realized successfully.

Exemplary quotes

8.1.1. Als de mensen het zelf maar doen. Want als ze zelf niet willen, dan kun je nog zo willen als energiecoöperatie maar dan trek je aan een dood paard. [Important to have people that are intrinsically motivated] (H 30:50)

8.1.2. Daarmee kun je zelf [met home] de energietransitie van je huis regelen. Maar weer met name die nadruk op ZELF het regelen. Niet iets doen op afstand. [People have to do it themself. Make it relevant for them, but let them do the work.] (32:56)

8.2. Community members really want to contribute. So thinking that you need to take away as much of the work as possible as a community leader or Stedin/service partner might have the opposite effect and they become demotivated. Responsibility creates action and ownership.

Exemplary quotes

8.2.1. Dus een aantal mensen die ik heb gesproken in de wijk, waar ik die kastjes heb aangelegd, daar zijn ook geïnteresseerden bij die betrokken willen worden. Dus dat is een, vanuit de inner circle communiceren what's in

it for me. [Really involving people, mobilizing the community. Making it a team effort.] (19:46)
8.2.2. Mensen moeten zelf verantwoordelijk worden voor het klimaat. En niet dat de plastic fabrikant, of de ijzer fabrikant bepaalt hoe het moet. Want daar zit altijd een verdienmodel aan vast. De baten bij de mensen houden en democratisering is een belangrijke beweegreden. [Important and vital: people should be responsible again. Trust in corporations is lower than ever. GLOCAL!] (H 20:53)
8.2.3. Leuk dat je energie verkoopt, en dat je dingen doet. Maar de community moet je op orde krijgen. Dat betekent niet dat ik dat doe. Ik heb bijeenkomsten gezien met 100 man, en daarna stopt het gewoon. Dus je moet de mensen zelf de dingen laten doen. Ik heb in de coöperatie van de 50 5 gevonden die zelf de dingen willen doen. Ik maak een soort van Start en zij nemen het over. Dus ik maak als projectleider wel facilitair zijn. Maar zij moeten het zelf doen. [The crux is to mobilize the community and let themself do the work. An outsider can kickstart it, but they have to do it themself in the end. Otherwise the people don't feel involved and the initiative fades away.] (H 30:28)
8.2.4. Die hebben ook een korte concentratieboog en kortere interesse boog. kijk voor Stedin is het gewoon business, en maakt het niet uit wanneer het af is. Want het is hun werk. Daar zijn ze dagelijks mee bezig en er zijn meerdere projecten. Maar voor een particulier is dit een project waarvoor ze gevraagd zijn en dan wordt het steeds langer, en langer en langer. Als je zegt van joh ik wel wel mee blijven spelen met die vereniging dan hoop je dat je binnen no time ook mee mag doen als speler. En wil je niet dat je op de bank moet blijven wachten als invaller totdat je een keertje mee mag doen. [If the involvement level of the participants of an energy community drops too low, they don't feel part of the system anymore.] (JK 25:02)

9. Internal communication

Internal communication preferences, mainly between the leader and the community members.

9.1. Community meetings are a proven method for creating a support base for a community project, like setting up an energy community. Therefore this form of communication needs to be used to its full potential.

Exemplary quotes

9.1.1. Hebben een keer of 6 ledenbijeenkomsten gehad [Do have meetings with all the community members on a semi regular basis where they present results.] (E 22:04)
9.1.2. Ik weet gewoon niet hoe die lijnen allemaal lopen. Maar wat dat betreft Willie stuurt wel veel mailtjes. En er zijn ook veel informatie avonden geweest. Er is een hele presentatie geweest enzo, dus dat vormt zich vanzelf. Daar is hij heel betrokken mee bezig. En de lijntje zijn heel kort hier dus je kan elkaar voor alles vinden en bevragen. [Because of the transparency and the 'closeness' of the people in the lead group like Willie, she is okay with following along.] (JR 31:15)

9.2. For community members to understand the implications of joining an energy community it is important to give them very specific knowledge about how this will affect their situation. Clearly lay out what is expected from them, and what this will cost and bring them.

Exemplary quotes

9.2.1. Dit is het, wat heeft hij [Willie] daarin van mij nodig. Wat wordt er van mij daar in verwacht. Wat gaat het me kosten. En dat eigenlijk maakt dat ik dan een plaatje kan creëren, is dit interessant ja of nee. [Information should be provided so the people can form their own opinion: don't push too much a how and very high level goal why. People want to form their own opinion!.] (JR 36:38)
9.2.2. Dus je moet geprikkeld worden met beelden en info avonden. En dan bijeenkomst, als dan alles concreet uiteengezet kan worden. En dan vooral wat voor moeite gaat het met kosten en wat voor tijd gaat het me kosten, en wat gaat het me überhaupt kosten aan investering. En dan moet het natuurlijk interessant genoeg zijn. [the steps to inform Joukje are quite straightforward: spark interest, inform, Desire, whats next? (AIDA)?] (JR 37:22)
9.2.3. Dus dat zijn factoren die beslissend zijn die uiteindelijk bepalen ik doe mee of niet. Dus degene die met een idee komt die moet in grote lijnen al wel een concreet plaatje hebben en kunnen neerzetten. [Needs to be as concrete/specific as possible already] (JR 37:49)
9.2.4. Toen hadden we een bijeenkomst. Waren jongens uit Enschede. Die hadden allerlei metingen gedaan. Toen kregen we per huishouden allemaal grafieken over ons gebruik. Dat was aan de ene kant heel leuk. En toen zag iedereen ineens van Gert dat ze op bepaalde vlakken een beetje afweken. Nou ik heb drie televisie, een bad, wij zijn best veel energie gebruikers. Toen dacht ik heb ik daar zin in? [Sharing too private details is a bit too much for Gert. Respecting each others personal freedom is necessary: a big brother idea is absolutely not what he wants] (G 39:38)
9.2.5. Ik zou in ieder geval zorgen zodat de app/software tool helemaal gebruiksvriendelijk is. En dat je dan ook goed kan uitleggen aan de bewoners, je krijgt deze tool van ons: die zit in het pakket. Net als bijvoorbeeld een subsidie van een warmtepomp. En als je je bij ons aansluit voordat pakket, krijg je een tool die meer inzicht geeft in je energieverbruik. Dat dat de grootste motivator moet zijn. Want het marktstelsel kun je nu wel gaan promoten maar dat is er nog niet. [Important notion: he really sees the whole product as one. It is a service package.] (J 36:01)

9.3. Data privacy is an issue of concern for some community members. In order to take this fear away they state it is important to be clear about why it is needed and who is the owner of the data. Preferably the community should have full control over the data that needs to be shared in order for an energy communities' systems to function on a technical level.

Exemplary quotes

9.3.1. Sociaal denk ik dat met name comfort, maar ook privacy een issue meespeelt. Mijn buurman zei al oh dat is heel handig als iemand die slimme meter data kan uitlezen: dan kan hij precies zien wanneer ik op vakantie ben. [Privacy and comfort are main issues.] (E 41:47)
9.3.2. Voor data enzo ben ik niet echt bang. Ik ben niet zo paranoia aangelegd ofzo. Dus weet je van mij mogen ze dat allemaal wel checken. Dit is het en dat krijgen ze. [Not very scared about data being an issue] (J 48:41)
9.3.3. Wat willen ze dan van mij weten? En is het dan anoniem? Dat zijn wel dingen die mensen huiverig maakt om er aan mee [LEF] te doen. [The privacy and anonymity is an issue for Anneke and she expect for other people as well.] (A 35:56)
9.3.4. Wat mij wel opviel aan het hele systeem. En daar zijn heel veel mythes over, en daar heb ik zelf ook een aarzeling bij, is dat je met al die slimme uitwisseling van energie. Moet je ook data gaan delen. De vraag is of mensen dat wel willen. Ik ben daar wel huiverig voor. Gaat Stedin dan meekijken met mijn energieverbruik? [Data privacy is seen as an issue by Anneke.] (A 35:35)
9.3.5. Controle, privacy, straling, ruimte, lawaai. dat zijn allemaal dingen die de technici niet zien. [People with less technical understanding see more issues according to ernst] (E 44:31)

9.4. Instead of expecting from community members to get on the knowledge level of the community leaders, the community leaders should get on the level of knowledge from the community members. Therefore making bits of how a community members' 'daily life' will be tangible and simple to understand should be the goal for community leaders.

Exemplary quotes

9.4.1. Kan ook iets op een scherm hebben dat het heel tastbaar gemaakt wordt. [A simple tool is already quite good at testing and serving as an MVP possibly.] (E 53:00)
9.4.2. Kijk, dit is een uitdraai van het greenchoice systeem. Hier kan je zien dat er een mismatch is tussen het

electriciteitsverbruik. [mismatch between supply and demand is visible on greenchoiche platform] (E 22:58)
9.4.3. Het moet een verhaal zijn dat begrijpbaar ivoor de mensen die meedoen. Het moet een verhaal zijn dat laat zien wat het voordeel is voor mensen, wat voegt dat toe. Het moet bijdragen aan de verduurzaming van Nederland. Moet ook bijdragen aan de ontlasting van het net. En het moet door een club als de onze, met ons niveau van professionaliteit gemanaged kunnen worden. En nou zijn wij niet zo super professioneel: dus dat moet wel heel erg eenvoudig zijn. [Clear expectation about LEF: what do you need to take on the challenge of implementing LEF? Well, relevance for the user again is a great tool to make it work. Without this no progress will be made probably.] (W 54:10)
9.4.4. Nee [ik hoef niet nauwkeurig te weten hoe het werkt], want mijn hoofd zit ook heel vol met andere dingen. En Willie zit in een positie wat heel fijn voor hem is zodat hij zich hier volledig op kan storten. Hij heeft ook die interesse om alles uit te diepen en er komt gewoon heel veel bij kijken. Maar waar ik kan helpen help ik wel mee. [She does not want to know the intricate details, but is aware of the complexity of the work Willie is doing and admires this.] (JR 32:15)
9.4.5. Wat er wordt gevraagd is toch wel mee te doen met de het stukje marktwerking testen. Maar door de complexiteit van het product gaat het enthousiasme wel achteruit. [Complexity and a failure to make the product and pilot relevant means people will lose interest over time.] (JK 21:07)

9.5. In order to successfully communicate to the community members, you need to talk not only about the technicalities, but also about the social aspect.

Exemplary quotes
9.5.1. Als je het puur vanuit de technische kant doet krijg je geen acceptatie, dat is niet wat we willen zeggen ze dan. [Match the user needs, make it relevant!] (H 23:55)
9.5.2. Sociaal, technisch, economisch moet je meenemen. Klopt! [trias energetica] (25:11)

10. Visible community characteristics
What characterizes different communities and what they have in common. This is mainly what is visible for the 'outside world', so also for Stedin.

10.1. Because right now starting an energy community is still relatively a path 'untrodden', the people starting an energy community need to be highly skilled already. Otherwise they are not even taking up the challenge at all. This knowledge hurdle is an strong limiting for the scalability and adoption of energy communities.

Exemplary quotes
10.1.1. Ik denk dat wij zelf heel veel weten. En waar nodig het opzoeken. En greenchoice heeft natuurlijk nu het nodige aangevuld. [They have a lot of knowledge already, but also they are getting knowledge from the partners] (26:30)
10.1.2. Nu in dit traject, nu zijn we eigenlijk de stap aan het zetten van energieneutraal naar een smart grid wijk die altijd groen is. Voor nu de informatie waar we dat vandaan halen is van de werkgroep leden zelf. Ernst werkt in de duurzame energie, Ik werk zelf als ondersteuner. Jacco werkt zelf bij alliander, dus heeft hij informatie. En niels de 4e is data analist dus die zit veel op data de systemen bouwen. [They have a lot of knowledge and intrinsically motivated people in the taskforce 'energy'] (E 1:01:46)

10.2. Most community members are still very unaware about the energy grid and how it functions. The situation used to be for a long time that it was always just … there. You turn on your lights, and they go on. Due to the energy transition this is shifting, people turn into prosumers and even start forming energy communities and become more aware of the whole of the energy sector behind their socket.

Exemplary quotes
10.2.1. Als je aan de gemiddelde Nederlander vraag, hoe is het gesteld met het Grid in je woonwijk, dan kijken ze je aan van waar heb je het over. [Regular people are unaware of the electricity system.] (JK 13:44)

10.3. There is a limit on how much communities are willing to do, especially when they do the work that the municipality or government could also be doing. If they don't feel supported by this municipality but the community does take over work from them, there will be a downturn in motivation.

Exemplary quotes
10.3.1. Daar zitten we vaak over te discussiëren. We doen dingen om de duurzaamheidsambities van de gemeente en overheid te realiseren. Dat doen we ook graag, want wij willen het ook. Maar het is volledig uit verband getrokken dat wij dat allemaal voor niks zouden doen. Daar zitten natuurlijk heel veel mensen tussen die hebben geen behoefte aan geld. Maar er zijn ook mensen zoals ik die de kar trekken zoals ik en die zijn ZZP'er. en dat lukt mondjesmaat. De gemeente moet daar wel wat structureel over nadenken. Wil je al die initiatieven aan de gang houden dan zul je toch ook een paar betaalde krachten daartussen moeten hebben die het aan de gang houden. [His explanation why he asks money for certain projects. And also a warning to the municipality that you should not expect too much from volunteers. If you want to keep progress you should also have a few paid people.] (WS 1:05:23)

11. Internal community dynamics
What dynamics are present within communities. This is less visible to the outside world and mainly determines outward characteristics.

11.1. If a large degree of trust is created in the community from the community members towards the leaders, they are willing to follow along without know the full implications for the community.

Exemplary quotes
11.1.1. Maar dat staat nog helemaal in het begin. En ik weet er zelf weinig van af, maar we gaan daar wel in mee. [She trusts willie and happily joins the project without know all the full details] (J 30:28)

11.2. Different community members have different needs in terms of 'personal space'. A community can have great benefits for its members, however it can also become suffocating when the community takes over too much and start limiting a members sense of control and freedom. This is a tight balance that is essential to get right. By making elements voluntary crossing personal limits can be avoided.

Exemplary quotes
11.2.1. Hoe cijfers dan sturend zijn, de mate van zorgvuldigheid daarmee omgaan dat is dan heel belangrijk. Ik vond voor een plenaire presentatie met alle gegevens van alle individuele huishoudens nog iets te ver. [Reinforcing that a community grid or energy project does not automatically create a desire to be open about your energy use. Even not in a community as open as the groene Mient.] (E 40:08)
11.2.2. Ik ken die groene mient ook. Maar dat gaat voor mij wel een stap verder. Maar dat is ook omdat ik al jaren woon waar ik woon, dat ik het ook gewoon prima vind dat ik af en toe gewoon de voordeur achter me dicht kan trekken en kan denken morgen gaan we de wereld weer aan. [It is nice to keep a certain level of distance for some people. They want to step out and step into the privacy of their house at times as well.] (A 29:50)

11.2.3. Want dat gaat mij in mijn vrijheid stukken beklemmen. Dat voel ik nu al. Als jij deze vraag stelt voel ik dat soort van meteen gebeuren. [Don't get too close and demanding. See it as a bonus where you can gain the community and yourself a little bit.] (49:51)
11.2.4. Maar dat sturen op of daarin misschien een soort bepaalde gedragsverandering creeren. Daar sta ik wel voor open, MAAR ik wil niet het gevoel krijgen dat ik daar teveel invloed op komt. Als ik het idee krijg dat ik op mijn vingers getikt wordt als ik 's avonds om 8 uur mijn wasmachine aanzet en dat had 5 uur moeten zijn, dan gaat het niet goed. [There is a fine line that should not be crossed when creating flex: don't really get into peoples lives too much.] (J 49:22)

12. The conditions leading towards successful energy community formation

There are a few conditions that need to be present in order to get an energy community project going. These conditions are both internal and externally determined.

Exemplary quotes

12.1. People of the value seeker type desire a guarantee that their efforts will be rewarded. And in the case of a monetary investment this also means the assurance that there is a outlook for a good return on investment.
12.1.1. Wilt wel de zekerheid en garantie dat het ook een stukje rendeert. [It needs to be relevant for the user! And sustainability is a nice goal, but is not yet relevant for the local consumers.] (J 51:11)
12.1.2. Je moet mensen aan het begin van een pilot enthousiast maken door te laten zien wat het hun scheelt qua kosten. Voor je investering terugkomt. Het economische ding is eigenlijk het belangrijkste voor de meeste mensen in Nederland. [Financial incentives are what keep a LEF system iteresting for longer after the curiosity has worn off.] (J 49:20)
12.2. In order to start an energy community you need a expert volunteer to help kick-start the community. When this is present the process of community formation will gain traction, otherwise the project will not get of the ground. Lowering this knowledge barrier is crucial in reaching a bigger amount of 'potential' energy communities
12.2.1. Het lokaal opwekken van energie en het dan ook lokaal verrekenen vinden wij interessant. Maar hoe je dat daadwerkelijk uitvoert dat gaat ons op dit moment nog even boven de pet. [Wim expressed that he does understand the concept of LEF and sees the value in it. but actually implementing it himself is seen as something that is completely different and much harder to achieve.] (WS 40:31)
12.3. You need people in the board of an community that are knowledge of the technicalities and also the social community aspect, only looking at one of the two is not enough.
12.3.1. De combinatie van elektrotechniek en bedrijfskunde dat is echt nodig. Je kunt de business wel begrijpen maar de techniek niet, Als je alleen techniek doet werkt het niet goed. Als je alleen bedrijfskunde doet werkt het ook niet goed. [You need botch: social, technical, and economical.] (9:49)
12.4. It is important to have a motivated community to pull of a community energy project. Not everyone needs to be a pioneer however, but small group of motivated individuals can make a big difference.
12.4.1. Als we in China zouden wonen zou dat een logische keuze zijn, dan zou je het gewoon uitrollen [over warmtenet kiezen obv. lokale bronnen]. Maar we wonen in een ander type samenleving. Ik zou toch beginnen ondanks dat het misschien niet logisch zou zijn in een wijk waar het bewonersinitiatief wil. Ook al kan die leiding nog 20 jaar mee. Maar dan als zij willen kan je daar een voorbeeld project van krijgen. Die er voor kan krijgen dat je daarmee misschien de wijk die nu nog niet wilt zegt, oh, dus wij hoeven nu nog niet de voorloper te zijn? Dat heeft iemand anders al gedaan. [Put everybody in the role they feel comfortable with. Some want to be first, allow them to be first. Some don't want to be first: don't force them to be first. Even though it makes on a 'cost benefit analysis' no sense to start with these groups.] (WJ 55:48)

13. A community gathering and generating knowledge

Since the field of energy communities is still in its infancy, the gathering and generation of knowledge is different from more established less innovative endeavours.

13.1. Not everything is fully crystalized and therefore there are a lot of unknowns about where the energy community field is moving towards. In order to still progress in this situation where there is limited knowledge an iterative way of working is adopted by most community leaders and developers. This process consists of the lean cycle build, measure and then learn. This is done at personal level, all the way to sector level.

Exemplary quotes

13.1.1. Mijn eigen huis verduurzamen doe ik stapje voor stapje. zonnepanelen, deur, radiatoren vervangen. Doelstelling is dat we zo goed geïsoleerd zijn om ook op een warmtepomp over te stappen. [Is quite active at home.] (W 09:10)
13.1.2. Wat de uitkomst wordt. geen idee. Laten we eerst eens ons best doen om minder energie te gebruiken. En dat we het zo goed mogelijk gebruiken. Dat we 's nachts zo min mogelijk gebruiken. En dat we elkaar helpen om dingen op orde te krijgen, zodat we zoveel mogelijk overdag gebruiken. Zodat we geen kernenergie centrales of gasturbines. [Doesn't know what will happen either.] (19:21)
13.1.3. Hoe dat financieel uit gaat pakken dat weten we op dit moment niet. Maar we weten niet hoe dit eruit gaat zien. [Are unaware of how everything will play out. People are really using a lean way of working in this sector. Build > Measure > learn] (H 9:00)

13.2. Other initiatives in the renewable energy sector (energy communities and cooperatives specifically) can be a valuable source of knowledge. Learning from each other and sharing best practises is a crucial in speeding up the development of energy communities.
13.2.1. Een soort sociale kaart maken van initiatieven in de haagse regio. [Idea from Gert: make a map and overview.] (G 1:00:10)
13.2.2. In ieder geval interview gedaan. Dus daar hebben we een boel van geleerd [Van PCR en SDE+ project in Betuwe]. We zijn achter het project gekomen doordat he op een lijst staat van Hier Opgewekt. Dus op die manier probeer je dan je informatie binnen te halen. [Speaking to other initiatives in the field helps a lot when you want to start your own initiative.] (A 50:40)
13.2.3. Het werkt heel goed als je actieve initiatieven iets kan bieden, dat zegt, dit lijkt een beetje op wat jullie willen. Ga eens met hen praten. [Linking communities can work well is Gerts expectation] (G 59:14)

13.3. Project partners are a vital source of knowledge for most community leaders.

Exemplary quotes

13.3.1. Dat is wel waar we veel informatie vandaan halen. En verder van de partners waar we mee samenwerken. Greenchoice halen we veel informatie vandaan, wedrive solar als partner daar halen we info vandaan ... ik hoop op termijn Stedin ook als partner te hebben, als dat LEF systeem openbaar wordt. Dan zou dat ook een mooie bron zijn. [The partners are an important source of knowledge] (WJ 1:03:06)
13.3.2. We willen wel kijken kunnen we energie met elkaar gaan delen in de wijk. Kijk, een laadpaal is inmiddels een algemene techniek. Een smart grid technologie app niet. We hebben wel met spectral gesproken, een bureau dat daar veel mee doet. aan de ene kant voor de normale dingen is het makkelijk, en voor de nieuwe dingen is het natuurlijk nog zoeken. [There is no clear cut place to look for information about energy sharing.] (WJ 1:05:12)

13.4. Because community leaders already are ‘expert volunteers’ and have the basics covered. So an important source of knowledge is within the community itself!

Exemplary quotes

13.4.1. Algemene informatie, gezien de kennis die wij hebben, is makkelijk te halen. Dus voor een antal algemene dingen, zoals ik wil een nieuwe laadpaal plaatsen waar moet ik de informatie vinden, dat is wel te vinden. Maar het gaat nu meer richting dat wij ook bezig zijn met dingen die nog niet bestaan. En dan is het natuurlijk ook kijken hoe kan je zorgen dat je dan aan relevante informatie daar over komt. Wij willen eigenlijk naar zo’n systeem als dat jij beschrijft, zo’n smart grid systeem. Ons doel is duurzaam worden en niet autarkisch [Finding information on new projects and innovative systems is very hard. Wijnand has not really got a clear answer or source where he would find information about this.] (WJ 1:04:36)

13.5. Knowledge is conjointly generated between the community and the service partners.

13.6. A service partner is essential to pull of the project of starting an energy community.

Exemplary quotes

13.6.1. De kastjes zijn ontwikkeld door i.LECO in Belgie, en die heb ik geplaatst. [Knowledge and tools come from service partner] (H 3:08)

14. The type of knowledge desired by communities from outside the community

A community, and specifically the community leaders, desire a whole range of knowledge from outside the community. In this theme it is laid out what type of knowledge specifically is desired by the community and from who.

14.1. Access to good data is essential for community leaders to allow them to craft their story to convince people to join the community or to develop the community further. This data is mainly focussed around community members’ electricity usage and what is possible on the Stedin grid in terms of Grid capacity.

Exemplary quotes

14.1.1. En als je het over de energie transisite hebt, dan helpt het wel om toch veel en uitgebreid en gedetailleerd informatie beschikbaar te stellen. en daar hoort dan toch helaas bij dat je ook mensen moet hebben die gebruikers daar bij kan helpen denk ik. [Data helps to make things tangible, and Aart also wants Stedin to be able to help him with that.] (A 1:12:56)

14.1.2. Het gaat om data van de slimme meter natuurlijk. Hoeveel nemen we af, en leveren we terug. [They measure the smart meter] (E 25:29)

14.1.3. De data van de warmtepomp meten we ook, Daar zit heel veel data in. [Measure the heatpump as well. Inside temp, outside temp, earth source temp, power usage] (E 25:47)

14.1.4. Het andere probleem aan de digitale kant. wat ik fantastisch vindt is dat het Stedin data publiceert gebruiksdata per straat. En dat vind ik heel mooi: want dat gebruik ik hier om te laten zien wat voor resultaten we boeken in terms of besparing van gas en elektra verbruik. [Showing insight into data is a good thing for Aart.] (A 1:11:31)

14.2. Sometimes you just need an expert explaining to you how LEF works

14.2.1. Het zou goed zijn als iemand een keer tot in detail komt uitleggen wat dat hoog dalem nou precies inhoudt. We hebben er al een grof beeld van. Dan kan je nadenken is dat toepasbaar in een wijk als de onze. Maar dan ook met name, wat is dan het verhaal richting de bewoners in de wijk om hun ook te enthousiasmeren dat ze daadwerkelijk meedoen. [Understanding the details about how the Hoog Dalem pilot functions is necessary.] (WJ 55:35)

14.2.2. Conceptueel is dit nog helemaal niet zo simpel om uit te leggen. Dus daar heb je nog wel wat voor nodig om dat goed te doen. En ik denk dat je daar wel professionele assistentie bij nodig hebt. [Aart expresses the need to have simple tools to explain the LEF concept.] (A 1:00:07)

15. Channels of choice for community members

Which methods and channels have the preference for a community to.

15.1. The regular channels of Stedin are known and used. They don’t seem to really spark a strong emotion.

Exemplary quotes

15.1.1. Een website raadplegen is wel handig. Zodat je tot nu toe kan zien wat er in de pilot is besproken. Een pagina met up to date informatie, waar ook documenten die ook ooit verstrekt zijn geweest ook weer terug kan vinden. [An online repository is a nice feature. To make sure you can find presentations/meeting notes later after they have been held or sent out.] (J 40:10)

15.2. Channels and experience of choice are community assemblies, community evenings and newsletters.

Exemplary quotes

15.2.1. Ik vind e-mail in combinatie met wat bewoners avonden, zodat je om de zoveel tijd zo’n avond in plant. Je moet toch ook de informatievoorziening up to date houden. Ik kan me voorstellen dat je een keer per jaar een bewonersoverleg doet. En dan 2x een nieuwsbrief. [Not too high frequency is desired. But some degree of active participation is needed in the shape of community meetings.] (JK 39:04)

16. Communities making the case for energy sharing

This theme is about whether communities talk about wanting to share their energy themselves.

16.1. Energy sharing is seen as a logical next step after setting up a community or a energy cooperative where renewable energy is generated in a community setting.

Exemplary quotes

16.1.1. We willen wel kijken kunnen we energie met elkaar gaan delen in de wijk. Kijk, een laadpaal is inmiddels een algemene techiek. Een smart grid technologie app niet. We hebben wel met spectral gesproken, een bureau dat daar veel mee doet. aan de ene kant voor de normale dingen is het makkelijk, en voor de nieuwe dingen is het natuurlijk nog zoeken. [There is no clear cut place to look for information about energy sharing.] (1:05:12)

16.2. Communities want to keep their electricity ‘local’ and in the community.

Exemplary quotes

16.2.1. Dan zou ik ook willen, want er komen momenten dat er energie overtollig is, en dan zou ik willen dat jullie er ook voor zorgen dat er een vorm van energieopslag komt. Dat de energie zoveel mogelijk in de buurt bewaart wordt. En niet naar Enschede gaat ofzo. [Gert expects a battery or storage solution from Stedins side.] (G 32:16)

17. Communities wanting to share knowledge

Almost all communities have a desire to share their knowledge and help other communities in getting further.

17.1. Communities also want to share knowledge with each other and Stedin. They want to contribute. (so the need to get knowledge from other communities has a reciprocal need!)

17.1.1. Als dit proces maakt dat het concreter wordt of misschien makkelijker wordt om het over te pakken of het te kopiëren om het zo maar te zeggen. Ja dan zijn we goed bezig. [the idea of helping other people by serving as a testing ground is appealing and seen as a benefit.] (JR 40:48)
17.1.2. Ja als het makkelijker kan, en duurzamer en de wereld wordt er beter van dan natuurlijk het liefst zoveel mogelijk [sustainability and easier? More please!] (JR 41:17)
17.1.3. Puur van hee, wij kunnen op deze manier bijdragen aan de energietransitie. Het aanleggen van dikke kabels voor de aanvoer en teruglevering. [Their focus is more on contributing to the knowledge and making the grid smarter.] (E 17:04)
17.1.4. Ook nadenken hoe dat communicatief overkomt. Want met name Wijnand is ook met alle energie strategieën bezig in Utrecht. Dus die weet heel goed hoe je het uitgelegd krijgt en je mensen meekrijgt. Dus wij dachten we kunnen mooi als experimenteer grond dienen. [Not only on the tech side but also they have the social structure to pull of a community project like this.] (E 17:41)
17.1.5. Ik denk dat het dan bijvoorbeeld erg leuk is om dat soort mensen dan bij ons of in Gorinchem uit te nodigen. Want het werkt toch altijd beter om als buren het aan elkaar vertellen dan als een of andere zeer ingevoerde persoon dat verteld. Dat je juist, zeker in de eerste fase, van deur tot deur dat met mensen doet. [The community sharing factor is very promising and interesting. Ernst brings it up himself: let them come to us.] (E 36:18)
17.1.6. Dat vinden wij juist erg leuk [kennis delen]. Wij hebben meestal eens in de maand en eens in de twee maanden rondleidingen. Soms komen er andere wijken of initiatieven, of andere wijken die bezig zijn. Die leiden we dan rond. Maar er zijn zeker 10-15 huishoudens die dan wel binnen willen laten zien. En we hebben een hele mooie gezamenlijke tuin. [Sharing knowledge is already part of their mission, so it is just a matter of connecting and inspiring.] (E 38:36)
17.1.7. Tweede doeleinde is communicatie en educatie. Wij hebben normaal elke maand een rondleiding van mensen die komen kijken. DAn laten we de gegevens ook zien. Proberen meer mensen dan alleen onze woningen te inspireren. [Really spreading the word as well outside their own neighborhood] (WJ 28:30)
17.1.8. Ik denk wel dat we 500 mensen per jaar hebben die aan een rondleiding meedoen. In het buurthuis houden we een algemene presentatie en laten we zien wat we op andere thema's doen. En op energie laten we dan de woningen zien. [Lot of visitors.] (WJ 30:33)
17.1.9. Ik zou eigenlijk, de communities voor wat betreft energie of klimaat dingen zouden eigenlijk in Nederland ook gekoppeld moeten worden. [you should link the communities in the Netherlands] (HW 38:30)

Community - Stedin level

19. Stedin communicating with communities

How communities like to be approached and communicated with by Stedin.

19.1. Whether the community leaders or Stedin communicates to community members needs to be clearly agreed upon.

Exemplary quotes

19.1.1. Dat zeg ik erbij. Soms kun je best een route hebben jullie hebben informatie, die wordt door de trekkers van het initiatief doorgeven naar hun achterban. En steeds via hen loopt het heen en weer. Maar je moet dan heel kritisch zijn dat je het gevoel hebt van goh, die peergroup om het verhaal heel simpel te vertellen. Wat wij zouden kunnen betekenen. Ik ben altijd voorstander. [Because of the difference in language of the leading group and the 'achterban' there is unnecessary complexity.] (G 51:00)

19.2. Community members sometimes prefer to hear the details of the community energy project (setting up an energy community) from Stedin directly instead of hearing it through the community leaders.

Exemplary quotes

19.2.1. Meestal gaat de communicatie altijd van Stedin naar de voorlopers naar de community. Dat kan goed gaan, als de voorlopers heel goed in staat zijn heel begrijpelijk uit te leggen wat er bedoelt wordt. Ik heb daarstraks verteld dat een paar momenten toch wel een doorbraak moment was dat de studenten toch wel op een iets begrijpelijkere manier in ieder geval konden vertellen wat er aan de hand was. Nou dan, sla je de voorloop groep over. [It is sometimes good for the community to hear the information straight from the source.] (G 52:11)
19.2.2. Nou daar zie ik namelijk wel verschil in [info van groene regentes of Stedin], ik denk dat, ik ken de groene regentes natuurlijk. Maar toch, als ik dan zoiets voor ogen zie als dit [LEF], dan je dan eerder informatie ook van de organisatie zelf wilt. Omdat dat de partij is waar je dalijk zaken mee gaat doen. En dan zou ik eerder een soort van ondersteunende informatie willen van de groene regentes, dat helpt dan wel. Maar de eerste informatie zou dan toch wel van de organisatie zelf moeten komen. [Primary goal is to get info from the organisation itself you are dealing with. So first hand is better] (A 43:13)

19.3. There is a desire for simple tools to explain the concept of an energy community in a straightforward and simple way. For example animations and information packages could already be very useful for a community member.

Exemplary quotes

19.3.1. Die filmpjes [over simpele zorgwet explainer video] hebben best wat gekost, maar die waren zo heerlijk. Ik kan me ook voorstellen dat jullie zorgen dat je informatie hebt die bewoners bijna op een jip en janneke manier uitgelegd wordt. En dat het online beschikbaar is gewoon. Dat dat een taak van jullie is. [Explainer videos has Gert an good experience with. And het would see it as a nice addition to have these from Stedin's side.] (G 54:55)
19.3.2. Het filmpje van greenchoice, ik denk dat zoiets in ieder geval al handig is. Dat legt in ieder geval het verschil uit tussen opwek momenten en gebruiksmomenten. En waarom je daar dus een stap in zou kunnen zetten. Zo'n soort benadering is denk ik voor de eerste fase, en dat zou je ook voor een smart grid iets soortgelijks kunnen maken. En voor smart grids zou je iets soortgelijks kunnen maken. Dat het niet alleen maar het productie moment is maar ook de dikte van de kabel bij wijze van spreken. Dat dat de uitdaging is waar we de komende jaren voor staan. [Explainer videos detailing the benefits of a smart grid are quite a powerful tool ernst expects.] (E 51:44)
19.3.3. Greenchoice is dus vooral daar ook mee bezig. Van hoe krijgen we dat uitgelegd. Want de eerste reactie is toch van hee hallo ik heb toch groene stroom? Dan moet ik nog meer gaan betalen omdat ik nog meer groene stroom krijg? [They intricacies of always having renewable energy is a whole different thing.] (E 37:08)

19.4. The current channels Stedin has in place are insufficient for the energy communities' needs. They want specialized knowledge they can only get from the LEF team, but reaching them through the regular channels is a challenge.

19.4.1. In eerste instantie was er dus niet direct [iets mogelijk]. Aan de ene kant begrijp ik dat, maar aan de

andere kant was het natuurlijk wel een kans geweest omdat ik heb gehoord van de pilot in Hoog-Dalem dat daar heel veel tijd is gaan zitten om die bewoners mee te krijgen. Dat is iets dat wij hier makkelijk hadden kunnen regelen. Ten eerste hebben wij bewoners die mee willen doen. Ten tweede hebben we een werkgroep waarin we dat werk kunnen regelen. Dat wij dat regelen dat de bewoners meedoen, hun data delen, hun enquêtes invullen. En allemaal dat soort dingen doen. [He understands that they are already busy with hoog Dalem. But also points out that they could have been much more efficient at running things and take work away from Stedin.] (E 52:22)

19.4.2. Maar als je echt ergens mee bezig bent waar je stedin voor nodig hebt, ja dan kom je gewoon op zo'n desk terecht. En dan blijken er ook [binnen stedin] weer allemaal clubjes te zijn. De ene gaat hier over, de andere daar over. enz. [Example of A's experience of the 'non alignment' of expertise and knowledge/help within Stedin] (A 1:08:10)

19.4.3. Ik heb zelf een paar keer geprobeerd vragen te stellen over het uitvallen van die inverters, maar daar ben ik niet doorheen gekomen. Toen zeiden ze er komt een monteur aan die is met een kwartier bij u. Maar toen zei ik dat heeft geen zin, want nu is het niet zonnig. [Ernst personally also had an interaction with customer support, but this was not really helpful for him.] (E 29:12)

19.4.4. Wat ik wel weet is dat het contact nu we met die proef bezig zijn. Dat is nu zo'n altijd groen project willen doen. En daar heb ik nu twee jaar geleden contact voor opgezocht met Stedin, van hee zouden jullie willen aanhaken. En toen had ik eigenlijk bij twee kanten was ik binnen gekomen, want Stedin is natuurlijk een grote organisatie. En bij twee kanten had ik eigenlijk gehoord dat het antwoord nee was. En twee keer was het zo van we zijn nu met hoog-Dalem bezig en we kunnen niet nog meer pilot wijken er bij hebben. Dat vonden wij jammer maar zijn nu uiteindelijk met greenchoice als partner een pilot aan het doen. [The experience of interacting with Stedin was that they first were being turned away.] (E 50:30)

19.4.5. Ik hou contact met Jan daar waar nodig. [Has contact with Stedin] (14:09)

19.4.6. Dat als ik gewoon de reguliere helpdesk bel, dan zijn de vragen zo specifiek, daar kunnen die mensen gewoon niets mee. Dus ik wil altijd graag vooraf dat je een offerte aanvraagt een soort consultancy traject. [Want a kind of intake meeting with Stedin. Before he actually asks for a quote for a network connection from Stedin] (WS 34:10)

19.4.7. Heb je wel eens gelanglaufed? Langlaufers hebben de merkwaardige eigenschap dat ze tegen de heuvel oplopen. En soms vinden ze dat leuker dan naar beneden te glijden. We staan nu bovenop die helling. Dus wij zijn in 2015 in gesprek met Stedin gepraat. En we zijn steeds hogerop gekomen. En met langlaufen naar boven toe kost vreselijk veel moeite. En als je niet de goeie borstels onder je skis hebt. Dan heb ik nu de goede contacten, maar het apparaat is niet ingesteld op decentrale energieopwekking. [It feels like walking uphill to cooperate with Stedin for WB. Once you know the right people, you get an entrance. But if you don't have that, you face a steep hill.] (WB 52:07)

19.5. The existing media used by Stedin are considered good enough by community members, so they can be used for communities as well.

Exemplary quotes

19.5.1. Ik krijg altijd nieuwsbrieven met informatie van Stedin, die lees ik ook bijna altijd wel. [Stedins newsletter is being read for information as well.] (WS 35:47)

19.5.2. Ik zoek veel op online bij Stedin over tarieven en prijzen. Dat neem ik altijd mee in de businesscase. [For detailed info he goes to the Stedin site] (WS 35:29)

19.6. Community members don't have to communicate with Stedin and they almost never do this.

19.6.1. Met Stedin zelf? Nee nooit. [The community members/not lead group people never really have had contact with Stedin.] (AR 41:52)

19.7. A personal 'link' within Stedin is desired by communities, for all sorts of reasons. The most important being sharing knowledge and answering their specific questions that can't be answered by the website or general communication channels.

19.7.1. Dus wil je echt iets met Stedin samen ontwikkelen, pilot of geïnstitutionaliseerd, dan denk ik dat je als lokale club echt een soort accountmanager nodig hebt die goede access biedt. Anders krijg je toch echt een beetje een kafka gevoel. [geen gezicht hebben] [See reflection] (A 1:09:01)

19.7.2. Ik wil ook graag informatie van persoon tot persoon. [He expresses the need for personal contact.] (WS 31:58)

19.8. When nothing is happening in a community it is important to still keep in touch. Don't allow enthusiasm to curb too much. This means that if there is not changing too much, there still needs to be communication happening and material created to communicate.

19.8.1. Ik kan niet herinneren wanneer de laatste nieuwsbrief is geweest eigenlijk, maar dat zegt eigenlijk al voldoende. [Low frequency of newsletter is a bit of a let down.] (JK 26:53)

19.8.2. De kunst is om dat enthousiasme vol te houden vanuit de start. En je ziet naarmate de tijd verstrijkt dat er minder gecommuniceerd wordt. Want ja, er gebeurt niet zo heel erg veel. En ja, deadlines worden verschoven. Dan wordt het enthousiasme om er aan mee te werken wel steeds kleiner. [After a project or pilot is started there is a bit of an information vacuum.] (JK 23:03)

19.8.3. Het onderdeel marktwerking is nog helemaal niet uit de voeten gekomen. Terwijl voor een hele hoop mensen dat de belangrijkste motivatie was om deel te nemen aan pilot 2. En als je dan een jaar lang geen resultaat of geen actieve rol voor de bewoners ben je ze kwijt. [Repeating the same: no active role or responsibility for the consumers and you lose their interest.] (30:05)

20. Desired role of Stedin towards communities

What role and with what attitude is desired from the point of view of communities from Stedin.

20.1. Communities feel not taken seriously at times by Stedin, or feel they are being treated as unprofessional.

Exemplary quotes

20.1.1. Het meest belangrijke is de local communities, die ook een positie in de EU hebben. Dat Stedin die net zo serieus neemt als de gemeenten en de systeemeigenaren ... en daar dus serieuze klantrelaties mee opbouwt. Nu voel ik mijzelf geen kabouter. Maar om als kabouter behandelt te worden is heel vermakelijk, om dat zo maar te zeggen. [the current position and posture towards local energie communities is not on an equal footing with the municipalities and Stedin.] (WB 1:05:40)

20.2. Stedin is expected to be a source of information by communities

Exemplary quotes

20.2.1. Dus je moet ook niet op de stoel van de marktpartijen gaan zitten. Maar je vroeg nu om de informatievoorziening, dus informatievoorziening vind ik wel iets dat wat je zou kunnen doen. Alle producten die daar bij komen kijken daarvoor zou je dan weer [de markt kunnen overlaten]. Ik vergelijk het even met de slimme meter, Stedin heeft die uitgerold. Maar je hebt dan weer allemaal van die apps en verbruiksmanagers. Dat is weer zoiets dat op de markt is gegooid. En als je een energieleverancier of zo'n app toestemming geeft kan je via je slimme meter je gegevens kunnen uitlezen. Zo zou ik het ook willen vergelijken met Smart grids: de basis wordt door Stedin neergezet. En als je dan liever met eneco, of essent, of wie dan ook het wilt gaan gebruiken. Dat is dan de keuze aan de consument of het bedrijf. [But don't go too far: don't offer the products and take away

roles in the market] (WJ 1:09:37)
20.2.2. Minimaal kan ze [Stedin] het faciliteren, informatie en in een ruimte. [Minimal activities expected from Stedin] (G 57:47)

20.3. Stedin is responsible for tariffs, and communities want information about this from Stedin.

Exemplary quotes
20.3.1. Dat soort dingen, daar wil ik Stedin voor gebruiken [tariffs]] [Want to use Stedin for tariffs] (HW 15:42)

20.4. Communities expect Stedin to allow them and to facilitate them with (parts) of the technology and information needed to create smart grids. They also expect Stedin to actively carry out this story and help the community tell the story to their 'supporters'. In short, stedin is the facilitator, and the community the executioner and responsible party.

Exemplary quotes
20.4.1. Nou in dit voorbeeld zou de rol van Stedin zijn om de LEF technologie te leveren. En ook om de documentatie en het verhaal te leveren waarom dit belangrijk is voor de energietransitie en dat ook even samen met de lokalen [de coöperaties] uit te willen dragen. [Stedins role is elaborated: focus on documentation and telling the story.] (1:00:08)
20.4.2. Dat je als netbeheerder samenwerkt met zo'n milieu centraal waar de informatie dan te vinden is. En dat je voor innovatieve bedrijven of wijken zoals wij dat je dan vanuit Stedin zelf diensten hebt die je als wijk kan inzetten. [The role is for the grid operator to provide the tools and services.] (WJ 1:07:21)
20.4.3. Jullie zijn een beetje de prorail van de NS. Jullie realiseren het fysieke. En wij zijn de beheerder van het fysieke. [How he sees the role distinguishment between Stedin and the community.] (G 33:00)
20.4.4. Dat soort concepten vind ik iets van jullie, de organisaties. Waarbij ieder concept eigenlijk iets van een voordeel heeft inplaats van een nadeel. [Stedins job to think of good solutions.] (G 46:39)

20.5. The primary role of Stedin is according to communities still the same: they should install, operate and maintain the electricity grid.

Exemplary quotes
20.5.1. Ik denk dat Stedin gewoon de partij is die het beheer doet van de techniek. Wat dat dan ook is. Dus de aansluiting, de meters bij mensen thuis. De hele kabel infrastructuur. Dat zou de rol van Stedin zijn. [He sees the same role for Stedin as they currently do. Only the technical aspect can be expanded on of course.] (WS 48:01)

20.6. Communities acknowledge that the customer group of Stedin is changing, and they sense Stedin is not yet fully equipped to deal with this shift. Where they previously only had to deal with either very large clients (e.g. municipalities or industry) they now get a new medium sized target group to deal with: energy communities. This requires a different approach.

Exemplary quotes
20.6.1. Naast de business to business markt moet er misschien wel een business to prosumer markt ontstaan. En dat is een hele andere houding. [Stedin needs to talk a different language to prosumers then to busines clients] (1:06:30)

21. Collaborating with Stedin
Communities have a preference for working together with Stedin. This is resulting from where knowledge is concentrated and hardware needed from Stedin.

21.1. When Stedin wants to cooperate with an (aspiring) energy community they should get on their level and make it relevant for the community and its leaders specifically. Issues like congestion are not of concern for community members. However, a tight community and being future proof are issues of concern for example. And these are the people that Stedin will have as their customers in the future.

Exemplary quotes
21.1.1. Het moet in ieder geval een begrijpbaar verhaal zijn. En duidelijk toegevoegde waarde hebben. En dan denk ik niet perse alleen aan geld. Dan denk ik ook aan duurzame argumenten. Daarnaast als er voor de organisatie de groene Regentes een aantal taken bedacht worden dan moeten dat taken zijn die met ons niveau uitgevoerd kunnen worden. [Clearly states what a community would need to start: clear benefits, relevance and a good division between tasks that the cooperative can do or Stedin/third party needs to do.] (WS 58:36)
21.1.2. Dus dit soort lokale gemeenschappen, ook al hebben ze soms niet de juiste tone of voice. En kunnen ze fase ongelijkheid niet begrijpen, of die weten niet wat congestie is. Of de zeven of acht handelsmarkten die er zijn. En doorzien dat allemaal niet. Dat zijn wel de .. waar mensen dadelijk in meegenomen moeten worden. Ze hebben dadelijk een andere vorm van klanten. Die keten draait dadelijk om. [Predicting how it will all change and the energy system will shift it's centre of mass towards local renewable energy. Even though de energy communities don't get all the problems.] (WB 1:05:56)

21.2. Communities and their leaders have a need for data from Stedin, since this can help them strengthen their story.

Exemplary quotes
21.2.1. Het zou mooi zijn als je de mensen die meedoen in een coöperatie, allemaal een slimme meter hebben. En dat de gegevens uit die slimme meter dan als coöperatie zou kunnen inzien en beheren. Dat je een directe afrekening kan maken. [New idea for how to use the cooperative more as a real energy supplier.] (WS 48:38)

21.3. Finding an 'entrance' into Stedin can be challenging for communities. They don't really know where to go right now. The regular channels are not up for the job. and only once they have connections within Stedin they feel like they can get further with their community energy project. (However, it is acknowledged that this is improving.)

Exemplary quotes
21.3.1. Het is tot noch toe een lastig proces geweest om met Stedin tot zaken te komen. Maar mijn laatste indruk is dat er tot noch toe wel stappen gemaakt worden. Het is een stuk positiever geworden. [The customer experience and collaboration got much better with Stedin for energy cooperatives.] (WS 29:01)
21.3.2. In eerste instantie was er dus niet direct [iets mogelijk]. Aan de ene kant begrijp ik dat, maar aan de andere kant was het natuurlijk wel een kans geweest omdat ik heb gehoord van de pilot in Hoog-Dalem dat daar heel veel tijd is gaan zitten om die bewoners mee te krijgen. Dat is iets dat wij hier makkelijk hadden kunnen regelen. Ten eerste hebben wij bewoners die mee willen doen. Ten tweede hebben we een werkgroep waarin we dat werk kunnen regelen. Dat wij dat regelen dat de bewoners meedoen, hun data delen, hun enquêtes invullen. En allemaal dat soort dingen doen. [He understands that they are already busy with hoog Dalem. But also points out that they could have been much more efficient at running things and take work away from Stedin.] (E 52:22)
21.3.3. Pas toen ik in de Baarnse klimaat alliantie zat kreeg ik een soort kanaal met een accountmanager. Die

overigens wel alweer vervangen is. [Example of that once you know someone within Stedin that is get easier to get into] (A 1:07:40)
21.3.4. Twee jaar geleden hebben we ze gelijk benadert. Toen kregen we te horen interessant, maar doen we niet. [Stedin was at first not interested in the initiative] (E 29:12)
21.3.5. Het bleek dat de club die [bij PCR zoutloos] niet de kanalen had om dit [de aansluiting, EAN nummers] niet had om dat allemaal te regelen. Er ging veel tijd overheen. [Again, example of that it can be tough to get into Stedin.] (AH 1:07:11)
21.3.6. Het lastige is je hebt natuurlijk nooit een telefoonnumer. Dus je belt maar gewoon het algemene nummer. Dan krijg je te horen het wordt uitgezocht, en dan wordt je niet teruggebeld. En dan bel je nog een keer iemand, dan is het weer iemand anders. [Experience of trying to get into stedin without an account manager.] (AH 1:09:10)
21.3.7. Ook het hele management systeem is een top-down systeem. Bestuurlijk, wetgevingstechnisch, management is gebaseerd op een top-down systeem. [The energy sector in general is organized in a top down way: this means there is not a lot of room for energy cooperatives/communities.] (WB 52:07)

21.4. Communities believe they are really helping Stedin with their energy community initiatives, and therefore also expect help from Stedin.

Exemplary quotes
21.4.1. Ik vind het LEF concept conceptueel een ontzettend goed concept. Ik heb genoeg gehoord over de problematiek van Stedin om voldoende capaciteit aan te leggen. [Understands the need for LEF, because of net congestion.] (AH 38:40)
21.4.2. [Ik begrijp] dat als je op kleine en middelgrote projecten aan peakshaving doet, dat dat heel veel waarde heeft (voor een netbeheerder). De huidige situatie in Nederland is dat we daar nul aan doen. Want we hebben een systeem met verrekening van zonnepanelen die iedereen toestaat elektriciteit op het net te donderen zonder kosten en dus niemand stimuleert om zelf die stroom af te nemen, zoals je in sommige landen bijvoorbeeld wel hebt. [Understands that flexibility has value for DSOs] (AH 39:10)
21.4.3. Op een dergelijke wijze dat er zo min mogelijk maatschappelijke kosten gemaakt worden. We moeten het niet zwaar maken maar slim maken. [He believes by implementing a smart grid they can save society a lot of money.] (WB 24:54)
21.4.4. Dat betekent dat we ook aan het transactiemodel van de toekomst werken. Dat is ook hetgeen waar Stedin ook in geïnteresseerd is. [They express what Stedin is interested in: the transaction model of the future.] (WB 36:46)
21.4.5. Die verzwaring zitten meerdere uitdagingen nodig. Daar is ontzettend veel kapitaal nodig. [WB acknowledges the big financial hurdles there are when just reinforcing the grid and not making is smart.] (WB 54:03)
21.4.6. Zij zoeken dus eigenlijk vanuit een elektriciteitsbedrijf naar hetzelfde als van een infrastructuurbedrijf zoekt. Hoe kunnen we een betere match krijgen tussen verbruik en opwek. En zij willen ons dus garanderen en willen kijken of er bij voorlopende klanten zoals bij ons een vraag is voor een product dat zegt je hebt altijd elk moment van de dag op uurbasis of kwartierbasis 100% groene stroom. Daarvoor gaan ze onze data dus heel nauwkeurig analyseren en gaan dus kijken hoe dat match met onze zonneproductie maar ook hun windproductie. En uiteindelijk kan daar dan uit voort komen we hebben bijv nog voor zoveel kwh opslag nodig in de wijk of elders. Dus dat is een beetje onze historie. [Their partnership with greenchoice is really a more commercial one: can they realize the product 100% green? Is there a market for this?] (E 9:42)

21.5. Communities and DSOs follow a completely different pace. Stedin is used to long and far horizons in their projects. However, communities are on a different timescale and used to different paces in projects. This difference in perception can create friction when not make explicit.

Exemplary quotes
21.5.1. Voor een energiebedrijf is het een lange adem, maar dat zijn ze gewend. Bewoners en particulieren willen graag korte stappen. Dit is waar we aan toe zijn en dit willen we bereiken. En dat moet binnen zo kort mogelijke termijn. [Customers and DSOs/pilot partners have a whole different pace of working and expect a different pace. The dso is much more used to slow working.] (JK 24:10)

21.6. When an aspiring community gets to Stedin, they don't know what they want yet or what is possible. So Stedin might talk them out of things that are unfeasible. This can feel as a bit of an annoyance at first, but when changing the plans the community acknowledges and respects this 'no' from Stedin.

Exemplary quotes
21.6.1. We hebben toen uiteindelijk een oplossing gekozen die schaalbaar is. We zijn van een projectnet status naar een groot experiment gegaan. Dat is een verstandig gemeenschappelijk besluit geweest. Dus die weerstand die heeft uiteindelijk tot warmte geleidt, ook binnen Stedin. [The initial struggles to get on the same page led to a better mutual understanding and cooperation with Stedin.] (WB 56:51)

21.7. Non-innovator communities expect Stedin to be professional and have a well working product, they can't be expected to have the patience and persistence of the pioneering communities.

Exemplary quotes
21.7.1. Wil je echt serieus projecten doen, dan moet dat gewoon behoorlijk goed geregeld zijn. [LEF projecten] Want je bent als lokale club ook gewoon gehouwen om wat te produceren. En als je met een instituut samenwerkt dat niet levert dan is dat wel een probleem. [Has high expectations of Stedin and wants quite a lot.] (AH 1:10:40)

22. Image of Stedin
The image of Stedin is that they are a valuable source of knowledge but also can be a slowing factor.

22.1. People see Stedin as a 'rule maker' (market facilitator), so when something is not allowed or possible by Stedin this is seen as Stedin's political choice. Even tough this is not the case and is simply dictated by law or regulations.

Exemplary quotes
22.1.1. Ik mag nu niet de stroom van mijn buurman afnemen en andersom. Dat is natuurlijk ook een politieke keuze. [points out it is a choice to make it illegal to trade electricity locally] (WJ 18:39)
22.1.2. Jullie als Stedin, zouden dat natuurlijk al kunnen regelen. Dat is iets wat makkelijk kan. Maar het mag nu nog niet. [The reality is different than the conceptual level.] (WJ 18:42)

22.2. Stedin is seen as a party that is hard to collaborate with. However, most people acknowledge also that this is mainly based on experiences in the past and see that Stedin is really improving in the customer centricity area.

Exemplary quotes

22.2.1. Nou Ja, Stedin is niet een heel makkelijk accessible bedrijf is mijn ervaring. [Stedin can be hard to get into for information and collaboration.] (AH 1:06:39)

22.2.2. Het eerste project opzetten ging goed met Stedin, maar de uitvoering duurde nogal. We hadden het dak al lang klaar en toen pas een maand later werd de aansluiting gerealiseerd. [Hiccups like this take the pace out of a project and leave a suboptimal experience] (WS 30:02)

22.2.3. Voor een nieuw project ben ik weer bij Stedin geweest om daarover te praten. en de mensen hebben heel goed meegedacht. Dus wel goed om te zien dat dat aan het veranderen is. [Wim experienced Stedin over a long period, almost 10 years. And he found that it is improving in the right direction.] (WS 31:05)

22.2.4. Dus contacten met Stedin? Wisselend. En nu de laatste keer erg leuk omdat ze zoiets hadden van hee, dit sluit wel erg aan bij het project in Gorinchem en andere projecten die wij hebben. [Only when Ecowijk Mandoras plans developed a bit further they started to get some traction with Stedin.] (E 31:06)

22.3. Stedin is an important player in the energy transition according to communities

Exemplary quotes

22.3.1. Over 10 jaar is Stedin heel belangrijk. En de abonnementsprijs voor de aansluiting. En de energie is gratis. Dus dan moet je naar hele andere vormen van dienstverlening. [Shares his prediction again, that Stedin wil be crucially important.] (WB 1:03:34)

22.4. Communities acknowledge Stedin has the power to have a positive impact on society, and hope that Stedin does take this opportunity.

Exemplary quotes

22.4.1. Als jullie als Stedin invloed kunnen uitoefenen op de mensen als verbinding onderling, of ook een verbetering van het sociale leven. Dan voeg je iets toe waar mensen vaak zelf in het heden nog niet over vragen. [G urges Stedin to take a holistic view when improving the sustainability of their customers and coming up with solutions] (G 45:54)

Sector level

23. The complexity of setting up an energy community

Because of the low maturity of energy community technologies and knowledge the ordeal of setting up an energy community is still a very complex and long process.

23.1. Starting your own energy community is a very complex affair. Aspiring energy communities (communities who are still in the process of setting up an energy community or have not started at all) don't have the knowledge themselves and need an outside expert source for this. This source can be Stedin but also a service provider.

Exemplary quotes

23.1.1. Conceptueel is dit nog helemaal niet zo simpel om uit te leggen. Dus daar heb je nog wel wat voor nodig om dat goed te doen. En ik denk dat je daar wel professionele assistentie bij nodig hebt. [Aart expresses the need to have simple tools to explain the LEF concept.] (A 1:00:07)

23.1.2. De techniek wordt uitbesteed en aangeleverd. [have a service provider] (H 23:35)

23.1.3. We hadden iemand die het hele proces is gaan leiden, Katja van der Valk. Zie is het hele project gaan trekken vanaf het begin. Zei is eigenlijk ook losgekoppeld van ons als bewoners. En dat was ook wel nodig, want je bent wel echt zo betrokken zowel emotioneel als met je persoonlijke voorkeuren. Dus zei was eigenlijk wel iemand die constant de lijn weer terugbracht: verhitte discussies moesten soms ook gewoon even stilgelegd worden om verder te komen. Anders kom je er niet uit en stagneert het. [Heated discussions and a person to pull the project that is not involved in the process was really helpful.] (J 11:57)

24. Empowering pioneers

There are different types of people: all the way from innovators tot aan late laggards and they all become active at different 'technology readiness levels' of smart grids.

24.1. To create momentum around an innovation you need to attract and empower the right people in the right phase. Forcing the early majority to innovate takes a lot of time, and skipping the innovators upsets them and creates resent.

Exemplary quotes

24.1.1. In eerste instantie was er dus niet direct [iets mogelijk]. Aan de ene kant begrijp ik dat, maar aan de andere kant was het natuurlijk wel een kans geweest omdat ik heb gehoord van de pilot in Hoog-Dalem dat daar heel veel tijd is gaan zitten om die bewoners mee te krijgen. Dat is iets dat wij hier makkelijk hadden kunnen regelen. Ten eerste hebben wij bewoners die mee willen doen. Ten tweede hebben we een werkgroep waarin we dat werk kunnen regelen. Dat wij dat regelen dat de bewoners meedoen, hun data delen, hun enquêtes invullen. En allemaal dat soort dingen doen. [He understands that they are already busy with hoog Dalem. But also points out that they could have been much more efficient at running things and take work away from Stedin.] (WJ 52:22)

24.1.2. En ik ben dus ook vanuit mijn werk bezig met aardgas vrije wijken. Dus bestaande wijken hoe kunnen we die aardgas vrij maken. En dan wordt er vaak gekeken naar waar zit er een grote warmtebron. Vaak is dat een datacentrum. Of een andere industrie. Maar er wordt niet vaak gekeken waar zit er een bewonersinitiatief, die al actief is. En dus eigenlijk voor het lastigste deel kan helpen. Dat zou eigenlijk mijn punt zijn/advies richting Stedin: (en andere partijen): die bewonersinitiatieven zijn misschien wel de belangrijkste die je wilt hebben. Want die bewoners weet je niet of ze wel mee willen doen. [The difficulty is in the inhabitants:] (WJ 54:42)

24.2. Energy transition players should be mindful of not putting too much on the plate of communities as well without helping the community: this creates resentment. So while communities should be able to organize themselves and do work themselves (which is actually beneficiary to the result of a community project as seen in an other theme) this should be done in cooperation with the bigger players (like Stedin and communities).

Exemplary quotes

24.2.1. Er zijn mensen in de ELP (elektrische laadpaal) wereld die denken graag mee, maar zodra er een nieuwe laadplein oplossing gekozen moet gaan worden en er moet geïnvesteerd worden in een buurt batterij en bidirectionele laadpalen. Dan moet er in geïnnoveerd worden. Zo'n deelauto concept dat wij dan moeten gaan starten. Dan mogen wij de publieke ruimte gaan inrichten. De gemeente snapt het niet, Stedin kan het niet, en wij moeten het dan gaan doen met 33 bewoners die geen probleem hebben met hun energierekening? Dus daar moet een oplossing gevonden worden. [WB calls out the blind spot and kind of 'strangle hold' that exists for innovation right now. Stedin can't offer more services: because they are not allowed to do this! The market is the only person to realize this. But that means Stedin needs to want to collaborate with the market.] (WB 1:10:06)

25. Global versus local

Stedin can protect or be a voice for communities on the national level.

25.1. By making energy production decentralized communities are taking over the role of energy producers. This threatens their business and they could try to slow down energy communities. In order to be able to stand up to energy producers energy communities expect Stedin to voice their interest on a national level.

Exemplary quotes

25.1.1. Wat ik vind, ik vind dat als wij minder energie het net op sturen dat wij ook een verlaagde kosten hebben. Dus Stedin moet zich daarvoor inspannen. Wat je ziet is dat de belangen van de ACM, dusdanig is dat Stedin niks te vertellen heeft. [Is regulated too much, according to HW] (HW 15:04)

25.2. The democratisation of the energy grid and keeping the benefits local is important for energy communities. They are sceptical of the big electricity companies (like Eneco), because they are always after profits. Stedin is different: since it is a semi-public institution they are seen as more trustworthy and more likely to act in the benefit of the community

Exemplary quotes

25.2.1. In feite zeg je het al. Als de windmolen boven mijn hoofd zoeft: en de winst gaat alleen maar naar de eigenaar daar van en niet naar mij. Dan ontwikkel ik weerstand. Dan zeg ik hoezo? [NIMBY can be turned around by making the affected people co-owner] (47:45)

25.2.2. Echt op smart grids gericht? Ja dan vind ik toch gewoon Stedin eerlijk gezegd als netbeheerder. Kijk, de rol van netbeheerder verandert van stroom van de ene plek naar de andere plek brengen naar dat ook de stroom teruggaat van de plek waar de consument zit of dat bedrijf. Ik zou het veel prettiger vinden dat die rol wordt opgepakt door de netbeheerder, dat daar een onafhankelijke rol zit. Dan dat wat nu gebeurt veel energieleveranciers er een rol in pakken, en dan zit er dus weer een commercieel verhaal aan vast. Dan moet je of 10 jaar klant bij ze zijn. Of dan moet je een speciaal product van ze afnemen. Dus wat mij betreft het liefst als onafhankelijke netbeheerder zou ik de informatie hierover bij Stedin willen halen. Als het dan om de consumenten kant gaat bijvoorbeeld een samenwerking met milieucentraal. [WJ's argumentation and preferred role for Stedin is to take a neutral position and be the information provider.] (WJ 1:07:05)

26. Desired role of other stakeholders

Sometimes communities also commented on the role of other key stakeholders, like service providers or municipalities. The opinions vary on who should be in the lead: Stedin, municipalities, HierOpgewekt or the service provider?

26.1. Municipalities are also expected to take an active role by communities, specifically on demanding sustainable solutions.

Exemplary quotes

26.1.1. Ik denk dat de gemeente in de toekomst wel veel meer een sturende rol kan hebben. Omdat die ook bij vergunningen van woningen en bouw misschien wel kan gaan eisen dat er meer aan duurzaamheid gedaan moet worden. En bijvoorbeeld kan gaan kijken naar dat je zodanig kan gaan kijken naar een community zodat er centraal een accu in de wijk geplaatst kan worden. [In the future a bigger role is expected by John for the municipality.] (JK 43:50)

26.1.2. Wat wij doen als groen clubje is steeds zeggen tegen de gemeente 'je moet meer doen'. Dus wij zijn ook een beetje de luis in de pels van de gemeente. [Enjoys making sure the municipality their plans are scrutinized.] (AH 13:41)

26.1.3. Ik vind dat de taak van de gemeente. Dus er zit ook een dwang op. Dat weten we ondertussen, dat weet heel Nederland. Daar hoef je geen discussie over te hebben, maar de manier waarop je dat uitrolt. Ik vind dat de overheid en de energiebedrijven daar een primaire taak in. Om dat gewoon op een zo gebruiksvriendelijk mogelijke manier uit te rollen. [It is the job of the bigger players to get actively involved in solving the energy transition in a user friendly way according to G] (G 44:18)

26.2. Municipalities are just like Stedin, sometimes a challenge to work with.

Exemplary quotes

26.2.1. Het kost erg veel energie om die aandacht ook binnen het gemeentelijk apparaat te verwerven. Want iedereen is voor participatie, maar op het moment dat je dan de gemeente vraagt. hoe geven we dan inhoud aan 50% lokaal eigendom dan is dat ook ingewikkeld. [The climate agreement about 50% renewable in community hands is still hard to really put on local governments their agendas.] (WB 48:40)

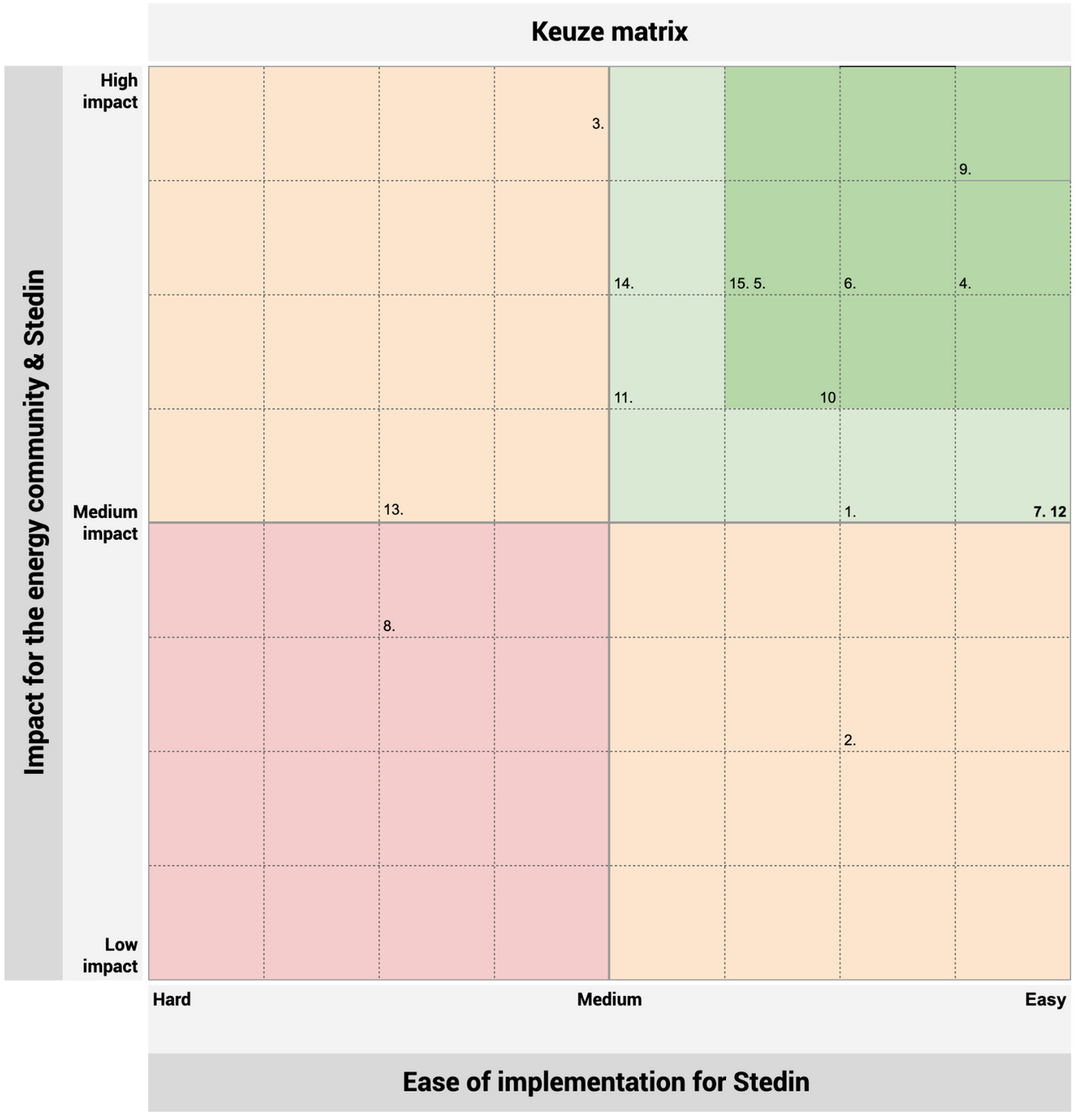
26.2.2. Wij mogen de gemeenten niet voor de voeten lopen als burgerinitiatieven. Dus de gemeente is er voor de gemeente en niet voor de bewoners. [Is a bit hung up about the municipality. WB feels like they are not there for the civilians, but just for themself.] (WB 48:50)

26.3. It is the role of the government to create the 'rules of the game' and allow communities to exist.

Exemplary quotes

26.3.1. Maar ik denk dat het ook de rol van de overheid is om nieuwe spelregels neer te zetten. Maar ik denk dat er op een gegeven moment wel een hoger maatschappelijk belang is, dat overstijgt dan de individuele belangen. [The government is allowed to take action according to WJ and change the rules] (WJ 16:09)

APPENDIX J - RESULTS CO-CREATION



Idee:

1. Ratingsplatform lanceren bij HIERopgewekt en de virtuele markt aldaar met echte contacten plaats laten vinden.

2. Een workshop pakket van Stedin dat een community kan spelen. Daarbij kunnen ze achter elkaars wensen komen en leren wat belangrijk is binnen de groep en wat niet.

3. Verbruiksdata van de deelnemers onderling tonen om verschillen inzichtelijk te maken. Dashboard welke meerdere communities met elkaar kan vergelijken. Daarmee wordt het community concept en de potentie al eerder inzichtelijk en draagt bij aan de motivatie om mee te doen.

4. Een overzicht maken van voorbeelden van energycommunities gebaseerd op praktijkcases, en gestructureerd op de drijfveren, doelen, manier waarop wordt samengewerkt en de uitvoeringsvorm.

5. Een vereniging van communities starten die met elkaar resultaten uitwisselen. Een webinar geven op reguliere basis voor nieuwe geinteresseerden. Partijen vinden die het model actief promoten en aanmoedigen. (Bv servicepartijen of gemeenten)

6. De duurzame, sociale en financiele voordelen geven van toetreding in een energie communitie.

7. Lever een duidelijk template aan van een projectschets dat een community kan invullen.Dit kan bijvoorbeeld via de LEF omgeving op de Stedin website. Of via een ander kanaal (hieropgewekt)

8. Hangt van je doelgroep af. Voor developpers kan je prima open source omgevingen gebruiken als GitHub. Maar voor een EC moet het makkelijker worden. Denk aan een Appstore of een objectieve rol als Consumentenbond. Zodat je daarin geen precedent schept tussen aanbieders van het LEF / LES concept.

9. vastleggen van verwachtingen, rollen en verantwoordelijkheden.
maak je ambities duidelijk; fomuldeer je innovatie onderzoeksdoelen.

10. Algemeen voorbeeld geven van een business case en de opbouw en verantwoordelijken voor uitvoering en compliance

11. Kwaliteitswaarborging. Toepassing van LEF als keurmerk. Deze eisen vooraf duidelijk maken en ook de voordelen van de eisen inzichtelijk maken

12. Mijn voorkeursantwoord gaat uit naar het automatiseren en daarmee verlagen van de werkdruk en maatwerk. Net als RVO kan je denken aan een aantal standaard invulvelden die ingevuld moeten zijn van het projectplan.

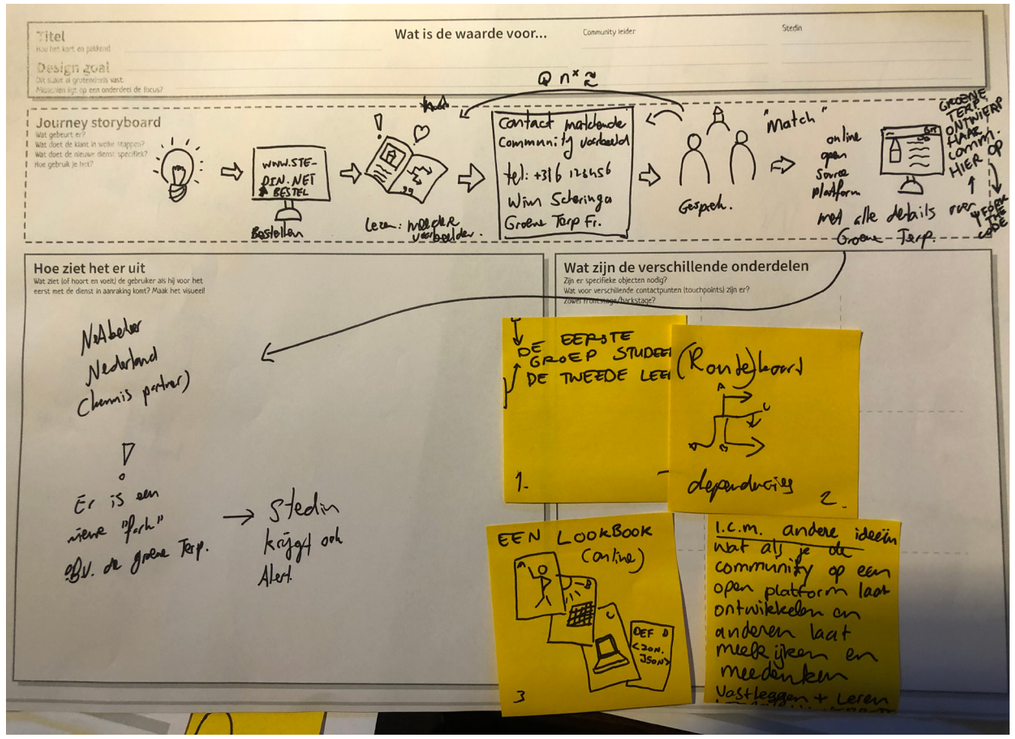
13. biedt een (gratis) simulatie model aan. laat de leden van de EC hier 3 maanden meet werken.

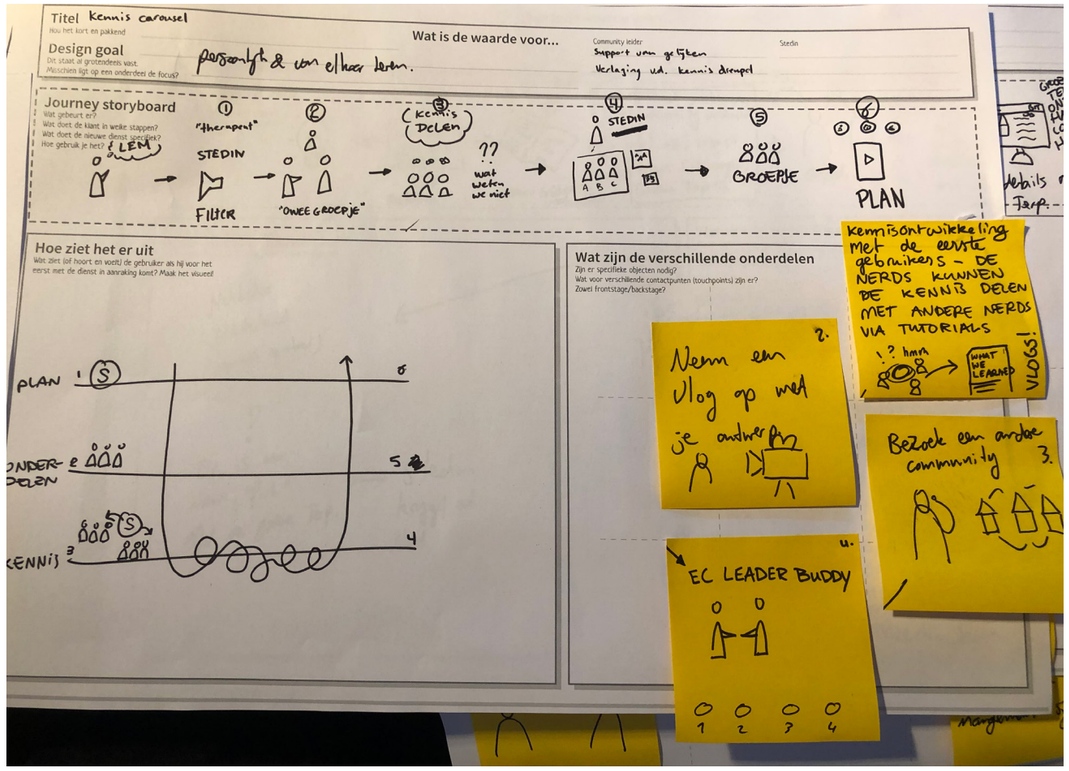
14. eigen omgeving op Stedin.net met achterliggende open data (niet voor iedereen toegankelijk)

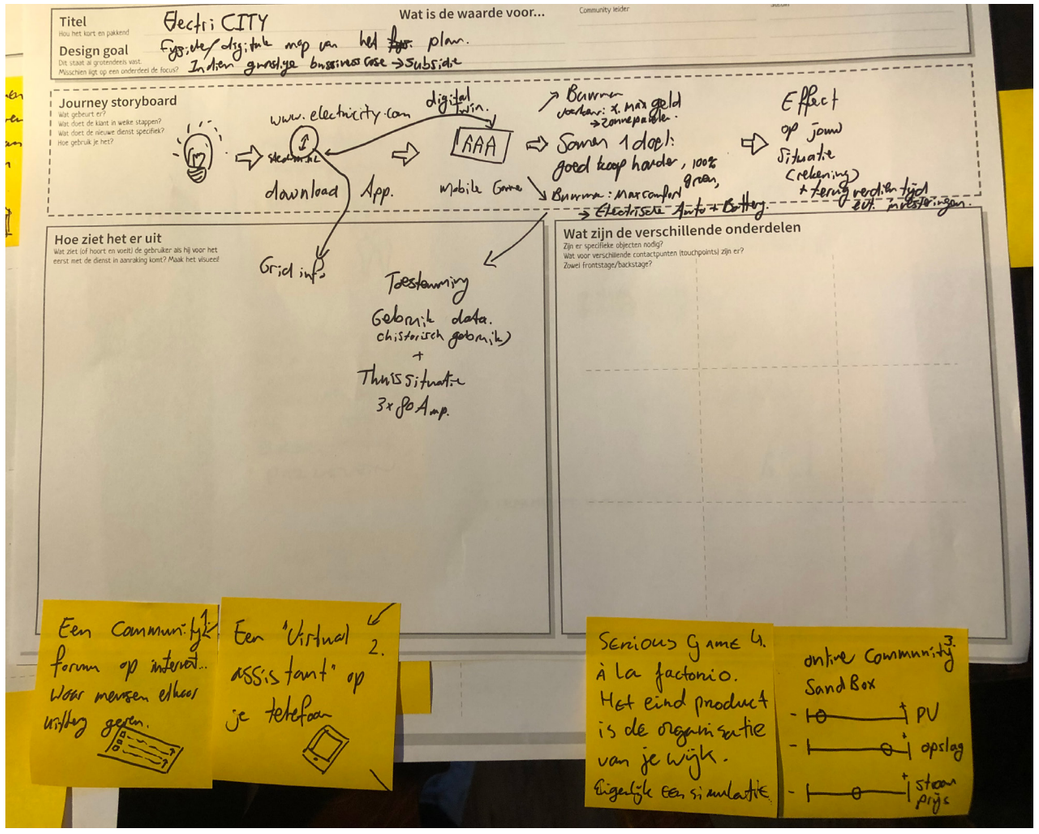
15. Duidelijke goverance voor het opstellen van het design. Momenten voor inspraak, maar het ook leuk en concreet maken. Continue meenemen: what is in it for me and them?

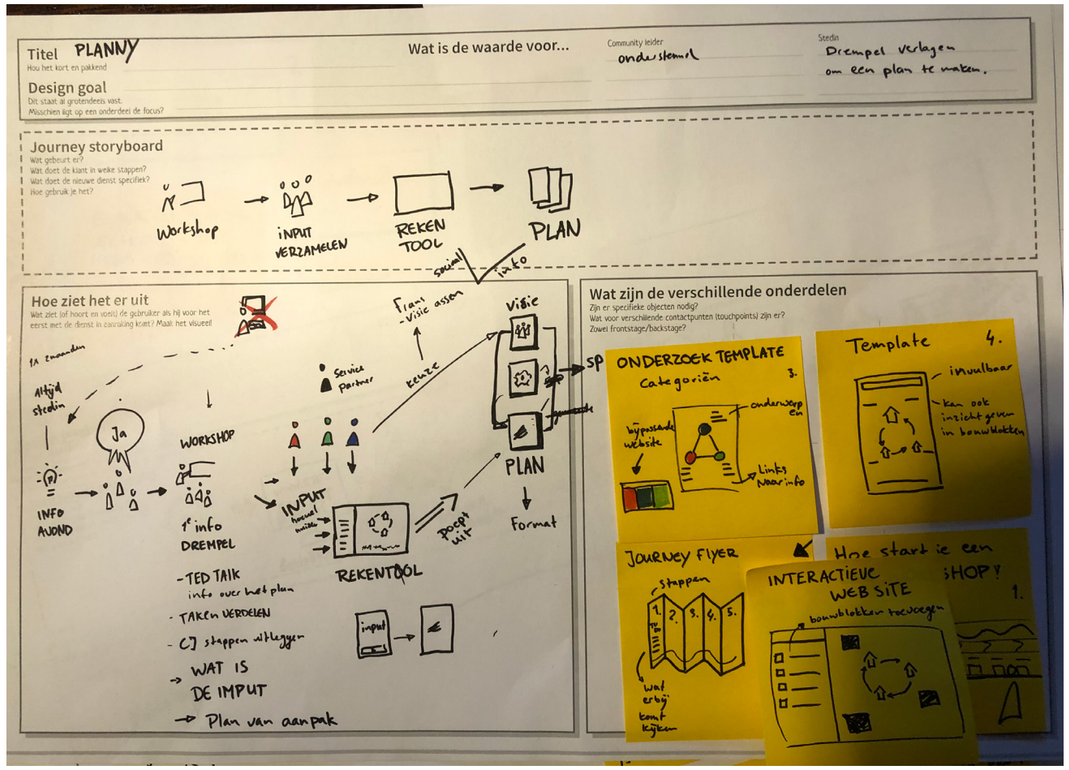
APPENDIX K - BRAINSTORM

Activity name	Description	Duration (min)	Start time	end time	Timing	Format
Preparation	setting everything up, putting up the materials	30	16:30	**17:00**	-	-
Walk-in	Getting everydody ready, preparing to start, write post-it if arrive with funny silly/story	15	17:00	**17:15**	-	-
Ice-breaker: get silly	Get silly, write an embarassing/funny/silly story about yourself on a post-it and fold it, throw in the circle. Everybody picks a post it and one by one read it out. You have to guess who it is.	5	17:15	**17:20**	~1 minute each	Plenary
designbrief Mindmap	Share design brief, people write out all the questions they have about it in a mindmap	15	17:20	**17:35**	-	Plenary
Purge	A braindump of the first ideas solving the designbrief, to be put up on a piece of larger paper. Green post-its	5	17:35	**17:40**	-	Write on post-its
Idea sheets ideation	On everyone's idea sheet they write the sub problem statement on top. Then go round the table with each sheet. On yellow post-its	25	17:40	**18:05**	Four times 5 minutes	Plenary, go round the table. Write/draw in silence
	Break	5	18:05	**18:10**		
Present criteria	Show the criteria. Only show this when the participants seem stuck. Otherwise avoid to keep the creativity flowing and the atmosphere very open	5	18:10	**18:15**		Plenary
create concept service proposition	The participants (including the facilitator, so 4 times) create in teams of 2 a concept service proposition. This is done twice, so after this activity there are four service propositions	40	18:15	**18:55**	Two times 20 minutes	In teams of 2 by 2.
Plenary present the proposition	Briefly present proposition to each other, and then the other two write the Plus, minus and interesting on a post it and put it on the sheet	15	18:55	**19:10**	3 minutes presenting per concept sheet	1 person presents

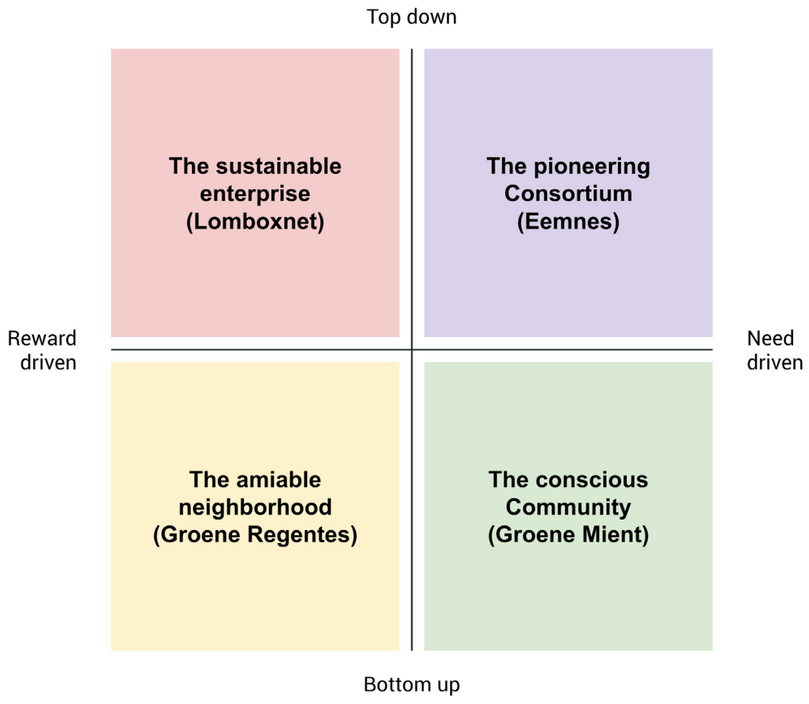

Titel
Design goal
Wat is de waarde voor...
Community leider
Stedin
Journey storyboard
Wat gebeurt er?
Wat doet de klant in welke stappen?
Wat doet de nieuwe dienst specifiek?
Hoe gebruik je het?
www.STE-DEN.NET
Bestellen
Contact makkelijk
Community voorbeeld
tel: +316 123456
Wim Scheringa
Groene Torp Fr.
Gesprek.
"Match"
online open source platform
Hoe ziet het er uit
Wat zijn de verschillende onderdelen
Zijn er specifieke objecten nodig?
Wat voor verschillende contactpunten (touchpoints) zijn er?
Zowel front stage/backstage?
Netbeter Nederland (Kennis partner)
Er is een nieuw "park" bijv. de groene Torp.
Stedin krijgt ook Alert
DE EERSTE GROEP STUDEE
DE TWEEDE LEE
(Roadschool)
dependency
2.
EEN LOOKBOOK (online)
3
I.c.m. andere ideeën wat als je de community op een open platform laat ontwikkelen en anderen laat meekijken en meedenken
Vastleggen + Leren


Titel kennis carousel
Design goal
persoonlijk & van elkaar leren.
Wat is de waarde voor...
Community leider
Support van gelijken
Verlaging vd. kennis drempel
Stedin
Journey storyboard
LEM
"therapent"
STEDIN
FILTER
"OWEE GROEPJE"
KENNIS DELEN
wat weten we niet
GROEPJE
PLAN
Hoe ziet het er uit
Wat zijn de verschillende onderdelen
PLAN
ONDER-DELEN
KENNIS
Neem een vlog op met je antwoorden
2.
Kennisontwikkeling met de eerste gebruikers - DE NERDS KUNNEN DE KENNIS DELEN MET ANDERE NERDS VIA TUTORIALS
WHAT WE LEARNED
VLOGS!
Bezoek een andere community
3.
EC LEADER BUDDY
4.


Titel
Electri CITY
Design goal
Fysieke/digitale map van het plan.
In één gunstige business case → Subsidie
Wat is de waarde voor...
Community leider
Journey storyboard
www.electricity.com
digitaal loket
AAA
Banner verkoop: + max geld → zonnepanelen
Samen 1 doel: goed koop handel, 100% groen,
Banner: marcomplan
→ Electrische Auto + Battery
Effect op jouw situatie (verlening + terug ontvangen tijd zelf investeringen
download App.
Mobile Game
Gratis info
Toestemming
Gebruik data. (historisch gebruik)
+
Thuissituatie
3x fase Amp.
Hoe ziet het er uit
Wat zijn de verschillende onderdelen
Een community form op internet.. Waar mensen elkaar vragen gaan.
Een 'virtual assistant' op je telefoon
2.
Serious Game à la factorio. Het eind product is de organisatie van je wijk. Uiteindelijk een simulatie
online Community Sand Box
PV
opslag
stroom prijs


Titel PLANNY
Design goal
Wat is de waarde voor...
Community leider
onderstemd
Stedin
Drempel verlagen om een plan te maken.
Journey storyboard
Workshop
INPUT VERZAMELEN
REKEN TOOL
PLAN
spiegel
info
Hoe ziet het er uit
Wat zijn de verschillende onderdelen
1x samenkomen
altijd stedin
INFO AVOND
Ja
WORKSHOP
1e info DREMPEL
Service Partner
Plan - Visie assen
Visie
Beurze
SP
INPUT
REKENTOOL
PLAN
Format
-TED TALK info over het plan
-TAKEN VERDELEN
-CJ stappen uitleggen
→ WAT IS DE IMPUT
→ Plan van aanpak
ONDERZOEK TEMPLATE
Categoriën
3.
onderwerp en
Links naar info
bijpassende website
Template
4.
invulbaar
kan ook inzicht geven in bouwblokken
JOURNEY FLYER
stappen
Wat erbij komt kijken
INTERACTIEVE WEB SITE
bouwblokken toevoegen
Hoe start je een SHOP?
1.

APPENDIX L - USER PROFILES AND STORIES



The conscious Community (Groene Mient) (Social) / Willem Schaker	Form a community with an ecological vision focussed on building a CPO project housing. The housing is built and everything finished. The community is up and running.	The need to do more and take their sustainability ambitions a step further arises. The ambition to become a self sufficient community that generates all their electricity is formed within the community. Possibly even autarkic.	Willem starts a projectgroup 'renewable energy' within the community and starts researching the possible opportunities of forming an energy community.	He finds the Stedin website through google and signs up for more information and to stay up to-date.	He starts researching what is possible in Stedin's operating area in terms of forming an Energy Community by ... [reviewing casestudies of other communities]	The projectgroup is very excited of the possibility to start using LES. They feel they can tailor this to their needs. To find out what they exactly want they hold multiple community meetings where they create different scenarios, based on information from Stedin.	Based on the input during the meetings they decide to go through: the community is enthusiastic and came to a consensus with full support for one of the scenarios.	The project sketch is filled in so they have a first outline of their project	Communicate the project sketch to Stedins [KDO? KAM?] and go over the plan together with Stedin to review it for feasibility	Relay the plan to possible partners (municipality, service provider), obtain grant, form a project team etc.
	Community origin	Realizing	Seeking	Discovering	Learning	Ideating	Resonating	Finalizing	Communicating	**Next Step**
The sustainable enterprise (LomboXnet) (Engineer) / Robert	Robert owns the car sharing company GreenDrive. This company was founded as an alliance between his installation services company and the municipality of Utrecht. By working together with multiple neighborhoods they grew into the biggest electric car sharing service in the Netherlands.	Robert gets interested in starting an energy community in his area when he hears about the Hoog-Dalem pilot. He thinks LES can bring new business to his electric car sharing company and extend their businessmodel.	He calls an expert to ask for advice. This is Leo, who works at one of the service providers that they have contracted in the past to build their charging stations	Leo, having worked closely with Stedin when installing charing stations for numerous clients, directs Robert to the Stedin community environment.	The innovation officer at GreenDrive gets the task to research the possibilities by using the Stedin community environment and come up with a plan. Using the Stedin community environment he learns about what type of smart grids and energy communities are possible and how this all works.	Using the tools in the Stedin community environment the innovation officer manages to select one of the neighborhoods they supplied car sharing services and charging stations to as a potential energy community. This neighborhood was the first to have their electric cars installed and is generally quickly in adopting new technologies. However their quick adoption of electric cars means this neighborhood is already very congested and there have been regular complaints about PV installations not working properly.	Together with their trusted charging station supplier they create a plan to launch an energy community in the selected neighborhood. They do this together with active residents during a series of three evening meetings and one larger community meeting.	They summarize the plans in a project sketch	Throught the Stedin community platform they notify Stedin of their plans. Stedin agrees to have a meeting with a [representative of KAM] to check their plans and offer some initial advice to steer their plan towards a more favorable set-up with Stedin. Stedin is very pleased with the plans: because of the energy community they can avoid some grid reinforcements in the area.	
	Community origin	Realizing	Seeking	Discovering	Learning	Ideating	Resonating	Finalizing	Communicating	**Next Step**
The amiable neighborhood (De groene Regentes) (Value seeker) / Henk Andriesse	The idea is born in in Henks mind to start a collective PV project and for this reason a collective is formed, with a board. The collective sucessfully completes a collective PV project in their postal code area. The project unifies the community and creates a shared vision amongst the participants.	Henk visits HierOpgewekt. There is a spark at HierOpgewekt that makes him interested in implementing LES in the community. He sees it as a way to keep the collective engaged, keep momentum and offer its members a bigger return on investement.	However, Henk perceives it as very complicated and does not yet really understand how it works and what the full implications of using LES are. He needs more background information about energy communities and energy sharing in a neighborhood. He starts looking online for more information.	He finds the Stedin community portal through google and Arrives at the Community landing page where all the accessible and easy to understand information about LES can be found.	Here he gets access to more information by signing up for the Stedin community portal. He leaves his contact information here and the size and region of the community so Stedin is notified of their interest.	He starts researching what is possible in Stedin's operating area in terms of forming an Energy Community by ... [reviewing casestudies of other communities]. Because of the good information he gains the confidence he and his local community can pull off a similar project.	He starts engaging in conversation with members of the collective and the board to pull out (latent) needs in the community and to see if there is support for starting an energy community	Develop the plan with the community and capture it in a project sketch	Communicate the project sketch to Stedins [KDO? KAM?] and go over the plan together with Stedin to review it for feasibility	Relay the plan to possible partners (municipality, service provider), obtain grant, form a project team etc.
	Community origin	Realizing	Seeking	Discovering	Learning	Ideating	Resonating	Finalizing	Communicating	**Next Step**
The pioneering Consortium (Eemnes) / Wanda	A municipality is faced with their climate targets. Wanda, the coucilor responsible for Sustainability is looking for new ways to reach her municipalities' targets.	Wanda is inspired by the EU legislation about Energy Communities and she sets out to find a testing groud to pilot an energy community.	She contacts the local energy cooperative "Lokale Kracht" their chairman Adriaan and gages his interest in taking on a new project, funded by the EU and the municipality.	They agree to start drafting a plan and see wheter there could be some interest amongst the members of Lokale Kracht to join. However, they realize they know far too little about these type of projects so will need to call in advice from outside.	Wanda knows their 'Regional manager' from Stedin, Erik van Veen, and contacts him directly to ask for advice from Stedin. He points her towards the Stedin community page for more information.	Wanda notifies Adriaan of the Stedin community environment. He starts researching what is possible together with a new project group of the collective.	Together with a VvE they create a project plan to start an energy community in a new all electric neighborhood 'Zuiderland'.	The consortium of the municipality, the VvE and lokale kracht present this to the municipality and Stedin.	They hold an information night at the town hall for the residents of the local town hall. Of the 60 households attending 43 sign an intention agreement that they are interested in joining the energy community when it goes live.	Because of the tools available in the Stedin community environment thier plan is feasible and they receive the necessary grant to start and can start looking for a service provider. Lokale Kracht take on the lead and sign an agreement with Service provider Green.I.T. to start measuring the electricity usage in the neighborhood
	Community origin	Realizing	Seeking	Discovering	Discovering	Learning	Ideating & Finalizing	Communicating	Resonating	**Next Step**

APPENDIX M - TEST OVERVIEW PROTOTYPE LEF EXPLORE PHASE

Introduction
To validate the direction of the design for the LEF customer service a test is necessary. The test is performed under supervision and observation of the designer. However the test is carried out independently without any help.

Participants selection
A mix of different participants are selected. The participants are selected to represent a wide spread of previous experience. So from complete novices in relation to energy communities or smart grids to community leaders who are already attempting to set up an energy community and a local energy market.

Objective of the test
Test the validity of the design, the design itself, spot initial improvements and to answer the research questions.

Research questions

- Is the six step process as communicated on the landing page clear, complete and correct?
- Do the participants feel motivated and interested to sign up for a project sketch/advice meeting?
- Is the business case relevant for the community at this stage?
- If any, which type of people feel comfortable filling in a project sketch?
- Is a website the right medium?
- What are the questions people are left with unanswered at the end of the test?

Setup
Introduction beforehand - Narrative
'You have solar panels on your roof already. However you want to become even more self-sufficient. You remember a talk you had with a friend about how they are setting up a local energy market in their neighborhood to become more sustainable while keeping their energy bill low. You are interested to see if this would also be possible in your neighborhood and start looking online for information. You find the LEF landing page and start reading…'

>> Please look at the landing page now and try to think out loud.

Setup prototype
The participants visit the website and prototype on their own device. The link is given to them at the start of the test.

Discussion afterwards/probe questions:

- What was the main message of the landing page?
- Was it clear to you what to do?
- How did the experience feel like?
- Was it complicated?
- What would your next step be afterwards?
- If you could, what would you change about the design?

APPENDIX N - LIST OF REQUIREMENTS

(Each requirement links to an insight)

This section details the list of requirements. The primary source for this is the synthesis from the interviews done, see Appendix I. The aim of revisiting the synthesis after the design brief is formed means that we look back at what was said with a different lens: the more scoped lens of the design brief.

The list of requirements is therefore also structured in line with the design brief:

"Design a central place that takes away [1] the knowledge hurdle for LEC leaders for starting a LEM, [2] communicate the customer journey of setting up a LES based LEM and [3] provide LEC leaders with tools to explore the possible configurations of their EC. The LEC leaders should also be enabled to [4] create a project sketch and discuss this sketch with Stedin."

The service should ideally …

0. General requirements

- To peak people's interest in energy communities focus the message on the energy transition and that energy communities provide a means to change social aspects. This should spark the curiosity of intrinsically motivated people (1.2)
- Target people who are intrinsically motivated in the energy transition already, they are already predisposed to joining. (2.3)
- Don't keep communities hanging for too long. Make regular updates and inform them even when nothing is happening: otherwise their enthusiasm drops too much and might turn into disinterest. (2.5)
- Communicate that the service is for intrinsically motivated people who already are aware of the fact that we need to transition towards a renewable based electricity system. Empower innovators to innovate and don't force the early majority to do this (3.3, 24.1)
- The project can be started top down or bottom up. However, for it to gain traction the community should always be involved in realizing a LES. (6.2)
- Community members really want to contribute so therefore it is essential that the service focuses on collaboratively making an energy community: Stedin just makes it possible but it is the communities' job to realize it. Also this responsibility creates ownership. (8.2)
- Take communities seriously: they might not be experts, they are motivated and should be treated accordingly. (20.1)
- Stedin is the source of information about LES (20.2)

1. Take away a knowledge hurdle for Energy Community (EC) leaders wanting to start a Local Energy Market (LEM) (communication)
This element of the design brief focuses on the inaccessibility of knowledge about the Layered Energy System developed by Stedin and starting and operating a Local energy Market. There is no single point of knowledge for these interested and intrinsically motivated individuals. There is however a clear need and interest in keeping renewable energy local. These individuals are most of the time already a community leader or closely involved in community energy projects like cooperative solar plants.

Knowledge requirements by community leaders (What)

- Take away the knowledge hurdle for intrinsically motivated people who want to start an energy community

but don't know how yet. (10.1)

- There are three general topics of knowledge about energy communities: the social aspect, the technical aspect and the economic aspect. All three should be addressed when informing community leaders and knowledge about all three should be available. (2.1)
- It should be made clear to community leaders that they should focus on all three areas of an community (tech, economics and societal aspects) and not only one. (community leaders of the engineer type tend to focus too much on the technology). (9.5)
- Communicate that it is possible to live comfortably and be sustainable, but that this will cost more. Sustainability is a tradeoff between comfort and money. (3.1)
- Community members are not directly interested in things like congestion or flexibility: they want a tight and resilient community, being futureproof and an economic benefit. So communicate that Stedin and communities are working towards the same goal but for different reasons. (21.1)

General knowledge requirements

- Explain why the Netherlands need to change towards an energy system that is based on renewables (3.4)
- It is important to communicate that sustainability is bigger then just investing in renewables: it is all about personal sustainability and community resilience. This resonates more with potential community members. (7.1)
- Community members want to know how joining an energy community will affect their situation and what is expected of them. Managing expectations like what will it cost them and what will it bring them is key. (9.2)
- Be clear about data privacy and ownership: data should be in the hands of the community and they should have the ownership of the data. (9.3)
- Turn motivated engineers into expert volunteers by explaining how they can set up an energy community (12.2)

Knowledge about the social aspect of communities

- Make the community leader aware of the fact that they can do a lot more, so not only focussing on creating a LEM, but inform them about other options as well. Like creating awareness for the fact that you can put your dishwasher on when the sun is shining yourself. I.e. behaviour based demand response. (4.1)
- Motivate communities to not only apply new technologies like LES but also show them that a large part is about behaviour change and using less energy as a result. (4.5)
- Communicate that by adopting a LES communities can become a contributor to society on a sustainability level, but also for knowledge and economic reasons. (7.3)
- Don't control the lives of people living in an energy community too much: what happens behind their front door is completely in their control. (11.2)
- Communicate that the goal is to keep electricity usage local and the benefits inside the community. (16.1, 2)

Knowledge about the technological aspect of communities

- Communicate that it is not necessary for an energy community to function to let other people directly control your appliances. (4.4)
- Make sure the community members can set their flexibility comfort zone themselves (high comfort or lowest price). (5.4)
- Simply explain how implicit flexibility works, why it is important and how an energy community can deliver this.

Knowledge about the economies of energy communities

- Knowledge about their return on investment, however this should not be communicated as the sole reason to join an energy community. (12.1)
- Offer ways for community members to compare themselves to other households or a community benchmark, even before a LES is implemented. (4.2)
- Create insight into how much you earn as a community member and what your savings and contributions are. (4.3)

Requirements of the medium (How)

Make it simple to understand: get on the level of the community members, don't expect them to get on the level of Stedin and the community leaders. (9.4)

If some degree of new knowledge is required, explain this clearly to get the community members up to speed. (9.4)

Give community members the means to contact Stedin when they don't understand the service or have questions about it, so an expert can simply explain it to them. Make this expert easy to find and contact. (14.2, 19.4, 19.7, 21.3)

A single place on the Stedin website should be used since this is probably already known by its customers. Also people start with google, therefore probably the service experience starts there. (15.1)

Community assemblies, community meetings and newsletters are simple existing channels that should be leveraged because the community is probably already familiar with them. (15.2)

2. Communicate the customer journey of setting up a Layered Energy System based LEM (communication)

This part of the design brief focuses on communicating the process of setting up a LES based LEM. This process is still very unknown and unstructured, because of the experimental nature of energy communities. There is a clear desire to structure this process more and offer more handholds for community leaders.

- Communicate the customer journey of starting an energy community. (5.1)
- Explain that the first step, before they start setting up a LES, they are advised to already have a community formed and mobilized. (6.1)
- Communicate that they need a motivated community, but should not wait for everybody to be on their team. It is better to start small with only the motivated people then to wait for everybody to be convinced. (12.4)
- Communicate that in order to succeed they need to take a bit of an iterative approach: don't expect everything to work straight away. Start small and build from there. (13.1)
- Communicate that it is alright to not know everything beforehand. It is more important to be motivated then to be all knowing. This is also not possible since energy communities are so new. They should trust in their own knowledge and vision! (13.4)
- Communicate that the process right now will probably be quite long and extensive, since Stedin does not go at the same speed as energy communities. (21.5)
- Explain that Stedin is also bound by laws and regulations and that some political standpoints of Stedin are externally determined. (22.1)
- Don't force energy communities to rely on private companies alone, since communities worry are mainly after the profits of these communities. (25.2)

3. Provide LEC leaders with tools to explore possible configurations of their EC. (communication/ collaboration)

This section is about exploring how what is desired and what is possible will affect their energy community design. So it is about tailoring the knowledge gained in the previous two steps to their own situation. Because no two communities are the same.

What do the community leaders want to explore (types of tools)

Give community leaders a handhold for holding community meetings, because of their effectiveness of creating support. (9.1)

Give the community leaders means to create trust within the community in their plans. Then the community members are willing to follow along without understanding the full context and implications, just the necessary things like how it will affect them. But not how all the details work. (11.1)

Link interested energy community leaders to other communities so they can exchange and share knowledge. (13.2)

Create a place where community leaders can share experiences about service providers, so Stedin does not express it's preference and remains neutral but community leaders can still get information about which external party to go to. Because having a service provider is still necessary for an energy community to succeed at this level of technology readiness. (13.1, 13.6, 23.1)

Allow community members to share their knowledge learned in their process of setting up an LEC with other communities, also allow them to capture this knowledge and best practices in a place for everybody interested to access. (17.1)

Provide LECs with data about the current energy community energy usage so they can make a prediction about how much they can save and how much flexibility they can offer. (14.1)

Give the leaders of an LEC knowledge tools (like animations, presentations, document/website) that they can share with potential members. These should explain in simple terms what LES and a LEM are. (19.3)

Give LEC leaders basic information about the grid build-up and how the grid is structured.

4. Create a project sketch and discuss this sketch with Stedin (Collaboration)

This part of the design brief is about how to summarize the plans developed in the previous parts and communicating this plan to Stedin, so they can give feedback on this plan and check its feasibility. This has a twofold effect: the community is forced to make their plans specific, something that is sometimes not really happening.

General requirements

Make it very clear and explicit what is to be expected from Stedin and what is the job of the community (division of work, almost like a statement of work). (8.2, 24.2)

A sense of ownership by the community about the project is essential for it to gain acceptance and succeed, this should be realized by consulting the whole community when making the project sketch. (8.1)

Don't force the communities to start doing the work of a DSO or municipality: it should be a joint venture. Expect communities to take on the extra work like setting up the community and running it. Not to take responsibility for the complete energy transition (10.3, 24.2)

Community leaders communicate to Stedin and the members, Stedin does not communicate directly to the community members in person. However Stedin can create communication means for the members the leaders can share. (19.1)

When Stedin tells the community that something in their project Sketch is unfeasible they should also explain why, then communities are more likely to shift their wishes and goals to something that is within what is possible on Stedin's grid. (21.6)

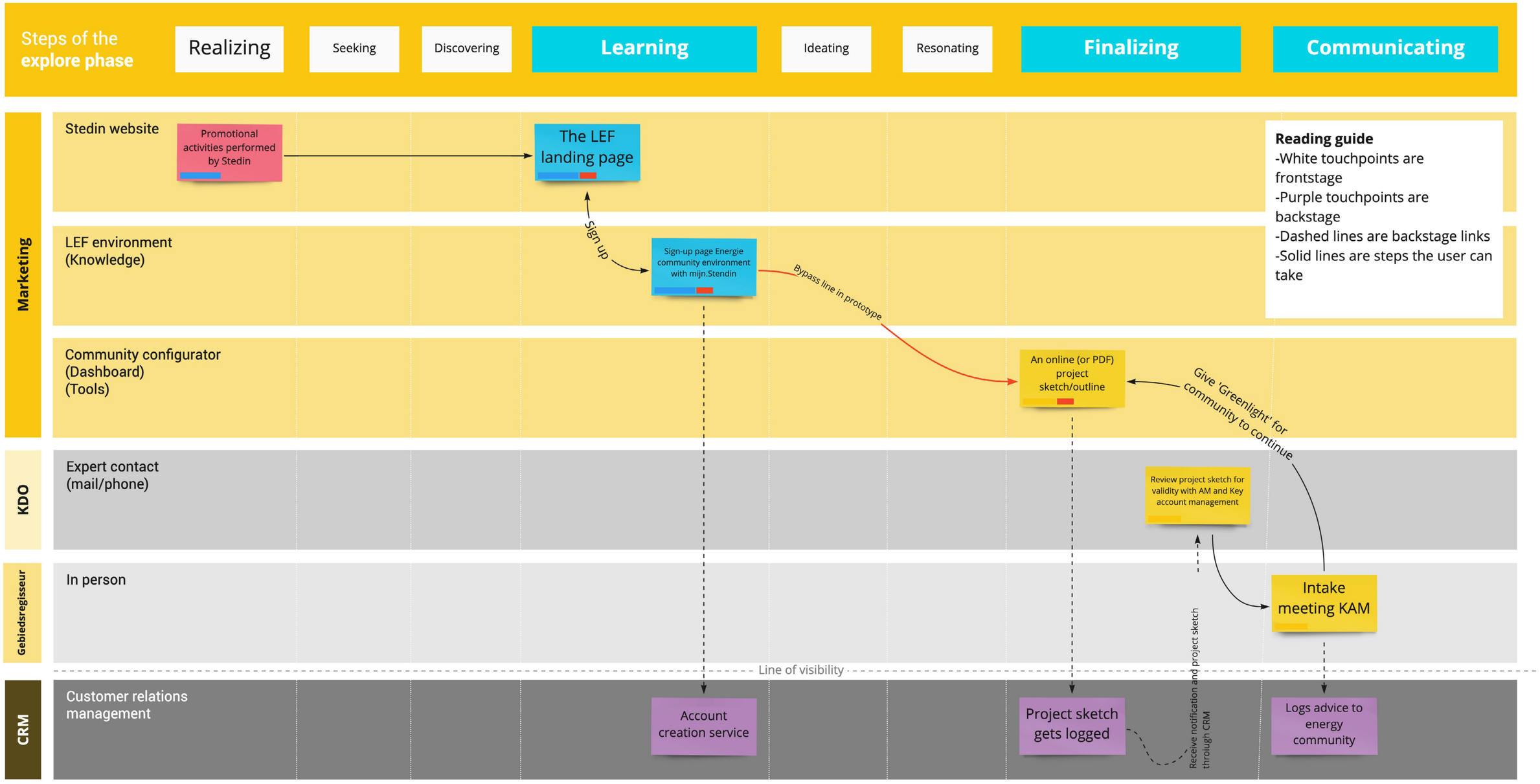
Content of the project sketch

Make explicit how much the community actually helps Stedin right now and can be expected to help in the future: this is to create the right expectations. (21.4)

APPENDIX O - ENERGY LAW SUMMARY (DUTCH)

Figuur 1: samenvatting van de belangrijkste beoogde wijzigingen (enkel voor elektriciteit)*

APPENDIX P - USER JOURNEY TEST SET-UP



APPENDIX Q - LANDING AND SIGN UP PAGE USED IN TESTING

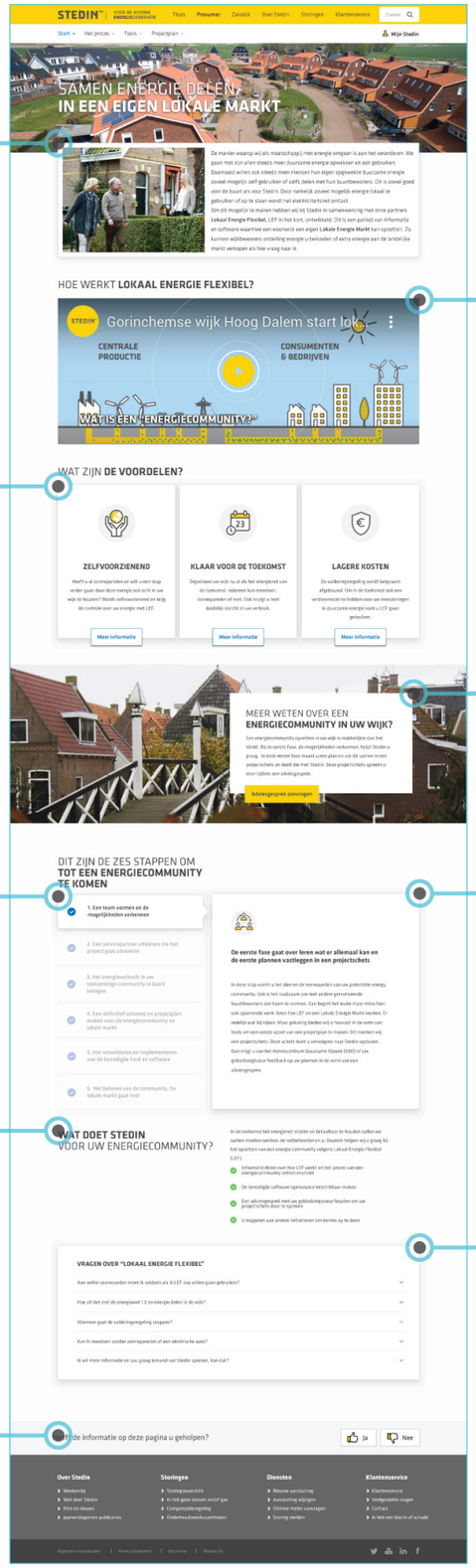
The introduction of the landingpage. It very briefly explains the context of LEF and what it does: enabling you to set up a local energy market (LEM). This introduction should instill a feeling of curiosity.

After they are interested and informed, the benefits are briefly explained with the option for more information. There are more benefits, but the main three are highlighted. These are based on the interviews conducted.

The goal of the landing page is also to provide basic insight into the process of setting up an energy community. That is done here with an interactive 'accordeon'-style widget as to not overwhelm the visitor with text.

The last part explains what Stedin offers and helps ECs with. One of the insights of the interviews was that a clear division of roles is essential for good collaboration. Therefore this is clearly communicated to the visitor at an early stage.

The visitor is asked if the information on this page helped him or her. This is used to determine if the page is clear enought.



An animation explaining how LEF works and what an energy community is. The goal is mainly to inform the visitor and allow them to gauge if LEF is what they are looking for.

Here the most important element of the page comes into view. The objective of the landing page is to get the visitor to sign up for an 'advice meeting' ***if*** they are interested. It is highlighted with an image to make it stand out and draw attention.

The step is described in short and then elaborated on. Optionally a link with more information could be put in place as well, but this is left out here.

It is customary for Stedin to place a FAQ at the bottom of an information page to cath the straightforward questions and reduce pressure on the Customer contact centre.

If the visitor is interested in continuing after reading the landingpage, he or she is explained how Stedin wil help and what the steps are after completing the project sketch.

The steps are laid out more explicitly than in the introduction to give a comprehensive overvie of the next steps.

The visitor fills in his contact information and a short description of his or her ambitions and interest.

Here the visitor continues by pressing the button.