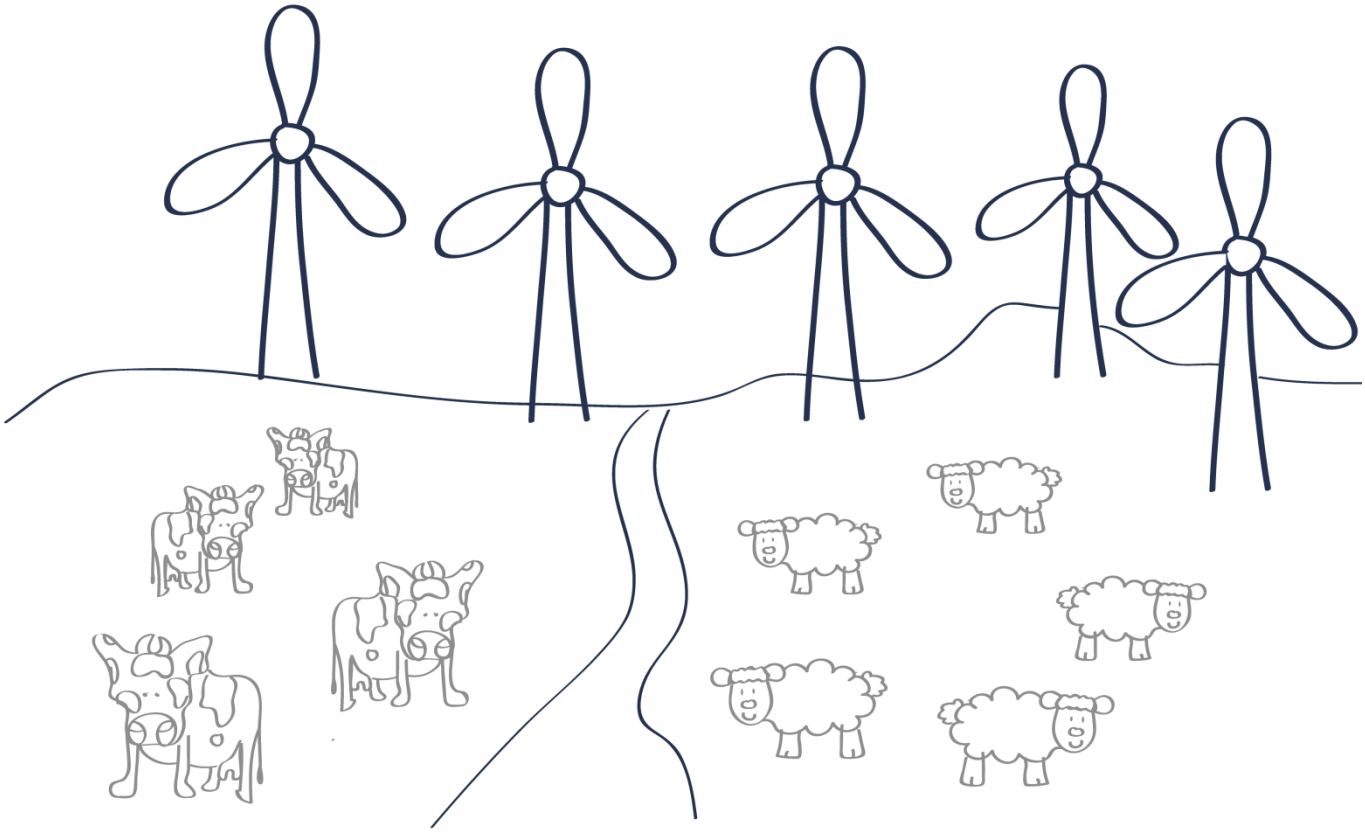
Local sustainable energy companies and municipal involvement

Designing a framework for municipal involvement



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Master Thesis
MSc. Systems Engineering, Policy Analysis and Management (SEPAM)
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Colofon

Design of a framework for Municipal involvement in local sustainable energy companies
This master thesis is the result of the research conducted for the completion of the master Systems Engineering, Policy Analysis and Management (SEPAM) of Hans Peter Oskam at the faculty of Technical Policy and Management at the Delft University of Technology.
The research is done within the company Royal Haskoning at the department of Strategy Management Consultants.

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"*De theorie* is *niet de wortel*, maar de *bloem van de praktijk*"

Preface

This graduation report is the result of a final thesis research within the master SEPAM at the faculty of Technical Policy management at Delft University of Technology.

The past months I have been working on this research in which I was a graduate intern at Royal Haskoning Strategy and management consultants. The graduation process has been a great opportunity to discover the field of municipalities and local sustainable energy companies. The municipal involvement in local energy companies is a new upcoming topic and it has been a great pleasure to focus my graduation research on this field.

I would like to thank my graduation committee for the challenge to take on this project and the guidance with regular dedicated feedback. Ellen van Bueren for all the time she took to help me structure my research, Ernst ten Heuvelhof for the insights in the theoretical framework, Petra Heijnen for the additional comments and Liesbeth Schipper for her guidance and making my time at Royal Haskoning more than valuable, as well as the other colleagues within Royal Haskoning SMC.

I would also like to thank all interviewees for their openness in sharing their experience on local sustainable energy companies, even though for some of them this is a sensitive topic. Furthermore also thanks to Jing Zhang of Royal Haskoning for the help of making a scientifically valuable questionnaire and to VNG for contacting the municipalities for the questionnaire. And finally I would like to thank the municipalities and the participants of the two participant observations as well as AgentschapNL and the VNG for the support.

And last but not least, I would thank Jose de Vries for her endless support, suggestions and feedback during all these months.

Summary

A local sustainable energy company (furthermore in the report indicated as LSEC) (*lokaal duurzaam energiebedrijf (LDEB*)) is often seen by municipalities as being a promising instrument to realize their local ambitions on various aspects. In recent years more and more municipalities in the Netherlands have announced plans to initiate a LSEC. The main problem owners in this research are the Dutch municipalities where (plans for) a LSEC exists and which are looking for a way to play a role in this development. This leads to the main subject of this research: the municipal involvement in these (plans for) LSECs. A local sustainable energy company (LSEC) is an organization which is directed at the realization of the local production and supply of sustainable energy, in the own region, for multiple local customers. Many municipalities struggle with the complexity and risks of their involvement in LSECs and the uncertainty of outcomes of these decisions on the level of municipal involvement.

This research investigates how municipalities can be helped in choosing their level of involvement in a local sustainable energy company. It aims to know which different choices municipalities can make in deciding on their involvement in LSECs through an empirical study. This research started from the analysis that many municipalities struggle with the complexity and risks of their involvement in LSECs and the uncertainty of outcomes of these decisions on the level of municipal involvement. The main research question was therefore defined as:

How can municipalities be helped in choosing their level of involvement in a local sustainable energy company?

This main research question was answered using 4 different collection methods, a desk research, a set of interviews, participant observation and a full population questionnaire. The theory study shows us that there are four aspects on which decisions have to be made. These four aspects together determine how municipal involvement in a LSEC looks like. These four aspects are:

1. Policy choices,
2. Technological choices,
3. Institutional choices,
4. Stakeholder choices.

These four aspects have been explored and for each of the four aspects a framework with options, most important advices and the current status on these aspects is designed.

From this research the following conclusions can be drawn:

- Local sustainable energy companies are still in the early stages of development.
- The reasons behind the municipal involvement in a local sustainable energy company are often personal and local.
- Municipalities can play three different roles (facilitator, financer or customer)
- Municipalities often take the initiative in the creation of local sustainable energy companies.
- Municipalities are often unaware of the instruments they can use and are risk averse.
- When a local sustainable energy company is created, detailed knowledge is needed on technological, institutional, policy aspects and on potential stakeholders.

Given these conclusions we can state the following recommendations for Dutch municipalities:

- Municipalities must draft a policy plan; even there is no plan for a local sustainable energy company at the moment.
- Municipalities must choose their preferred model for involvement, and makes sure it understands the related roles and instruments.
- If a municipality decides it want to be involved in a local sustainable energy company, it must clearly indicate which public values are at stake to justify their involvement in a private market.

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1. Research outline

1.1. Introduction

The Dutch energy landscape is in transition. Since several years the Dutch policy towards energy is aimed, at increasing the security of supply, increasing the affordability and reducing emission energy infrastructure (EZ 2008; EZ 2011). This clean energy infrastructure has to be realised through an increase in the amount of renewable energy that is being produced, reducing the total amount of energy used and improving energy efficiency (Benner, Leguijt et al. 2009). If this policy succeeds it will help to raise the efficiency of electricity generation from fossil fuels and accelerate deployment of clean energy in the electricity sector. Achieving these goals would result in diversification of the electricity mix, reduced dependence on fossil fuels and abatement of CO2 emissions, all of which help to improve energy security and mitigate climate change (EIA 2010).

Government organisations are playing a big and important role in safeguarding the public values related to the energy sector, not only on the national and European level, but more and more on the regional and local level. Especially with the goal of increasing the amount renewable energy, energy efficiency and energy savings, local municipalities have a large influence and level of ambition. A prime example of this ambition is the 2007 policy agreement between the association of Dutch municipalities (VNG) and the national government (het Rijk) where both parties declared to try to realise these clean energy goals and committed themselves toward goals on reducing greenhouse gas emissions and increasing the share of renewable energy (VNG 2007).

A local sustainable energy company (furthermore in the report indicated as LSEC) (*lokaal duurzame energiebedrijf (LDEB*)) is often seen by a lot of municipalities as being a promising instrument to realise the clean energy goals and to increase the production of sustainable energy (AgentschapNL 2010). In recent years more and more municipalities in the Netherland have announced plans to initiate LSEC.

Municipalities such as Dordrecht, Meppel en Lochem have announced that they will form such a local sustainable energy company to increase the total amount of renewable energy that is used in their municipality (Velthman, 2010). Although it may be popular and promising for municipalities, there are not a great number of real successful local sustainable energy companies.

More than a dozen Dutch municipalities are currently in a variety of stages of developing such a LSEC. A variety of stages, ranging from performing feasibility studies to implementing a business case. The phenomenon of more municipal involvement in local energy companies can be seen in the larger trend of a growing ambition in decentralising traditional government tasks. All these efforts do not automatically mean that the local policy efforts aimed at realising a clean energy sector will be a success. To get some idea on how these LSEC look like in practice, two short examples are presented,

An example of a municipality which tried to initiate a local sustainable energy project is the municipality of Woerden. In 2009 the city council of Woerden initiated and founded the local sustainable energy company (LSEC) called *Duurzaam Dienstenbedrijf Woerden (DDW B.V.) (Velthman 2010).* The municipality wanted to redevelop an old railway area and had the ambition to create a sustainable district heating system.

The initial goal of this LSEC was to stimulate the realization of sustainable energy projects in the entire municipality. The first project was the realization of a geothermal heat pump system in a new district heating network. The city council took the initiative and funded the project with public financing, because no private companies were willing to invest. The municipality made the choice not to involve any other public parties, housing cooperatives or citizens because they reasoned that it was a public task to realize this project. Therefore it created a public owned B.V. The realization of the first project proved to be more difficult than expected due to internal distrust between managers of the DDW and the civil servants of the municipality (Velthman 2010). Due to the financial crisis the business case was no longer economical feasible and the city council redraw the promised public funding and started a process to end the LSEC. In December 2010 the LSEC was terminated and despite the fact that a large amount of public funding was spent, there was no sustainable energy project realized.

Another example of a LSEC is the geothermal project of the municipality of The Hague (*Aardwarmte Den Haag V.O.F.*). The goal of this project is to build a district heating system which is heated by geothermal

energy for 4.000 houses. There are six co-owners of this LSEC; the municipality of The Hague, two large energy companies and three housing cooperatives. Each co-owner invested 2,5 million euro into the project. In this LSEC the municipality is just one of the projects partners, while in the Woerden example the municipality was the only owner and bared all involved financial risks.

This huge variety of plans and ideas for LSECs lead to a huge variety of options for municipal involvement, and also to an automatic and often implicit process of selection types of municipal involvement. In a few years it could be concluded that the efforts of municipalities and their local energy policies in realising an increased share of renewable energy are a success or not (Baarsma 2006).

The process of realisation of any LSEC is no more and no less than the process of influencing the behaviour and attitudes of other local actors that in the end a successful LSEC thrives. This research is aimed at studying these LSECs and the way Dutch municipalities are involved (Edelenbos 1999).

1.2. Research description

This section presents an overview of the research rationale and methods needed to research the phenomenon of municipal involvement in LSECs.

1.2.1. Problem Description

Dutch municipalities have various **ambitions** in their policy on safeguarding public values. Some of these topics relate to create local sustainable energy. The ambitions relating to the local sustainable energy range from ambitions on the reduction of greenhouse gasses, to increasing employment and the number of jobs available in their region. Municipalities are arguing that LSECs could help in safeguarding public values and realising these ambitions. Therefore, these municipalities gained an interest in developing LSECs and being **involved** in developing these LSECs. For this research the main problem owners are in this way indicated as the Dutch municipalities where (plans for) a LSEC exists and which are looking for a way to play a role in this development. This leads to the main research subject of this research: the municipal involvement in these (plans for) LSECs.

In this research a **local sustainable energy company** (LSEC) is an organisation that is aimed towards the realisation of the local production and supply of sustainable energy, in the own region, for multiple local customers.
*(*In Dutch: *Een lokaal duurzaam energiebedrijf is een zelfstandige organisatie die als initieel doel heeft het streven naar de productie en levering van duurzame energie, in eigen regio, aan meerdere lokale afnemers.)*

LSECs often have a combined mission to serve energy clients and achieve general municipal ambitions. Municipal involvement can be seen considered a success when the LSEC is stable in the long run and when its activities contribute to municipal ambitions. Although practice shows that not every municipal involvement in a LSEC is a success (Velthman 2010). There is no certain degree of involvement in a LSEC, that guarantees to be successful and it is unsure which are the exact consequences of such involvement because of the differences per LSEC in region, characteristics and situation. There are many examples of unsuccessful LSECs in which municipalities were deeply involved, as well as many examples of successful LSECs where the municipality was not involved at all. In this way LSECs can be seen as complex systems. In theory successful municipal involvement should stimulate those activities within a LSEC that will contribute to the municipal ambitions and lead to stability in the long run. But practice shows that there is a high level of unpredictability and uncertainty about the outcomes and effects of certain choices of municipal involvement (different roles and instruments) in the level of success of an LSEC and therefore the corresponding success for the fulfilment of the ambitions and related public values.

The previous observations lead to the following six focus points:

1. Municipalities want to realise their ambitions and want to safeguard certain public values on topics such as, sustainability, employment, innovation and energy,
2. Several municipalities see municipal involvement in a LSEC as a possible mean to realise their ambitions,
3. A LSEC is an independent local professional organisation which supplies sustainable energy for local customers,
4. Every LSEC operates in a different local context, with local actors and local characteristics.
5. In theory successful municipal involvement should stimulate those activities within a LSEC that will contribute to the municipal ambitions and lead to stability in the long run,
6. There is a high level of unpredictability and uncertainty about the outcomes and effects of certain choices of municipal involvement.

1.2.2. Problem Definition

The situation around LSECs defined in 1.2.1 lead to the following problem definition:

Many municipalities struggle with the complexity and risks of their involvement in LSECs and the uncertainty of outcomes of these decisions on the level of municipal involvement.

1.2.3. Research Questions

To create clearness in the complexity and provide municipalities support in their decisions on municipal involvement the main question of this research is defined as:

How can municipalities be helped in choosing their level of involvement in a local sustainable energy company?

In current research there is no existing model which can help municipalities in decision making in the aspects of ambitions, roles, instruments, risks and needed competences related to LSECs. The way municipalities at the moment design their involvement can, in some circumstances, be described as interactive governance, a way of designing policies whereby a municipality involves its citizens, social organizations, enterprises, and other stakeholders in the early stages of the policy-making process (Edelenbos, 1999).
The difference with more traditional public policy procedures is that parties are truly involved in the development of policy proposals, whereas in classic opportunities of public comment, citizen and interest group involvement only occurred once the policy proposal had been developed. Interactive decision making is a policy practice. The interactive governance leads to a difference in every municipal context with its unique set of local actors, geography and social structures. In this way the perfect generic solution or recipe for municipal involvement does not exist and cannot be made. The purpose of this research is to create clearness in the complexity and guide municipalities in the future when they are designing their own suited roles and instruments regarding local sustainable energy companies. The goal of this research will therefore be:

to design a decision support tool for municipal involvement to help them in the process of making decisions that determine their involvement in a local sustainable energy company.

This research will design a decision scheme for municipalities. Such a design scheme could be a first-step towards a complete support tool, which can be directly used by decision-makers themselves in finding the most suitable form of municipal involvement in local sustainable energy companies.

To answer the main research question the research must first provide insight in the different choices and approaches that municipalities have regarding their involvement in LSECs and how this process is handled nowadays. To create clearance in a design and answer the main research question first the following sub questions must be answered:

1. *Why are municipalities involved in LSECs?*
2. *Why do local sustainable energy companies exist?*
3. *Which models for municipal involvement in a LSEC exist?*
4. *How do municipalities and stakeholders decide on their involvement in a LSEC in practise?*
5. *What are possible consequences of their choices?*
6. *What is the status of municipal involvement in LSEC in the Netherlands?*

1.2.4. Research Methodology

To give an answer on the research questions formulated in the previous paragraph it is needed to explore the variety, find the factors and design a model in a systematic approach (a research framework). This section indicates what methods are used to answer the sub questions. The research can be separated into three phases:

1. A theoretical phase,
2. An empirical phase,
3. A design phase.

The first three sub research questions will be answered by a theoretical framework in chapter 2. Sub research questions 4 and 5 will be answered by an empirical study described in chapter 3. The main research question will be answered in chapter 4, where the decision support tool will be designed.

Chapter 2: Theoretical framework

The theoretical framework will answer sub research question 1, 2 and 3.

1. *Why are municipalities involved in LSECs?*

The first question focuses on the municipal involvement. This is basically the policy of a municipality regarding the relationship with a local sustainable energy initiative. A description of what the reasons are for municipal involvement. This sub question will be answered through a scientific literature study focused on the following two parts.

- A description of reasons for municipal involvement
- A description of scientific models on how municipal involvement is designed.

2. *Why do local sustainable energy companies exist?*

This sub question investigates the existence of local sustainable energy companies. There is not a single type or standardized view on what local sustainable energy companies are and how they operate, are formed and look like. The available scientific literature on hybrid organizations as well as the history of the energy market given an indication why LSECs exist. This question will be answered through a scientific literature study on two parts:

- An overview of the development of local sustainable energy companies throughout history.
- The theory of hybrid organizations and how they are formed and designed.

3. *Which models for municipal involvement in a LSEC exist?*

Since there are no direct models to implement for municipal involvement this question will be answered by looking at two other examples of models of municipal involvement. The involvement in these cases can in some cases be considered similar to the choices surrounding municipal involvement in LSECs. The two researches used are the research of the Dutch commission on Broadband and Market order (ICM) (Ten Heuvelhof 2004) and a research on energy savings (Resezzy, Dimotrov et al., 2006).

The third sub question will be answered through providing

- An overview of generic models that are used for municipal involvement in local broadband companies as reported by the ICM (Ten Heuvelhof 2004) and on energy savings as reported by Resezzy, Dimotrov et al. (2006)

Chapter 3: Empirical study

Chapter 3 will answer sub research questions 4,5 and 6.

4. *How do municipalities and stakeholders decide on their involvement in a LSEC in practice?*
5. *Which are the possible consequences of their choices?*
6. *What is the status of municipal involvement in LSEC in the Netherlands?*

To these sub questions, a situation sketch is needed to give insights in the choices for municipal involvement in LSECs. This section will give insights in the current situation of LSECs in the Netherlands based on a series of interviews, a questionnaire, a desk research and through participatory observation.

Chapter 4: Designing a decision support tool

The main research question will be answered in chapter 4 by sketching a decision support scheme. This scheme should be seen as a tool to support municipalities in investigating the choices they could make in their involvement when dealing with a plan for local sustainable energy companies.

This tool will consist out of a structured presentation of the combined institutional and technical design space that municipalities have in designing the institutional, technical and process element related to their involvement in a LSEC, and will also give insight in the possible consequences of their design choices.

The main research question will be answered by:

- An overview of requirements and design space generated by the theoretical framework and the empirical study which the design should encounter
- The model (tool) exists of an overview of practical and realistic options, approaches and choices for municipal involvement in a LSEC that can be used as a guideline to formulate the municipal involvement.

Furthermore chapter 4 will verify and validate the design using two different types of testing:

- Verification: The design is verified by using it in a role playing game among a group of experts. In this case the Royal Haskoning SMC group (25 participants) has tested and evaluated the design.

Chapter 5: Conclusions, recommendations and reflections

The last chapter will provide the conclusions, including a reflection on the chosen methods and approaches and will present recommendations for future research.

1.2.5. Research Data methods

The data needed to perform this research will be collected using 4 different collection methods, a desk research, a set of interviews, participant observation and a full population questionnaire (figure 1).

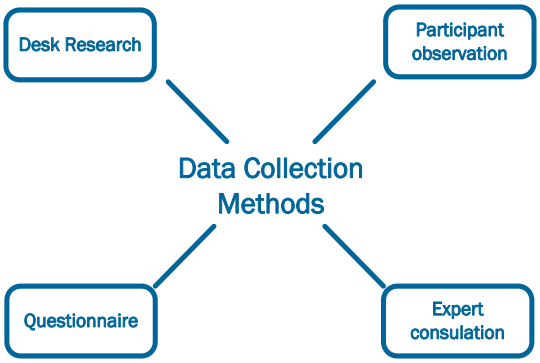


Figure 1: Data Collection methods

1. **Desk Research**

The main methodology of this research is based on the available literature of the theory on involvement in hybrid organisations, the history of LSECs as well as insights of the literature on municipal involvement. Furthermore through a desk research of policy documents of municipalities from publications of governmental and non-governmental institutions, documents, annual reports and databases from both open sources and available reports, a case study of existing LSEC's in the Netherlands is conducted.

2. **Questionnaire**

A full population questionnaire using mostly closed end multiple choice questions to test the validity of the framework and factors that are found will be used. A postdoctoral expert was available to help with constructing and designing the questionnaire.

3. **Interviews**

Experts and stakeholders in a LSEC are interviewed and consulted. In total 10 interviews are performed. The interviewed organizations are a bank, a scientist, 4 municipalities, 2 external advisors and 2 large energy companies. The interviews gave insight in how municipal involvement works in practise.

4. **Participant observation**

The last consultation method is the participation in the existing Community of Practise on LSEC's organised by the AgentschapNL in which 15 Dutch municipalities share their thoughts, problems and experiences. Also several meetings within Royal Haskoning on actual projects dealing with local sustainable energy have been visited and observed.

1.2.6. Research Scope

Due to the limited scope and time available for this research the following subjects will be excluded from the analysis and design phase:

- A detailed technical descriptions of technologies. It is assumed that all generic technologies will be suited for all Dutch municipalities.
- LSEC's which are only aimed at supply are not taken into account.
- The macroeconomic factors: national level energy policies and frameworks,
- Macroeconomic conditions: the institutional framework dealing with energy efficiency,
- Energy prices, tariffs and subsidies

The focus lies on the determinants of municipal market involvement that are directly related to the current state of LSECs in terms of statutory powers of local governments and the financial sources to exercise these.

1.2.7. Research stakeholders

There are four different key stakeholders involved in this master thesis research. The first and primary stakeholder is the TU Delft, which will serve of the prime evaluator of total research. The second stakeholder is Royal Haskoning Strategy and Management Consultants, this stakeholder will serve as the key research process facilitator. The VNG (Vereniging Nederlandse Gemeenten) is involved as a partner in performing the questionnaire, they will deliver feedback on the questionnaire design, contact information

and will partly facilitate the questionnaire process. The AgentschapNL is involved as feedback partner and organiser of the Community of Practice on LSEC's.

2. Theoretical framework

In order to understand the municipal involvement in local sustainable energy companies a research has been done on municipal involvement in general as well on the process in which this involvement occurs (2.1). Since local sustainable energy companies, as in the form they occur now, are often hybrid organizations this research also further investigates hybrid organizations and the reason of existence of hybrid organizations (2.2). Together with the research on hybrid organization this will answer sub research question 1. This theoretical framework will give an answer on sub questions 1, 2 and 3

1. *Why are municipalities involved in LSECs?*
2. *Why do local sustainable energy companies exist?*
3. *Which models for municipal involvement in a LSEC exist?*

In order to give an answer why local sustainable energy companies exist in the way that they are known in the current market a literature study is conducted on the history of local sustainable energy companies (2.2). To shape a foundation for the involvement of municipalities in LSECs research has been done on existing models for public involvement in public utilities, looking into a study of involvement in broadband companies in the Netherlands and a study of saving energy services in Eastern Europe (2.4). The chapter will end with a concluding paragraph describing the findings as well as answering the sub research questions (2.5). Since this chapter will comprise many different aspects within the theoretical framework all the paragraphs end with a conclusion and can also be read independently.

2.1. Municipal involvement

In order to give an advice on the involvement of municipalities in LSECs an understanding must be made why municipalities want to be involved in the first place. These reasons will be defined in 2.1.1. The origin of the involvement, in other words the process of how the involvement of municipalities arises will be discussed in 2.1.2. The sections ends with an conclusion in 2.1.3.

2.1.1. Reasons for involvement

When we want to elaborate on municipal involvement, we must define what municipal involvement is. According to Dye (Dye 1998) public policy is whatever a government choose to do or not to do. Rosenthal (Rosenthal 1996) described policy as the set of intentions, choices and actions of public organizations aimed at influencing and regulating social development. Therefore, I will regard municipal policy as an important part of municipal involvement on local sustainable energy companies. For the field of this study I define municipal involvement in LSECs as:

The total set of activities and relationships which a municipality has with a local sustainable energy company.

Hoogerwerf (Hoogerwerf 2008) defined policy as: *the effort to reach certain goals with certain means in a series of steps*. If the policy is meant to reach certain goals it must be defined in advance what these goals are as well as why the government is the right stakeholder to implement the means to achieve these goals. According to Ten Heuvelhof (Ten Heuvelhof 2004) the government is the right actor when the private sector is not able to supply certain values that the government has indicated as important. In this way a government does not have to act in all topics it finds important, most free market products are simply provided by the market itself without much government interference. If a private market fails in providing these public values this is called market failure. To investigate of if a government should act; four questions need to be answered (Ten Heuvelhof 2004):

1. What is the public value at stake?
2. Is the private market not able to safeguard this public value or are there any negative effects related to the usage of the product or service?
3. At which government level (national, regional, local) action is needed?
4. Are the public benefits higher than the public costs?

If these questions lead to a situation where public values need safeguarding by a municipality, the local government must design an approach to do this. Defence, roads and public health are all examples of public goods which require some collective intervention to address. Typically this intervention is in the form of government regulation or production. With increased urbanization, negative externalities become more noticeable (congestion, pollution, CO2-emmissions etc.). More goods and services experience market failures, and citizen demand for public provision increases (Warner 2008). This has led to the expansion of local government involvement over time into new arenas of service delivery – e.g. garbage collection, water distribution, environmental management, infrastructure provision and human services. Key to the challenge of using markets for public goods is recognition of what a public good is in the first place. This is a policy choice and can be seen as the primary goal on why a public actor should design policy or should act. But how can a government, such as a municipality, safeguard these public values?

According to Ten Heuvelhof (Ten Heuvelhof 2004) there are four generic approaches on how a government could safeguard these public values at stake:

1. Enhancing a positive effect. This could mean stimulating innovative research in sustainable energy, or creating a market for green electricity. These effects can be direct economic effects or indirect economical affects such as employment.
2. Enhancing the safeguarding mechanisms in the private sector. The means the safeguarding of the completive market and making sure that there is a level playing field for all competitors.
3. Prevention of negative effects. Such as air pollution, greenhouse gas emissions.
4. Wealth redistribution. Stimulating employment and investments in low income areas.

In 2008 the energy council of the national government formulated the primary public values of the municipalities (EZ 2008). These public values serve as an argument why some sort of government involvement in the energy infrastructure can be perceived as justified. In the report it is reasoned that the primary focus of a government should be on three public values:

1. Affordability: Prevent high prices due to the abuse of market power, increase economic efficiency, employment and overall economic wealth
2. Acceptability: Minimize the negative effects on the environment (greenhouse gasses, air pollution and other environmental aspects)
3. Availability: Increase the security of supply through international energy politics, diversification of production technologies and fuel.

To safeguard these public values, a public energy policy can be formulated. A energy policy can not only be made on the national and European level, but also on the regional and local level. Government organizations are playing a big and important role in safeguarding the public values related to the energy sector (EZ 2008). These local municipalities are considered to have a better understanding and more knowledge on their own region, stakeholders, companies and communities. They are closer related to their markets and can therefore:

- Act quicker than national governments.
- Communicate better and faster with the community and private sector within their own municipality.

The involvement of a government can also have negative effects on the mechanisms in the free market. Direct involvement of a government into the private market can lead to market distortion and turn into illegal state-aid for example. Municipal organizations are the main process-managers and process-designers of their own involvement process (Koppenjan and Groenewegen 2005).Therefore if a municipality wants to influence a social problem and wants to safeguard a public value it must balance between finding a solution for the problem at stake and minimizing the negative side effects of the solutions. These negative effects of government involvement are called market distortions. From this vision on government involvement we can learn that when municipalities are designing their involvement they must clearly indicate which public values are at stake that justifies their involvement in a private market and why they are the right public actor to act and not the national government.

2.1.2. Policy design cycle

But how does the process of this public policy making works? Due to the complexity of hybrid organizations as well as the aware choice municipalities must make of which public values are at stake the decision of involvement requires a dedicated process. Various other authors on public policy have stated that public policy is made in advance in incremental steps, cycles and phases. .According to these authors these incremental models have to be followed before the government is going to act and respond ad hoc to problems that occur. Governments should be rational and must design policy that has high goals and should not make quick policies on minor problems that pop-up day by day. Several policy cycles exists, an example is the made by Parsons and Greenwood (Parsons and Greenwood 1999). Their cycle exist out of 7 incremental phases. Another example of a process approach on policy design is the policy cycle of (Hoogerwerf 2008). He describes five phases in policy design (table 1).

Table 1: Policy design cycles

Parsons and Greenwood 1999	Hoogerwerf 2008
1. Problem, 2. Problem definition, 3. Identifying alternative solutions, 4. Evaluation of solutions, 5. Selection, 6. Implementation 7. Evaluation	1. Agenda setting 2. Policy design 3. Policy choice 4. Implementation 5. Evaluation

These two policy design model are combined by Van Hoesel, Leeuw et al. (van Hoesel, Leeuw et al. 2005). This combined policy design cycle is presented in figure 2 and exists of six phases;

1. Agenda setting: This phase starts when a social problem or a public value is brought to the attention of the government. If a social problem has the attention of the policy makers there is a chance that policy will be made.
2. Policy design: The new policy is prepared and designed.
3. Policy decision: In this phase the actual decision on the policy is made. Within municipalities this is done by the city council.
4. Policy implementation: When the decision is made that a certain policy is going to be implemented, all necessary arrangements needed have to be made. Organizations which are responsible for the policy execution have to be instructed.
5. Policy execution: When all necessary arrangements have been made and all organization have been instructed the policy has to be executed. This execution of policy can take several years, or as long as the policy is in place.
6. Policy evaluation: When the policy is finished, the policy need to be evaluated in order to see whether it was effective, efficient and acceptable. Lessons for future policy need to be drawn.

Step1 and 2 will be elaborated on further below.

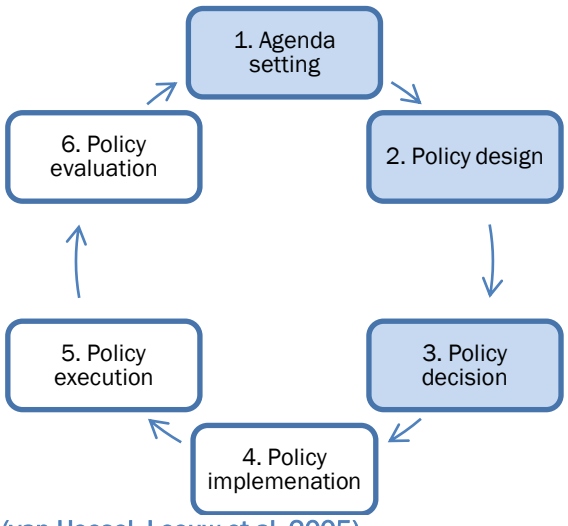


Figure 2: Policy design cycle (van Hoesel, Leeuw et al. 2005)

The policy design starts when a social problem is brought to the attention of the government. If the current or expected situation in the perception of a stakeholder differs from the ideal situation a social problem is perceived. The stakeholder who perceives this problem is the problem owner. The problem owner tries to convince the policy makers (politicians) within governments to put the social problem on the political agenda (van Hoesel, Leeuw et al. 2005). If a social problem has the attention of the policy makers there is a change that policy will be made. But who decides what topics and problems are on the agenda? According to Kingdon and Thurber (Kingdon and Thurber 2003) there are three different streams that all are fighting for attention. These streams are:

- The policy stream
- The political stream
- The problem stream

The policy stream is filled with solutions and policy core actions that a government can adopt. The problem stream is filled with social problems that need attention and a place on the agenda. The political stream is filled with political events or opportunities such as political crises and elections. When these streams come together a "policy window" is created in which a certain topic can arrive on the agenda on which a policy will be made. This model is illustrated in figure 3. The stream model is not linear, since three streams flow relatively independently through the policy system; ideally, a compelling problem is linked to a solution that is most politically feasible.

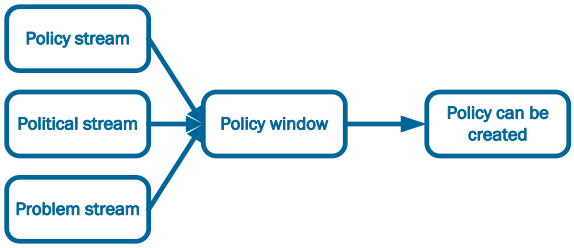


Figure 3 Stream model (Kingdon and Thurber 2003)

The stakeholders are not a part of stream but have interest in different possible solutions and problems. Kingdon and Thurber (2003) call these stakeholder "policy-entrepreneurs". The policy-entrepreneurs have the task to actively use these policy windows to get their solutions and problems on the agenda. In this research this theory is particularly interesting since the plans for a LSEC can be seen as a solution. It is part of the policy stream and it is actively seeking problems and political events to connect with in order to create a policy window in which the LSEC could arrive on the agenda. This phase in which policy-entrepreneurs are constantly fighting for attention and the right policy windows can be long and irritating. A nice example is the following quote of a policy-entrepreneur of LSEC plans working for the AgentschapNL:

"The phase of agenda settings has past; we are going to take big steps with the possibilities of today"

Maarten van Poelgeest,
Climate ambassador Sustainable Energieproductie AgentschapNL

This quote shows that even when certain solutions arrive on the political agenda and there is a great chance that actual policy will be made, there are still a lot of steps to be made before the actual solution is implemented. For this research it is very important to notice that according to Kingdon and Thurber (2003), policy is not designed in advance, but rather ad hoc in a reaction to events that occur.

The design of the policy contains eight steps (Hoogerwerf 2008). These eights steps should create a clear policy based on more reliable information on the social problem, the mechanism behind the problem, the policy goals, roles and instruments, implementation and policy effects in order to increase the chance on a success. The eight step model of Hoogerwerf (2008) and the policy design cycle are strongly cumulative and each step or phase must be based on the previous one. The eight steps within the policy design phase are:

1. Analysis of design assignment. In this step the policy designer will analyse for whom the policy is designed, who asks for the policy and within which time frame the policy is needed.

2. Analysis of problem situation. This step focuses on the actual problem situation, how big is the problem, who perceives the problem, what current trends are related to the problem. This will lead to a strict definition of the problem and problem owner.
3. Analysis of causal relations. This step tries to find the causal relations, mechanisms and effects which create and influence the problem. Hoogerwerf (2008) advices to use a causal loop diagram to find the needed relationships between factors.
4. Formulation of goals. This step deals with the question; *What does the policy want to achieve and how it is going to be measured if this is achieved?* The goals can be found within the causal loop diagram. The policy can "attack" one generic factor or multiple specific factors that influence the problem. The goals are chosen not only using the causal loop diagram but the choice is also influenced by external factors such as local politics, legal possibilities and financial opportunities.
5. Choice on instruments and their effects. When the goals of the policy are determined a choice must be made on the tools and actions that are going to be used on order to create. This can be done by the creation of a systematic inventory of possible instruments. Hoogerwerf (2008) distinguishes that all instruments can be divided into general or individual instruments and into choice increasing or choice decreasing instruments. He reasons that all instruments must be related to the causal loop diagram of step 3.
6. Design of implementation process. When a choice is made on which instruments are going to be used, an implementation plan has to be made. Who is going to implement the instruments and when are they going to be implemented? Are there other public organizations that already use these instruments?
7. Costs and benefits. The total lifetime costs and benefits of the policy must be calculated in order to evaluate if the policy is efficient and acceptable within a public budget. Special attention must be paid to external financial effects.
8. Formulation of policy design. After the previous seven steps the detailed and final policy text can be drafted.

It must be noted that the reality is often different than a rational design process. Due to a lack of information, time, or budget some phases are ignored (Koppenjan 2004). Complex problem are often not solved in a social vacuum through a relational design process. Critics on this approach point to the fact that designers have "bounded rationality" and policy design is an interactive social process. For this research the ad hoc stream model is more in line on what is known on how LSEC are being designed and are been formed.

2.1.3. Conclusion

The government should be seen as the right actor when the private sector is not able to supply certain values which the government has indicated as important. A government should answer the following question in order to get a rational indication on the reason why it should act on a certain topic.

1. What is the public value at stake?
2. Is the private market not able to safeguard this public value or are there any negative effects related to the usage of the product or service?
3. At which government level (national, regional, local) action is needed?
4. Are the public benefits higher than the public costs?

These questions can be used in advance to a government reaction to a problem or afterwards as a justification of government involvement. Government involvement can also have negative effects such as illegal state aid and market distortion. Therefore municipalities must make a considerate choice on their reasons for involvement. It must balance between finding a solution for the problem at stake and minimizing the negative side effects of the solutions. Municipalities must clearly indicate which public values are at stake to justify their involvement in a private market. It is reasoned that the primary focus of a government should be on three public values:

1. Affordability: Prevent high prices due to the abuse of market power, increase economic efficiency, employment and overall economic wealth
2. Acceptability: Minimize the negative effects on the environment (greenhouse gasses, air pollution and other environmental aspects)

3. Availability: Increase the security of supply through international energy politics, diversification of production technologies and fuel.

The indication of the involvement happens through a conscious process. Kingdon and Thurber (Kingdon and Thurber 2003) show with their stream model "solutions", policies are often not designed incrementally. Often a solution or instruments is already given or is set on the agenda by irrational arguments in the political arena. The stream theory combined with the agenda setting phase learns that when dealing with municipal involvement in LSECs the solution is already given; the "solution" or general "policy" is given. The creation of a LSEC is the solution of municipalities to realize some of the social problems (or to safeguard the public values). However a LSEC is not a clearly defined policy or set of instruments and therefore we cannot ignore the design of municipal involvement in LSECs. We cannot prove that every instrument has been designed rationally to achieve certain goals.

Table 2: incremental policy design vs. the stream model

Rational incremental model	Ad hoc stream model
Policy is designed in advance, in incremental steps with a clear goal and ambitions.	Policy is a ad hoc reaction to "solutions "that exist and political events that occur
1. Agenda setting: 2. Policy design: 3. Policy decision: 4. Policy implementation: 5. Policy execution: 6. Policy evaluation:	• Problems • Solutions • Political events
Policy design is a intellectual rational process	Policy design is a interactive social process
Policy makers are rational	Policy makers have bounded rationality

To summarize:

- There are sometimes goals related to a municipal involvement in a local sustainable energy company.
- There are certain instruments used by governments which are related to local sustainable energy companies.
- Policy is often a ad hoc reaction to social situations in society
- Local sustainable energy companies are a "solutions" that seeks constant attention from policy makers

The fact that the general policy/solution (creating a LSEC) is given, does not mean that there are no choices to be made on the involvement of a municipality in a LSEC. This section showed that we cannot demand that these choices on involvement are made before the LSEC is created or that it is a rational process. Therefore we still need to know how municipal involvement in LSEC looks like in practice and which generic models for involvement we can distinguish.

2.2. History of municipal involvement in energy companies

The previous section explorer, why municipalities could be involved in the energy sector and how they theoretically could act on problems within the energy sector. In this section a histrorical context is presented in order to give answer to the question

4. Why do local sustainable energy companies exist?

The energy market is a market with a remarkable development of interchanging policies. LSECs in their current shape are part of this energy market. In this way LSECs are the outcome of a historical process of incremental steps. Process design shows that organizations, such as LSECs, are created in interactive processes between stakeholders (Koppenjan and Groenewegen 2005). To understand the existence of current LSECs we must start by analyzing this process and the stakeholders over time. This paragraph will therefore describe this historical process starting by the origin of the gas and energy market (2.2.1.), followed by the centralization and in that way the fall of local sustainable energy companies (2.2.2) and the rise of LSEC by an overview of the development in the past ten years (2.2.3). The paragraph ends with an overview of the research, formulating a conclusion (2.2.4).

2.2.1. Origin of Local sustainable energy companies

The supply of gas, as the first source of energy, was first introduced in Rotterdam at the beginning of the 19th century by large international multinationals such as the English Imperial Continental Gas Association (ICGA) (van Noort 1993). The introduction in Rotterdam was the start of a trend of introducing gas in other large cities in the Netherlands. As more and more applications for gas and electricity were introduced the importance of gas for municipal society increased. Especially during the industrial revolution the demand for gas increased tremendously for industrial applications but also for public lighting. In 1827 ICGA was given a permit to lay an extensive private gas infrastructure in the centre of Rotterdam for the delivery of gas to industrial complexes, houses and street lanterns. The first gas fired street lanterns where introduced in 1835 in Rotterdam by ICGA. The number of gas fired street lanterns continued to grow during the 19th century as shown in figure 4.

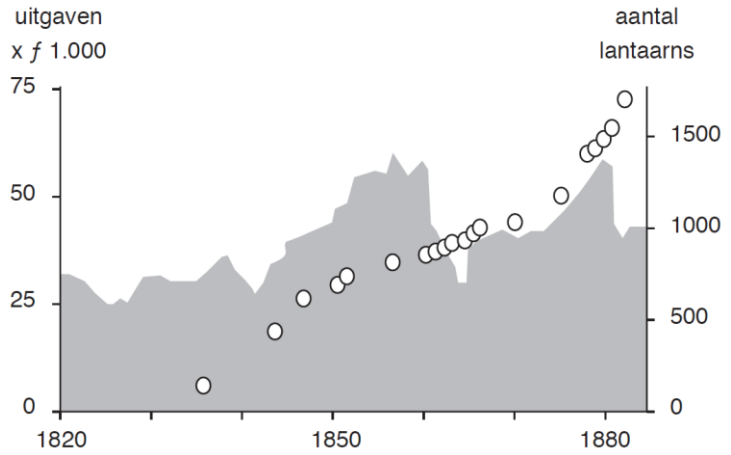


Figure 4: Number of street lanterns in Rotterdam and the municipal expenditures for gas (van Noort 1993)

In the Rotterdam gas market three main actors where active:

1. The municipality, as the main customer and the licensing authority for the building of a network of gas pipelines.
2. The large gas company: ICGA was the owner and monopolist of the gas network
3. The private customers. In streets where a gas pipeline exists, private customers could get a connection to the gas network.

The relation between the ICGA and the municipality of Rotterdam was governed in a contract. In 1825 ICGA received a permit to build a network of gas pipes in Rotterdam in order to deliver gas for industrial use and street lanterns. Customers that lived in a street with a gas pipeline could get a connection to the gas

network, though at high costs. The municipality of Rotterdam signed a contract for the delivery of gas for gas fired lanterns for 20 years (van Noort 1993).

The relation between ICGA and the municipality of Rotterdam was a close but tense relationship. Both had their own form of market power but were also dependent on each other and could not operate independently. Each time the contract needed renewal tensions increased for both partners. If the ICGA pushed its market power too much, the municipality could threaten to start its own gas company or give a permit for a second gas network. Though both options did not seem very likely at that time because municipal budgets were not sufficient to finance a gas network and they also benefitted from the relation with ICGA since with their high market power the municipality could get very low gas prices (below marginal costs) at the cost of the private customer.

Table 3 the three main actors in the municipal gas market and their roles, instruments and interests in the 19th Century (van Noort 1993).

	Municipality	Energy company	Private customer
Roles	Licensing authority Large customer	Producer,transport, distribution and supply	Small customer
Instruments	Gas infrastructure permits Long-term contracts	Long-term gas contracts	Short-term contracts
Interests	Low long term gas prices Lowinfrastructure expenditures	High gas prices	Low short term gas prices

As shown in table 3, none of the actors had completely overlapping roles, instruments or interests. On the long term none of the three actors could join forces or aspect that their interest would be served by the other actors.

This was also noticed by the smaller third party, the costumers (citizens and small businesses), who had virtual no market power. This led to the development of a second gas network started by the small private companies. In December 1852 the New Rotterdam Gas factory (NRG) was founded, this was the second private gas company in Rotterdam (van Noort 1993).

Around the same time the small private customer started protesting at the city council to call an end to the large market power of ICGA and demand that the city council would safeguard the public value of low and fair gas prices. As an answer to these protests, the municipality of Rotterdam started buying smaller gas suppliers and started their own municipal gas company: GEB (In Dutch: Gemeentelijke energie bedrijven). In 1887 the municipal Rotterdam gas company (GEB) was the only gas producer and supplier left and the era of private gas companies came to an end. For the next 100 years, gas delivery and supply were in public hands in the Netherlands. The GEB can be seen as the first Dutch municipal local energy company. It leaded to lower prices for the smaller private customer but higher prices for the municipality since it could not receive the sub-marginal-prices at the expense of the private customer anymore.

The introduction of electricity started a few years later in Rotterdam in 1894. Small private initiatives initially received little support from the GEB since the advantages of the large-scale usage of electricity was not directly clear to the city council and they feared that electricity could become a competitor the monopoly of the GEB on energy supply.

Only when the municipal Rotterdam harbour company indicated that the advantages for the economic vitality of the harbour where immense the GEB started building an electricity infrastructure. In 1894 the first municipal electricity production facility was build. The rise of municipal energy companies resulted in a reshuffling of the roles and position of the classic three stakeholders. The large energy producer an independent stakeholder merged with the municipality, see figure 3. This lead to the dependency of private customers on the municipal institution but market power decreased since the role of the municipalities was to provide the energy at fair prices and had no dominant profit motive.

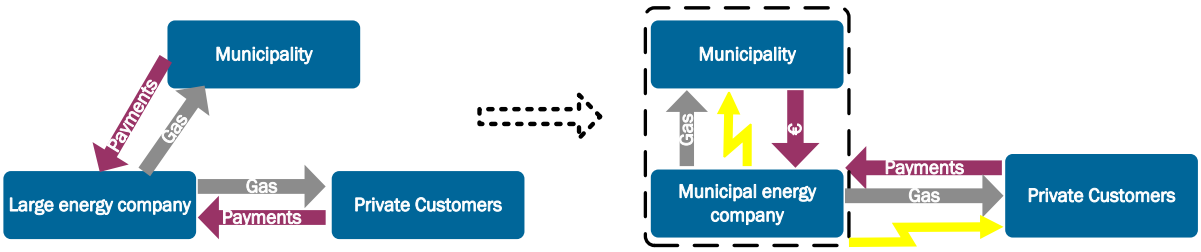


Figure 5: Shifting Stakeholder relations around 1900

Dutch municipalities, like Amsterdam, Nijmegen and Den Haag, followed the example of public municipal energy companies like the GEB in Rotterdam and mid-20th century almost all larger Dutch cities had their own municipal energy company *(GEB)*. The large cities, with their densely populated city centres, could build a gas and electricity infrastructure at relatively low costs per household.

However, the smaller more agricultural areas on the other hand, with a low population density, could not find sufficient public funds or private companies to build an energy infrastructure, because of the higher costs. It lasted until the 1920's until the Dutch provinces realised that they needed to take their responsibility for this matter in order to realise electricity and gas infrastructures in the smaller municipalities. This was the start of the provincial energy companies.

2.2.2. The fall of the municipal energy company: Centralisation

In the mid-20th century, almost all larger municipalities in the Netherlands had their own municipal energy company which produced, transported, distributed and supplied electricity and gas to all customers within the region. Since the use of electricity rose tremendously and more and more local networks where connected, the first regional electricity grids emerged. Around 1950, all regional and municipal electricity grids were coupled and a large national electricity grid was operational.

In 1981, the national economic optimization program started (LEO) (In Dutch: Landelijke Economische Optimalisatie (LEO)) (Wijers 1998). This LEO program allowed the technical regulation of all Dutch power plants from a central point and was the end of total autonomy of the Dutch local energy companies. It meant that a central organization in Arnhem decided which power plants were allowed to supply the demanded amount of electricity and which plants where forced to power off. The program was considered a success since it allowed economical optimal use of power plants. An effect of the success of the LEO program was the fact that the Dutch government introduced the ambition to form one large Dutch monopolistic energy company (GBP) (IN Dutch: Grootschalig Productiebedrijf (GPB)) (Wijers 1998). The central argument was that one single public governed monopolistic power company would be an effective instrument to safeguard the Dutch interest in an international competitive energy market.

In 1989 the national government launched the plan to split the distribution companies and production companies into two separate companies. The idea behind this plan was that it would allow a nationwide and international focus for the production companies, while the distribution companies could focus on their specific region. This again meant a large decline in the influence of the local governments, since the production companies would change their focus point from municipalities to much wider regions. The new energy law of 1989 started a large concentration trend, which leaded to the merger of 15 regional energy companies into 5 large energy companies (Eneco, ENW, Nuon, PNEM and E.on).

The policy towards a central planned electricity sector, ironically led to the arise of the first local energy companies during the early 1990's because of two reasons:
First of all, this heavily regulated oligopoly of large producers, with its high amount of overproduction in combination with the limited opportunities for electricity imports, led to a situation of high electricity prices in the early 1990's.
Secondly, the energy crisis of the 1970's forced the Dutch government to introduce a policy, which stimulated investment in decentralized and sustainable energy production in order to increase the diversification and thus the security of supply of the Dutch energy sector. The policy introduced investment subsidies for decentralized energy production.

In 1996 a directive from the European Parliament demanded the formation of an internal competitive electricity market before 1999, abandoning the formation of a single monopolistic energy. The directive demanded free entry of new energy producers. This directive was the basis for the electricity law of 1998 and was the start of the liberalization, privatization and heavy regulating trends. The EU directives only demanded for a formal unbundling of the production, distribution and supply parts of the large energy companies, which meant that the shares of the different distribution and production companies were allowed to stay in the hands of one owner. The Dutch government, however, decided that next to a formal unbundling they demanded a full ownership unbundling. This option would split the ownership of production from the transmission system. The goal of this legislation was:

- To create a competitive internal market for the production, import and export of electricity
- Shape non-discriminatory access to the electricity networks (with respect to availability, affordability and acceptability of the electricity sector)

The government decided that it was necessary to keep the large electricity transmission and distribution networks in public control. The unbundling legislation package (Splitsingswet and other.) had three effects:

1. More mergers between energy production and transmission companies stimulated by the governance in order to create competition on a national level. The five large energy companies (Edon, PNEM, Eneco, Nuon en ENW) all sought a suitable partner to take-over the last remaining municipal en regional energy companies. An example is the merger of PNEM and Edon into Essent in 1999 (see figure 6).
2. Ownership unbundling of production, transmission and distribution within a company. Essent, for example, was forced to sell it transmission network to the public transmission company TenneT. The distribution part of Essent, was unbundled into one new company named Enexis. The shares of Enexis remained in public ownership (municipalities and provinces). The reaming part of Essent (production and supply) also stayed public ownership.
3. The take-over of the large energy companies by foreign companies. Due to the EU policy of creating one European electricity and gas market the electricity markets of the Netherlands, Belgium, France and Germany where coupled and adjusted so that they would allow cross-border trade. This leaded to a situation where the large Dutch energy companies (who were relatively small compared to the large German and France energy companies) became interesting partners for the foreign energy companies, who were seeking to increase their European market share. Essent (the remaining production and supply parts), for example, was sold to RWE in 2009. Nuon was sold to Vattenfall in October 2009. Eneco en Delta, despite several hostile take-over attempts of E.On, remained in public hands.

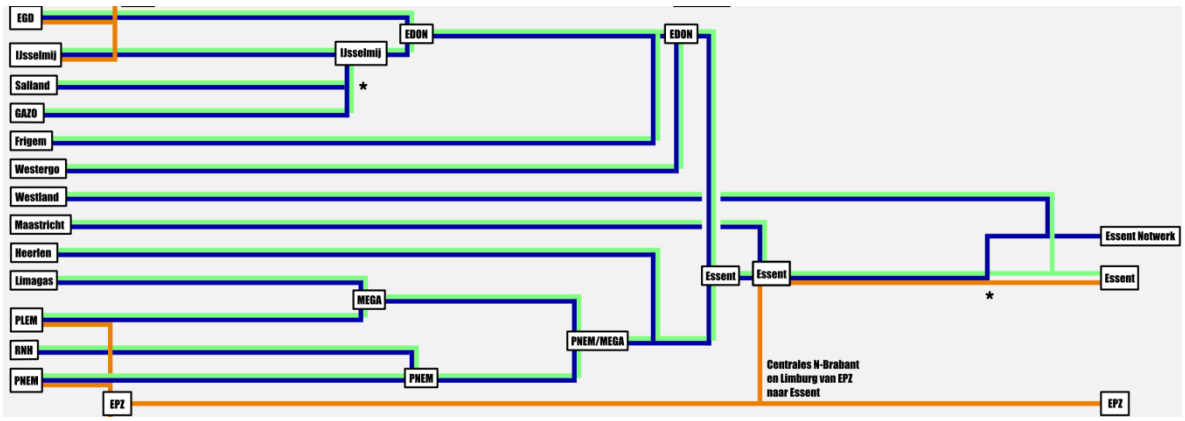


Figure 6: Timeline of Essent

This transition had two effects on municipalities:

1. Due to the mergers the municipalities became only small shareholder in the remaining large energy producers (Nuon, Essent, Eneco and Delta), decreasing their influence.
2. Due to the take-over a lot of municipalities (almost 60%) had to sell their shares the Dutch municipalities together received 5,7 billion euro for the sale of their shares.

2.2.3. The rise of the local sustainable energy company

In the first decade of the 21th century, for the first time in 100 years, almost 60% of the Dutch municipalities did not have a formal connection anymore to one of the large energy production companies. This does not mean that the are no connections anymore, because these energy companies are still firmly regulated. This gave the municipalities an opportunity to revaluate their role and ambitions related to local energy infrastructure. The rise of the local sustainable energy companies results from the trend towards higher sustainable clean energy goal

The rise of technological possibilities within clean energy led to a new trend of investing in sustainable energy. Increasing the amount of renewable energy, energy efficiency and energy savings are goalson which local municipalities can have a large influence. These new sustainable energy technologies were not costs effective, therefore the private energy companies did not invest much in this new sector.

In this way municipalities also developed a level of ambition to reach these goals. A prime example of this ambition is the 2007 policy agreement between the association of Dutch municipalities (VNG) and the national government (het Rijk) where both parties declared to try to realise these clean energy goals and committed themselves towards goals on reducing greenhouse gas emissions and increasing the share of renewable energy (VNG 2007). With this agreement the National Government acknowledges the role of municipalities and together they drafted and signed the *"Climate agreement Municipalities and the National Government 2007-2011" (Klimaatakkoord Gemeenten en Rijk 2007-2011)* (KGR). This agreement has served as the start of some of the local energy and climate policies. Recent research done by the VNG shows that more than 50% of all Dutch municipalities have adopted and implemented the key elements of the KGR (VNG 2009). This agreement state that both parties (municipalities and the national government) will:

1. Stimulate and promote the Renewable energy systems (RES) target of 20% in 2020
2. Strive to double the amount of onshore Wind capacity in 2011
3. Create opportunities for the implementation of renewable energy in the local zoning plans.
4. Use their influence (as shareholder) to stimulate energy companies to increase their RES and the use of residual heat.
5. Stimulate and create the development of projects involving "Green gas".

The establishment of LSECs

Municipalities started to facilitate, stimulate and organize local projects and initiatives and guide the physical implementation of renewable energy (such as wind parks, biogas installation, heat-storage and solar-PV) in the built environment.

A recent evaluation of the implementation of the VNG climate agreement (KplusV 2010), shows that in the last four to five years (2005-2010) a growing number of Dutch municipalities is actively seeking partnerships with the private sector and the community sector. Representatives from the private and community sector both acknowledge the changing role and instruments of Dutch municipalities in the last few years. The private sector recognizes the new 'matchmaker' and intermediating role of many municipalities, next to the more classic facilitating and regulating role of municipalities. KplusV (KplusV 2010) conclude that the new role of matchmaker demands a stronger foundation and assurance in municipal policy, the municipal organization and in municipal instruments.

KplusV (2010) also conclude that in the period 2004-2008 the budget for sustainable energy and climate policy has increased and that there is a strong correlation between economic ambitions and climate ambitions. These new partnerships, between the private, community and public sector, in the field of energy, are realized in various ways:

1. Initiatives focuses on energy savings are called energy saving companies (ESCOs). They are focussed on realising energy savings in buildings and industrial installations, or on realising sustainable energy production capability.
2. New partnerships focussed at energy production are called local sustainable energy companies (LSECs). Examples of municipalities who in the last 6 years have been involved in plan for a LSEC are Apeldoorn, Tilburg, Texel, Veenendaal and Heerhugowaard. These LSECs have a wide variety in used technologies, institutional designs and types of stakeholders involved.

In this research the focus lies on LSECs. A LSEC is defined as an organization that is aimed at the realization of the local production and supply of sustainable energy, in their own region, for local customers. The rise of these local sustainable energy companies and their relationship with its municipality is the central theme in this research.

Choice on technology

Before the rise of the LSEC, the primary used technologies were all fossil fuelled technologies, such as gas and coal fired plants. The key aspect of sustainable energy is the fact that it is based on non-fossil fuels. Therefore these newly formed LSEC all had to make a (implicit) choice in the used sustainable energy technology.

2.2.4. Conclusions on the history of municipal involvement in energy companies

The liberalization and privatization policies of the last two decades resulted in a situation where large energy companies merged and were taken over by international larger companies. This led, together with the subdivision between producing and distributing energy companies to a decrease of influence by the Dutch municipalities. Due to the take-over most municipalities had to sell their shares in the large energy companies, receiving a very significant amount of funds to spend. It meant the end of a formal connection between the energy companies and the municipalities. This revaluation led to a list of public values that the government should safeguard regarding the energy sector. In the same time the rise of interest in climate change and concerns about greenhouse gas emissions led to the ambition to provide cleaner energy. These developments were the starting point of the rise of local sustainable energy companies, which also gained the interest of several municipalities for involvement. The fluctuations on public and municipal involvement in the energy sector are illustrated in figure 7.

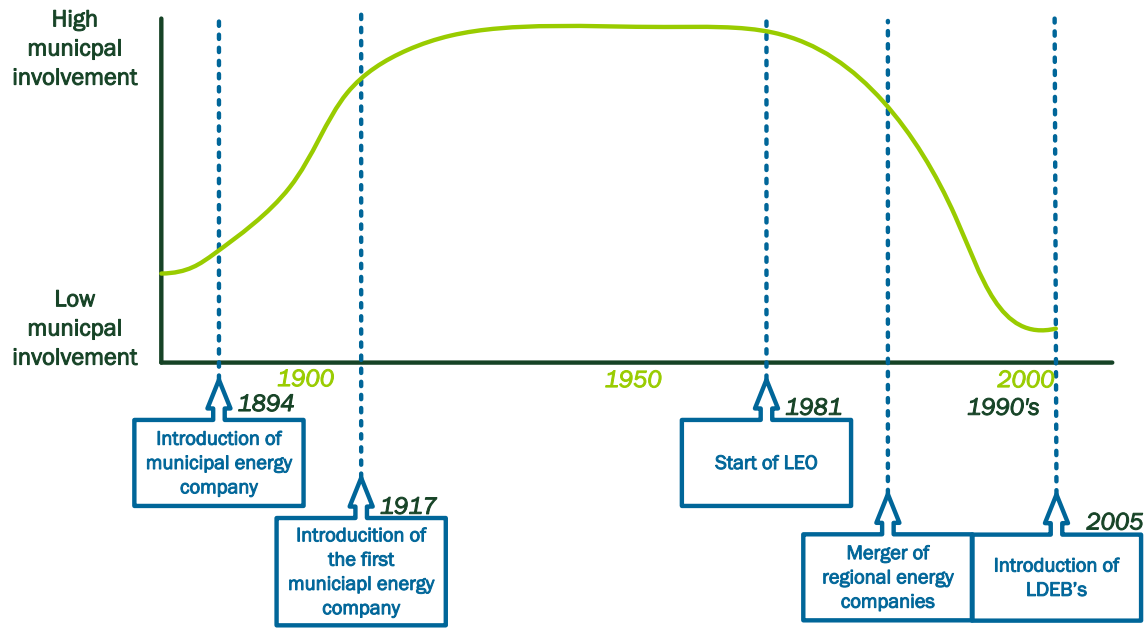


Figure 7: Fluctuations in municipal involvement in the energy sector over the past 150 years

From the history four main conclusions can be made:

- The way governments are involved differ for each type of energy output and conversion technology
- The two dominant stakeholders in the energy sector are the supplier as well as the customer. The municipalities have played a huge role in this matter over the past 150 years, starting the investment in the energy network as well as providing energy at fair prices. They can be considered as the link between private customers and the energy company and can even act as both, depending on its own chosen level of involvement.
- Some of the municipalities do not have a formal connection with the energy companies nowadays but do have large funds to invest, due to the sale of the energy company shares.
- Throughout history there are three governmental related public values: affordability, acceptability and availability.
- Municipalities can play a role in the development of producing renewable energy, energy efficiency and energy savings. This is also acknowledged by an agreement between municipalities and the government that the local governments will stimulate renewable energy systems.

2.3. Hybrid organizations

The historical analysis showed (section 2.2) that local sustainable energy companies are hybrid organizations because, they have mixed private and public values and elements in their operations (Kickert 2001). In this section the theory behind hybrid organizations will be explored using existing literature. It will start by looking at what hybrid organizations are (2.3.1), followed by the challenges of a hybrid organization (2.3.2). An overview of the main drivers to form hybrid organizations is given in 2.3.3 and the paragraph ends with a conclusion in 2.3.4.

2.3.1. The structure of a hybrid organization

Many authors have used different definitions raging from very pragmatic to very strict theoretical. The term "Hybrid organization" is introduced by Williamson (1991). Williamson (1991) used a broad definition of hybrid organizations: all organizations that produce physical goods and operate between a pure private form and pure public form (Ruys 2006). In my opinion this definition is too strict since it does not include clusters, networks, symbiotic arrangements, supply-chain systems, administered channels, nonstandard contracts, and so on. In this way the definition of Kickert (2001) where hybrid organizations cover 'a broad spectrum but over only one dimension: pure government agencies on one end to commercial firms on the other' is much more usable.

Despite the lack of consensus on the specific definition of hybrid organization, scholars tend to agree that hybrid organizations contain mixed sectors of legal, structural, and/or mission-related elements (Smith 2007). However, the scope and consequences of these hybrid organizations have not been extensively studied. Even the language to be used in discussing the hybrid sector is in dispute (Kosar 2008). Research on these organizations is challenged by the many different definitions and interpretations (Smith 2007). Next to these often semantically questions the number of empirical literature on partial privatization of local services is extremely scarce (Bel and Fageda).

Hybrid organization can be seen as a combination of a public and private organization. Next to these two dimensions of public and private a third dimension can be introduced: the community (Karré). This third dimension, community, is defined as private, informal and non-profit. This sphere of community organization is also called the civil society (*maatschappelijk middenveld in Dutch*). Organizations placed in the middle of the three dimensions are often the most typical a mix of public, private or community organizations (figure 8). These are hybrid organizations, they are not public, private or community oriented, but encounter all parts. In general it can be seen as that the public role is the fulfilment of a required task, while the private role is to create revenue.

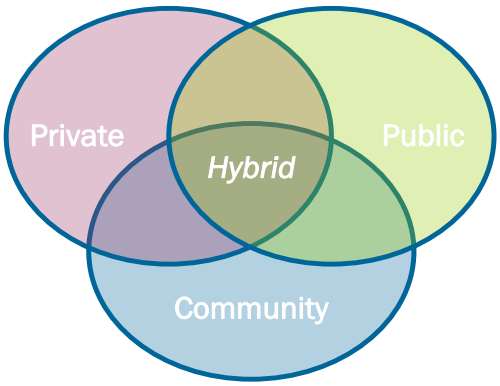


Figure 8 Three dimensions of hybrid organizations (based on (Karré 2011))

In the Netherlands the distinction between public and private spheres was never strict. A strict separation between the public and private spheres is unrealistic. According to Kickert (2001) it is far better to try to understand hybrid organizations than to try to deny them out of existence. Many organizations that are nowadays seen as public companies have their origin in the private or community sphere. Examples are the Dutch railway company (NS) and the water company of Amsterdam (Waternet) (Karré 2011). During the mid-20th century many public services where state owned. There are many public services which combine a task orientation and a private market orientation.

The public vs. private dimension can be used to further explore different types of hybrid organizations. On this dimension the various organizational arrangements that are in existence can be ordered. A fully public owned and operated organization which performs a public task is the most classical or strict public organization and can be placed on the far public end of the public vs. private dimension (see figure 9). (Groenewegen and Lemstra, 2007). On the other end of this dimension fully private companies which operate on a spot market via classical contacting are situated. Companies which use relational contracting between producer and customer are also seen as fully private companies. Between these 2 extremes a series of hybrid arrangements is placed. These hybrid arrangements have a wide variety of different arrangements and often have a complex ownership structure. Groenewegen and Lemstra (2007) suggest that a driver behind a higher privatization is the level of complexity of the related service. If a service or product has high asset specificity and a large number of involved actors than it is more likely that the service is provided by a public arrangement.

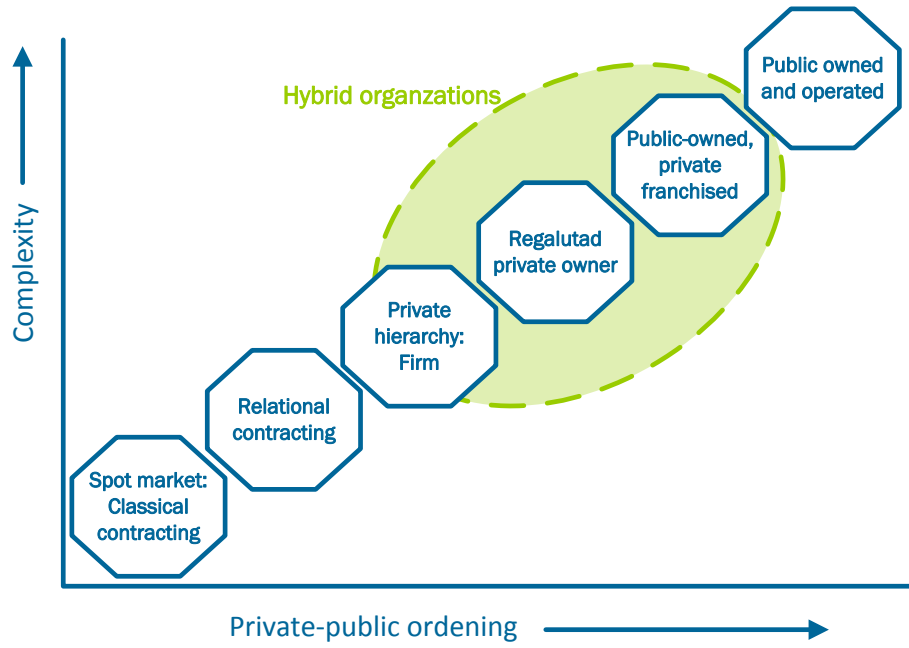


Figure 9: Static Blueprints for market regulation (Groenewegen and Lemstra 2007)

Other authors who classified the various organizations on the public vs. private dimension were Perry and Rainey (1988) who categorized eight type of institutions. These institutions differ on their mode of ownership, funding and mode of social control. These three factors together define whether a company is a hybrid organization. For instance a 'bureau' which is publicly owned and funded and operates as a polyarchy is not a hybrid organization while a 'government enterprise' which is owned and funded publicly as well but operates in the market can be seen as a hybrid organization. These institutions are stated in table 2. Perry and Rainey (2008) distinguish six type of hybrid organizations between the extremes of the bureau and the private enterprise (in figure 10 category 2-7). Perry and Rainey (1988) clearly show that there are six different types of hybrid organizations, since local sustainable energy companies can be seen as a hybrid organization I reason that these six types also can be used within LSECs. This means that when a LSEC is newly formed there should also be made a choice on the institutional layout and the way the new organization is governed.

Next to the choice in technology (derived from the historical context) this gives us a second aspect on which a choice has to be made when a LSEC is formed.

Category	Ownership	Funding	Mode of Social Control	Example
1. Bureau	Public	Public	Polyarchy	Bureau of Labour Statistics
2. Government corporation	Public	Private	Polyarchy	Pension Benefit Guaranty Corporation
3. Government-	Private	Public	Polyarchy	Corporation for public

	sponsored enterprise				broadcasting
4.	Regulated enterprise	Private	Private	Polyarchy	Private electric utilities
5.	Government enterprise	Public	Public	Market	Public electric utilities
6.	State-owned enterprise	Public	Private	Market	Airbus
7.	Government contractor	Private	Public	Market	Grunman
8.	Private enterprise	Private	Private	Market	IBM

Figure 10: Categorization of institutions in the public and private sphere (Perry and Rainey 1988)

2.3.2. Challenges within hybrid organizations

Hybrid organizations combine the three dimensions of public, private and community which all have their own institutional logic. Institutional logic refers to the total set of practices, assumptions, norms, values, beliefs and rules by which these organizations handle (Orlikowski and Jay 2010). These logics are described in table 4 and give a clear point of reference on the distinction between the three dimensions.
It shows that hybrid organizations are complex systems since there are organizational differences between the public and private sector on ownership and financing as well as between the products they provide and the markets they tap (Kickert 2001).

Table 4 Institutional logics of the three organizational spheres (Orlikowski and Jay 2010)

Institutional Logic	Public	Private	Community
Ideal type organization	**Government bureaucracy**	**Business firm**	**Non-profit organization**
Normativity / strategic imperatives	Policy implementation, serving public administration, accountability, safeguarding public values	Revenue, profit, client service, private value creation	Mission driven, solidarity, selflessness
Capacity	Coordination of public recourse, rule making, regulating, enforcement of power	Salesmanship, innovative services	Collective action, education
Constraints/ structure	Law, procurement rules, transparency	Rules of the Game, responsibility to Financers, client attention	Normative expectations of stakeholders
Time	Budget cycles, election cycles	Sales cycles, quarterly reporting	Campaign momentum, grant funding cycles
Space	Public meetings, public hearings,	Businesses, homes	Neighbourhoods, events, meetings, intimacy

As we can see from table 4 hybrid organizations can take advantage of the freedom of the private market but must also take notice of budget cycles and election cycles of its public stakeholder. This increases the complexity of the operational environment of such an organization. This also is the case for LSECs; they can compete on the private electricity market but must also deal with the policy cycles of municipalities and the often high expectations of involved citizens. In this way to successfully realize a hybrid system, it involves the manipulation of a complex web of numerous interrelated physical and social variables. In this web, causal relationships are difficult to identify. The local sustainable energy companies are typical multi-actor, multi-level, multi-disciplinary systems. This complexity thus creates a high level of uncertainty (van Bueren 2008).

Orilkowski and Hay (2010) have performed a theory-building field study of the Cambridge Energy alliance to better understand the challenges of hybrid organizations. This study is particular interesting since it clearly describes two main challenges, or paradoxes, that all hybrid organizations have to cope with. These two paradoxes show that the challenges that hybrid organizations have to deal with originate from the different stakeholders involvement and institutional logic (Orlikowski and Jay 2010):

1. Various goals and expectations: This is 'The paradox of hybrid legitimacy': hybridity expands success to a broader range of exchange relationships, but undermines exchange partners' willingness to commit resources to an organization which defies conventional schemas and familiar types,
2. Hybrid organizations always change over time.: This is the 'catalyst's paradox': alternative institutional logics (private logic and public logic) have varied definitions of success and failure which conflict. Data suggest that this second paradox can be successfully navigated through reflective thinking, developing variable and complex practices, and cultivating resource streams that reward the organization for serving the whole and pasts of a constituency simultaneously (Orlikowski and Jay 2010).

These two paradoxes show that the challenges that hybrid organizations have to deal with originates from different stakeholder involvement and institutional logic. Joldersma and Winter (2001) observe the same challenge: hybrid organizations are dependent on external resources, government policies, and multiple stakeholders. They have to deal with vague, public and private goals and different stakeholders' interests. The stakeholders are the external parties the organization interacts with, but also concerns internal parties such as staff and the board. They all have an interest in the organization's future. Because hybrid organizations have to deal with many stakeholders with different interests, political power struggles between stakeholders are more likely to occur. (Joldersma and Winter 2001).

An important conclusion from these paradoxes is that hybrid organization and their goals are often highly complex and are constantly changing and interacting with its social environment.

2.3.3. Drivers to form hybrid organizations

In the previous section the different definitions of hybrid organizations. In this section the questions on why organizations are hybridized and the drivers are behind this hybridization are explored. In the historical context we also noted these trends (section 2.2.).

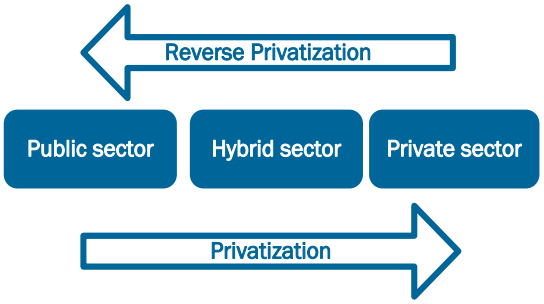


Figure 11: Two trends: Reverse privatization vs. Privatization

A starting point to identify different drivers that can be distinguished in literature is the trend towards more privatization on the national level on the one hand and the trend of more reverse privatization on the local level on the other hand. These trends are particularly interesting because with both trends the number of hybrid organizations can be increased (see figure 11).

Often because of efficiency and reducing government spending, the governments of many countries have decided to privatize these public services. At the same time we see more and more local governments again participating in the private market through market oriented organizations. This reverse privatization is not a return towards the direct government monopoly of the past. Instead we see local governments using markets, but playing a market structuring role in building competition, managing monopoly and reducing transactions costs of contracting.

The term privatization is used in this research in a broad sense. It refers to all initiatives for marketization of public organizations (Joldersma and Winter 2001). These privatisation policies have been implemented worldwide in the last two decades (Bel and Fageda 2007).

The field of privatization is well researched, especially in the field of privatization on the national level there is quite some empirical research available. On the local level there is the problem that empirical research has the limited ability of existing studies to explain what drives local privatisation (Bel and Fageda 2007).

Drivers derived from privatization.
Government restructuring of services and products remains a central focus of research on the role of the public sector in modern society. Observing that public involvement is still the dominant form of public goods service delivery in the United States and believing that private provision is more cost efficient, researchers have tried to explain why services have been privatized (Warner and Hebdon 2001). Three main drivers can be identified:

1. *Lower public expenditures*
2. *Lower prices for end users*
3. *Ideology of smaller governments*

The first driver behind privatization is the wish of many governments to lower their public expenditures. When a public company is no longer an integrated part of the government, then this government is no longer obliged to put this organization on it financial balance sheet, this is a fiscal restriction. If there are private parties willing to provide the service it saves the government financial means. Among the studies for European countries, only Dijkgraaf, Gradus et. Al. (2003) study of the Netherlands finds fiscal restrictions to be a relevant influence on local public service choices (Dijkgraaf, Gradus et al. 2003; Bel and Fageda 2007). A second driver is to lower the prices for end users. There seems to be evidence that contracting out government services saves customers spending on these services and products, and sometimes it even saves a lot of money, compared to public provision (Dijkgraaf, Gradus et al. 2003). The third driver is a non-economical driver but is more ideological. Often the more liberal and pro-globalization fractions in western democratic society have a strong wish to privatize as much public services as possible. These three drivers can also be used in the debate on how municipalities can be involved in LSECs.

Drivers derived from reversed privatization.
From the literature two drivers have been identified that originate in the reversed privatization. These are:

1. Failed privatization
2. Call for greater democratic engagement in services

The first driver comes from the failed privatization. In the last decades more and more criticism on further privatization is found in literature. The privatization trend emphasized speed and flexibility and the advantages of markets for both greater private sector engagement and consumer voice for citizens (Savas, 1987) but these private market solutions suffer from high transactions costs and this has led to a new trend on more network governance based on relational contracting and trust (Goldsmith & Eggers, 2004; Brown, Potoski, & van Slyke, 2007)

Another driver is the needs of more democratic engagement in services, in other words the involvement of the customer. There is an increased need to combine the use of markets, democracy and planning to reach decisions which may be both efficient and more socially optimal (Warner 2008).

The dilemma of privatization vs. reverse privatization also deals with the question whether the public sector should be involved in a product or service or not, which is as well discussed in section 2.1.

2.3.4. Conclusions on hybrid organizations

Hybrid organizations are organizations that encounter both private and public roles and contain three dimensions: private, market and community. A hybrid organization can either have public or private ownership and funding and operates in a polyarchy or market. This also depends on the complexity of the service: if a service is complex and has a large number of involved actors than it is more likely that the service is more public of nature.

Hybrid organizations are complex organizations since they have to deal with both private and public interests. The main challenges of hybrid organizations are the various goals and expectations of the three dimensions as well as the fluctuation over time in the main goals and expectations. This mainly depends on the different stakeholders and their different interests who all need to be taken into account as well as the vague formulation of public and private goals.

Hybrid organization and their goals are often highly complex and are constantly changing and interacting with its social environment.

Hybrid organizations originate due to privatization or to reverse privatization. Three main drivers behind privatization can be identified:

1. *Lower public expenditures*
2. *Lower prices for end users*
3. *Ideology of smaller governments*

Drivers to reverse privatize an organization are the fear of failed privatization and a call for greater democratic engagement in services

Perry and Rainy clearly show that there are six different types of hybrid organizations, since a local sustainable energy companies can be seen as a hybrid organization I reason that these six types also can be used within LSECs. This means that when a LSEC is newly formed there also should be made a choice on the institutional layout and the way the new organization is governed. Next to the choice in technology (derived from the historical context) this gives us a second aspect on which a choice has to be made when a LSEC is formed.

There is a high level of unpredictability and uncertainty about the outcomes and effects of certain choices of municipal involvement (different roles and instruments) in the level of success of an LSEC and there for the corresponding ambitions and related public values.

2.4. Models for municipal involvement in public services

From the previous sections we have learned that local sustainable energy companies can been seen as hybrid organization which mix private, public and community elements in their goals and social environment (section 2.3.). We also know that municipalities should be involved in the local energy sector if they feel that an important public value needs safeguarding. These important public values are:

1. Affordability: Prevent high prices due to the abuse of market power, increase economic efficiency, employment and overall economic wealth
2. Acceptability: Minimize the negative effects on the environment (greenhouse gasses, air pollution and other environmental aspects)
3. Availability: Increase the security of supply through international energy politics, diversification of production technologies and fuel.

But how could such a hybrid organization in the local energy sector look like? What kind of generic strategies could municipalities adopt when encountered whit such initiatives?

In the literature a generic model for municipal involvement in LSEC has not been found. However there are studies performed on municipal involvement in similar types of organizations. In order to make a framework of municipal involvement for LSECs it can be interesting to look into this research. Therefore the following paragraph will give insights on different models of involvement. Two types of models will be discussed. The first is a model for municipal involvement in local broadband companies (2.4.1) and the second is an overview of municipal involvement in energy in Eastern Europe (2.4.2). The paragraph ends with a conclusion (2.4.3).

These models can be seen as institutional layouts

2.4.1. Models for involvement in internet companies

In this paragraph the study performed on municipal involvement on local broadband companies will be reflected. In 2004, the governmental commission on market structuring (*Interdepartementale Commissie Marktordening)* (ICM) performed a research on the struggle of municipalities with their involvement with local broadband companies (Ten Heuvelhof 2004).
A growing number of public and private parties are developing plans aimed at stimulating the deployment of broadband networks (glass fiber). With the choice for a particular type of involvement and the effects of that choice, dilemmas on market regulation and market distortion can arise. These dilemmas can range from questions on the efficient way of safeguarding public values to tendering issues. (Ten Heuvelhof 2004). The ICM tried to develop several models that could help public parties with their choices on involvement in local broadband initiatives. This lead to the development of five generic models for municipal involvement which municipalities can use on the decision on how to approach the deployment of a local glass fibre network without negative effects in market regulation (Ten Heuvelhof 2004).

Due to the similar structure this research can be perceived as a guideline for the involvement of municipalities in local sustainable energy companies. Though it also differs from the situation on LSECs. Broadband network are essentially new infrastructures, while a LSEC is more focussed on production capacity that is coupled on an often existing infrastructure (the electricity or gas grid). Despite the difference in infrastructure the same generic involvement models could possibly be used in LSECs.

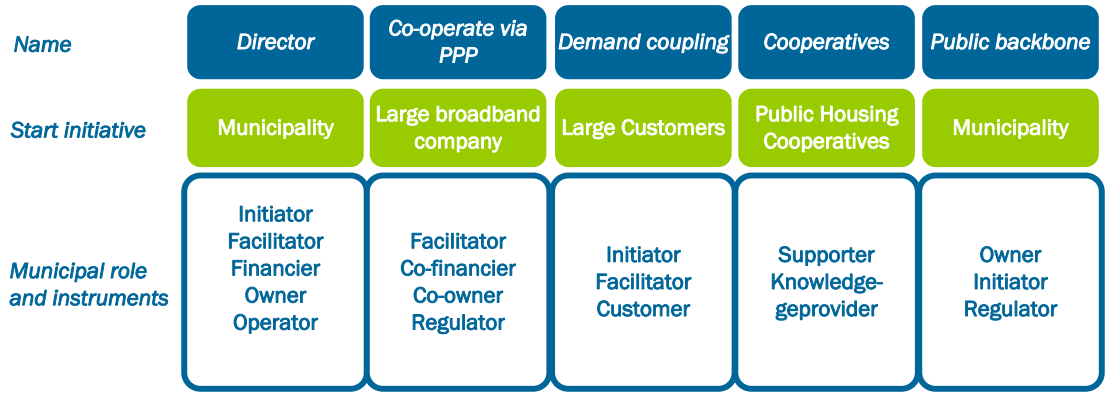


Figure 12: Blueprints for Local broadband companies (Ten Heuvelhof 2004)

The 5 models of involvement range from demand coupling to financial participation of municipalities. The 5 generic models are illustrated in figure 12. The models consist of a set of possible roles which depend on the start initiator. The roles are combinations of functions and instruments that the municipalities can perform. Some recommendations in the model are specifically applicable for the broadband situation. The more general recommendations that can be used in sustainable energy are stated in the model descriptions below.

Broadband Model 1: Municipal director
The first model (see figure 12) is based on a strong position of the municipality. The municipality is the initiator of the local infrastructure. Other possible roles the municipality can perform are Financer, owner and operator (in Dutch: *exploitant*).
The specific recommendations for this model are:

- A municipality must choose how a third party access to the infrastructure is governed.
- In this model public funding must be minimized as much as possible to prevent that private parties will not invest because they expect to get public funding automatically. This can disturb the willingness to invest by private parties.
- Create an independent controller/regulator who controls the different possible conflicting roles a municipality can have. A municipality can be the owner operator and user of the system but these roles could possibly be conflicting (Ten Heuvelhof, 2004).

Broadband Model 2: Co-operate via Public Private Partnership (PPP)
In the second model (see figure 12) the municipality acts as a "matchmaker" between large companies which are already active in the sector to create local infrastructure. The existing large companies which have customers in the municipality invest together in a new local company which will serve all local customers. This new company is a close co-operation of existing competitors. The municipal role is to facilitate the creation of this new company. It can act as Financer and co-owner. If the municipality acts as co-owner the organization will have a hybrid character.

- Special attention must be paid to the creation of this new hybrid organization because with PPP organizations goals and targets are often not met (Ten Heuvelhof, 2004).

Broadband Model 3: Demand Coupling
In the third model (see figure 12) the municipality act as a demand coupler who couples local demand. This model is especially interesting for smaller municipalities that are less interesting for the private sector to invest in. If the demand is coupled the total demand can be high enough to be interesting for private parties to invest. The role for the municipality is therefore to facilitate this demand coupling and initiate this process. Because of the small role of the municipality there are less chances of market distortion. A municipality can choose to first couple its own internal demand, or it can choose to couple demand of a households and businesses in the municipality. If the municipality also chooses to couple its internal demand it becomes a customer of the new company.

Broadband Model 4: Corporations
The fourth model (see figure 12) involves a critical role of the housing corporations. In this model the housing corporation takes the initiatives and facilitates the creation of the infrastructure. The housing corporations also own and finance the creation of the infrastructure. The municipality tries to limit its involvement as much as possible, but it is possible that the municipality acts as demand coupler (as in

model 3). A specific recommendation is to carefully consider the fact that tenants of the housing corporations can become obliged to be a customer of the new service, it is limiting their choice in service provider.

Broadband Model 5: Public backbone
The fifth and last model (see figure 12) recommends building the new infrastructure or service on top of an existing infrastructure (such as the electricity, gas or telecom grids). Advantages of this model will be that the over capacity of the existing infrastructures could be used, which will increase the economic efficiency of those infrastructures. These often public infrastructures are already public owned, so the new service should also be government owned. The role of the municipality in this model is regulator, initiator, owner and financer.

Next to these 5 generic models for municipal involvements, there are other options to consider when a municipality wants to stimulate the creation of a new service or infrastructure. The ICM report recommends the following incentives that municipalities can use:

- Creation of a revolving fund in which the municipality gives low interest loan to private parties who are willing to invest in the new infrastructure. The loans will be paid back when the infrastructure turns out to be profitable.
- Financial guarantees, where a municipality gives a guarantee on the loans from a private party. This private stakeholder can get lower interest on its loans and therefore the investment becomes less risky.
- Lowering taxes and permit costs. When a municipality lowers the costs of permits and local taxes, it becomes more profitable to invest in the local infrastructure for private parties.

2.4.2. Models for involvement in energy services

The second study that can be used as an indicator to explain the different roles of municipalities is made by Resezzy, Dimitrov et al. (2006) on municipal involvement in Eastern-Europe on the market of energy savings. The research enclose three countries in transition: Bulgaria, Hungary and Macedonia. This study also differs from the LSECs since energy savings services are often aimed at reducing the amount of energy consumed, while LSECs are aimed at producing energy. Despite the differences in goal also this division of models can be used as inpiration to formulate the different models of involvement for the LSECs. Resezzy, Dimotrov et al. (2006) identify four different energy services models:

1. Market initiator,
2. Buyer or customer,
3. Borrower or financer,
4. Implementer or initiator.

The most interesting finding from this research is that the roles range from incremental involvement towards wider involvement. The incremental role is the role of market initiator which can be perceived in the broadest while the role of implementer is most specific and determined. An overview of the factors of the roles can be found in table 4.

Table 5 Institutional logics of the three organizational spheres (Orlikowski and Jay 2010)

Involvement framework	Major factors
Market initiator	• Statutory obligations and powers of local governments, energy-related tasks, • Public procurement rules, • Ability to retain financial savings from energy efficiency improvements, • Municipal expertise in energy efficiency.
Buyer	All of the above and: • Sufficient and stable sources of municipal revenue, • Access to non-budgetary revenue (see next).
Borrower	All of the above and: • Municipal creditworthiness, • Easiness in obtaining bank loans (related to the provision of bank guarantees/collaterals, • Debt limitations, etc.),

	• Availability of preferential loans, • Availability of state/donor programs for energy efficiency.
Implementer	• Municipal expertise in energy efficiency, • Sufficient and stable sources of municipal revenue.

The research furthermore indicates a wide range of barriers, mainly responsibility issues and budget issues, for municipal involvement which mainly come forward from two general weaknesses in the three countries:

1. Vague definition of government tasks
2. Inadequate financial resources

Which model of municipal involvement is applicable depends on a number of factors which can mainly be divided in three types:

1. Ownership. Municipalities want some sort of authority over the system as well as clear roles,
2. Municipal financing: there must be an ability to raise money,
3. Motivation and other incentives: the motivation to improve the energy savings as well as of the employees to participate.

2.4.3. Conclusions on models for municipal involvement in public services

Two studies of model involvement have been evaluated. The report of Ten Heuvelhof (2004) generates five types of models in which municipalities can take on one or more roles. The models depend on the start initiator. With certain municipal ambitions also certain roles are involved. When the two sets of models are combined the following generic elements and lessons can distinguished. First we distinguish that municipalities can play different roles. These roles are facilitating, financing, acting as a customer or regulator. These roles can be narrowed down into specific actions or instruments. These instruments all relate to a particular role. The choice on which models are going to be used can be seen as a major institutional choice. It is very important to notice that these models also involve the choice on what type of partners (or stakeholders) are going to be included.

- Stakeholder choices: The literature study indicated that LSECs are typical hybrid organizations. The rise of a LSEC is in this way dependent on different stakeholders. The different type of stakeholders used must be derived
- Institutional choices: In hybrid organizations there are different types of business forms. A suitable business form must be chosen as well as which parties are willing to bear the risks, costs and profit.
-

Table 6 Roles, instruments and lessons from the municipal involvement models

Authors	Municipal roles	Instruments	Lessons for municipalities
Ten Heuvelhof (2004)	Facilitator, Financier, Customer,	- Creation of a revolving fund - Financial guarantees. - Lowering taxes and permit costs. - Providing information and knowledge - Initiating - Owning shares	- Public funding must be minimized as much as possible - Use existing infrastructures if possible - Involve other partners if there is a mutual interest - Be careful with complex PPP constructions
Resezzy, Dimitrov et al. (2006)	Financer Facilitator Customer	- Initiating - Public procurement rules, - Creation of a revolving fund, - Give financial guarantees, - Lower taxes and permit costs.	- Make a clear definition of government tasks - Create sufficient financial resources - Clearance in ownership and some sort of authority by municipalities, - Create an ability to raise money, - Have motivation to improve the energy savings as well as of the employees to participate.

2.5. Conclusions

Municipalities can be seen as the right actor when the private sector is not able to supply certain values which the municipality has indicated as important .Municipalities must clearly indicate which public values are at stake to justify their involvement in a private market. It is reasoned that the primary focus of a government should be on three public values:

1. Affordability: Prevent high prices due to the abuse of market power, increase economic efficiency, employment and overall economic wealth
2. Acceptability: Minimize the negative effects on the environment (greenhouse gasses, air pollution and other environmental aspects)
3. Availability: Increase the security of supply through international energy politics, diversification of production technologies and fuel.

The theory on policy making (section 2.1.) learns that when dealing with municipal involvement in LSECs the solution is already given; the "solution" or general "policy" is given. The formation of a LSEC is the solution of municipalities to realize some of the social problems (or to safeguard the public values). However a LSEC is not a clearly defined policy or set of instruments and therefore we cannot ignore the design of municipal involvement in LSECs. We cannot prove that every instrument has been designed rationally to achieve certain goals.

- There are sometimes goals related to a municipal involvement in a local sustainable energy company.
- There are certain instruments used by governments which are related to local sustainable energy companies.
- Policy is often an ad hoc reaction to social situations in society
- Local sustainable energy companies are a "solutions" that seeks constant attention from policy makers

In the same time the rise of interest in climate change and concerns about greenhouse gas emissions lead to the ambition to provide cleaner energy. Municipalities can play a role in the development of producing renewable energy, energy efficiency and energy savings. Local sustainable energy companies are by nature hybrid organisations, because they mix private and public values and elements in their operations. To realize such a system successfully, involves the manipulation of a complex web of numerous interrelated physical and social variables. The scientific literature on these hybrid organizations shows that the rise of these LSECs fits within the debate of privatization and reverse privatization. LSECs mix elements of the private, public and community sector. This mixture increases the complexity of the environment in which the LSECs operates. Hybrid organizations originate due to privatization or to reverse privatization. Drivers to privatize an institution into a hybrid organization are to: lower public expenditures, lower prices for end users and because of ideology of smaller governments. Drivers to reverse privatize an organization are failed privatization and a call for greater democratic engagement in services.

Table 7 Roles, instruments and lessons from the municipal involvement models

Authors	Municipal roles	Instruments	Lessons for municipalities
Ten Heuvelhof (2004)	Facilitator, Financier, Customer, Regulator	- Creation of a revolving fund - Financial guarantees. - Lowering taxes and permit costs. - Providing information and knowledge - Initiating - Owning shares	- Public funding must be minimized as much as possible - Use existing infrastructures if possible - Involve other partners if there is a mutual interest - Be careful with complex PPP constructions
Resezzy, Dimitrov et al. (2006)	Market-creator Regulator Financer Facilitator Customer	- Initiating - Public procurement rules, - Creation of a revolving fund, - Give financial guarantees, - Lower taxes and permit costs.	- Make a clear definition of government tasks - Create sufficient financial resources - Clearance in ownership and some sort of authority by municipalities, - Create an ability to raise money, - Have motivation to improve the energy savings as well as of the

			employees to participate.

The literature research showed that LSECs are typical hybrid organizations, which are rather complex due to the different types of **stakeholders** which all have different interests and the different type of **technologies** on sustainable energy available. This makes decision of municipal involvement a complex matter containing many different types of choices. It requires a conscious process, in which municipalities must clearly define why they want to be involved and how, in other words their **policy**. The models of involvement sketched by Ten Heuvelhof (2004) showed different roles a municipality can take on as well as different **business forms**.
This literature study showed four types choices on municipal involvement

- Policy choices: The policy of municipalities regarding LSECs involves the instruments they will be willing to use, and in this way the role they will adopt, as well as when these instruments should be used in the process. It starts by formulating clear goals by the municipality, what they would like to achieve.
- Institutional choices: In hybrid organizations there are different types of business forms. A suitable business form must be chosen as well as which parties are willing to bear the risks, costs and profit.
- Stakeholder choices: The literature study indicated that LSECs are typical hybrid organizations. The rise of a LSEC is in this way dependent on different stakeholders. The different type of stakeholders used must be derived
- Technical choices**:** An LSEC is a system that contains process, institutional and technological components. Since an LSEC is a policy design which contains a certain technology the energy output and technology must be chosen.

The four types of choices depend on each other (figure 13). A LSEC can also be initiated by starting at one of the four choices. This shows that the policy design on municipal involvement is an iterative process. Therefore it is impossible to make an incremental step by step plan for policy design as sketched by Hoogerwerf (2008), but rather through the vision of (Kingdon and Thurber 2003). This means that during the process of creating a LSEC choices on these aspect have to be made. Often these choices will be made implicit and non-rationale and therefore this framework can be used in advance when the possibilities are explored or is can be used when the LSEC is already formed to evaluate the process of creation.

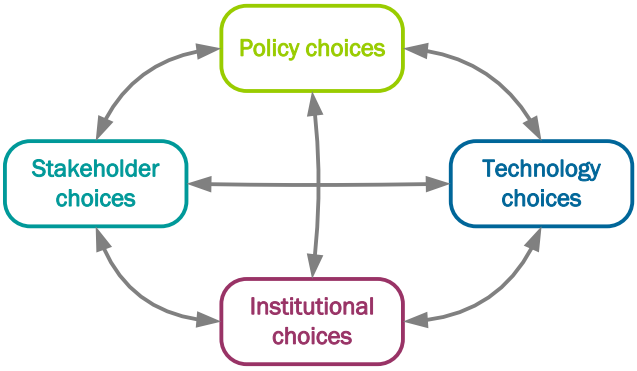


Figure 13: Aspects that together determine how a municipality is involved in a local sustainable energy company

3. Empirical study

3.1. Introduction

The theoretical framework created an overview of the history of LSECs, the type of company LSECs are, how and why municipalities are involved and which types of models for municipal involvement exist. Since LSECs have been studied for a short period, the literature lacks insights in involvement of models that are explicitly viable for LSECs. To gain a better insight on the different choices to be made in setting up a LSEC further empirical study is considered necessary. The chapter starts with an introduction on the case study (3.1) and the methodology used (3.2). The results of the research will be discussed in 3.3 using the different decision themes defined in the literature study. The empirical study will give an answer on sub research questions 4 and 5.

4. *How do municipalities and stakeholders decide on their involvement in a LSEC in practise?*
5. *What are possible consequences of their choices?*

3.2. Methodology

In order to gain an understanding what the different options in the policy, institutional, stakeholder and technological choices are, further empirical research is considered necessary. The study of the theory showed that choices on these four aspects play an important role in the way of municipal involvement in a LSEC. This chapter aims at providing detailed insight in the way choices are being made by municipalities on these four aspects (figure 14).

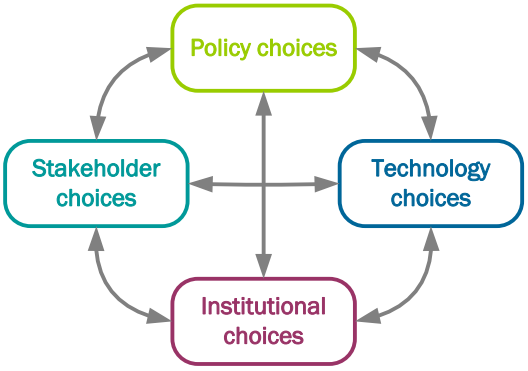


Figure 14: Four aspects on municipal involvement

The empirical research exists of four types of studies:

1. A Desk study based on an analysis of existing sustainable energy policy documents from municipalities,
2. Semi-structured interviews with experts,
3. Participant observation at meetings with experts,
4. A nationwide questionnaire among all Dutch municipalities.

Methodology of desk study on policy instruments
To set up a framework of the possible options, different municipal policy documents have been analysed on topics or themes that relate to LSECs, for instance sustainability, energy, climate and economics. Different municipal policy documents that covered one or more of these topics were selected through a quick internet scan. In total twenty-two policy documents have been analysed. For the different options on energy output and technological options also a quick internet scan was conducted to gain an understanding of the activities of energy companies and gather examples of realized technologies within certain LSECs. A list of which municipalities are chosen to be studies is stated in appendix F. This seemingly random method of method is because there is no complete list on which municipalities are currently involved in LSEC or have a policy document on how they are involved in LSECs.

The technological choices and how municipalities are involved in the LSECs with different technologies is also research using a desk study. In table 21 a total of twelve examples of LSECs are given, two per technology, which is based on information provided on the internet.

Table 8 Examples of LSEC per technology

Technology	Example 1	Example 2
Wind turbine	Biddinghuizen	Goeree-Overflakkee
Solar PV-cells	Coevorden	West Maas en Waal
Biomasa	Leeuwarden	Beesterzwaag
Geothermal heat pump	Veenendaal	Amsterdam (Oosterdok)
Geothermal energy	Heerlen	Den Haag
Industrial waste heat	Culemborg	Purmerend

Methodology interviews and participant observation
This qualitative research was performed to gain an understanding of the consequences of the choices on the four aspects found in the theory study (technological, institutional, policy and stakeholder choices), and to get a first understanding of this process in practice. The semi structured approach was chosen because it was not known beforehand which variables the interviewees would consider important or emphasize on. A detailed list of the interview design is presented in appendix A. The interviews were prepared according to five main topics:

1. Formulating ambitions (Policy choices),
2. Choosing instruments and roles (Policy and institutional choices),
3. Partners to include (Stakeholder and institutional choices),
4. Type of technology and output (Technology choices),
5. Competences and risks (General).

The interviewees were selected through an internet scan on the known LSECs and their involved stakeholders. The interviewees were contacted through e-mail or telephone. In total nine interviews were conducted. Stakeholders were chosen since they were involved in the realization of a LSEC and to reflect on their experience on the creation of LSECs. Two of the interviewees were municipalities, and the other seven were important stakeholders who all were deeply involved in the process of creation a LSEC. The list of interviewed stakeholders and their relationship to the LSEC cases are presented in table 22.

Table 9 List of interviewees

Nr.	Type
1	Consultant on LSECs
2	Municipality
3	Consultant on LSECs
4	Energy producer
5	Energy producer
6	Municipality
7	Energy retailer
8	Researcher
9	Bank

The interview time was approximately one hour, all interviews were recorded. Most participant wanted to participate if the results should be used anonymously. All interviews were recorded. The results have been analysed on each of the four aspects (Technology, Institutional, Policy and stakeholders).

Methodology participant observation
The interviews have been strengthened by participant observation at sessions of a:

1. Community of Practice of municipalities that are involved in LSECs.
2. Consortium meeting of potential investors in a LSEC.

The Community of Practice was attended by municipalities that discussed and exchanged their experience in involvement and approach towards LSECs. The other meeting involved private companies which were

exploring together the possibility of the realization of a LSEC. The two different types of community of practice with different types of participants were considered a valuable addition to the interviews. They can be considered as additional focus groups in which the creation of local sustainable energy companies was the topic of discussion.

Methodology nationwide questionnaire

A nationwide questionnaire is performed to gain knowledge on the most often used options which can be chosen in the four different aspects (technology, institutional, policy and stakeholders) within the municipalities in the Netherlands. The goal of the questionnaire was to give a clear indication and validation on how municipalities are involved in LSEC in practice. The current research lacks an overview on existing local energy companies and how municipalities in the Netherlands are exactly involved. Neither the Dutch association of municipalities (VNG), nor the program bureau of the Dutch government (AgentschapNL) have an overview on what municipalities are exactly doing with LSECs and how municipal involvement looks like and how many municipalities are currently involved in LSECs. For this reason the AgentschapNL and the VNG showed a great interest to generate this overview and were therefore attracted as partners in the questionnaire.

In total 117 municipalities participated in the questionnaire. Out of a total 418 Dutch municipalities this leaves us with a response rate of 28 %. In order to test whether the results of the questionnaire were representative a comparison test has been performed. The distribution of municipalities according to the number of residents of the response group has been compared to the known distribution of all 418 municipalities. The results show that the percentages of the response group align with the percentages of the control group (all 418 municipalities). This shows that there is a strong indication that the response group is representative for the total population (table 23).

Table 10 Comparison test on number of residents

Number of residents	Netherlands Source: CBS	(Percentage)	Response group
0 – 20.000	145 (34,6 %)		30 (25,6 %)
20.000 – 50.000	202 (48,3 %)		56 (47,9 %)
50.000 – 100.000	46 (11 %)		21 (17,9 %)
100.000 – 200.000	19 (4,5 %)		7 (6,0 %)
200.000 +	6 (1,4 %)		3 (2,6 %)
Total	418 (100%)		117 (100 %)

Of the 117 municipalities only 16.2 % of the respondents has an actual active LSEC in their municipality. 40.2 % of the municipalities has plans for a LSEC and 43,6 % has neither of both (table 24). In total 56,4% (66 respondents) of all respondents is in some way involved in a LSEC.

Table 11 Number of LSECs and plans for LSECs

	Municipalities in % (based on 117 respondents)
Active LSEC	16,2% (19)
Plans for a LSEC	40,2 % (47)
No plans for a LSEC	43,6 % (51)
Total	100 % (117)

The questionnaire, the detailed questionnaire results and the questionnaire design can be found in appendix D.

3.3. Results

In order to maintain a structured approach the results are discussed using the four different aspects defined in the literature research:

3.3.1. Policy choices
3.3.2. Institutional choices
3.3.3. Stakeholder choices
3.3.4. Technological choices

Some of the results of the empirical research indicated findings that do not fit into the project steps but are considered relevant for the understanding of municipal involvement. These findings are discussed in an extra paragraph on the general findings on the status of LSECs in the Netherlands (section 3.3.5).

3.3.1. Policy choices for municipalities

As concluded from the literature study (chapter 2) the policy of municipalities regarding LSECs involves the instruments they will be willing to use, and by that the role they will adopt. I define municipal involvement as:

The total set of activities and relationships that a municipality has with a local sustainable energy company.

The activities which municipalities perform when dealing with a LSEC are called instruments. Instruments are limited in time and budget and have often specific targets. The policy choices depend on how the initiative for a LSEC starts. It can start from different aspects.

Either a municipality can be approached by citizens (with a certain technology and business form) (figure 25) to start a LSEC or it can be initiated by the municipality itself. As the literature indicates municipalities must make a considerate choice of involvement and must clearly indicate which public values are at stake to justify their involvement in a private market. In other words they must validate their involvement with an underlying ambition which will give ground to the question why municipalities should act. Again the design of municipal involvement is not something that is an intellectual and incremental process but is rather a reaction of municipalities when they are confronted with plans for a LSEC.

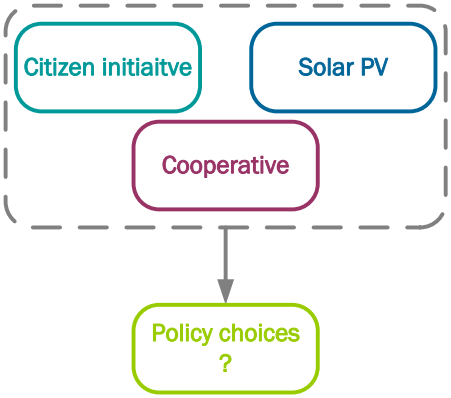


Figure 15 A citizens cooperative which wants to realize solar PV panels can demand for municipal policy choices

Ambitions

The total set of goals, visions, ideal images and policy end points can be seen as the ambition. Ambitions are the corner stone of most municipal sustainable energy policies. In the theoretical framework (Such as stated in (EZ 2008) three main public values that relate to sustainable energy have been formulated:

1. Affordability: Prevent high prices due to the abuse of market power, increase economic efficiency, employment and overall economic wealth
2. Acceptability: Minimize the negative effects on the environment (greenhouse gasses, air pollution and other environmental aspects)

3. Availability: Increase the security of supply through international energy politics, diversification of production technologies and fuel.

In this empirical study I have looked if these three main ambitions are really being used in practise and if they are really the corner stone of municipal involvement in LSECs.

Results of the desk study

In the policy documents of municipalities, ambitions are stated on various levels (macro, meso, micro) and are both focussed on internal ambitions (be a professional organization, facilitating community demands) (Brummen, Zwolle) and on external ambitions (CO2-reduction, employment rates) (Ede, Harderberg). Some municipalities formulate very strict targets (Harderberg) while others (Zwolle) formulate very broad start ambitions which can need further details. The ambitions found in the policy documents as well as the documents of the VNG (2010) and the EZ (2008) which are discussed in the theoretical framework are divided in the ambitions formulated. The following lists of ambitions have been found in several municipal policy documents. These eight ambitions can be seen as the "hard choices" which municipalities make if they have to choose ambitions that will relate to their actions in relations with a LSECs.

Affordability:

1. Employment: A decentralized production unit must be built, maintained and operated; this will stimulate the demand for local labour en thus can create jobs within the municipality (Leeuwarden 2010),
2. Affordable energy: The ambition to supply citizens with an affordable (cheap) energy bill is often stated (EZ 2008),
3. Innovation and education: The building of new decentralized energy production facility with the use of new technologies and innovative design can stimulate the need for high skilled workers and provide research opportunities for academic institutions (Hardenberg 2008),
4. Improving economic growth of local businesses (EZ 2008).

Acceptability

5. Acceptable "Clean" energy: Another argument to have a high ambition on the share of renewable energy is the goal to achieve substantial Greenhouse gas emission reductions. The ambitions can be a local translation of the formal nationwide ambitions of the VNG agreement (VNG, 2010) as discussed in 2.1.3.
6. Sustainable image: A high share of renewable energy can give a municipality a positive image toward their citizens and the outside world (Leeuwarden 2010).
7. Create awareness by local citizens: The presence of a local sustainable energy company can stimulate the awareness of local citizens and business on the importance of climate change, energy savings and sustainability (Hardenberg 2008).

Availability

8. Security of Supply: In the external trends of some sustainable policies it is reasoned that fossil fuel supplies are ending, that our society must mitigate away from these fossil fuel needs in order to secure our supply of energy. This "fear" is called security of supply (EZ 2008).

The ambitions can be divided into the three public values (affordability, acceptability and availability) that are distinguished in chapter 2.

Results on interviews on policy choices

The detailed summaries of al interviews are presented in appendix A. The following generic conclusions on municipal policy making are found.

1. The interviewees indicate that besides a general municipal ambition personal commitment of municipal executives is necessary to actually implement the policy on LSECs. The interviewees think that only if a particular person with influence has a certain ambition things will change. A dedicated municipal executive or manager of a LSEC increases the realization of goals set in the policy documents and made by formal agreements.

2. Interviewees indicate that they have never encountered a municipality which had a detailed policy on how to be involved in a LSEC in advance of an initiative. None of the stakeholders have encountered a municipality who had full and clear formulated ambitions when they were first confronted with plans for a LSEC.

3. Some interviewees experience a slow bottom-up approach in which small consumers and household are creating a small foundation or cooperative which couples their demand in "green" energy. These small organizations turn into LSECs when the municipality has the ambition of realizing its own local sustainable energy production. These small initiatives often "forget" to realize a professional independent organization.

4. The interviewees indicate two other drives for LSECs which are costs and affordability. Availability issues, such as long term security depends on the costs. Municipalities will not make commitments of current budgets for goals that are 20 years away. Municipalities who have shares in an energy company only have high ambitions on creating LSEC when they know that that energy company is also investing. They do not want to risk getting lower dividends from their shares in their energy companies.

5. The interviewees indicate the municipalities as risk averse and are hesitating in trying new roles and instruments.

Result out of the questionnaire on policy choices

The eight ambitions stated in the desk study results (section 3.3.1.) were found in the municipal policy documents have been tested in the questionnaire. The most important ambitions found were employment, security of supply and supporting local businesses (table 12). This was confirmed in the interviews. According to the interviewees employment and stimulating and supporting the local economy are the primary drivers for an active role of the municipality. The goals to reduce green house emissions, create a sustainable image or create awareness have been found to be less important for municipalities than could be expected on the basis of their policy documents.

Table 12: Municipal self-rating on different ambitions on 10-point scale

Ambition	Municipality without a LSEC	Municipalities with (plans for) a LSEC	Difference
1. Employment	7,84	8,33	0,49
2. Security of Supply	7,71	8,13	0,42
3. Support local businesses	6,93	8,03	1,1
4. Affordable energy	6,87	7,73	0,86
5. Awareness	7,06	7,68	0,62
6. Acceptable "Clean" energy	6,41	7,33	0,92
7. Sustainable image	6,21	7,17	0,96
8. Innovation and education	5,43	6,97	1,54

The results of the questionnaire indicated that the ambitions on innovation and education are not the dominant drivers for municipalities, which is also confirmed by the interviews, even though they are mentioned as motivators in the policy documents. Furthermore the interviewees indicate that national climate mitigation agreements (such as the one between the VNG and the national government) do not have any influence on local ambitions. The idea of "sustainability" is only a term used to cluster innovative activities within the agricultural sector. The national agreements between regional and national governments have influence but only if a local municipal executive commits himself to realizing those goals. Otherwise it is 'just a piece of paper'.

An interesting finding from the questionnaire is that municipalities with (a plan for) a LSEC rate all the possible ambitions higher, which might indicate that they are more aware of the role they play in local governance.

Instruments

According to Hoogerwerf (2008) a choice must be made on the instruments (the tools and actions) which are going to be used. He distinguishes that all instruments can be divided into general or individual instruments and into choice increasing or choice decreasing instruments. The theoretical framework however does not elaborate further on specific tools or actions. Therefore the instruments should be generated from the empirical research. The instruments vary from very informal "matchmaking" between potential customers to formal financial relationships. In the policy documents the roles are often defined implicitly and are related to the definition of the function and task of the municipality in general and core functions of the municipalities. Often they are cited as: communicating, directing, enthusing, regulating, facilitating, setting an example etc. In the theoretical framework (section 2.4.) different roles were defined based on the research of Ten Heuvelhof (2004) and (Rezessy, Dimitrov et. al., 2006). I have decided to combine these roles into three types of roles. Ownership of shares is in my opinion a financial role and could therefore be combined with financer. Initiating is some sort of facilitating and these two could therefore be combined. In the Netherlands the national government is the regulator of the energy market. Municipalities therefore do not play this role and therefore this specific role has been excluded from the empirical study. Therefore we have three different roles:

1. Financer
2. Facilitator
3. Customer

Desk study

A first indication of the actual roles used by municipalities in practise when building a plan for a LSEC is given in the documentation of AgentschapNL (AgentschapNL 2010) based on municipal experiences with LSECs They state three possible roles which contain an overlap with the roles sketched by Ten Heuvelhof (2004), in two occasions roles are combined (facilitator & initiator and financer & owner):

1. Financer or Owner: A municipality can choose to actively support and cooperate with a LSEC via financial support. This financial support can be with actively influence via shares, becoming a member in a cooperative, or it can be without formal influence via a grant or financial guarantees. The financing role can be the most risky in term of financial losses.
2. Facilitator or initiator: When a municipality actively uses its formal and informal powers that are non-statutory in order to facilitate the process of the formation of a LSEC it is using this role. Instruments related to this role can range from actively support the LSEC in the media to financing feasibility studies and providing information on how to form a LSEC. This roles can be performed in partnership with other stakeholders. (AgentschapNL 2010)(AgentschapNL 2010)(AgentschapNL 2010)(AgentschapNL, 2010)
3. Customer: The municipality can for instance act as a regular customer buying electricity or heat for its own organization use. It can also act as a "launching customer" where the municipality acts as a principal who gives a concession to consortium or actor to deliver sustainable energy to a new building project or it can act as the first large customer.

In order to see whether these roles are actually performed the policy documents from municipalities with (plans for) a LSECs are analysed which show that most municipalities really use these three roles (table 13).

Table 13 List of municipalities in LSECs and their roles

Nr.	Municipality	Financing	Facilitating	Customer
1	Den Haag	Yes	Yes	Yes
2	Woerden	Yes	Yes	No
3	Ferwerderadiel	Yes	Yes	No
4	Veenendaal	Yes	Yes	No
5	Culemborg	Yes	Yes	No
6	Delft	Yes	Yes	Yes
7	Winsterswijk	Yes	Yes	Yes
8	Dordrecht	Yes	Yes	Yes
9	Ameland	No	Yes	No

10	Opsterland	No	No	No

The following instruments divided in the three types of roles have been found in the policy documents:

Financing instruments:

A recent publication of the IPO (Inter Provincial Overleg) (IPO 2011) called "Financing options in energy for governments" gives us a first indication on what financial instruments exists for municipalities. They state the following instruments:

1. Shareholder: A municipality could buy shares in the newly formed LSEC B.V. and they could bear a share of the risks. In this case the municipality has to comply with state aid rules.
2. Subsidy: A municipality provides funding to implement a particular activity or operation. After performing the activity or action the funds don't need to be paid back. Often a portion of the costs is reimbursed. This is often shown as a percentage of eligible costs. (IPO 2011)
3. Guarantees: The municipality is taking a certain risk. This may involve the following risks
    a. Lean risks (the municipality pays the remaining debt if the LSEC no longer meets the commitment requirements, such as with bankruptcy).
    b. Interest rate risk: (there is a risk that interest rates are currently higher than budgeted, with the result that the project is no longer profitable.
    c. Cash flow guarantee, the municipality sustains necessary cash flows.
4. Direct loan: The municipality sets temporary funding to a LSEC. The LSEC is obliged to repay the funds, possibly including interest.
5. Revolving funds: The municipality provides funds through a venture capital fund. These funds are loans that have to be paid back when the investments turn out to be profitable.
6. Membership of a LSE cooperative. The municipality acts as a full and founder member of the local sustainable energy cooperative.
7. Providing municipal land.

Facilitating instruments:

Non-financial instruments that are aimed at helping the formation of a LSEC are various in appearance and type. In recent publications of ECN (Velthman 2010), commercial process management companies (Zwang 2011) and AgentschapNL (AgentschapNL 2010) the following categories of instruments have been identified.

1. Feasibility studies: The municipality can perform these studies itself if they have the skills and know-how to do this.
2. Support for small services: Municipalities can finance small expenditures such as information evenings, rent for an office or other minor facilitating expenses.
3. Matchmaker between stakeholders: Municipalities can act as a matchmaker between potential partners and stakeholders. Within this instrument it can act as a leading initiator or leave the initiative of the formation of a LSEC at other parties. This is probably the least formal instrument. This instrument also comes back in the second model of ten Heuvelhof (2004): Co-operate via Public Private Partnership (PPP).
4. Information provider: Municipalities could provide information on: How to make a LSEC.
5. Provision of administrative support: They could provide support of municipal officials in term of FTE's.
6. Public support in the media
7. Assistance grant: Rapid and any digital processing of permit applications for establishment of a local sustainable energy company.

Customer instruments:

The energy produced by the LSEC is the main product to be delivered to the customer. The following instruments relate to that of the delivery of energy.

1. Launching Customer: When a municipality acts as the launching customer it awards a contract for the supply of sustainable energy for its own use. This "own use" can be for the street lights or a district heating system. This instrument can vary from large design, build, finance, maintain and operate (DFMBO) contracts or simply electricity contracts (AgentschapNL 2010). It is called launching, because without this first contract the LSEC would not be economical feasible.

2. Matchmaking between customers: A municipality can bundle small customers together which together can serve as a launching customer (AgentschapNL 2010).
3. Regular customer: The simplest instruments is when the municipality buys energy from the LSEC like a regular customer (Zwang 2011).

Questionnaire result on used instruments

In the questionnaire respondent was asked to indicate if they used the seventeen instruments as stated in the previous section. As shown in table 14, more than eighty percent of the respondents indicated that they used some of the facilitating instruments. All these seventeen instruments have been used by at least some of the municipalities, but only a few are used by more than 10% of the municipalities with (plans for) a LSEC. As the results show the role most often used by municipalities is the role of facilitator (83,3%) A slight majority (57,6%) also acted as financer Only 43,4 % of all respondents acted as customer.

Table 14 Used roles within Municipalities

Roles used by municipalities *(66 respondents)*	
Facilitator	83,3 %
Financer	57,6 %
Customer	43,4 %

But which instruments within these roles are currently being used by municipalities? Performing or paying for feasibility studies (47%) and administrative support (56,5%) were the most popular instruments. Followed by public support in the media (28,8%). Other used instruments are being a shareholder (21,2%), support in grant application (18%), subsidies and matchmaking between potential customers (both 19, %) (Table 15).

It can be expected that the financial roles are more often being used by municipalities that are already are involved in an active LSEC, since municipalities with only a plan for a LSEC have not yet decided on these instruments. If we compare the use of financial instruments between these two group we indeed can conclude that almost forty percent of the municipalities with a successful LSEC are shareholder or have given subsidies. Also the use of public media support and the financing of small expenses are instruments that are used more by municipalities with a active LSEC.

Table 15 Comparison between used instruments

Instruments	**Municipalities with plans for LSEC** *(47 respondents)*	**Municipalities with active LSECs** *(19 respondents)*
Facilitating instruments		
- Administrative support	56,1 %	38,9 %
- Feasibility studies	47 %	50,0 %
- Public support in the media	28,8 %	38,9 %
- Support in grant application	18,2 %	16,7 %
- Financing of small expenses	15,2 %	33,3 %
Financing instruments		
- Shareholder	21,2 %	39%
- Subsidies	19,7 %	33,3%
- Guarantees	10,6 %	16,7 %
- Provision of municipal land	10,6 %	11,1 %
Customer instruments		
- Matchmaking between potential customers	19,7 %	33,3 %

Interviews result on instruments

The following conclusions can be drawn based on the interviews. The detailed summaries of each interview are presented in appendix A.

- The interviewees indicate that they consider municipalities mainly as facilitator. According to the interviewees municipalities should provide training, information and facilitate support.

- It is important that municipalities create the requirements and constraints in new building project in such a way that the creation of a LSEC is possible.

- Nevertheless the interviewees also emphasize the lack of knowledge within municipalities to fully understand the choices they make on the different instruments. They often make decisions based on experiences of other municipalities and the feeling they have within the different options without overviewing the consequences.

- Remarkable is that, according to the interviews, although they are unaware they have outspoken expectations as shareholder. Since a role is a description of the tasks in general terms it is better to focus in a discussion on instruments since these are more specific and create a clearer overview of practical insights.

- Dividing the instruments into roles can help to create an understanding which other instruments a municipality can set into action which suit its role.

- The interviewees think municipalities should not use financial guarantees. Although they seem to be the most interesting for municipalities because you support the creation of a LSEC while it does not cost money, it is a trap, because municipalities are required to take a risk while they do not have any influence in the LSEC.

- But a municipality can act as a launching customer in the realization of large sustainable energy project and should also finance feasibility studies.

- The creation of a LSEC must not be “paper tiger”. Municipalities also must act as a “match maker” in creating an integrated design in which all necessary stakeholders are combined. In this way a municipality should focus on process management rather than on project management. It should not solely take the initiative but start the initiative together with its citizens.

- Another finding of the interviews is that larger municipalities have more possibilities that the smaller municipalities. Large municipalities have a wider range of instruments out of which they can choose than smaller municipalities, because some instruments demand a lot of effort from the municipal officials. These smaller municipalities also do not have the means to perform a detailed research on their possibilities on LSECs. Within these small municipalities a business opportunity for companies must be created to help these municipalities in this process.

- If a municipality chooses to be a shareholder they also want to be truly involved in the activities of the LSEC. A municipality acting as a shareholder should always aim, according to the interviewees, at selling those shares at some point in time when the involvement of the municipality is no longer needed. The reason for this is that municipalities are very conservative shareholders. As shareholder they are primary focussed on financial return and dividend. Municipalities do not say much on what the hybrid organization must do and tend to be only focussed on the return of investment on their shares, they often almost “forget” that they have shares in hybrid organizations.

Conclusions on policy choices

A policy design exists of deciding which instruments to use based on their goals and ambition. The instruments can be divided into roles to create awareness of which other instruments can also be used. An overview of these options are shown in figure 16. The instruments do not exclude each other. None of them could be chosen or even all of them. The series of alternative combinations is therefore almost infinite. The decisions on each of these three steps should form a consistent and logical combination in order to achieve the ambitions set.

Figure 16 Overview of possible process instruments in municipal involvement

3.3.2. Institutional choices for LSECs

The next section will focus on institutional choices. It is important to notice that a municipality only needs to make a choice on these aspects if it is going to take the initiative or when it is confronted with an initiative in which the choices are still open. Since 66 % of the municipalities is one of the co-initiator of a LSEC plan, I think these aspects are important.

Since LSECs are hybrid organizations the Policy design of LSECs should focus on choosing how the LSEC will get an official form, who will bear the responsibility for the different tasks and risks. Since there are many different types of hybrid organizations which differ in who takes the financial risks and what the roles are of the different partners different business forms are possible.

As shown in the theoretical framework hybrid organizations are very complex, since they have to deal with both private and public interests. The various goals and expectations must be formulated clearly. For instance: who takes the biggest financial risks? What roles does each partners play? These agreements have to be formalized in some sort of business form. From the policy documents five different business forms have been found (figure 17):

Nr.	Municipality	Business form
1	Den Haag	V.O.F
2	Woerden	B.V.
3	Ferwerderadiel	Fund
4	Veenendaal	B.V.
5	Culemborg	B.V.
6	Delft	B.V.
7	Goeree-Overflakkee	Cooperative
8	Lochem	Cooperative
9	Heerlen	N.V.
10	Texel	Cooperative

Figure 17: Examples of known LSEC and their business form

Business forms:

1. Fund: In Ferwerderadiel (Friesland) a revolving fund has been created by the municipality to provide low interest loans and investments to initiators who want to start a LSEC.
2. General partnership (V.O.F.) The general partnership form has been used in the Aardwarmte The Hague project. In this project all partners had equal investments, risks, influence and shares in the newly formed LSEC. See figure19.
3. Limited company (B.V.) The use of a limited company is the most classic and traditional form of an enterprise, In four out of ten LSECs this form has been chosen
4. Joint-stock company (N.V.) One of the oldest LSECs in the Netherlands is the Heerlen Minewater N.V. This district heat company uses old mineshaft to produce heat.
5. Cooperative (Cooperatie) The wind cooperatives are the oldest form of LSECs. An example applied of a wind cooperative is Zeeuwind, which received a very favourable compensation per kWh from its local energy distribution company. This rule additionally stimulated Zeeuwind to recruit new members, and it nowadays is the largest wind cooperative by far. Another example concerned the energy distributor PEN in the province of Noord Holland. PEN allowed the cooperative Kennemerwind to establish wind turbines in a wind power plant originally built and exploited by PEN. It moreover adopted a very favourable payback tariff for cooperatively owned wind. These wind cooperatives are owned by their members, these members are often customers and investors at the same time. The wind cooperatives in the Netherlands have around 10.000 members in total.

Questionnaire results on institutional choices

It can be expected that other business forms are also possible such as a foundation, an association or a municipal bureau, but the policy documents did not suggest these types of forms. In the questionnaire only

a small percentage of respondents (16,7%) (19 respondents) answered the question, in this way no significant result can be concluded from that data.

Interview results on institutional choices
The following conclusions can be drawn from the interviews. The summaries of the interviews are presented in appendix A.

- The interviewees indicate that the role of municipalities increases when large production facilities arises and that it is less necessary when the private initiators are dominant.

This is in line with the theory of hybrid organizations that the more complex, more involvement is needed. The different stakeholders and their different interests all need to be taken into account. The interviewees did not discuss specific business forms but indicated that it is important that you have one or two persons who are willing to invest a lot of time and effort in the formation of the new cooperative.

- Trust is utterly important for any initiative where public, private and community parties are involved

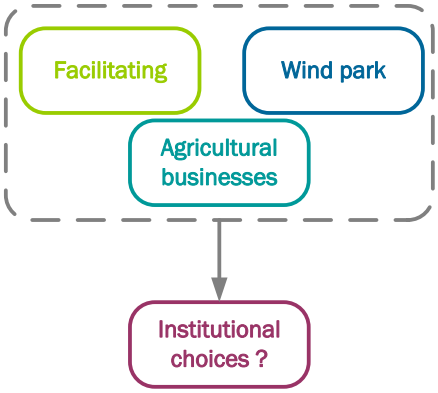
- The chosen business form musty be able to leave room for the individual ambitions and interest of all involved parties.

- A close relation between the public principal and the hybrid organization is not something many interviewees prefer.

They fear that a close relationship with the public principal makes it impossible to react quickly on market changes. They see themselves more as entrepreneurs than as guardians of public values.

- A hybrid organizations also has its benefits. They can compete with private competitors on lower prices due to public funding, which is gained by saying the public values are guaranteed.

As with the other aspects (policy and institutional) a municipal is in practise confronted with an initiative in which , for example, three out of four aspect are already determined and only has a choice in institutional aspects (figure 18). This again shows that building or creating a LSEC is not an incremental process but a process that take different forms for each new LSEC. A general blueprint of the perfect LSEC cannot be designed.



Figuur18: Example of an initiative in which only institutional choices have to be made

Conclusions on institutional choices

It is important to realise that not all institutional choices will lead to direct involvement of a municipality. A LSEC can always be a completely private initiative without any municipal involvement. Within these business forms a municipality can be a member (of a cooperative), a shareholders (as with a B.V., N.V. of a V.O.F.) or an investor (as with a funds). These choices are only important when a municipality takes the initiative or when it is confronted with a community or private initiative in which the institutional choices are not yet made. In such a case it would help if a municipality had made a choice or policy in advance.

Table 16 Conclusions on institutional choices

	Options	Lessons	Status
Institutional choices	1. Fund (*fonds*) 2. General partnership (V.O.F.) 3. Limited company (B.V.) 4. Joint-stock company (N.V.) 5. Cooperative (Cooperatie)	- The role of municipalities increases when large production facilities arises and that it is less necessary when the private initiators are dominant. - Trust is utterly important for any initiative. - Leave room for the individual ambitions and interest of all involved parties. - A close relation between the public principal and the hybrid organization is not preferred. - A hybrid organization can compete with private competitors on lower prices due to public funding.	No data available

1.3.2. Stakeholder choices for LSECs

The next section will focus on stakeholder choices. It is important to notice that a municipality only needs to make a choice on these aspects if it is going to take the initiative or when it is confronted with an initiative in which the choices are still open. Since 66 % of the municipalities is one of the co-initiator of a LSEC plan, I think these aspects are important.

Within hybrid organizations different partners are possible. Partners should be seen as stakeholders that share a part of the financial risks, or have direct influence in the LSEC and are participating in the project from the start. Partners must add value by bringing some sort of resources and a positive and motivated attitude into the formation of a LSEC. The desk research in partners in LSECs shows that almost in all cases the municipality or local citizens are the initiator of the initiatives. Next to the municipality six different partners in LSECs have been found who were involved from the start (table 18). These LSECs often have public and private partners, as is shown in table 17. An overview of the partners can be found below:

1. Local Businesses: The desk research on ten LSEC initiatives showed that in only one encountered LSEC local businesses were involved from the start. In Veenendaal the municipality and the regional development company approached local business with the question whether they wanted to participate in the new LSEC. The local businesses did participate in the new project.
2. Local Citizens: In four out of ten LSECs local citizens were involved from the start. In three of those initiatives local citizens are the initiators. Only in Culemborg actual production capacity has been realised. In Culemborg local citizens had the unique opportunities to take-over an existing district heating system from the water company Vitens. In Ameland en Texel the citizens coupled their demand in green electricity but they did not have sufficient funds to realize a production facility.
3. Large energy company: The large energy companies are often approached (six out of ten LSECs in table 15). Municipal waste companies such as HVC and ROVA are conspired to be a large energy producer. Energy companies which are primary focused on energy retail (such as Greenchoice) are also considered to be large energy companies. These large energy companies are often involved as an operator of the production facility or as demand coupler and back-office support for the LSEC.
4. Province: The Province is only involved in one found LSEC (in Ameland). The involvement of the Province was limited to providing subsidy.
5. Water board: In Delft the water board was the co-initiator of the LSEC plan. The water board and the municipality performed a combined feasibility study on the use of industrial waste heat from the sewage treatment plant of the water board.
6. Housing corporation: The housing corporation are involved in three out of ten LSECs. They are only involved in LSECs which are aimed at realizing a district heat network. The housing corporation served as primary long term customers and end-users of this produced heat.

Table 17 List of LSEC with their primary partners

Nr.	Municipality	Initiator	Partner	Partner
1	Den Haag	Municipality	3 Housing corporations	2 Large energy companies
2	Woerden	Municipality	-	-
3	Ferwerderadiel	Municipality	Customers	
4	Veenendaal	Municipality	Housing corporation	Local Businesses
5	Culemborg	Citizens	Water company	Energy company
6	Delft	Municipality/Water board	Energy company	Housing corporation
7	Winterswijk	Municipality	Energy company	
8	Dordrecht	Municipality	Energy company	
9	Ameland	Citizens	Municipality	Province
10	Texel	Citizens	Energy company	

Some of the partners found in the empirical study overlap with the possible partners sketched by Ten Heuvelhof (2004) in his different models of involvement within local broadband companies. Energy companies are in the case of LSECs similar to broad band companies in the case of ten Heuvelhof (2004), being the supplier. Housing corporations and customers and local businesses play a role in both LSECs and local broadband companies. The public partners found which have not been mentioned in the model of involvement of ten Heuvelhof (2004) are water boards and provinces. Also other stakeholders have been found which did not act as primary partners. It is however possible for LSECs to choose these parties. These potential partners are:

1. Project developers,
2. Agricultural businesses (farmers).

Questionnaire result on stakeholder choices

The questionnaire showed that in 66.7% of the LSECs the municipality is the main initiator and that in almost 45 percent of all LSEC, they are also considered a co-owner. Other parties that are often the initiator of (plans for) a LSEC are local businesses, local customers and the province. A notable conclusion from table 18 is that large energy companies are not often involved as main initiator but are in 22,7% of all cases involved as co-Financer. Local businesses are also in ¼ of the plans involved as co-financer. In 21,2% of the cases the citizens are attracted as co-financers.

Table 18 Stakeholder within LSECs

	Co- initiator	Co-owner
Municipality	66,7%	44,4%
Local businesses	28,8%	25,8%
Citizens	16,7%	21,2%
Province	15,2%	16,7%
Housing corporation	13,6%	9,1 %
Project developer	13,6%	13,6%
Agricultural businesses	10,6%	13,6%
Large energy company	9,1%	22,7%
Water board	3,0%	7,6 %

Citizens are also attracted in the initiation phase but to a much lesser extent than expected.

Interview results on stakeholder choices

The following conclusions can be distinguished. The complete set of summaries from the interviews is presented in appendix A.

- According to the interviewees especially citizens can be useful but are often neglected in the early project phases, which might indicate that the initiators lack knowledge on which private and community parties are available and their strength. They know the local situation and know the other local stakeholders. Transparency is important.

- The ideal situation would be that the end-users are the owners of their own energy production company. They could become a member of the municipal energy cooperative.

- Although housing corporations are only attracted in 13,6% of the cases the interviewees indicate that when a new district heating system (with geothermal energy or geothermal heat and cold storage) is created the involvement of local housing corporations is essential. The housing corporations will be the most important customers in the creation of a new heating system.

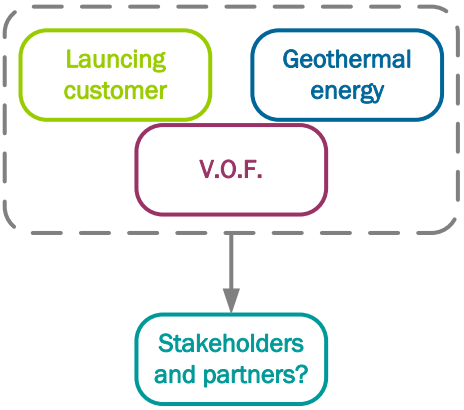
- According to the interviewees the large energy companies are having difficulties with finding a role in this new development of LSECs.

- The interviewees advice to involve the large national energy companies only when there is no other possibility. The reason for this is that the interest of the large companies is often not in line with the local interests.

- The interviewees indicate that banks and financial partners which are essential for the success of most projects are getting involved too late in the process. In the policy documents banks are also not mentioned as possible stakeholders. Often banks are contacted when the business case is not economic feasible and they need to provide a solution, but all the other aspects are already decided on.

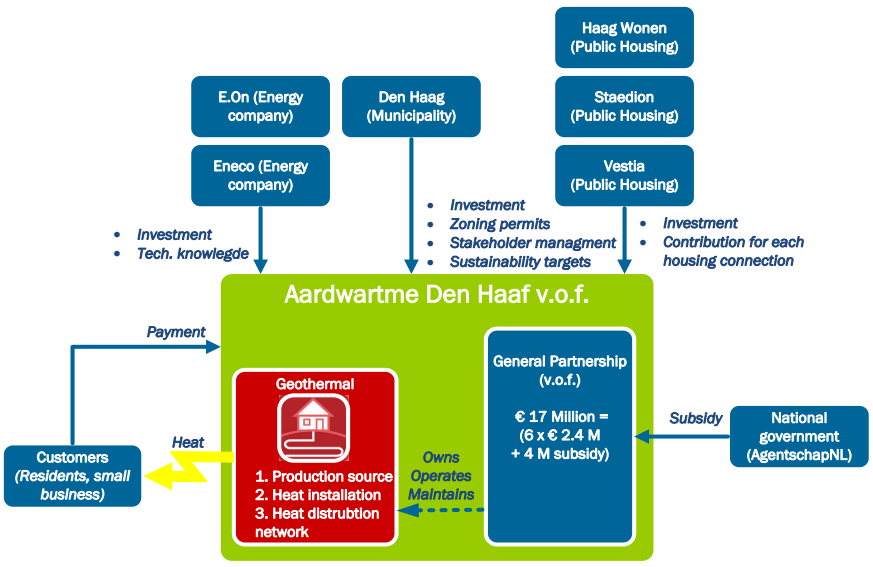
- The interviewees indicate that municipalities tend to involve the big energy companies because they think it is “easy”. An advantage of involving large energy companies is the access they have to “cheap money” on the capital market. A point of attention must be made regarding banks: Their primary goal is never to safeguard public values; they are involved to make profit.

The interviewees indicate that this is beneficial since small consumers are willing to invest in local production at a lower rate of return than more classic stakeholder such as banks and investment funds. They really want to get involved in their own sustainable energy company. An example of a such involvement in a LSEC is the Aardwarmte Den Haag V.O.F. In this geothermal district heating project the municipality created a LSEC together with two large energy companies and three housing corporations. This partnership and the most important resources of each partner are illustrated in figure 19 en 20.



Figuur19: Example of a LSEC initiative in which stakeholder have to be chosen.

Two findings from the interviews are the failure of many projects due to the implicit way of making clear the different responsibilities of all stakeholders and to a difficult commitment of the stakeholder for the long run. For instance end users and customers want to know for sure they will get energy in the next ten years. But suppliers of biomass are unwilling to make ten years long supply contracts because they fear they cannot deliver in the long run.



Figuur20 Aardwarmte DenHaag

Conclusions on the stakeholder choices

Table 19 Options, lessons, status on stakeholder choices

	Options	Lessons	Status
Stakeholder aspects	1. Municipality 2. Local businesses 3. Citizens 4. Province 5. Housing corporation 6. Project developer 7. Agricultural businesses 8. Large energy company 9. Water board	- Make stakeholder responsibility and interests explicit! - Incorporate local partners, they have local knowledge - Transparency towards each other is is important. - The ideal situation would be that the end-users are the owners of their own energy production company. - When a new district heating is created the involvement of local housing corporations is essential. - The large energy companies are having difficulties with finding a role in this new development of LSECs. - Involve the large national energy companies only when there is no other possibility. - Involve banks and financial partners as soon as possible	Most often involved stakeholders: *Co-Initiators:* Municipality (66,7%) Local businesses (28,8%) Citizens (16,7%) Province (15,2%) Housing corporation (13,6%) Project developer (13,6%) Agricultural businesses (10,6%) *Co-owners:* Municipality (44,4%) Local businesses (25,8%) Citizens (21,2%) Province (16,7%) Project developer (13,6%) Agricultural businesses (13,6%) Large energy company (22,7%)

1.3.3. Technological choices for LSECs

The next section will focus on technological choices. It is important to notice that a municipality only needs to make a choice on these aspects if it is going to take the initiative or when it is confronted with an initiative in which the choices are still open. Since 66 % of the municipalities is one of the co-initiator of a LSEC plan, I think these aspects are important.

As identified in the historical context, the type of involvement has a close relationship with the type of technology. LSECs exist in various forms; one of the most characteristic aspects is the type of technology used. The types of technology used in local sustainable energy companies are all based on decentralised and sustainable production units that can produce, transport and deliver gas, heat, cold or electricity to local customers. The following energy outputs are described in the appendix E and are possible options energy outputs to produce in a LSEC:

1. Electricity infrastructure
2. Gas networks
3. Heat & cold network

System description from energy production to market output
The energy sector exists of four different divisions which all have their unique function in bringing the energy output to the market. The technical system consists of the physical chain through which energy flows, from the power plants in which it is generated, through the transmission and distribution networks (with all their supporting equipment) to the supply to the end consumer where the electricity is consumed. These four divisions are:

- Production: The production of energy,
- Transmission: The transport of energy nationwide and internationally ,
- Distribution: The distribution of electricity from the high voltage power grid to large costumers or building,
- Supply: The monitoring, metering, administration and sale of energy to the end consumers.

The possibilities of LSECs of the three different types of energy outputs will be described based on these four divisions. Figure 20 explains and illustrates the different divisions in the electricity sector.

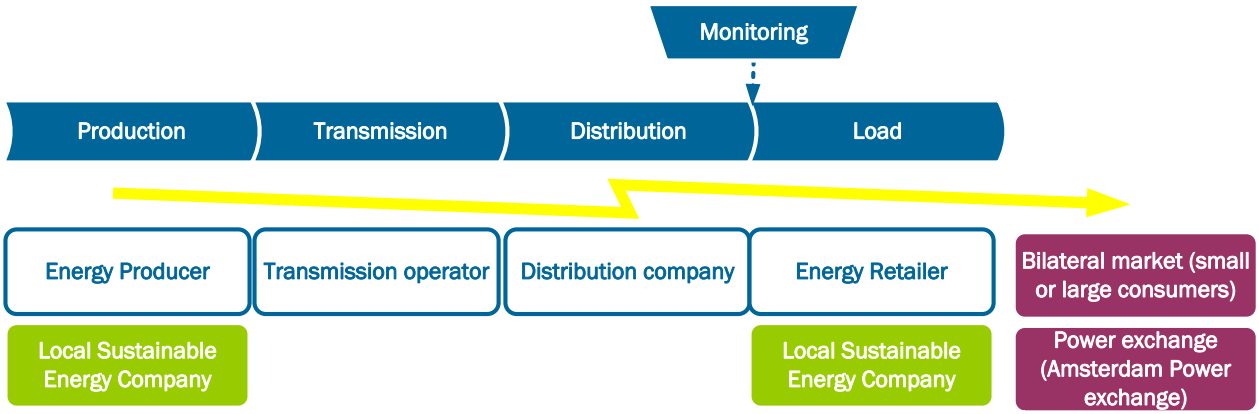


Figure 21 the different technical system divisions within the electricity system that a LSEC can perform

Possible divisions for LSECs using Electricity as energy output

1. *Production:* Traditionally the role of energy producer is performed by the large energy producers with large centralize power plants. Since a LSEC is always aimed at realising their own renewable production capacity, in this research, this function would primarily be performed by the LSECs (see figure 20).
2. *Transmission:* The role of transmission party for electricity cannot be performed by a LSEC. Therefore if a LSEC produces more electricity than it can sell to local customers it must sell this electricity on either the bilateral market or the spot market or sell it to a electricity retailer (like Oxxio, Green choice, Nuon, Eneco etc.)

3. *Distribution:* for electricity LSECs can only perform the role of distributor in partnership with regional distribution companies or when the customer is direct connected to the production facility. For example when the solar PV-cell is in the roof of the costumers building, the wind turbine is at the same location as the customer or when the biomass installation in within the same industrial complex. Technically this is not a strict distribution role but an internal role within the production function.
4. *Supply:* LSECs can perform the functions of supplier or can hire some of these functions at other companies.

LSECs can perform three of the four main roles within the technical infrastructure of electricity. The production function of electricity is the core business of most LSECs, since it involves the generation of sustainable energy. The supply, or retail, function is also an import function for an LSEC since it involves the marketing functions and increases visibility towards the customers and the community.

System description: Biogas networks

1. *Production:* Physically, the gas system consists of on and off shore fields and smaller biogas installations from which gas is produced and storage.
2. *Transmission:* The transport networks exists of pipelines for import and export and are generally long-distance transport (transmission) networks. In the transmission network gas is transported under high pressure over long distances.
3. *Distribution*: The distribution networks serve to conduct gas at a regional level to the end users. This is done by regional distribution companies like Cofely, Enexis, Stedin and Liander. This takes place at lower pressure levels.
4. *Supply*: The supply consists of the installations and appliances in which the gas is used (combusted).

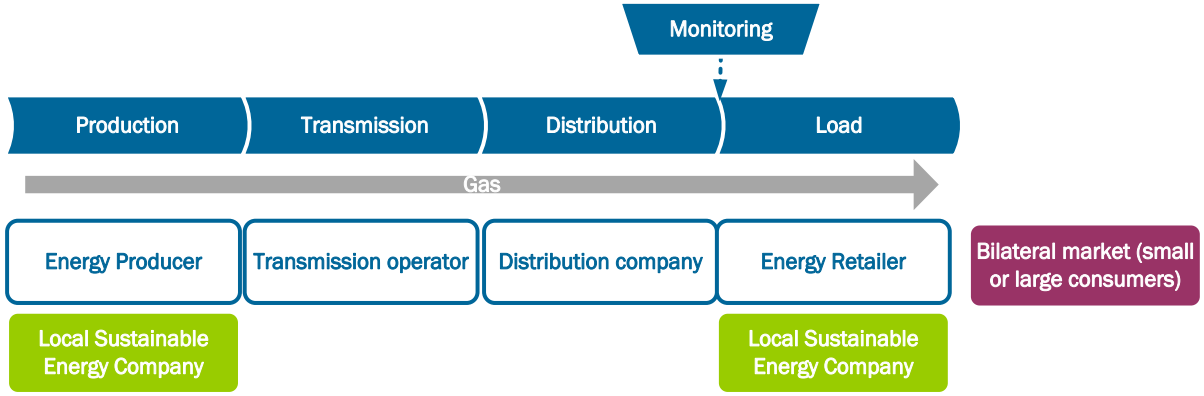


Figure 22 the different technical system functions within the gas system that a LSEC can perform

Possible divisions for LSECs using Gas as energy output
A biomass installation is the only sustainable installation using gas as an energy output. So this is the only installation in which LSECs can occur. As with electricity, a LSEC can produce gas, thus act as a production company and can supply, monitor and sell it to the end user, thus act as the gas retailer. As is shown in figure 22, a LSEC can perform two out of four possible tasks within the gas infrastructure.

System description: Heat and Cold networks
The production of heat and cold as an energy production is relatively new in the energy sector and the infrastructure is very different from electricity and gas. Physically heat and cold cannot be transported over large distances without significant losses. Therefore, heat and cold are always produced at a relatively close distance from the end user. Heat can be sustainable produced from industrial waste heat, solar boilers, geothermal energy, geothermal heat storage and from biomass. Cold can be produced using a geothermal heat pump. A cold and heat transport and distribution network is often only several hundreds of meter long and is therefore mostly used in urban areas. In this way the production, transmission, distribution and supply are closely connected.

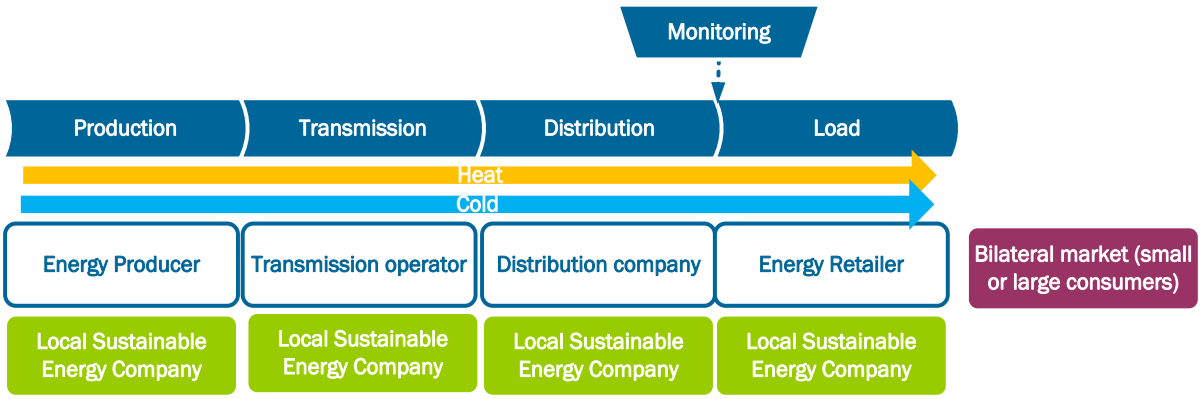


Figure 23 the different technical system functions within a heat and cold system that a LSEC can perform

Possible divisions for LSECs using heat or cold as energy output
The LSEC in this way can also serve as production, transport, distribution and retail company. Cold and heat is therefore the only energy product where the LSEC can perform all four possible technical functions (figure 23). Actually, with the production and supply of heat and cold a LSEC can and must perform all four possible technical functions within the system. It must produce a reliable and constant amount of heat, or cold and it must transport and deliver this to the right end user. An LSEC is therefore often directly involved to the end user.

The energy output can be generated with different technologies. In this research six types of technologies have been found that are possible to implement in a LSEC:

1. Wind energy,
2. Solar PV,
3. Biomass,
4. Geothermal heat pump,
5. Geothermal energy,
6. Industrial waste heat.

Table 20 shows the different examples of LSECs which use the different technologies. The first three technologies will be discussed in appendix E to create an insight how these technologies are used within LSECs and how are spread over the four divisions (production, transmission, distribution and supply). As well as to generate a sense of price and output and give some examples of existing LSECs that use these technologies. This selection of LSECs has, once again, been made through an internet scan and available literature on these LSECs. Due to still a small number of LSECs which actually have realised production facilities, only a few number have been found.

Table 20 Examples of LSEC per technology

Technology	Example 1	Example 2
Wind turbine	Biddinghuizen	Goeree-Overflakkee
Solar PV-cells	Coevorden	West Maas en Waal
Biomasa	Leeuwarden	Beesterzwaag
Geothermal heat pump	Veenendaal	Amsterdam (Oosterdok)
Geothermal energy	Heerlen	Den Haag
Industrial waste heat	Culemborg	Purmerend

Heat, cold, gas and electricity are the four primary products that a LSEC can deliver as energy output. In this research, sustainable energy is defined as non-fossil and non-nuclear based energy generation. Not all sustainable energy technologies can produce all four possible energy outputs. Table 21 shows which primary technologies can produce which types of energy output. None of the known technologies used in LSEC is capable of providing all four types of energy output.

Table 21 Possible output per technology

Technology	Electricity	Gas	Heat	Cold
Wind turbine	X			
Solar PV-cells	X			
Biomass	X	X	X	
Geothermal heat pump			X	X
Geothermal energy	X		X	
Industrial waste heat			X	

The most used technologies are wind turbines, PV-cells, anaerobic co-digesting (biomass), geothermal heat pumps, geothermal heating and waste incineration plants. These technologies are all so-called "proven" technologies which have no inherent technological problems and have been used on a large scale else in the world. This means that there are no insurmountable barriers for these technologies besides the local physical settings. Especially heat and cold (and in some cases gas) need to be installed in the direct proximity of the end consumer. Biomass can either be transported and distributed directly to the end consumer or feed-in the Dutch national natural gas grid. Electricity is in most cases directly feed in the regional distribution networks.

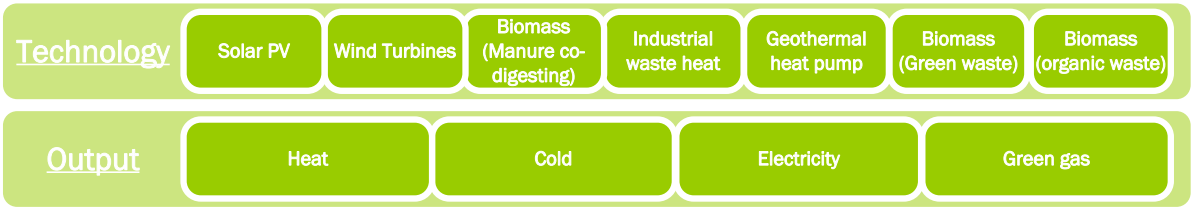


Figure 24: options for technologies and their output

Some technologies have a high stakeholder complexity and others have a low stakeholder complexity due to technological aspects; this is shown in table 33. In the theoretical framework on hybrid organizations Groenewegen and Lemstra (2007) plea that high asset and stakeholder complexity requires more public involvement., this was also recognized by the interviewees in section 3.3.3. In this way it is reasoned that if the stakeholder and asset complexity is high due to the used technology, the municipal involvement is more focussed on facilitating and "match making" between stakeholders, which requires time and dedication. It is best to develop a hybrid organization that lies in the area which they call "publicly owned and privately franchised" (Groenewegen and Lemstra, 2007). Some technologies like Solar Power and Wind power, which are grid connected need a strong customer base of operation. The municipal involvement of such LSECs is therefore more focussed on customer relations. According to the theory of the types of hybrid organizations the LSEC is in this case less complex and therefore also will need less pubic involvement; it thus can have a regulated private owner (Groenewegen and Lemstra, 2007).

Table 22 Complexity of sustainable energy technologies

	Asset Stakeholder complexity	Amount of extra financial support needed (€/KWh)	Amount of Customers needed at start-up
Onshore Wind	Low	Low	Low
Solar PV	Low	High	High
Biomass	High	Low	Low
Geothermal heat pump	Very High	Low	High
Geothermal energy	Very High	High	High
Industrial waste heat	Very High	High	Low

Solar Power does not need large investment sums at the start-up, therefore a municipality is often not directly financial involved at the start-up. The stakeholder complexity is also relatively low, since it only requires at suitable place to install the solar panels and a grid connection. Some municipalities however offer some financial support of this early phase to account for finding a suitable roof and to cover the

organizational expenses. The type of organization could be a relational contracting (Groenewegen and Lemstra, 2007).

Wind power does have large investment costs at forehand, but the overall economic feasibility is profitable, with the current and past tax support schemes, therefore almost no municipal financial support is needed in the start-up phase. Modern wind turbine have become larger and larger, therefore municipal involvement is needed for the integration of these wind parks in the landscape and zoning plans. Stakeholder complexity within the LSECs system is not very high If the LSEC has acquired all the necessary permits and has a suitable location to place the wind turbines, no other big interdependencies with other stakeholders exist. Therefore stakeholder involvement is low. Overall the municipal involvement in wind only LSEC is the lowest of all six technologies. In this way a hybrid organization can be a private hierarchy firm, a regulated private owner, or public owned and private franchised firm (Groenewegen and Lemstra, 2007).

Biomass installations have a very high level of stakeholder complexity since they often have multiple input products and multiple output products (heat, electricity and gas). Therefore a close and sustainable relation between all dependent stakeholders is of key importance. Municipal involvement in biomass LSECs is therefore more focussed on stakeholder management. In this way a public owned, private franchised will be an option to organize this hybrid organization (Groenewegen and Lemstra, 2007).

Geothermal energy is the newest and most unproven technology of the six available technologies. The permits are the most complex of all technologies and therefore municipal involvement is mostly focussed on this aspect. Geothermal energy systems are often coupled to district heating system, which creates as high stakeholder complexity. This is one characteristic of all district heating systems, since all customers are fully dependent on the district heating system for their heat.

These district heating systems can be connected to industrial installations which produce *industrial waste heat*. For industrial waste heat and large geothermal heat pump systems the type of municipal involvement is often focussed on fast permit authorization and stakeholder management. As well as with biomass installations, a public owned, private franchised would be an option to organize this hybrid organization (Groenewegen and Lemstra, 2007).

Questionnaire results on technologies

Due to the small amount of active LSECs there were no significant results on which technologies were mostly used. But if we include the municipalities which are still in the exploration phase we can see that solar power and biomass are the most researched technologies/ considered interesting for a LSEC. Geothermal energy is the least popular technology (table 23). The interviewees also indicate that the small foundations and initiatives are mostly focused on solar energy.

Table 23 Used Technologies

Technology	Technologies used by municipalities with (plans for) LSECs (based on 66 respondents)
Wind	34,7%
Solar	51,4 %
Geothermal heat storage	34,7 %
Geothermal energy	20,8 %
Biomass	72,2 %
Industrial waste heat	25,0 %

Interview results on technologies

The following conclusions from the interviews can be drawn. The summaries of all interviews is presented in appendix A.

- With relatively new technologies such as geothermal energy, large geothermal heat storage networks and biomass installations, you need a lot of primary investment of direct stakeholders. In more proven technologies such as a wind park, you can finance the project with up to 95% of external funding. In this way the interviewees think municipalities have particularly a large role when large production facilities (such as wind farms, geothermal heat networks) have to be realized. Especially with heat and geothermal energy and biomass installations the involvement of the municipality is essential, according to the interviewees, because these projects are often complex in terms of the number of stakeholders. In these types of installations municipalities must

facilitate, couple demand and inform private parties on the opportunities for creation of LSECs. LSECs mix public tasks (stimulating the production of sustainable energy) and commercial activities.

- The more the private activities are dominant within a LSEC the less a municipality should be involved.

- The type of technology which is used partly determines the way municipalities are involved.

- Technologies can be political sensitive. An interesting remark from the interviewees is the role of political twists when choosing a technology. Each political party has its own favourable technology or project. When certain political parties adopt a technology (for instance wind energy) the discussion on these technologies becomes politic and rational arguments do not play a role anymore. When their plans do not receive support of other political parties, they are not willing to support technologies of other parties. Therefore the choice of technology depends highly on local political situations. Most interviewees agree that the starting point of these initiatives should be the organizational ambitions, not the technical concept.

Table 24 Options, lessons and status of used technologies with LSECs

Options	Lessons	Status
Output choices - Cold - Heat - Electricity - Biogas Technology - Solar PV - Biomass - Geothermal heat - Geothermal heat storage - Industrial waste heat	- The type of technology which is used partly determines the way municipalities are involved. - The more the private activities are dominant within a LSEC the less a municipality should be involved. - Technologies can be political sensitive - Municipalities have particularly a large role when large production facilities - In projects with high stakeholder complexity municipalities must facilitate, couple demand and inform private parties on the opportunities for creation of LSECs	Used or planned technologies within plans for LSECs. Wind (34.7%) Solar (51.4 %) Geothermal heat storage (34.7%) Geothermal energy (20.8 %) Biomass (72.2%) Industrial waste heat (25.0%)

1.3.4. General findings

The process formation of a LSEC, or any other decentralized energy project, exists out of different project phases. For the process phases a study of the LWU (Landelijke Uitwerking Windenergie) was used. They indicate four different phases for the formation of a wind turbine project including special purpose organization. This can be seen as an example for the formation of a LSEC (LUW 2011).
These phases are:

1. Exploration phase:
    a. Pre-exploration phase. A municipality could use some of its statutory duties during this phase. It can indicate possible locations in its spatial plan. It also can use non-statutory duties like providing information to possible initiator on how to form a LSEC. A reconnaissance of general options or a framework for general LSEC designs options are a tool that could be used.
    b. Feasibility phase. When one or more actors are willing to take the initiative in forming a LSEC, its feasibility has to be explored. During this phase, actors have decide on their role and have an indication on what instruments they are going to use.
2. Planning phase: When there is a clear indication that the formations of a LSEC is feasible and several actors have shown interest in participating, the formal formation of an independent organization is the next step. Additional studies and contracts are often needed. Permits have to be granted in this phase and a project plan has to be made and potential customers have to be found.
3. Realisation phase: This phase starts when all permits are granted, an independent organization is formed and sufficient funding is found. In this phase the actual energy production facility is build. A municipality has obliged statutory roles as regulator and monitoring of permits but also non-statutory roles.
4. Operation phase: During this phase, the production facility actually produces and supplies energy to the intended customers in the region. There is a cash flow and the LSEC has to maintain the facility. Of the municipality is the LSEC are participant in the LSEC is bears risks or can even get dividend.

General findings out of the questionnaire
Respondents were asked to indicate in which project phase their (plans for a) LSEC currently is. 58 percent of the municipalities indicated that their LSEC plans were still in the exploration phase. This means that the developments of LSEC are just beginning at the moment. It is a young and developing phenomenon. Therefore not many best practises exist to date. Only 14% of the respondents indicated that there was an actual energy producing LSEC active within their municipality. Within the next couple years further studies have to be performed in order to see whether these initiatives will turn into actual energy producing LSECs/

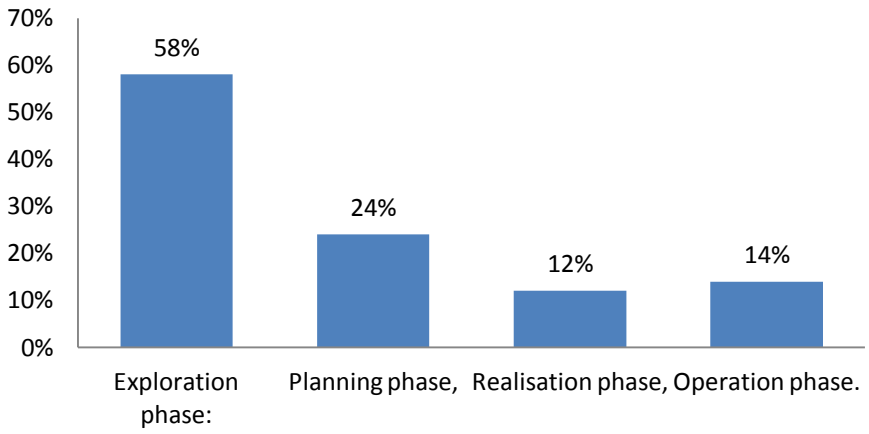


Figure 25 Status of LSECs

General findings out of the interviews
The interviewees also gave some very interesting general remark in LSEC which would not fit in any aspect particular. These findings are summarized in this section. A full version of the summaries of the interview is presented in appendix A.

- According to the interviewees municipalities have frequently unrealistic ideas on sustainable energy projects.

- Municipalities regularly invest under pressure of the political parties in the city council to invest the budget (or the funds coming from selling the Nuon and Essent shares). Often the entire city council is in favour of these projects.

- You also see a strong relationship with political budget cycles. Mayors and Municipal executive councillors promise these projects, but the projects are often stopped when the Municipal executive councillors are not re-elected. In this way municipalities are often unrealistic and underestimate the creation of a LSEC.

- Furthermore they consider municipalities risk averse and hesitating in trying new roles and instruments. A solution can be to create a formal transparent policy plan. The transparency and the very strict use of the incremental policy plan (first feasibility studies, then a feasible business case etc.) proved to decrease the political risks. It is necessary to precisely define the different responsibilities of all stakeholders involved.

- The LSEC projects should have really long-term horizons. Municipalities are afraid to use their contracting role, because they fear they have to oblige to the European contacting rules, while in reality they do not. They are afraid of any risks, they do not understand completely.

- Most interviewees think the situation will be much more complicated if the municipality has shares in the large energy company.

Table 25 Generic lessons and status on project phases

Phases	Lessons	Status
The different project phases that exist are: 1. Exploration phase: a. Pre-exploration phase b. Feasibility phase 2. Planning phase 3. Realisation phase 4. Operation phase	- The situation is more complicated if the municipality has shares in a large energy company. - The LSEC projects should have really long-term horizons. - Municipalities must create a transparent policy plan to decrease political risks. - Municipalities are often unrealistic and underestimate the creation of a LSEC. - Municipal investments have a strong relationship with political budget cycles.	Exploration phase: 58% Planning phase, 24% Realisation phase, 12% Operation phase. 14%

4. Designing a decision support tool

The theoretical framework of chapter 2 sketches the reasons why municipalities exist and the way they can be involved regarding the theories of hybrid organizations, municipal involvement in general and existing models on municipal involvement. The empirical study of chapter 3 elaborates on how municipal involvement in LSECs works in practise. In this chapter the findings will be combined leading to a design that can help municipalities in making decisions on their involvement. The findings out of the previous sections are used to design a decision support tool and a set of involvement models. This section will lead to the fulfilment of the main research goal:

To design a decision support tool for municipal involvement to help them in the process of making decisions that determine their involvement in a local sustainable energy company.

First the design space is filled with the conclusions from the previous sections (4.1). Secondly the necessary requirements for the decision support tool will be presented (4.2). This together will lead to the formulation of different models of LSECs and how municipalities can be involved (4.3). This is followed by the actual design of a decision support tool (4.4). The tool is verified in a testing environment

4.1. Design space

In the theoretical study and the empirical study we have learned that the area on which municipality can make a choice when they are confronted whit a plan for LSEC is very broad and complex. The reality in these LSEC is that different for each LSEC. Therefore we cannot determine one set of precise options or steps that municipalities can inclemently follow in order to form a successful involvement in LSEC. Sometimes no involvement at all is the best involvement. These studies also showed us that the process of municipal involvement is rather vague, complex and ad hoc. Decisions are not made in advance in one moment, but throughout the process. The options that municipalities have are infinite. We can say however that someone within the LSEC must make a choice on 3 different aspects (technological, institutional, stakeholders) and that a municipality must make choices on its policy towards a LSEC. That “someone” within the LSEC process can be a municipality if it takes the initiative, but it can also any other stakeholder within the LSEC, these options are illustrated in figure 26 and 27.

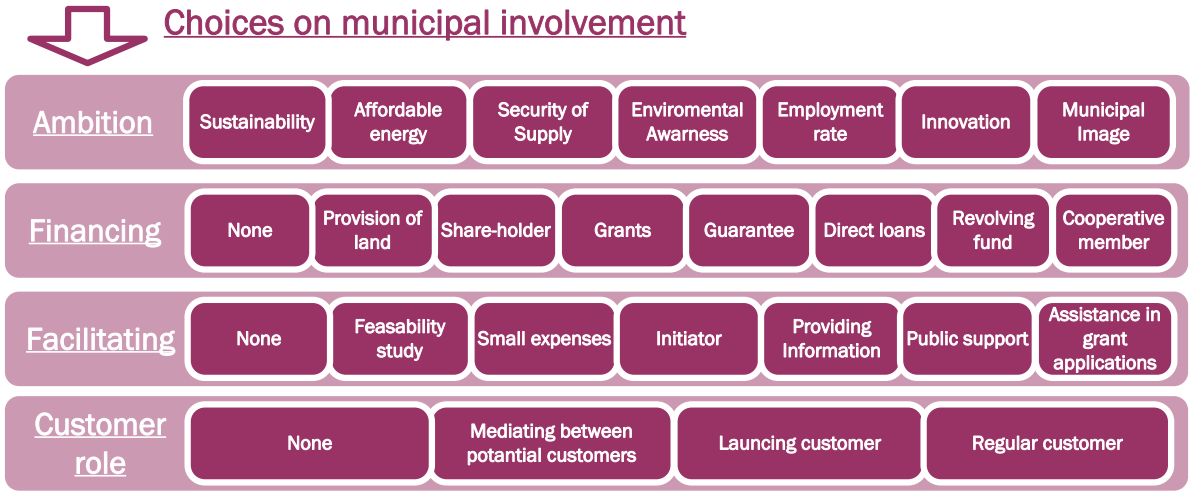


Figure 26: Choices on municipal involvement

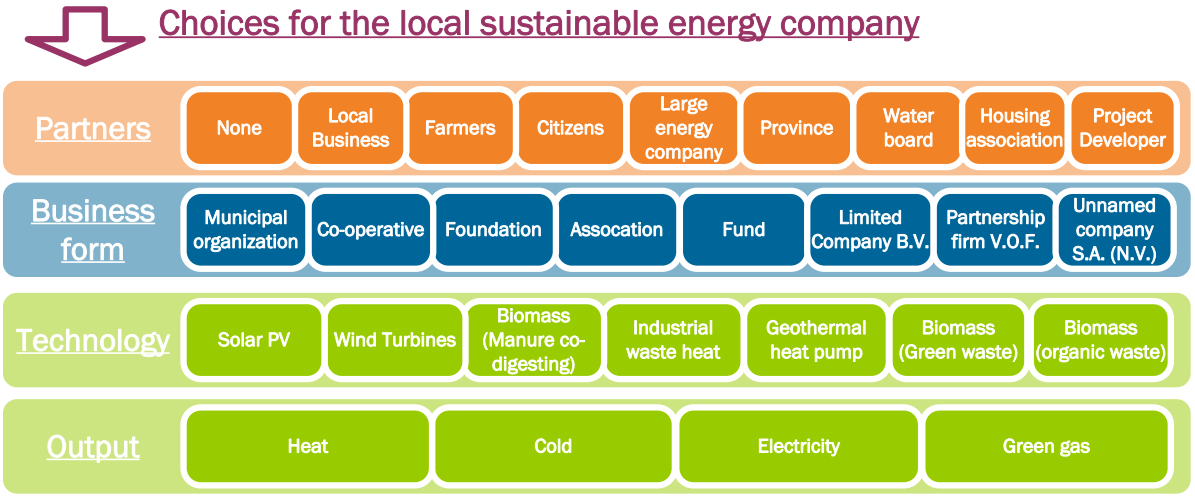


Figure 27: Design options for a LSEC

The process in figure 28 illustrates that the model is iterative; choices can even change within the process of the formation of a LSEC.

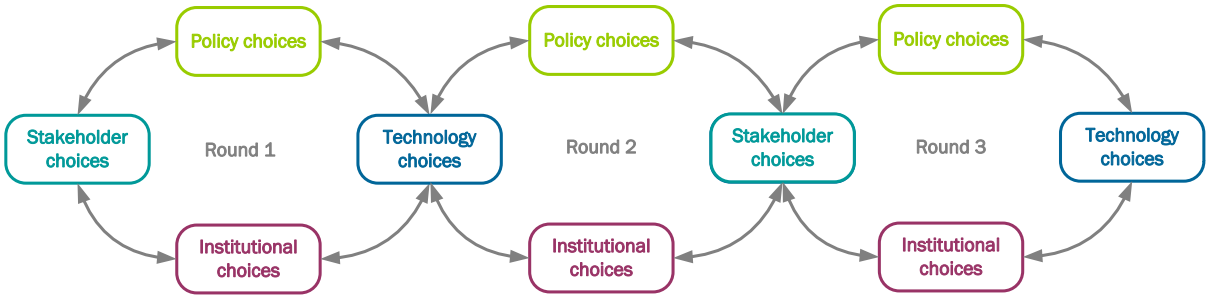


Figure 28 Iterative process of decision making on municipal involvement in LSECs

4.2. Requirements

A design for a decision support tool that municipalities can use must comply with certain requirements. One of the conclusions from the empirical study was that there is a great difference between small and large municipalities. Smaller municipalities do not have much time, budget or personnel to perform extensive policy studies on topics like LSECs. Therefore the use of a decision support tool for such municipalities cannot cost too much in time and funds.
Table 21 shows us that the amount of options is quite extensive and that the amount of combinations is even bigger. Therefore the process of making decisions on these topics is rather complex. A tool should help in decreasing this complexity. Therefore it should be simple and transparent.
A municipality is nearly never the only stakeholder in a LSEC. Therefore insights in advance in the interest of the different stakeholders can prevent conflicts between the different stakeholders later on in the process. Consequently a tool should help in giving insights in the stakeholder interests. To conclude the general requirements for a decision support tool are that it should be:

1. Affordable
2. Quick
3. Simple to understand
4. Transparent
5. Give insights in stakeholder interests

4.3. Model for involvement in a LSEC

In line with the models on involvement presented in section 2.3., a series of conclusions and reflection on these involvement models can be made.
First a remark has to be made. In view of the complexity and multi-actor nature of technologically complex systems, a model or design for a LSEC cannot be a 'blueprint' created through an intellectual process by a designer behind a desk. In as far as hybrid organizations are created in such a manner, they are often adapted (beyond recognition) during the process of decision-making and implementation. Mostly, designs appear to have been established during a historical process of iterative steps. The doctrine of process design assumes that designs are created in interactive processes between stakeholders. This can be an unguided, spontaneous process. However, process design is focussed on improving that process by conscious efforts to structure it more adequately. (Koppenjan and Groenewegen 2005). Two studies of model involvement have been evaluated (in section 2.3.) generating five types of models:

Table 26 Theoretical models on municipal involvement from section 2.4.

Models of Ten Heuvelhof (2004)	Models of Resezzy, Dimitrov et al. (2006)	Roles of municipalities
Municipal director	Implementer	Initiator, facilitator, financer, owner, operator
Co-operate via Public Private Partnership (PPP)	Borrower	Facilitator, co-financer, co-owner, regulator
Demand Coupling	Buyer	Initiator, facilitator
Corporations		Facilitator (Supporter, knowledge provider)
Public backbone	Initiator	Owner, initiator

In this section I will design four models for municipal involvement. These models consist out of type LSEC. These hybrid organization types are based on Perry and Rainey (Perry and Rainey 1988) (section 2.2) and the blueprint made by Groenewegen and Lemstra (Groenewegen and Lemstra 2007). The roles are based on the empirical study and the results from the interviews. The four models are shown in table 23. The four models build on each other, like the model of Perry and Rainey (1988).

Table 27 Models for involvement

	Model 1: Demand coupler	Model 2: Match-maker	Model 3: Co-creation	Model 4: Public LSEC
Organization	Regulated	Regulated	Government	Municipal owned

type (Perry and Rainey 1988)	enterprise	enterprise	contractor	enterprise
Municipal roles	Facilitating	Facilitating, customer	Facilitating, financing, customer	Facilitating, financing, customer
Municipal instruments	Information provider Provision of administrative support Public support in the media Assistance in grant application Regular customer	All of previous ones, plus: Feasibility studies Support for small services: Facilitating/Initiator Matchmaking between customers: Subsidy Guarantees: Revolving funds	All of previous ones, plus: Shareholder Direct loan Membership of a LSE cooperative. Providing municipal land.	All of previous ones, Municipal budget
Most suited technologies	Solar Wind Biomass	Biomass Solar Wind Industrial waste heat Geothermal heat storage	Geothermal energy Geothermal heat storage Industrial waste heat	Geothermal heat storage

Model 1: Demand coupler

In this model the municipality helps the local private sector in creating a market for sustainable energy. It will act as a market initiator by coupling existing demands within the municipality. This model is a mixture of the ICM "demand coupling" model and the "Implementer" model of Resezzy, Dimtrov et. Al (2006) (see table 13). The LSEC within this model is a private enterprise (Perry and Rainey 1988) or relational contracting (Groenewegen and Lemstra, 2007)

If municipalities want to use the model of involvement they should:

- Facilitate as much as possible, stimulate local initiatives
- Do not initiate a LSEC, but let the private sector take the initiative.
- Ask for private sector parties to indicate the possible demands that can be coupled.
- Let all financial benefits and costs for the private parties.

In this model the municipality is primary a facilitator of private initiatives. This model is particularly interesting for solar power. Solar Power does not need large investment sums at the start-up, therefore a municipalities is often not directly financial involved at the start-up. The stakeholder complexity is also relatively low, since it only requires at suitable place to install the solar panels and a grid connection.

Model 2: Match-maker

In this model the municipality acts as a matchmaker between potential investors, customers and producers. It gets deeply involved in the exploration process of the LSEC. The LSEC can be a private enterprise. This model is designed for larger projects in which the municipality must take the initiative in order to get the process of creation started.

Technologies such as large wind parks, large solar parks and biomass projects are suited for this model. Modern wind turbine have become larger and larger, therefore municipal involvement is needed for the integration of these wind parks in the landscape and zoning plans. Stakeholder complexity, within the LSECs system is not very high, if the LSEC has acquired all the necessary permits and has a suitable location to place the wind turbines there are no other big interdependencies with other stakeholders. In this way a hybrid organization could be a regulated private owner (Groenewegen and Lemstra, 2007) or regulated enterprise (Perry and Rainey, 1988).

Model 3: Co-creation

In this model the municipality acts as a co-creator of the project. The municipality will act as a partner with other stakeholders in investing, initiating and owning the LSEC. The LSEC can act as the government contractor. This model is intended for complex projects where asset specificity is high and end-user protection is needed. Especially for large heat networks (such as with Geothermal heat, geothermal energy And industrial waste heat). The organization in this way will be a governmental contractor (Perry and Rainey, 1988).

Model 4: Public LSEC
In the fourth model the municipality acts as the only owner, initiator and operator of the LSEC. The LSEC would be a municipal owned enterprise. This model is intended for projects where the municipality has large risks involved. Such a project could be a new municipal office with an integrated heat network and geothermal storage. The surplus of heat could be delivered on other customers. Since the municipality operates in the market this model can be seen as a public enterprise of Perry and Rainey (1988). In the research of Groenewegen and Lemstra (2007) this would be public owned company which operates in the market and therefore with private values, so a hybrid organization.

Figuur 29: Models for involvement

4.4. Decision support tool

I have chosen to design a game as the primary part of the decision support tool, because a simple game can be implemented easily, quick and without high costs. The game is written in Dutch because the members of the target group for this tool are Dutch municipalities and their Dutch stakeholders.

The form of the game is a role-playing negotiating game. The goal of the game is to let a group of people experience which choices are possible when creating a LSEC. The ambition is not to create a game in which all possible design options are being explored but only a few variations. The setting of the game is a group of stakeholders who are sitting together and have to make six important choices on the design of a LSEC. Although the game has several roles it can be played within a municipality as a role playing game, with the partners, or just with a selected group. The idea of the roles is to create an understanding of the different interests in a LSEC. The 5 roles that I have chosen are:

- Municipality
- Large energy company
- Local Businesses
- Local Citizens
- Agricultural Businesses or Housing corporations

Because not every municipality or case is the same, two versions of the game have been designed. Each version has a unique stakeholder. The first version of this decision game is illustrated in figure 27. The second version is presented in appendix C.

I have decided to let only 5 players participate in the game at the same time. Otherwise the game would be too long and it would only complicate the game without any advantages.

Version 1:
The first version is situated around a small municipality in an agricultural region. The complicating factor is that this municipality is situated in a region where the number of households is diminishing. An extra factor is the fact that this municipality has 8 million euro available out of the sales of the Nuon shares.

Version 2:
The second version is situation in a large growing municipality in an urban area. This municipality has no large funds available.

Rules of the game
Each game has five participants. Each player randomly gets a role of a fictional stakeholder in a LSEC. These stakeholders have been chosen out of the design space (section 4.2). Each participant should negotiate on the six questions while trying to defend the interests of its role/stakeholder as good as possible. There is no winner at the end. The game starts when all players are settled and have understood the rules. The game ends when all questions have been answered A session takes approximately 25 minutes.

Game layout
The game layout and design are presented in figure 27. The following questions are illustrated:

Question 1: Rank the following ambitions (with the most important one on top):

- *Energy prices*
- *Employment*
- *Rate of return on investments*
- *Sustainability*

In this question the participants must negotiate which public values are considered as most important in the future LSEC plans. They must rank the ambitions from the most important one to the least important one

Question 2: Choose a technology:

- *Solar*
- *Biomass*
- *Wind*
- *Geothermal energy*

In this question the participants must choose a technology. In order to trigger discussions, each technology has been given a score on the four public values out of question one. The scores range from (++ to - -). These scores are fictional.

Question 3: Which stakeholder should take the initiative?

- *Municipality*
- *Large energy company*
- *Local Businesses*
- *Local Citizens*
- *Agricultural Businesses or Housing cooperatives*

Question 4: Which stakeholders will be the largest end-used/customer of the LSEC?

- *Municipality*
- *Large energy company*
- *Local Businesses*
- *Local Citizens*
- *Agricultural Businesses or Housing cooperatives*

Question 5: Which stakeholder will bear the largest investments and will get the most shares?

- *Municipality*
- *Large energy company*
- *Local Businesses*
- *Local Citizens*
- *Agricultural Businesses or Housing cooperatives*

Question 6: Which stakeholder should facilitate the process?

- *Municipality*
- *Large energy company*
- *Local Businesses*
- *Local Citizens*
- *Agricultural Businesses or Housing cooperatives*

Royal Haskoning SMC Rollenspel

Maak je eigen lokaal duurzaam energiebedrijf

Rollenspel
Maak gezamenlijk met 5 partijen strategische keuzes op 6 onderwerpen. Het doel is om inzicht te krijgen in de verschillende keuzes die betrokken partijen hebben bij het realiseren van een lokaal duurzaam energiebedrijf. Behartig zo goed mogelijk het belang van jouw actor in de onderhandelingen.

Casus: Kleine groene gemeente
Kleine landelijke gemeente in een krimpgebied
Inwoners: 30.000
Gemeentelijke budget voor duurzame energie: 8 Miljoen euro

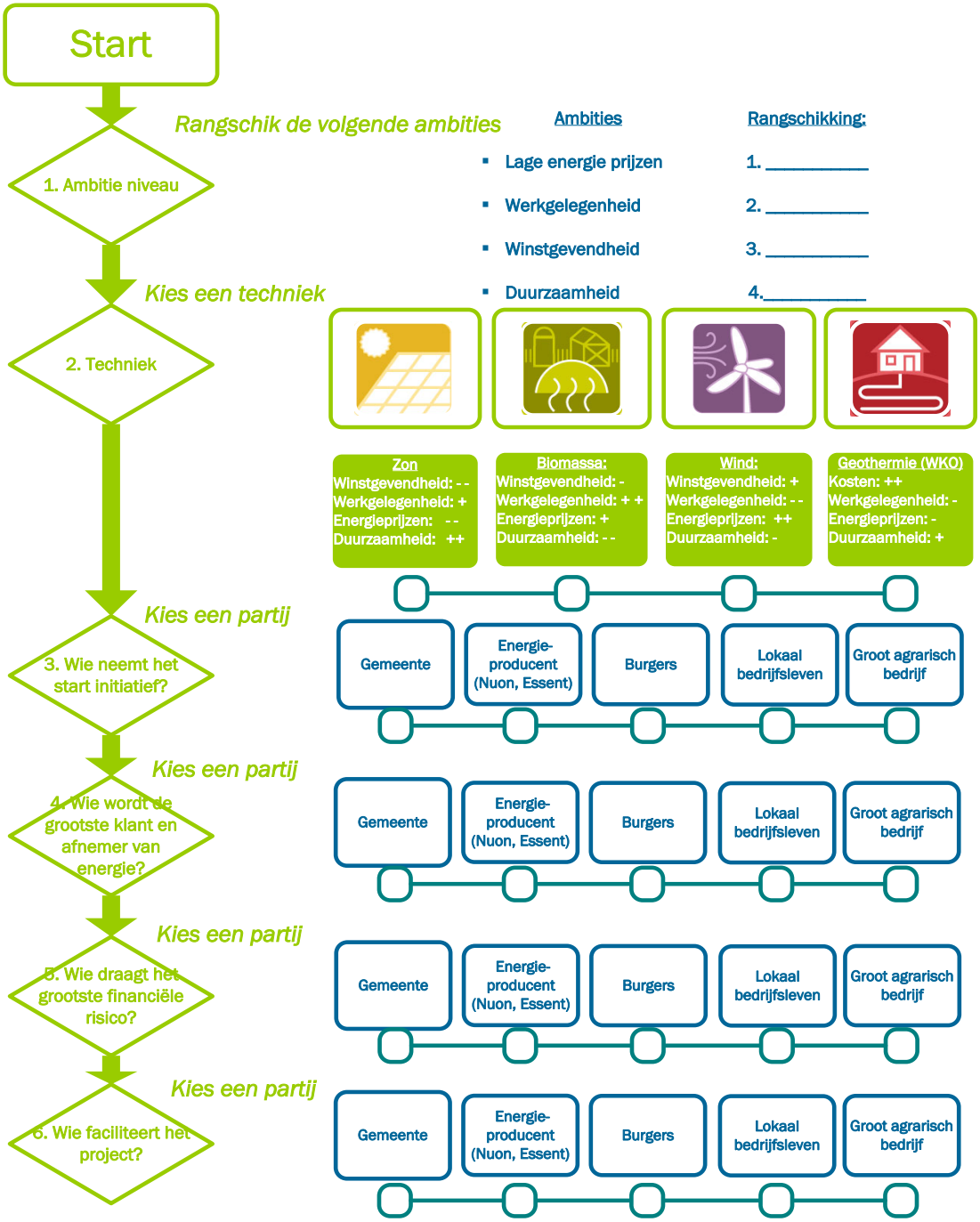


Figure 30 Decision support game

4.5. Verification (Game test)

To test whether the goal of this game was achieved and in order to see whether the game works as intended a verification session has been organized.

Testing situation
The game was tested with a group of volunteers. The group consisted out of thirty process managers from the Royal Haskoning Strategy and Management consultant department. First a short presentation on LSECs and municipal involvement was given. Six groups of five participants were formed. Each participant received a card with a role.

Lessons learned
During the game I observed on how the games were played. The following things were notable:

- During question 1. Some groups started a discussion on the definition of the term “sustainable”
- During almost all questions groups tried to insert extra options.
- In question 2 some groups started discussions on the scores. Some participants had the “feeling” that the fictional scores were not “right”
- In groups where one participant felt responsible for the process the game was quicker finished and faster agreements on all topics were reached.
- In some group there was not enough knowledge on the working of some technologies and the consequences of the characteristics on the choices.
- The sessions did indeed take approximate 25 minutes.
- A majority of participants indicated that they had more insights in the problems that could arise when stakeholder enter the process of creating a LSEC.

Conclusion
The overall conclusion on the game sessions was positive. The initial goal of the game was reached. A large majority of the thirty participants indicated that they had more insights in the possible conflicts and type of questions that could arise when the would be involved in creating a LSEC. The participants indicated that they saw the use of the game and indicated that they would like to use the game themselves with external stakeholders.
However this game has not been tested on real stakeholders who are actually involved in LSEC. The added value of this game on real stakeholders should be further tested.

5. Conclusions and recommendations

5.1. Conclusions

A local sustainable energy company (furthermore in the report indicated as LSEC) (*lokaal duurzame energiebedrijf (LDEB*)) is often seen by a lot of municipalities as being a promising instrument to realize the clean energy goals and to increase the production of sustainable energy. In recent years more and more municipalities in the Netherlands have announced plans to initiate a LSEC. Municipalities are arguing that LSECs can help in safeguarding public values related to the energy sector and to stimulate the local economy, employment and environmental awareness. The main problem owners in this research are the Dutch municipalities where (plans for) a LSEC exists and which are looking for a way to play a role in this development. This leads to the main subject of this research: the municipal involvement in these (plans for) LSECs. A local sustainable energy company (LSEC) is an organization which is directed at the realization of the local production and supply of sustainable energy, in the own region, for multiple local customers. Many municipalities struggle with the complexity and risks of their involvement in LSECs and the uncertainty of outcomes of these decisions on the level of municipal involvement. This research investigates how municipalities can be helped in choosing their level of involvement in a local sustainable energy company. It aims to know which different choices municipalities can make in deciding on their involvement in LSECs through an empirical study. This research started from the analysis that many municipalities struggle with the complexity and risks of their involvement in LSECs and the uncertainty of outcomes of these decisions on the level of municipal involvement. The main research question was therefore defined as:

How can municipalities be helped in choosing their level of involvement in a local sustainable energy company?

This main research question was answered using 4 different collection methods, a desk research, a set of interviews, participant observation and a full population questionnaire.

The theory study shows us that there are four aspects on which decisions have to be made. These four aspects together determine how municipal involvement in a LSEC looks like. These four aspects are:

5. Policy choices,
6. Technological choices,
7. Institutional choices,
8. Stakeholder choices.

The theory however does not give an insight on the exact options within these four aspects, neither does it gave insight in how decision making works within these four aspects.

In order to see whether these four aspects and other lessons from theory actually relate to reality an empirical study is performed. First a desk study on existing LSEC is done in order to get an indication on which options for involvement municipalities have. Secondly a series of interviews and participatory observations sessions has been performed to get a better understanding on how the ad hoc reality of municipal decisions on their involvement in LSEC works and looks like. Thirdly a nationwide questionnaire is done in order to know what choices municipalities make in realty and what the current state of municipal involvement in LSECs is in the Netherlands. This resulted in the following conclusions.

Conclusion 1: The reasons behind the municipal involvement in a local sustainable energy company are often personal and local.
One of the key aspects of a local sustainable energy company is that fact that it is created in a local setting. Therefore a strong local driver is needed. Personal ambitions of a powerful stakeholder have much more influence on local sustainable energy developments than nationwide agreements or targets set by the government. A committed and ambitious local politician or municipal official is often the source of high level of municipal involvement in a local sustainable energy company. However, this personal commitment makes these local sustainable energy companies vulnerable for budget cycles and re-election cycles.

Conclusion 2: Municipalities can play three different roles
The empirical study and the scientific theory showed that municipalities can act as facilitator, financer or customer when they are confronted with the plan for a local sustainable energy company. A large majority of the municipalities that are involved in a local sustainable energy company currently acts primary as facilitator. The use of financial instruments can tighten the relation between the local sustainable energy company and the municipality. When a municipality is also one of the co-owner of a local sustainable energy company, this can lead to the creation of hybrid organization. These hybrid organizations are often difficult to manage because they have to serve both public as private interests.

Conclusion 3: Municipalities often take the initiative in the creation of local sustainable energy companies.
A majority (66.7%) of the Dutch municipalities that is involved in (the development of) a local sustainable energy company, acted as initiator of the initiative and was the main driver behind the creation of the LSEC.

Conclusion 4: Municipalities are often unaware of the instruments they can use and are risk averse.
Despite the fact that municipalities often take the lead in the creation of a LSEC, they are not always aware of all possibilities, options, approaches and pitfalls.

Conclusion 5: When a local sustainable energy company is created, detailed knowledge is needed on technological, institutional, policy aspects and on potential stakeholders.
This research showed that when a local sustainable energy company is created major choices have to made on four differ aspects. Each aspect has different options and combinations of options. There is no strict order in which the decisions on these aspects have be taken. An LSEC initiative can start of each of the four aspects. The process of decision making on these aspects is iterative and vague. Literally an infinite amount of combinations is possible. This teaches us that the field LSEC is a interdisciplinary, complex and uncertain subject.

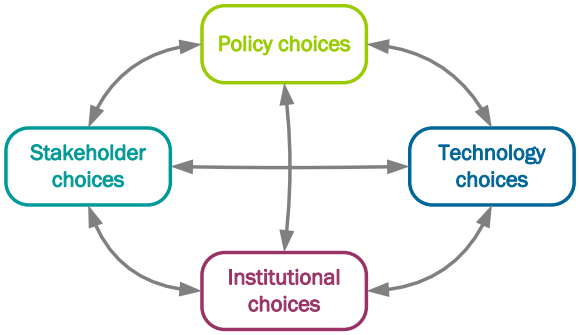


Figure 31: Aspects that together determine how a municipality is involved in a local sustainable energy company

Conclusion 6: Local sustainable energy companies are still in the early stages of development.
From the empirical studies is follows that 56% of the municipalities in the Netherlands is in some way involved in (plans for a) local sustainable energy company. Of these 56% only a quarter is involved in a local sustainable energy company that actually produces sustainable energy. A majority of the plans is still in the exploration phase. Therefore we can conclude that the existence development of local sustainable energy companies is not wide spread, but is still being developed.

These conclusions are also incorporated in a framework. This framework gives municipalities insight in the options, lessons and current status on each important aspect that plays a role when deciding on the level of involvement in a local sustainable energy company. This framework is presented in table 28.

Table 28 Conclusions on the four mayor aspects

	Options	Lessons	Status
Policy aspects *Ambitions* *Roles and instruments*	1. Employment 2. Security of Supply 3. Support local businesses 4. Affordable energy 5. Awareness 6. Acceptable "Clean" energy 7. Sustainable image 8. Innovation and education 1. Financing role (7 detailed instruments) 2. Facilitating role (7 detailed instruments 3. Customer role (3 detailed instruments)	- Municipalities should only act if the private market in not able to safeguard a public value - Ambitions only play a role if they are adopted by a powerful stakeholder - Ambitions must have a local source, call on a local problem. - National (top-down) goals do not work - Facilitate were possible, finance if necessary - Policy choices are often made afterwards when the other choices are already made - Ambitions often serve as justification of choices made. - Municipalities often lack the knowledge on all possible instruments, they should hire this knowledge - Private parties expect that a municiplaites has a clear policy towards LSECs! - Municipalities also must act as a "match maker"	Most important ambitions: 2. Employment 3. Security of Supply 4. Support local businesses An interesting finding from the questionnaire is that municipalities with (a plan for) a LSEC rate all the possible ambitions higher *Facilitating instruments* - Administrative support 56,1 % - Feasibility studies 47 % - Public support in the media 28,8 % - Support in grants application 18,2 % - Financing of small expenses 15,2 % *Financing instruments* - Shareholder 21,2 % - Subsidies 19,7 % *Customer instruments* - Matchmaking between potential customers 19,7 %
Institutional aspects	1. Fund (*fonds*) 2. General partnership (V.O.F.) 3. Limited company (B.V.) 4. Joint-stock company (N.V.) 5. Cooperative (Cooperatie)	- The role of municipalities increases when large production facilities arises and that it is less necessary when the private initiators are dominant. - Trust is utterly important for any initiative. - Leave room for the individual ambitions and interest of all involved parties. - A close relation between the public principal and the hybrid organization is not preferred. - A hybrid organization can compete with private competitors on lower prices due to public funding.	No data available
Stakeholder aspects	1. Municipality 2. Local businesses 3. Citizens 4. Province 5. Housing corporation 6. Project developer 7. Agricultural businesses 8. Large energy company 9. Water board	- Make stakeholder responsibility and interests explicit! - Incorporate local partners, they have local knowledge - Transparency towards each other is is important. - The ideal situation would be that the end-users are the owners of their own energy production company. - When a new district heating is created the involvement of local housing corporations is essential. - The large energy companies are having difficulties with finding a role in this new development of LSECs. - Involve the large national energy companies only when there is no other possibility. - Involve banks and financial partners as soon as possible	Most often involved stakeholders: *Co-Initiators:* Municipality (66,7%) Local businesses (28,8%) Citizens (16,7%) Province (15,2%) Housing corporation (13,6%) Project developer (13,6%) Agricultural businesses (10,6%) *Co-owners:* Municipality (44,4%) Local businesses (25,8%) Citizens (21,2%) Province (16,7%) Project developer (13,6%) Agricultural businesses (13,6%) Large energy company (22,7%)
Technological aspects	Output choices 1. Cold 2. Heat 3. Electricity 4. Biogas Technology options: 1. Solar PV 2. Biomass 3. Geothermal heat 4. Geothermal heat storage 5. Industrial waste heat	- The type of technology which is used partly determines the way municipalities are involved. - The more the private activities are dominant within a LSEC the less a municipality should be involved. - Technologies can be political sensitive - Municipalities have particularly a large role when large production facilities - In projects with high stakeholder complexity municipalities must facilitate, couple demand and inform private parties on the opportunities for creation of LSECs	Used or planned technologies within plans for LSECs. Wind (34.7%) Solar (51.4 %) Geothermal heat storage (34.7%) Geothermal energy (20.8 %) Biomass (72.2%) Industrial waste heat (25.0%)

5.2. Recommendations for municipalities

Recommendation 1: Municipalities must draft a policy plan; even there is no plan for a local sustainable energy company at the moment.
The initiative for the creation of a local sustainable energy company can be launched from the private, the public or the community sector. Even when a municipality decided that it will not take the initiative for the creation of a LSEC there is a large chance that it will be confronted with questions on this field from the private and community sector. These questions can range from; Does the municipality want to invest in the regional biomass company? Can the municipality help us with the creation of solar cooperative? When a municipality is not prepared to such questions, their response will be inadequate and ad hoc. Private parties do expect that a municipality is prepared to such questions and will feel discouraged when to see that a municipality is not capable of providing a clear answer. Therefore a municipality must explore the possibility of involvement in a local sustainable energy company.

Recommendation 2: Municipalities must choose their preferred model for involvement, and makes sure it understands the related roles and instruments.
Municipalities can explore their possibilities for involvement by performing the following three steps:

Step 1: Play the "create your own local sustainable energy company"- game internally or with local actors. By playing this game a municipality can create awareness in its own organization or community what mayor choices have to be made when a local sustainable energy company is created, it will also gave insight in the different interests , trade-off and pitfall exists within the process of the creation of a LSEC.
Step 2: Read the framework for municipal involvement (table 28) and make sure that you acquire basic knowledge on the options as presented. This will assure that someone within the municipal organization will have some basic knowledge and overview on what options exist and what the status of local sustainable energy companies is.
Step 3: Discuss and choose a preferred model for involvement.

Table 29 Models for involvement

	Model 1: Demand coupler	Model 2: Match-maker	Model 3: Co-creation	Model 4: Public LSEC
Organization type	Private enterprise	Regulated enterprise	Government contractor	Municipal owned enterprise
Municipal roles	Facilitating	Facilitating, customer	Facilitating, financing, customer	Facilitating, financing, customer
Municipal instruments	Information provider, Provision of administrative support, Public support in the media, Assistance in grant application, Regular customer	All of previous ones, plus: Feasibility studies, Support for small services, Initiator, Matchmaking between customers, Subsidy Guarantees, Revolving funds	All of previous ones, plus: Shareholder, Direct loans, Membership of a LSE cooperative, Providing municipal land.	All of previous ones, Municipal budget
Most suited technologies	Solar Wind Biomass	Biomass Solar Wind Industrial waste heat Geothermal heat storage	Geothermal energy Geothermal heat storage Industrial waste heat	Geothermal heat storage

Recommendation 3: If a municipality decides it want to be involved in a local sustainable energy company, it must clearly indicate which public values are at stake to justify their involvement in a private market.

If a municipality decides that it will be involved in a local sustainable energy company and has an idea how this involved ideally would look like it must carefully reconsider why they are choosing the type of involvement. The must understand that ex-post evaluation of hard target will not always work within a social-technological system such as a local sustainable energy company is. (recommendation 2 and 3 can be followed in any order)

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Appendices

A. Interviews

Interview design and approach

In order to answer the third research sub question 10 stakeholders have been interviewed. The third sub research question is:

1. *How do municipalities and stakeholders decide on their involvement in a LSEC in practise?*

Interviewees have been selected through an internet quick scan on the known LSEC projects. I invited 15 different stakeholders and tried to indentify which stakeholder was closed involved in the start process and therefore had the greatest change to have a idea on how the municipality involved was formed. The interviewees have been contact through e-mail or telephone. In the interview invitation a short introduction of the topic was given including the main research question of this research. The interview time was approximately 1 hour. Most participant wanted to participate if the result where used anonymous. All interviews have been recorded. Therefore the transcripts of these interviews have not been included in this appendix. All interviews have been recorded with permission of the interviewees. In Table 7 a list interviewees is presented. The names of the interviewees are not included.

Figuur32: List of interviewees

Nr.	LSEC Case	Type
1	Veenendaal	Consultant on LSECs
2	Putten	Municipaplity
3	Putten	Consultant on LSECs
4	Dordrecht	Energy producer
5	General	Energy producer
6	Delft	Municipality
7	General	Energy retailer
8	General	Researcher
9	Veenendaal	Bank

The interviews were qualitative and semi-structured. The following questions have been asked. The basis of these interview questions are the steps as identified in the section 3. Special attention was paid to the case to which the interviews were involved.

Interview questions

Formulating ambitions:

1. Which reasons and ambitions do municipalities have to be involved in LSECs?
2. What is the source of these ambitions and reasons?
3. Does municipal involvement in LSECs helps in safeguarding certain public values?
4. Is the internal return on investments for municipalities more important than the safeguarding of these public values?

Choosing a role:

5. How could you describe the role of the municipality in stimulating sustainable energy or the creation of the LSEC?
6. Did the municipality played an active role?
7. Why did the municipality play this role?

Choosing instruments:

8. Could you describe some of the instruments the municipality used in the creation the LSEC?

When to use these instruments:

9. Did the municipal role in the creation of the LSEC differ per project phase?

Figuur33 Project phases

Partners to include:

10. Which stakeholder are most important and which have critical resources? Why?

Which technology to choose and which type of output to choose:

1. Which type of technology is most suitable to use when creating a LSEC?
2. Does the type of technology have influence on the type of municipal involvement?

Competence and risks:

3. Do municipality have the competences to perform the roles they have chosen?

Interview 1: 3P Consultants

3P consultants is a consultancy firm which delivers process management services for the creation of LSECs and has helped several municipalities in the creation of LSECs.

Choosing a role:
3P recognizes two paths on the creation of LSECs. The first path is a slow bottom-up approach in which small consumers and household are creating a small foundation or cooperative which couples their demand in "green" energy. These small organization turn into LSECs when the state the ambition of realizing their own local sustainable energy production. These small initiatives often "forget" to realize a professional independent organization. Municipalities should provide training, information and facilitating support to these small initiatives in this path. Municipalities could be an initiator. It is important that municipalities create the requirements and constraints in new building project in such a way that the creation of a LSEC is possible. They can act as a contracting party of a large building project. Municipalities could designing business cases in such a way that they create incentives that will serve the public tasks of the municipalities. A municipality must act as launching customer in the realization of large sustainable energy projects and should also finance feasibility studies. Of a municipality is involved in such a way the starting point must always be the technologic solution. The creation of a LSEC must not be "paper tiger". Municipalities also must act as a "match maker" in creating an integrated design in which al necessary stakeholders are combined.

Choosing instruments:
Municipalities lack the knowledge to fully understand the choices they could make on the different instruments. They often make decisions based on experiences of other municipalities and the feeling they have with the options. If a municipality chooses to be a shareholder they also should be truly involved in the activities of the LSEC. A municipality acting as a shareholder should always aim at selling those shares at some point in time when the involvement of the municipality is no longer needed.

Partners to include and when to include them:
Municipalities tend to involve the big energy companies because they think it is "easy". Municipalities lack the knowledge on which private parties are available. The for instance do not know that you out-source almost al activities of LSEC (back-office, ICT etc.) to external management. In creating a new district heating system (with geothermal energy or geothermal heat and cold storage) the involvement of local housing cooperatives is essential. Also financial parties should be involved in the first project phases and not only when there are problems in making the business case economical feasible. The large energy companies are having difficulty with finding a role in this new development of LSECs. An advantage of involving large energy companies is that the have access to "cheap money" on the capital market.

Which technology to choose and which type of output to choose:
The small foundations and initiatives are mostly focused on solar. Especially with heat and geothermal energy the involvement of the municipality is essential because these projects are often complex in terms of the number of stakeholders. IN wind energy project the role of the municipality is very limited. There are enough private sector parties who are willing to invest in wind turbine projects and there is enough information available on these projects.

Interview 2: Municipality 1

The municipality is a small agricultural municipality in middle of the Netherlands. It has 22,000 residents. The municipality was involved in 2 large biomass projects in the last few years.

Formulating ambitions:
The ambitions to realize the second biomass project came from the region suitability development organization in which the municipality of Putten participated. The asked of Putten cold find a place in its spatial plans for a large biomass installation. Putten was chosen because there were already some biomass plans within the municipality. The initial plan for biomass digester came from local agricultural companies. These local agricultural companies all asked the municipality on which locations a biomass installation was possible. Stimulating and supporting the local economy is primary driver for an active role of the municipality. The idea of "sustainability" is only a term used to cluster innovative activities within the agricultural sector.

Choosing a role:
The Christian identity also played a role; this meant that there was an idea that the agricultural sector should deliver more than only economic prosperity. It should also left something for future generations. The nationwide ambitions on sustainability also led to a municipal council agreement on sustainability, but it played a secondary role when compared to economic arguments.

Choosing instruments:
Because the municipality had chosen to play an active role within the creation of these large biomass plans, they also wanted to perform and pay for the necessary feasibility studies and active support in the permitting process. Further municipally financial support was not yet discussed publically.

Partners to include and when to include them:
Participating of local residents was not considered in the early project phases. The municipality thought it only needed to inform the local resident when on the plans for a large biomass installation. The municipality thought it did a good job the inform the local residents before the feasibility studies where ven completed. IN retrospective this was a mistake, the local residents assumed that the feasbalility studies where already completed and that these information evenings where the last possibility to stop the project. They immediately created a biomass action group called "Tegengas" to stop the municipal plans. This action group was directly supported by political opposition in the city council.

Which technology to choose and which type of output to choose:
Each political fraction has its own favorable technology or project. Political twits do play a role when choosing a technology. When certain political parties adopt a technology (for instance wind energy) the discussion on these technologies become politics and rational arguments do not play a role anymore. When their plans do not receive support of other political parties, they are not willing to support technologies of other parties. In Putten this happened with a large wind turbine park. Local residents launched this plan and sought political support for the wind turbines. Because this project didn't received support of the majority of the municipal council they boycotted the new biomass plans immediately.

Competence and risks:
The transparency and the very strict use of the incremental policy plan (first feasibility studies, then a feasible business case etc.) proved to increase the political risks.

Interview 3: KplusV Consultants

KplusV is a consultancy company. They have advised several municipalities on the creation of LSECs, biomass installations and Climate en Energy policies. KplusV was very ambitions on creating LSEC and helping municipalities in creating LSECs, but due to recent experiences we have become very skeptical on this topic.

Formulating ambitions

The main ambitions of municipalize are not climate goals but employment and stimulating the local economy. In particular with biomass projects the modernization of the agricultural sector and increasing employment are the main sources of ambition. Availability issues, such as long term security of supply and affordability of the energy products does not play any role. Innovation and climate mitigation do play a role but less than employment and stimulating the local economy. National climate mitigation agreements (such as the one between the VNG and the national government) do not have any influence on local ambitions. Local climate polices have some influence but only if a dedicated municipal official really is putting effort in it. Otherwise it is just a piece of paper.

Choosing a role:
The active role of the municipality of Putten in its Biomass project came from a very active municipal official who also was part of the regional development board. This regional development board sought a pilot project to stimulate the bio based economy. The municipal executive board found this a good idea and offered to seek a spot in the local spatial plan for the realization of large biomass plant. The municipality of Putten tough hit had to play an active role and take the initiative because otherwise the project would have started at all. Other instruments that the municipality would use are giving available land and active support in the media.

Choosing instruments:
The municipality of Putten took the initiate in paying for the feasibility studies. 2 large local companies already had plans for biomass installations. The municipality sought partnership with these plans and combined them together with the plans of the regional development board. The municipality of Putten also thought on investing the funds that came available through the sell of the Nuon shares.

Partners to include and when to include them:
The municipality actively sought partnership with local plans of local agricultural companies. They did not incorporate local residents or other parties… Luckily this wasn't the fact in this case. In both projects the municipality thought it needed the support of local residents only in the last phases of the project. They did not want active involvement of local residents. The primary role of the municipality was informing the local residents, not participating of local residents. Consultants such as KplusV are in fierce completion with other smaller consultant on these smaller projects. If you want to start a LSEC you should first seek partnership with local companies and only involve the large national energy companies of there is no other possibility. The interest of the large companies is often not in line with the local interests.

Which technology to choose and which type of output to choose:
The choice of large depends on local political situations.

Competence and risks:
The municipality of Putten did another large biomass project together with a large energy company. This project was a success in term of the fact that the installation is completed and running, but the cooperation between the municipality and the energy company was a failure. The large energy company put a lot of pressure on the municipality to invest more and more funds into the project. It was a large pilot project for the energy company and the economical feasibility was doubtful, therefore the energy company tried to put more and more risks at the municipality. This also had influence at the personal relationships between the municipality and the energy company. This project lead to the situation that in future LSEC the large energy companies only wants to participate if the business case already complete and there risks and agreements are already signed. KplusV thinks the situation would even be more complicated if the municipality had shares in the large energy company

Interview 4: HVC Alkmaar

HVC is a large energy and waste company that is owned by Dutch municipalities and Dutch water boards. HVD helps municipalities that have shares in HVC in the realisation of LSECs and sustainable energy policies.

Formulating ambitions
Municipal executives which have high ambitions are the main source of ambitions on LSECs. Only a personal commitment of municipal executives could force the implementation of actual policies on LSECs.

The national agreements between regional and national governments have influence but only if a local municipal executive commits himself to realizing those goals.

Choosing a role:
Larger municipalities have more possibilities that the smaller municipalities, These smaller municipalities do not have the means to perform as detailed research on their possibilities on LSECs, therefore there is a business opportunities for companies to help these municipalities in this process.

Choosing instruments:
HVC performs sustainability scans for municipalities. They do this free of charge, because they see this as their public task. They help municipalities in creating feasibility studies and in the process of the creation of feasible business cases. Large municipalities have a wide range of instruments out of which they can chose, because some instruments demand a lot of effort from the municipal officials. Municipalities are very conservative shareholders. As shareholder they a primary focussed on financial return and dividend. They do not say much on what the hybrid organization must do and tend to be only focussed on the return of investment on their shares, often they often almost “forget” that they have shares in HVC.

Partners to include and when to include them:
Local parties are the main stakeholder that should be incorporated in the creation of a LSEC. They know the local situation and know the other local stakeholders. Housing cooperatives are not the most logical parties because they do not have the knowledge on sustainability and local energy situation to be of much of an extra value. A large energy company such as HVC which is already owned by municipalities and has specific knowledge on how to create these technologies cal infrastructures is a more logical choice. Transparency is important. Choosing public enterprise such HVC as a primary party is logical from a municipal perspective because they do not want to create a new competitor to their own municipal-owned companies.

Which technology to choose and which type of output to choose:
HVC help municipalities in all sustainable technologies they want to choose. HVC thinks municipalities should always pick the economic most suitable option.

Competence and risks:
Municipalities are risk averse and are hesitating in trying new roles and instruments.

Interview 5: Delta

Delta is a large energy company which operates in the province of Zeeland. It is still public owned. The shares are owned by the local municipalities and the province.

Formulating ambitions:
Municipalities have often unrealistic ideas on sustainable energy projects. They have good intentions, but the reality is that these projects are often bases on financial quick sand. Municipalities often invest under pressure of the political parties in the city council to invest the budget (or the funs made by the sell of the Nuon and Essent shares). Often the entire city council is in favor of these projects. You also see a string relationship with political budget cycles. Mayors and Municipal executive councillors often promise these projects, but the projects are often stopped when the Municipal executive councillors are not re-elected. They often promise things in the far future, because they know the will not be held responsible of the ambitions and goals are not met. A LSEC needs some scale (in terms of customer numbers and production size) to be successful. The municipalities in Zeeland do not have high ambition in creating new sustainable energy companies of some scale since they are afraid that these LSEC would compote with Delta, and therefore they would get fewer dividends. The most important ambitions are costs and affordability. They will not make commitments of current budgets for goals that are 20 years away.

Choosing a role:
Municipalities who have shares in Eneco or HVC only have high ambitions on creating LSEC when they know that Eneco or HVC is also investing. They do not want to risk getting lower dividends from their shares in Eneco and HVC.

Choosing instruments:
The third role municipalities play is the role of regulator. They decide on permits. So if a competitor of Delta (or the LSEC in which they have shares) wants to build a production facility in their region, than the municipalities have conflicting interests.

Partners to include and when to include them:
Delta participates in sustainable project in the Zeeland region. Participating means that must invest. Municipalities often only approach us when they need money to realize these projects. So we are contacted very late in the project phases. You see that LSEC want to have professional shareholders on which they can rely. Therefore you see that some LSEC ask for big financial partners, because these shareholders demand professional reporting and a professional organization. This increases the professionalism of the LSECs.
It is the opinion of Delta that municipalities should seek partnership with other municipalities and should stimulate LSEDC to seek partnership with other LSEC in order to create synergy benefits. The creation of a customer back office and ICT service that are needed to operate an energy company are very expensive. Therefore, in the end, they should create some sort of "Rabobank model". A national cooperative that serves as the support group for local companies.

Competence and risks:
This paradox also exists within Delta. The shares of Delta are partly owned by the municipalities. So if they ask Delta to invest in LSECs in Zeeland. They risks getting lower dividends of these LSEC are not as profitable as the classic activities of Delta.

Interview 6: Municipality of Delft

The municipality of Delft is a large municipality with 95,000 inhabitants. It is involved in the creation of a local heat company which will deliver heat through a district heating network. This LSEC has the ambition to produce a substantial part of the heat through sustainable energy and the use of industrial waste heat.

Formulating ambitions
The national agreements do not had much influence on the local ambitions. The local ambitions of the creation of delft heating company had their origin in the possible use of industrial waste heat from DSM and the AWZI. CO2 reduction is the most important ambition. Delft had made very strict goals on the amount of tons of CO2 emissions that must be reduced. Security of supply is especially important within the realization of a district heating system because you need heat at every moment in time for the next 30 years.

Choosing a role:
The municipality acted as a contracting party for the district heating network. They called a tender for the realization of two parts. A tender for the distribution company and a tender for a heat production company.

Choosing instruments:
With the design of the tender the municipality had a large influence in design the requirements and constraint in such a matter that sustainable energy would be a part of the district heating system. The problem with this tender process was that the municipality was lacking knowledge on how such a district heating systems work. This information asymmetry led to a situation in which the municipality became dependent on Eneco (which won the distribution tender)

Partners to include and when to include them:
The municipality took the initiative in this project. They first contacted the local water board of Delfland. These two public parties performed and paid the feasibility study. In the next phase the water board decided that it was not their primary tasks to realize a district heating system, therefore the municipality contacted Eneco (in which they had shares) with the plan. Eneco asked for the partnership of several large housing cooperatives in Delft. The housing cooperatives would be the most important customers of the new heating system. Local residents are only involved in the realization of the plans for the production facility. Local resident do not have any problems with a district heating system, because they do not see it in their neighborhood. It is important that all stakeholder thrust each other.

Which technology to choose and which type of output to choose:
Wind turbine are not an option in Delft because there are no suitable locations. The choice for a district heating system as the primary source of sustainable energy was part of a path depend approach. The municipality started with the study for the use of industrial waste heat. The initial ambition on CO2-reduction will not be met. If you only want to realize CO2-reduction you should build a LSEC based on solar-PV.

Competence and risks:
With the involvement of the housing cooperatives the risks and the information asymmetry between the municipality and Eneco diminished because the housing cooperatives also had this problem. Therefore they could

Interview 7: Greenchoice

Greenchoice is a Dutch sustainable energy company which sells "Green energy" on the Dutch market. It is primary focused on the retail part of electricity but has the ambition to produce its own sustainable electricity. They facilitate and support the bottom-up creation of local sustainable energy cooperatives.

Formulating ambitions
The main sources of ambitions are local citizens who want to have sustainable energy produced in their own region. Greenchoice facilitates these initiatives. The first phase in this facilitation is demand coupling. When the demand of these small consumers are bundled they can invest a small portion of their profit in local production. Small consumers are willing to invest in local production at a lower rate of return that more classic stakeholders such as banks and investment funds. The really want to get involved in their own sustainable energy company. They are the main driver forces behind most projects that Green choice supports.

Choosing a role:
Municipalities have particularly a large role when large production facilities have to be realized, such as biomass installations. The must facilitate, couple demand and inform private parties on the opportunities for creation of LSECs

Partners to include and when to include them:
The most important partners to include are the end-users. The ideal situation would be of the end-user where the owners of their own energy production company. They could become a member of the municipal energy cooperative. It is important that you have one or two persons who are willing to invest a lot of time and effort in the formation of the new cooperative. Thrust is important. The support of a municipality could really help in the starting phase.

Which technology to choose and which type of output to choose:
The starting point of these initiatives should be the organizational problems not the technical concept

Competence and risks:
All these project have really long-term horizons.

Interview 8: Dutch School of Public Administration (Nederlandse School voor Openbaar Bestuur)

The interviewee is a researcher at the Dutch school of public administration in The Hague. He wrote his PhD on hybrid organizations in the Dutch waste sector. The Dutch waste sector is dominated by hybrid organizations that have their origin as government enterprises.

Formulating ambitions
Ambitions always have a personal source. Only if a particular person with influence has a certain ambition thing will change. A dedicated municipal executive or manger of a LSEC means more the realization of goals the policy documents and formal agreements.

Choosing a role:
LSECs mix public tasks (stimulating the production of sustainable energy) and commercial activities. The more the private activities are dominant within a LSEC the less a municipality should be involved

Choosing instruments:
When the LSEC still is depended on public funds an active role of municipalities is needed. The less risky the financial instruments a

Partners to include and when to include them:
The relationship between the hybrid organization and its public principal is always a difficult one. If the LSEC is relatively successful and no major problems occurs there will not be much interest and attention from the public principal. Municipal executives do not want to have much influence or a close relationship if there is no political advantage for them. Municipalities often do not know exactly what the hybrid organization is doing and they do not have the knowledge to fully understand the dilemmas and problem hybrid organization are facing. Distance between the municipality and a LSEC can also force LSEC to become more professional since it forces both parties to clearly define each other responsibilities.

A close relation between the public principal and the hybrid organization isn't something much hybrids organization prefers. They fear that a close relationship with the public principal makes it impossible to react quickly on market changes. They see themselves more as entrepreneurs than as guardians of public values. At the same time these hybrid organizations are benefitting of their "hybridness". They can compete with their private competitors on lower prices due to their public funding, and they defend this by saying that they are defending the public values.

Interview 9: Triodos bank

Formulating ambitions and Choosing a role:
Banks and financial partners which are essential for the success of most projects are getting involved to late in the process. Often banks are contacted when the business case is economic feasbale and we need to provide a solution. We think they should have come earlier. But on the other hand we doe not want to get involved in the very early fuzzy front end, in that stage most partners do not trust each other enough. That stage takes a lot of time.

"As a bank you have a lot of influence, but you should only use that influence on those subjects you play are"

It is very important to precisely define the different responsibilities of all stakeholders involved, this is often done implicitly and that is a source of why many projects fail in the end. Municipalities are often playing an financial role with the arguments that the private sector isn't doing it. But if the private sector does not want to invest why should a municipality do that? That is not their expertise. Municipalities are enthusiastic on national initiatives but when, in the end, they have to make commitments they won't give up any control on their investments. Municipalities should primarily facilitate. "

"They should be entrepreneurs but should set the private parties back to work"

Choosing instruments:
Relatively new technologies such as geothermal energy, large geothermal heat sotorga networks and biomass installation, you need a lot of primary investment of direct stakeholders. In more proven technologies such as a wind park, you can finance with up to 95% of external financing.Municipalities should not use financial guerantees. They seem to be the most interesting for municipalitites because you support the creation of a LSEC, but it doesn't costs you money. But it is a trap, beacuase municipality do take a risk but they do not have any influence in the LSEC. So they must not use guarantees.

Partners to include and when to include them:
Banks are not safeguarding public values, we are involved to make profit. Getting stakeholder committed for the long run is very diffulcult. End users and customer want to now for sure they will get energy in the next 10 years. But suppliers of biomass do not want to make 10 year long suplly conracts because they fear they cannot deliver in the long run.

Which technology to choose and which type of output to choose:
The Triodos Bank recognizes two different approaches on how local sustainable energy projects are realized. The first path is one where a technology driver initiator starts with a very clear idea of which type of technology is going to be used. This can be a large wind farm, a geothermal heating districts heating system or a biomass installation for instance. These initiators start with the technological side and then start building a business case around the project. Later on in the projects they often discover that they need other stakeholder to participate and finally an independent company or "special purpose vehicle" is created. After that stage they start thinking on who will be the customer, the end user and who is going to retail the energy that is going to be produced? This is more a top-down approach.

Competence and risks:
Municipalities are afraid to use their contracting role, because they fear they have to oblige to the European contacting rules, but they don't. They are afraid of any risks they do not understand completely. They are risk averse. Municipalities are not suited to be a professional shareholder in enterprises

B. Participatory Observation

I have participated in two meetings in which the creation local sustainable energy companies was the main topic.

The first meeting was 2-day event with the community of practise on LSECs. The members of community of practise are municipalities which are involved in LSECs. A discussion flyer was designed to given to the participants of the Community of practice to introduced my research (see figure 32).

The second meeting was a 1-day long meeting of 4 private companies who together where exploring the possibility of the realization of a LSEC. During both events I have tried to extract the lessons that could be learned on the 9 steps.

Steps on municipal involvement:

1. Formulating ambitions
2. Choosing a role
3. Choosing instruments
4. Choosing when to be involved?
5. When to use these instruments?
6. Which partners to include?
7. Which business form to choose?
8. Which technology to choose?
9. Which type of output to choose?

Figuur34 Discussion flyer CoP

Meeting 1: Community of Practice

The central theme of the 2-day event was the experience of the municipality of Lochem on the creation of 2 LSEC-like projects in the last few years. The first project the project called ADEL (*Armhoede Duurzame Energie Landschap*). This was a subsidy project in which a agricultural neighbourhood was allowed to perform energy scan and feasibility studies on how their neighbourhood could be energy neutral. This was a pilot project for the municipality. The second project was called *EnergieLochem.* This project consists out of the initiative to create a local energy cooperative.

Formulating ambitions
The source the ambition on sustainability was an active municipal executive. The municipality had stated that it wished to be energy neutral in 2020. The election of this new municipal executive was the starting point of the creation of both projects and clearly opened a window of opportunity for a LSEC.

Choosing a role:
The municipal executive (*wethouder*) initiated the formation of *EnergieLochem* with 5 citizens. The municipality placed an advertorial in a local newspaper in which they supported this initiative and called on other citizens to join this initiative. Within 8 weeks 652 other citizens of Lochem had joined the initiative.

"The process management, thrust and the personal relationship are the cornerstones of a successful LSEC"

A municipality should focus on process management rather than on project management. It should solely take the initiative but start the initiative together with its citizens. The goals should be supporting local citizens in safeguarding their own public values.

Choosing instruments:
The initial goal of this LSEC was to supply al member with local sustainable energy. The municipality stated before this project was started that the ideal role of the municipality would a facilitating role, it wanted to support initiative from the local community with small actions. These small supporting actions proved to be quite successful. These small instruments included small money for expenses.

Partners to include and when to include them:
The EnergieLochem project was a typical bottom-up project where the start initiative came from the local citizens. The idea was to involve the expertise that existed within the own community. This meant that as little funds a possible where spend on lawyers, process mangers and consultants. The process of formation was deliberately build on personal expertise. Next to the importance of external stakeholder the internal stakeholder within the municipal organization are even more crucial. Small municipalities often have only one or two municipal officials who are working within the field of sustainability and energy.

"Municipalities should dictate what the private sector should do".

"The public sector exists to support the community and the private sector. "

Which technology to choose and which type of output to choose:
First the right persons needed to be found, the choice on technology came later on. Because of the low sunk costs the EnergieLochem project was focused on releasing a solar-PV park. In the ADEM project no technology was yet chosen.

Competence and risks:
The municipal executive dared took huge risks and states very high ambition on the shares of sustainable energy and the amount of CO2-reductions.

Meeting 2: LSEC consortium formation

This meeting was a 1–day events on which several potential investors in a LSEC sat together in discussing if they would bid on a tender on a LSEC. The call for tender was realised by a regional development company. This regional development company is owned by the province and three local municipalities. The purpose if this particular development company was to realize a large agricultural and greenhouse park of 3000 hectares. The realised a closed tender to three large engineering companies to write a process plan for the creation of a local energy company. Three of these engineering companies where independent consultants companies and one was a building and operating company who was willing to invest several million euro into such projects. This local energy company should be able to provide energy solutions to the greenhouse entrepreneurs in the area.

Formulating ambitions
The plan that had to be written with the partners consisted out of two parts

- A general vision and ambition
- A business case

The difference between the independent engineering companies was that they were focused on the interest and possible solution of the business in the area. The building company was only interested in its own ambitions and did not have a focus on the business in the area.

Choosing a role:
The regional development company had indicated that it was willing to invest up to 20 million euro in the next 20 years in an energy infrastructure. They also wanted that the local energy company could stimulate and facilitate the realization of the sustainable energy production units in the area in the next 10 years.

Partners to include and when to include them:
The consortium existed out of four private technological engineering companies. These companies had never cooperated before on such a plan. The tender arrived at one of the parties and it realised in could not do make a bid alone.

The consortium agreed that some ownership and influence must come from the local businesses that already existed in the area. A bottom-up approach was preferable.

Which technology to choose and which type of output to choose:
Several option where discussed. The biomass option was the most preferable. The most ideal situation was the creation of a single large biomass unit, but this was not possible due to the social-institutional environment. The agricultural greenhouse businesses are traditionally energy independent. They are not very positive on investing together with their neighbors in a new large project. Their neighbors are there competitors.

Competence and risks:
Since the parties did not worked together before this tender on such a project there was very little thrust and understanding on each other ambitions. Also the agreements and division fo task was not cleat at al. This led to a situation where nobody knew was the interest of the other parties was, how they where supposed to earn money on this project and what was expected of them. At the end of the day when there should have been made some formal agreements every parties hesitated in taking any initiative.

C. Decision support tool

Royal Haskoning SMC Rollenspel

Maak je eigen lokaal duurzaam energiebedrijf

Rollenspel
Maak gezamenlijk met 5 partijen strategische keuzes op 6 onderwerpen. Het doel is om inzicht te krijgen in de verschillende keuzes die betrokken partijen hebben bij het realiseren van een lokaal duurzaam energiebedrijf. Behartig zo goed mogelijk het belang van jouw actor in de onderhandelingen.

Casus: Kleine groene gemeente
Kleine landelijke gemeente in een krimpgebied
Inwoners: 30.000
Gemeentelijke budget voor duurzame energie: 8 Miljoen euro

Start

Rangschik de volgende ambities

Ambities	Rangschikking:
▪ Lage energie prijzen	1. _____
▪ Werkgelegenheid	2. _____
▪ Winstgevendheid	3. _____
▪ Duurzaamheid	4._____

1. Ambitie niveau

Kies een techniek

2. Techniek

Zon	Biomassa:	Wind:	Geothermie (WKO)
Winstgevendheid: - -	Winstgevendheid: -	Winstgevendheid: +	Kosten: ++
Werkgelegenheid: +	Werkgelegenheid: + +	Werkgelegenheid: - -	Werkgelegenheid: -
Energieprijzen: - -	Energieprijzen: +	Energieprijzen: ++	Energieprijzen: -
Duurzaamheid: ++	Duurzaamheid: - -	Duurzaamheid: -	Duurzaamheid: +

Kies een partij

3. Wie neemt het start initiatief?

Kies een partij

4. Wie wordt de grootste klant en afnemer van energie?

Kies een partij

5. Wie draagt het grootste financiële risico?

Kies een partij

6. Wie faciliteert het project?

Gemeente	Energie-producent (Nuon, Essent)	Burgers	Lokaal bedrijfsleven	Groot agrarisch bedrijf
Gemeente	Energie-producent (Nuon, Essent)	Burgers	Lokaal bedrijfsleven	Groot agrarisch bedrijf
Gemeente	Energie-producent (Nuon, Essent)	Burgers	Lokaal bedrijfsleven	Groot agrarisch bedrijf
Gemeente	Energie-producent (Nuon, Essent)	Burgers	Lokaal bedrijfsleven	Groot agrarisch bedrijf

Figure 35 Game version 1

Royal Haskoning SMC Rollenspel

Maak je eigen lokaal duurzaam energiebedrijf

Rollenspel
Maak gezamenlijk met 5 partijen strategische keuzes op 6 onderwerpen. Het doel is om inzicht te krijgen in de verschillende keuzes die betrokken partijen hebben bij het realiseren van een lokaal duurzaam energiebedrijf. Behartig zo goed mogelijk het belang van jouw actor in de onderhandelingen.

Casus: Grote groeiende gemeente
Snel groeiende stedelijke gemeente
Inwoners: 150.000
Gereseveerd gemeentelijk budget voor duurzame energie: 0 euro

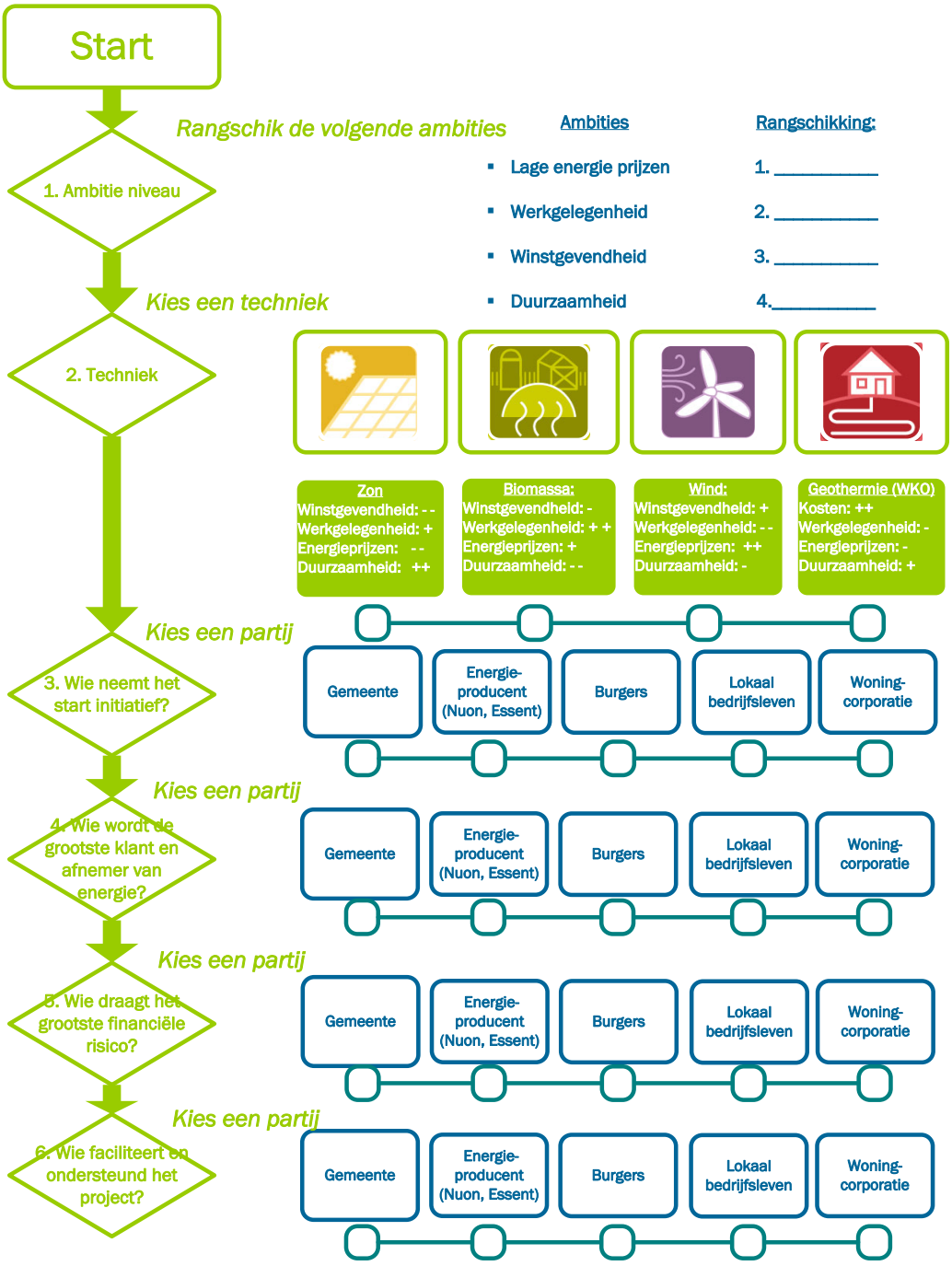


Figure 36 Game version 2

D.Questionnaire

Introductie
De verduurzaming van de energievoorziening in gemeenten is een uitdaging met vaak verrassende nieuwe rollen voor Nederlandse gemeenten. Veel gemeenten onderzoeken hiervoor de mogelijkheden tot het (mede)oprichten van een Lokaal Duurzaam Energiebedrijf (LDEB).

Samen met u willen wij onderzoek doen naar deze verschillende verschijningsvormen van Lokale Duurzame Energiebedrijven (LDEB) in Nederland, en de verschillende verrassende rollen, ambities en mogelijkheden voor de Nederlandse gemeenten op dit vlak.
Het AgentschapNL, de VNG, Royal Haskoning en de TU Delft ondersteunen gezamenlijk dit onderzoek.

Het eindrapport met de gedetailleerde resultaten van deze enquête zal beschikbaar worden gemaakt voor alle deelnemende Nederlandse gemeenten. De resultaten zullen anoniem verwerkt worden. Het invullen van de enquête zal ongeveerd 10 minuten duren.

1. Kunt u aangegeven hoe belangrijk de volgende ambities zijn voor uw gemeentelijke organisatie (College, Raad en beleidsmedewerkers) met betrekking tot lokale duurzame energie.

		Helemaal niet belangrijk	Niet belangrijk	Niet geheel belangrijk, niet geheel onbelangrijk	Belangrijk	Heel erg belangrijk
1.	Het halen van klimaatdoelstellingen (CO2-reductie, energiebesparing, aandeel duurzame energie)	O	O	O	O	O
2.	Betaalbare energierekening voor de inwoners en bedrijfsleven van uw gemeente	O	O	O	O	O
3.	Betrouwbare energievoorziening voor burgers en bedrijven	O	O	O	O	O
4.	Werkgelegenheid in de gemeente	O	O	O	O	O
5.	Ondersteunen van het lokale bedrijfsleven	O	O	O	O	O
6.	Creëren van bewustzijn, op het gebied van energiebesparing en duurzame energie, bij burgers	O	O	O	O	O
7.	Het stimuleren van innovatie en kennisontwikkeling door het gebruik van nieuwe technieken.	O	O	O	O	O
8.	Het imago van de gemeente als duurzame gemeente.	O	O	O	O	O

Toelichting vraag 2: Een lokaal duurzaam energiebedrijf is een zelfstandige organisatie die streeft naar de productie, levering en beheer van duurzame energie, in eigen regio, aan lokale afnemers.

Bijvoorbeeld: Een energie coöperatie, een burgerinitiatief, een gemeentelijk warmtebedrijf, een gemeentelijk energiebedrijf, een ecopark, een energie vereniging of een duurzame energie stichting.

Alle initiatieven die streven naar de productie, levering en beheer van duurzame energie, in eigen regio, aan lokale afnemers.

Let op!: Lokale duurzame energiebedrijven die enkel gericht zijn op energiebesparing, vallen buiten deze enquête!

2. Is er in uw gemeente een bestaand lokaal duurzaam energiebedrijf (LDEB) actief?
   - o Ja (naar vraag 4)
   - o Nee (naar vraag 2)

3. Zijn er op dit moment in uw gemeente plannen en/of ideeën voor een lokaal duurzaam energiebedrijf?
   - Ja (naar vraag 5)
   - Nee (naar vraag 3)

4. Zijn er in het verleden in uw gemeente ooit plannen en/of ideeën geweest voor een lokaal duurzaam energiebedrijf?
   - Ja (naar vraag 15)
   - Nee (naar vraag 19)

Toelichting vraag 4: Indien er in uw gemeente meerdere bestaande lokale duurzame energiebedrijven zijn, vul dan de volgende vragen in voor het meest gevorderde lokale duurzame energiebedrijf.

5. Welke organisatievorm heeft dit lokaal duurzaam energiebedrijf?
   - Coöperatie
   - Stichting
   - Vereniging
   - Fonds
   - Besloten Vennootschap (B.V.)
   - Vennootschap onder firma (V.O.F.)
   - Naamloos Vennootschap (N.V.)
   - Overig, namelijk…

Toelichting vraag 5: Een oprichting van een lokaal duurzaam energiebedrijf bestaat uit de volgende fasen en bijbehorende producten

Ideeën- en onderzoeksfase: Haalbaarheidstudies, brainstormsessies etc.
Oprichtingsfase: Consortiumvorming, contractvorming, sluitend krijgen businesscase
Bouw- en realisatiefase: De zelfstandige organisatie bestaat reeds , maar er is nog geen eigen energieproductie.
Exploitatiefase: Er wordt op dit moment energie geproduceerd.

6. In welke fase van ontwikkeling bevindt dit lokaal duurzaam energiebedrijf zich?
   - Ideeën- en onderzoeksfase
   - Oprichtingsfase
   - Bouw- en realisatiefase
   - Exploitatiefase, er wordt op dit moment energie geproduceerd.

7. Op welke vormen van energieproductie richten de lokaal duurzaam energiebedrijven zich in uw gemeente? (Meerdere antwoorden mogelijk)
   - Windenergie
   - Zonne-energie
   - Warmtekoude opslag (WKO)
   - Geothermische energie
   - Biomassa (Co-vergisting, Verbranding, vergassing)
   - Industriële restwarmte
   - Overig, namelijk…
8. Bij welke partij lag in het startinitiatief voor dit lokaal duurzaam energiebedrijf?
   a. Gemeente
   b. Lokaal bedrijfsleven
   c. Agrariërs
   d. Burgers
   e. Bestaand energiebedrijf
   f. Provincie

g. Waterschap
h. Woningcorporaties
i. Projectontwikkelaar
j. Anders, namelijk:

9. Welke van de volgende faciliterende instrumenten hanteerde uw gemeente bij lokale duurzame energiebedrijven? (Meerdere antwoorden mogelijk)
    a. Geen
    b. Financiering haalbaarheidsonderzoeken
    c. Financiering handgeld voor kleine diensten (bijv. voorlichtingsavonden)
    d. Initiatiefnemer
    e. Informatie verstrekker, over: *"Hoe zet je een LDEB op?"*
    f. Beschikbaar stellen van ambtelijke ondersteuning.
    g. Publieke steun in de media
    h. Hulp in subsidieaanvraag
    i. Actief bemiddelen tussen potentiële klanten en het LDEB
    j. Overig, namelijk…

10. Welke van de volgende financiële instrumenten hanteerde uw gemeente bij lokale duurzame energiebedrijven? (Meerdere antwoorden mogelijk)
6. Geen
7. Aandeelhouder
8. Subsidies
9. Garanties
10. Directe leningen
11. Lening uit gemeentelijk duurzaamheidfonds/revolving fund
12. Lidmaatschap van een duurzame energie coöperatie
13. Beschikbaar stellen van gemeentelijke grond
14. Overig, namelijk…

11. Welke van de volgende klantgerelateerde instrumenten hanteerde uw gemeente bij lokale duurzame energiebedrijven? (Meerdere antwoorden mogelijk)
    a. Geen
    b. Enige en eerste klant, Launching Customer
    c. Actief bemiddelen tussen potentiële klanten en het LDEB
    d. Reguliere klant
    e. Overig, namelijk…

12. Welke partijen zijn medefinancier of mede-eigenaar? (Meerdere antwoorden mogelijk)
    a. Gemeente
    b. Lokaal bedrijfsleven
    c. Agrariërs
    d. Burgers
    e. Bestaand energiebedrijf
    f. Provincie
    g. Waterschap
    h. Woningcorporaties
    i. Projectontwikkelaar
    j. Anders, namelijk:

13. Denkt u dat uw gemeente wederom dezelfde instrumenten zou hanteren bij een toekomstig nieuw plan voor een lokaal duurzaam energiebedrijf?
    a. Ja (naar vraag 19)

b. Nee (naar vraag 14)

14. Kunt u kort beschrijven welke rollen (faciliteren, financieren en/of klant) en instrumenten uw gemeenten uw gemeente anders zou aanpakken bij een volgend plan voor een lokaal duurzaam energiebedrijf? (Open vraag)

Toelichting vraag 15: Een oprichting van een lokaal duurzaam energiebedrijf bestaat uit de volgende fasen en bijbehorende producten
Ideeën- en onderzoeksfase: Haalbaarheidstudies, brainstormsessies etc.
Oprichtingsfase: Consortiumvorming, contractvorming, sluitend krijgen businesscase
Bouw- en realisatiefase: De zelfstandige organisatie bestaat reeds , maar er is nog geen eigen energieproductie.
Exploitatiefase: Er wordt op dit moment energie geproduceerd.

15. In welke fase bevonden deze plannen voor een lokaal duurzaam energiebedrijf zich?
    a. Ideeën- en onderzoeksfase
    b. Oprichtingsfase
    c. Bouw- en realisatiefase
    d. Exploitatiefase, er wordt op dit moment energie geproduceerd.

16. Bij welke partij lag het startinitiatief voor dit lokaal duurzaam energiebedrijf?
    - Gemeente
    - Lokaal bedrijfsleven
    - Agrariërs
    - Burgers
    - Bestaand energiebedrijf
    - Provincie
    - Waterschap
    - Woningcorporaties
    - Projectontwikkelaar
    - Anders, namelijk:

17. 17. Op welke energiebronnen richtte dit lokale duurzame energiebedrijf? (Meerdere antwoorden mogelijk)
    a. Windenergie
    b. Zonne-energie
    c. Warmtekoude opslag (WKO)
    d. Geothermische energie
    e. Biomassa (Co-vergisting, Verbranding, vergassing)
    f. Industriële restwarmte
    g. Overig, namelijk:

18. Wat is voornaamste reden dat het (plan van het) lokaal duurzaam energiebedrijf nooit is gestrand? (Meerdere antwoorden mogelijk)
    a. Onrendabele businesscase
    b. Mislopen subsidie (SLOK, SDE, IKS, etc.)
    c. Er is onvoldoende vertrouwen gebleken tussen de betrokken partijen
    d. Overig, namelijk…

19. Hoeveel inwoners heeft uw gemeente?
    a. 0 -20.000
    b. 20.000 – 50.000
    c. 50.000- 100.000
    d. 100.000 -200.000

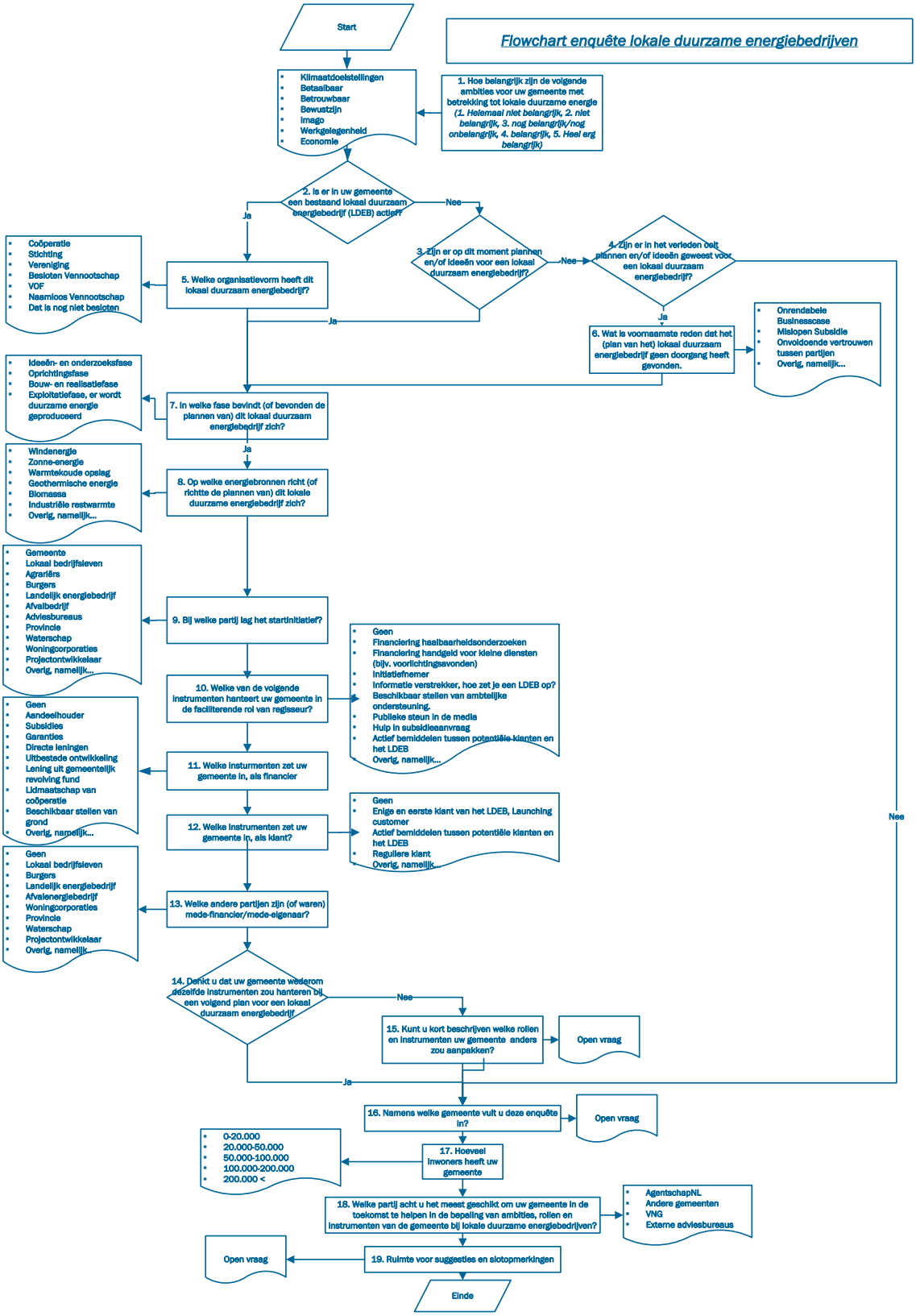
e. 200.000 <

20. Welke part acht u het meest geschikt om uw gemeente in de toekomst te helpen in het proces van ambities, rollen en inzet van instrumenten bij lokale duurzame energiebedrijven?
    a. AgentschapNL
    b. De Vereniging van Nederlandse Gemeenten (VNG)
    c. Externe adviesbureaus
    d. Andere gemeenten
    e. Overig, namelijk…

21. Heeft u nog aanvullende opmerking en vragen over de betrokkenheid van gemeenten bij lokale duurzamen energiebedrijven? (Open vraag)

Hartelijk dank voor het invullen van deze enquête. Uw verdere vragen en opmerking kunt u sturen naar duurzameoverheden@vng.nl

Questionnaire flowchart



Questionnaire Results

The first question in the questionnaire (which can be found in appendix D) was on whether or not the municipalities are involved in LSECs. It was asked if they have an active and energy producing LSEC within their municipality, plans for a LSEC or neither of both. The results show (table 15) that only 16,2 % of the respondents has an actual active LSEC in their municipality. 40,2 % of the municipalities is has plans for a LSEC and 43,6 % has neither of both. Therefore we can conclude that 56,4% (66 respondents) of all respondents is in some way involved in a LSEC

Figuur37: Number of LSECs and plans for LSECs

	Municipalities in % (based on 117 respondents)
Active LSEC	16,2% (19)
Plans for a LSEC	40,2 % (47)
No plans for a LSEC	43,6 % (51)
Total	*100 % (117)*

Step 1: Formulating ambitions
Respondents were asked if they could indicate how important several ambitions were to them, generated in the theoretical and empirical study. The respondents had to use a 5 point scale. The results (table 16) show that for both municipalities with and without (plans for) a LSEC that the ambitions on innovation and education are the least important. The difference between the two groups was also the largest on this ambition. It can be concluded that municipalities without (plans for) a LSEC find innovation and education on sustainable energy not very important. The most important ambition for both groups is employment

Figuur38: Importance of ambitions

Ambition		**Municipality without LSEC**	**Municipalities with (plans for) a LSEC**	**Difference**
1.	Acceptable “Clean” energy	6,41	7,33	0,92
2.	Affordable energy	6,87	7,73	0,86
3.	Security of Supply	7,71	8,13	0,42
4.	Employment	7,84	8,33	0,49
5.	Support local businesses	6,93	8,03	1,1
6.	Awareness	7,06	7,68	0,62
7.	Innovation and education	5,43	6,97	1,54
8.	Sustainable image	6,21	7,17	0,96

Step 2: Choosing a role
The respondents indicated that a large majority (83,3 %) of the municipalities that is involved in (plans for) a LSEC used some of the facilitating instruments and in this way were in the role of facilitator (see table 17). A slight majority (57,6%) also used financial instruments and acted as a financer. Only 43,4 % of all respondents used customer related instruments, acting as a customer.

Figuur39: Used roles within Municipalities

	Municipalities that are involved in LSEC and that have used certain roles (based on 66 respondents)	
Roles	*Some*	*None*
Facilitating instruments	83,3 %	16,7 %
Financing instruments	57,6 %	42,4 %
Customer instruments	43,4 %	57,6 %

Step 3: Choosing instruments
When we take a closer look at which financial, facilitating and customer related instruments are being used by municipalities, a few thing are notable. All instruments that are stated in the empirical study (section 3) and in the design space are being used by municipalities. But only a few are used by more than 15% of the municipalities that are involved in (plans for) LSECs. Performing or paying for feasibility studies, administrative support and public support where the most popular instruments.

Figuur 40: Most used instruments

	Municipalities that used the instruments *(only of those municipalities with (plans for) a LSEC (based on 66 respondents)*
Facilitating instruments	
- *Feasibility studies*	47 %
- *Administrative support*	56,1 %
- *Public support in the media*	28,8 %
- *Funding of small expenses*	15,2 %
- *Support in grant application*	18,2 %
Financing	
- *Shareholder*	21,2 %
- *Subsidies*	19,7 &
Customer instruments	
- *Matchmaking between potential customers*	19,7 %

Step 4: Choosing when to be involved
The respondents indicated that in 66, 7% of the (plans for) LSECs the municipality acted as the prime start initiator.

Step 6: Which partners to include
The municipality is not the only important stakeholder in the creation of a LSEC. In 66,7% of a LSECs the municipality is the main initiator. Other parties that are often the initiator of (plans for) a LSEC are Local Businesses and local citizens. A notable conclusion from table 19 is that large energy companies are not often involved as main initiator but are in 21,2% of all cases involved as co-financier.

Figuur 41: LSEC stakeholders

	Initiator	**Co-financer**
Local Businesses	28,8%	25,8%
Agricultural businesses	10,6%	13,6%
Citizens	16,7%	21,2%
Large energy company	9,1%	22,7%
Province	15,2%	16,7%
Water board	3,0%	7,6 %
Housing corporation	13,6%	9,1 %
Project developer	13,6%	13,6%

Step 7: Which business form to choose
Respondents were asked to indicate which business from the active LSEC in their municipality is using. Since only a small percentage of respondents (16,7%) (19 respondents) answered the question no significant result can be concluded from the data.

Step 8 en 9: Which technology and output to choose
Since only a non-significant part of the municipalities (only 19 respondents) had an active LSEC we cannot conclude which technologies are currently being used. But if we include the municipalities which are still in the exploration phase we can see that solar power and biomass are the most researched technologies/ considered interesting for a LSEC. Geothermal energy is the least popular technology.

Figuur 42: Used Technologies

Technology	**Technologies used by municipalities with (plans for) LSECs (based on 66 respondents)**
Wind	34,7%
Solar	51,4 %
Geothermal heat storage	34,7 %
Geothermal energy	20,8 %

Biomass	72,2 %
Industrial waste heat	25,0 %

E. Sustainable energy technologies

Electricity infrastructure

Production

Within the electricity sector the production function is performed by the stakeholder who owns and operates the power plants. This is where the electricity is generated. This can be done by fossil-fuelled power plants such as coal-fired power plants, gas fired power plant and diesel fuelled generators, or by non-fossil fuel power plant such as PV-cells, wind turbines, nuclear power plants, geothermal power plants, hydropower biomass fired power plants and other less common renewable energy sources.

There are no significant power storage options in modern electricity grids. This means that the electricity that is generated must always be consumed instantly, in this way the electricity is sold directly form production partners to their customers. Since electricity cannot be stored it is only produced if the producer knows it can sell the power to a customer. Often this is done by long-term (several weeks or months) contracts with large customers. The other option is to trade the electricity at the spot market. The APX is the only Dutch power exchange In practice, supply and demand will not be balanced all the time. A system operator, TenneT has the responsibility of maintaining the physical balance nevertheless.

Transmission

The transmission happens through a high voltage power grid nationwide and internationally. Most large power plants are directly connected to the nationwide high voltage grid that is operated and owned by TenneT. In the supply phase the electricity load is consumed by the customer.

Distribution

The distribution networks distribute the electricity from the high voltage power grid to large costumers or buildings are owned by the regional distribution companies such as Liander, Stedin, and Enexis. All electricity distribution network companies in the Netherlands are currently owned by provinces and municipalities. Therefore the involvement of municipalities in these distribution network is relatively large, since they receive dividend.

Supply

Retail companies sell contracts to household customers for electricity and gas. Examples of such companies are Green choice, Nuon, Essent and Oxxio. The retail companies of Nuon, Essent, Delta and Eneco are part of these same companies as the big energy producers. Retail-only companies such as Green choice, Oxxio and Atoomstroom do not have a production company. They don't produce any electricity themselves. Other important functions of these electricity retail companies are:

- Monitoring
- Marketing
- Back office and help desk services
- Retailing
- Billing services

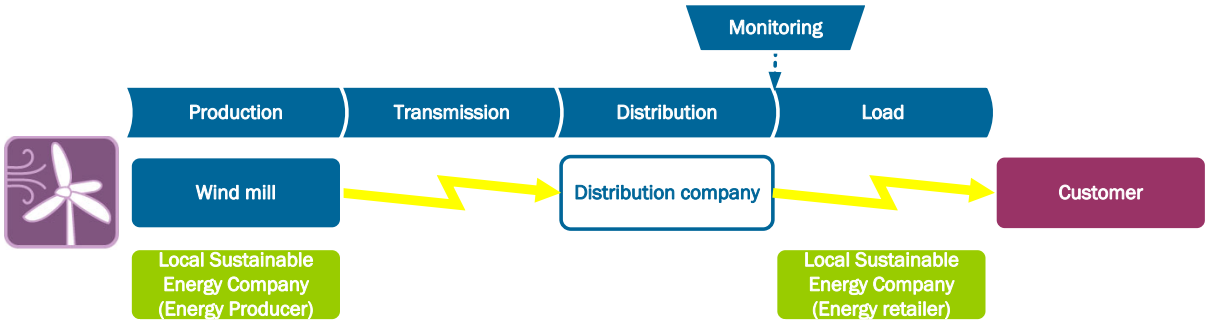
Wind energy

LSECs primarily aimed at Wind energy are among the oldest types of LSECs in the Netherlands. All 25 Dutch wind cooperatives were founded during a relatively short period, from 1986 to 1992 (Agterbosch 2006), especially in what are known as 'wind-abundant areas' (figure 15). Two third of the turbines ever installed by wind cooperatives were installed during the 1990's. Positive regional and local social conditions were the main driver behind the realization of these wind cooperatives.

Figure 19 shows the most important wind cooperatives and their locations. These examples illustrate the importance of regional and local conditions for the implementation capacity of a particular cooperative.

Figuur43: Location of wind cooperatives in 2004

A LSEC primary aimed at wind energy must perform the role of the production company as well as the retail company as is explained in figure 25. LSECs only exists as onshore wind parks.



Figuur44 Energy chain Wind

- Price: Onshore wind turbines are with the support of the SDE and the EIA economical feasible. A disadvantage is the high sunk costs of 1-2 million Euros of the first wind turbine. This makes it hard for relative unorganized cooperatives or group of civilians to realize a big wind park.

- Output: Wind turbines can only produce electricity. Since the wind is not secure to deliver energy (the wind does not blow always or as exact as predicted), the power output of wind turbines are intermittent. On average a wind turbine can produce between 2000 and 3000 hours a year in the Netherlands. Since all wind turbine are bigger than 55 KWp every wind turbine must be connected to the power grid.

- Net metering: The financial feasibility of wind turbine is better per KWh than for solar cells (see below), the impact of the net metering problem that occurs with solar cell do not have a huge impact on the economic performance of wind turbine. This means that an LSEC with wind turbine always must trade the electricity for the wind turbine on the bilateral electricity market or the spot market. Most Dutch wind cooperatives have outsourced that role to a specialized commercial retailer like WindUnie or Green Choice who also performs some of the retail tasks, such as monitoring and the financial back office.

LSECs with wind turbines as primary technology fall within 2 different types.

5. The first type are the classical wind cooperatives that are founded in the 1980 s and 1980sd, there are 15 of such wind cooperatives in the Netherlands. The classical wind cooperatives can be found in Goerre-Overflakkee, Den Helder, West-Friesland, Alkmaar, Drachten, Hoorn en Vlissingen.
6. The second type are the modern wind LSECs that have been formed in the last decade, such as Biddinkhuizen en Zaandam.

The relation between municipalities and wind LSECs is therefore not very new and unexplored.

Table 10: Examples of Wind LSECs

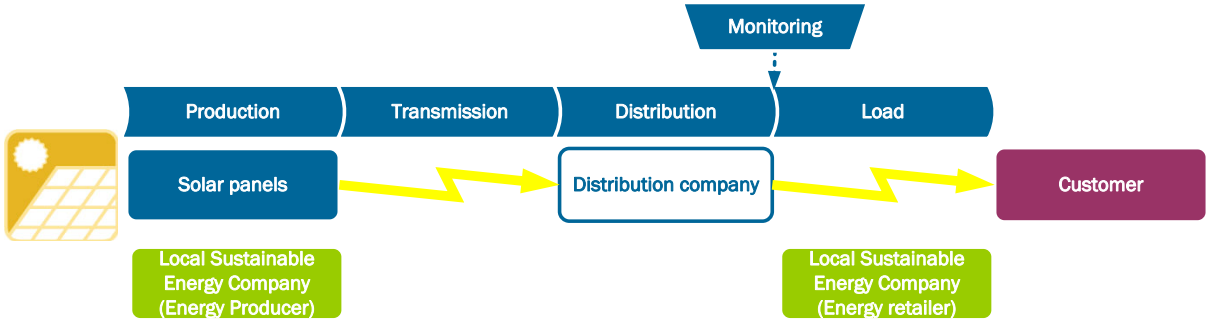
	Example 1: Goeree-Overflakkee	Example 2: Biddinghuizen
Name	Deltawind (1989)	Windpark Kubbeweg BV (2006)
Status	22 Turbines of various types and building year	The park consists out of 17 Vestas V80 2MWe turbines
Role LSECs	Production	Production (retail via WindUnie)
Municipal involvement	Permit authorization, Allocation, Zoning	Permit authorization, Allocation, Zoning

Solar energy

Solar panels are arrays of photovoltaic cells, which transform direct sunlight into electricity. The use of solar panels mostly occur on existing buildings. Solar powered LSECs can deliver the electricity that is produced directly to the power grid or they can install these solar panels within buildings where the electricity is used internally. When the customers are directly connected to the production facility there is no need to transport the produced electricity via the power grid and the electricity can directly be delivered from the solar panel installation.

Possible options for LSECs using solar energy as technology

When a LSEC chooses to connect the production installation to the grid it still needs to sell the daily amount of electricity. A LSEC with grid connected solar panels need to perform both the production function as well as the supply function of the electricity system, (see figure 21) .



Figuur45 Energy chain Solar

Price:

The relatively high price of solar cells and therefore the high price for electricity production is a disadvantage of solar panels. An advantage are the low sunk costs and the small start-up costs.

Output:

Solar Cells can, like the wind turbines, only produce electricity. Since the sun does not always shine, the power output of solar cell are intermittent, on average a solar cell can produce between 800 and 1000 hours a year in the Netherlands. If a LSEC only has a grid connected solar panel and it also performs the task of the retailer, then the LSEC has its program responsibility. Therefore, it is obliged to also deliver electricity even when the sun does not shine as predicted. This brings extra costs.

Net metering (Saldering).

The current electricity law in the Netherlands states there is an electricity tax of 11 €ct for every KWh that is produced and transported over the power grid. When a solar cell is not connected to the grid but directly to the end user there is no electricity tax owed as long as the total annual amount of electricity produced is less than 3000 KWh. Some commercial electricity retailers (such as Green choice) compensate the electricity tax up to 5000 KWh. Large solar panel installations (above 55 KWp) are obliged to be connected to the power grid. The main problem for LSEC is therefore that the power of large solar installations which are installed on the roofs of farms or on other building cannot directly be used by the end consumers without paying electricity tax. This makes solar installation financial unfeasible. Therefore many LSECs which have the ambition to build large scale solar pan installation fail or have stalled their projects until the net metering problems have been solved.

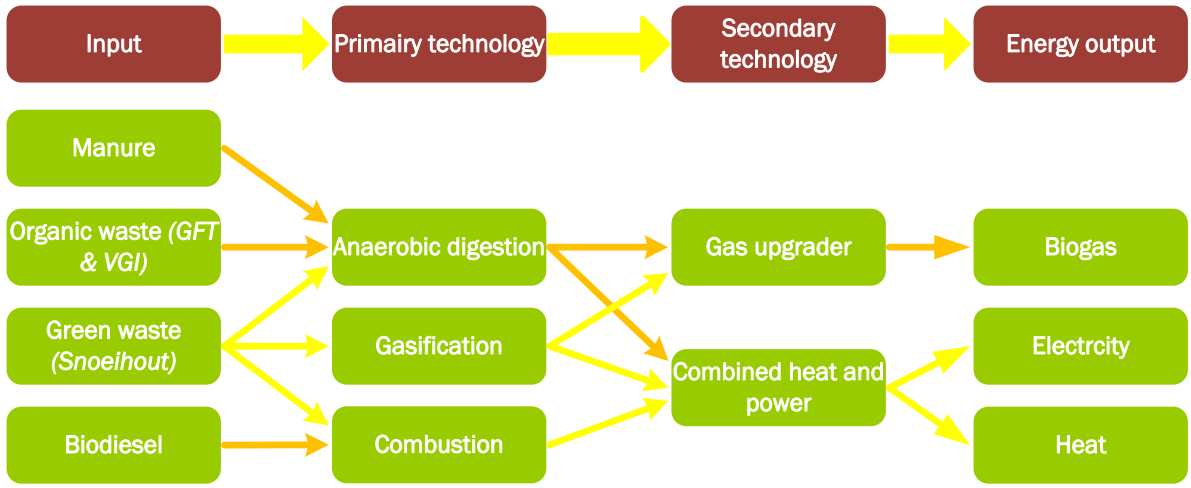
Only one fully independent LSECS with solar power as prime energy source is known in the Netherlands (Municipality of West Maas en Waal). LochemEnergie is an LSEC which is typical for the large majority of solar LSECs which have not found a solution for the net metering problems and therefore stalled their projects. Other LSECs with the same status are found in: Utrecht, Coevorden, Ameland, Texel, Soest and Zuthpen.

Figuur46: Examples of Solar LSECs

	Example 1: Lochem	Example 2: West Maas en Waal
Name	LochemEnergie	BoerenBuur
Status	Feasbility studies, cooperative is founded,	An installation of 31,000 Euro ex VAT for an 11.7 kWp PV system. 6 customers. Per customer, about 800 to 1000 kWh per year.
Role LSECs	Partly retail (with Green Choice)	Production and retail
Municipal involvement	Facilitating, financing of start-up phase	None

Biomass

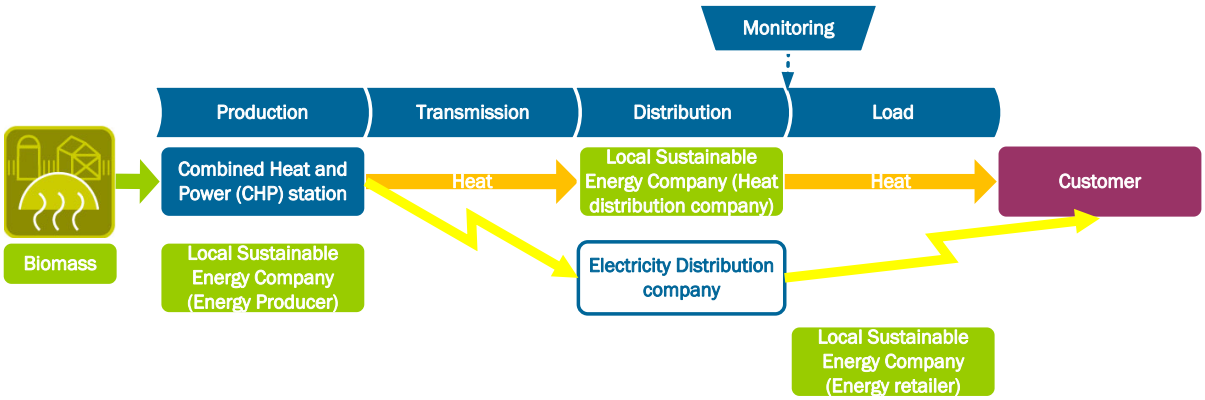
The use of biomass to produce heat, electricity or heat and cold is the oldest form of electricity production. Modern biomass production facilities arose in the last 20 decades due to their low carbon footprint and their usage of organic waste (such as manure and waste from the food industry). Biomass is the only sustainable energy technology that can produce all three sustainable energy products (electricity, biogas and heat). The input for biomass can be divided into 4 categories; Manure, organic waste, green waste and biodiesel. There a three main conversion technologies for biomass; combustion (burning), anaerobic co digestion and gasification (AgentschapNL 2010). These different output, inputs and conversion technologies are presented in figure 22. At the left hand side are the different input options presented. These input option need a conversion technology, this is the primary technology. Only the gasification of green waste (snoeihout) is not a fully proven technology, which at this moment cannot be implemented on a large scale in the Netherlands. When anaerobic digestion is choose as primary conversion technology, biogas will be produced. This biogas can be used internally in a combined heat and power installation to produce heat and power.



Figuur47 Biomass conversion options

Possible options for LSECs using biomass as technology

A LSEC which used any of the possible biomass technology combinations is dependent on external stakeholder for the supply of biomass (manure, organic waste, green waste and biodiesel). Most LSECs with biomass aim at retrieving this supply of biomass from the surrounding region.



F. Policy documents

Figuur48: Analyzed municipal policy documents

1. Zwolle	2. Den Haag
3. Brummen	4. Woerden
5. Katwijk	6. Ferwerderadiel
7. Vaals	8. Veenendaal
9. Pijnacker-Nootdorp	10. Culemborg
11. Tynaarlo	12. Delft
13. Harderberg	14. Winterswijk
15. Ede	16. Dordrecht
17. Leeuwarden	18. Ameland
19. Oldambt	20. Opsterland
21. Oegstgeest	22. Texel

G.Scientific paper

Local sustainable energy companies and municipal involvement: A national survey

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Scientific article - SPM5910 – Master Thesis Project

Abstract: Since several years a majority of the Dutch municipalities do not have a formal connection anymore to one of the large energy production companies. This gave the municipalities an opportunity to revaluate their role and ambitions related to local energy infrastructure. At the same time a trend of more sustainable clean energy has arisen. Municipalities saw an opportunity to safeguard their public values by creating a local sustainable energy company. A local sustainable energy company is seen by some municipalities as being a central part of their local energy policy Municipalities who are involved in the creation of local sustainable energy companies have certain ambitions or ideas. As a result municipalities can use a variety of instruments, particularly in the field of facilitating and financing management. But at the moment there is a lack of comprehensive information on how widespread these LSECs are in local municipalities and which instruments are mainly used to makes these LSECs a success. The purpose of this paper is to survey the prevalence of a selected set of instruments, ambitions and stakeholders that are related to LSECs within local municipalities. Given the common perception that local municipalities are getting increasingly involved in local energy companies, a significant use of instruments related to LSECs would be expected. The main research question in this paper is therefore: *To what extent are Dutch municipalities involved in (the development of) local sustainable energy companies and how are they involved?* In this explorative research, a survey questionnaire was mailed to all 418 Dutch municipalities. Municipalities were asked to answer questions regarding their ambitions, roles, used instruments and partners within these LSECs. The overall result shows that a majority of Dutch municipalities is involved in the realization of a LSEC and thus has some active ambitions, defined in roles and translated into instruments related to a LSEC. The most important reasons to start an LSEC are to create security of supply, employment and to support local businesses. Municipalities with plans for a LSEC score higher in importance in all ambitions indicating that they are more aware of their ambitions and how to fulfil them In almost all cases municipalities act as facilitator in the realization of a LSEC. The majority also uses financial instruments but only a minority acts as customer.. Various authors reason that municipalities must safeguard public values, which in the case of energy means making energy available and affordable in an acceptable way. The empirical study confirms that municipalities have ambitions on these public values.

Keywords: Municipalities, local government, sustainable energy policy, local energy companies

Introduction

Traditionally, the municipalities have played an important role in the energy system, both as the owner of the regional local energy-distributor, as well as the owner of local energy companies and as owners of large numbers of public buildings. Next to ownership in the energy system the municipality also plays an important role in providing information and advice on energy-related topics (Nilsson and Mårtensson 2003). Around the 1970'ss more focus on diversification of energy sources emerged and thus a first introduction and penetration of renewable energy technologies was created by public policy (van der Noort 1993). The liberalization and privatization resulted in a situation where large energy companies merged and were taken over by international larger companies. This led to a decrease of influence by the Dutch municipalities. Due to the take-over most municipalities had to sell their shares in the large energy companies, receiving a very significant amount of funds to spend and the end of a formal connection between the energy companies and the municipalities (Burger 2001).

Although the energy companies have been liberalized privatized and most of the municipalities have sold their shares in the large national energy companies, they still play an

important role in the Dutch energy policy. (Nilsson and Mårtensson 2003). Within the local energy sector the municipality is the primary policymaker en policy executer (Burger 2001). In 2009, for the first time in 100 years, almost 60% of the Dutch municipalities did not have a formal connection anymore to one of the large energy production companies. This gave the municipalities an opportunity to revaluate their role and ambitions related to local energy infrastructure (Burger 2001).

An outcome of this revaluation is that municipalities have the responsibility to safeguard certain values regarding the energy sector. In short the energy should be affordable, and available and the corresponding negative effects should be minimized (EZ 2008).

Besides this opportunity of revaluation a trend of sustainable clean energy increased. The rise of possibilities within clean energy let to a new trend of investing in sustainable energy. Increasing the amount of renewable energy, energy efficiency and energy savings are goals where local municipalities see an opportunity to have a large influence on.

Municipalities saw an opportunity to safeguard their values using possibilities within clean energy, by creating a local sustainable energy company (furthermore in this paper indicated as LSEC) (*lokaal duurzame energiebedrijf (LDEB*)). A LSEC is seen by some municipalities as being a central part of their local energy policy (AgentschapNL 2010). In recent years more and more municipalities in the Netherlands are announcing plans to initiate LSEC (AgentschapNL 2010).

Municipalities also developed a level of ambition to reach the clean energy goals. A prime example of this ambition is the 2007 policy agreement between the association of Dutch municipalities (VNG) and the national government (het Rijk) where both parties declared to try to realize these clean energy goals and committed themselves towards goals on reducing greenhouse gas emissions and increasing the share of renewable energy (VNG 2007). With this agreement the National Government acknowledges the role of municipalities and together they drafted and signed the *"Climate agreement Municipalities and the National Government 2007-2011" (Klimaatakkoord Gemeenten en Rijk 2007-2011)*(KGR). This agreement has served as the start of some of the local energy and climate policies. Recent research done by the VNG shows that more than 50% of all Dutch municipalities have adopted and implemented the key elements of the KGR (VNG 2009). This agreement state that both parties (municipalities and the national government) will:

6. Stimulate and promote the Renewable energy systems (RES) target of 20% in 2020

7. Strive to double the amount of onshore Wind capacity in 2011

8. Create opportunities for the implementation of renewable energy in the local zoning plans.

9. Use their influence (as shareholder) to stimulate energy companies to increase their RES and the use of residual heat.

10. Stimulate and create the development of projects involving "Green gas".

A recent evaluation of the implementation of the VNG climate agreement (KplusV 2010), shows that in the last 4 to 5 years (2005-2010) a growing number of Dutch municipalities is actively seeking partnerships with the private sector and the community sector to achieve these goals. Representatives from the private and community sector both acknowledge the changing role and instruments of Dutch municipalities in the last few years. The private sector recognizes the new 'matchmaker' and intermediating role of many municipalities, next to the more classic facilitating and regulating role of municipalities. KplusV (KplusV 2010) concludes that the new role of matchmaker demands a stronger foundation and assurance in municipal policy, the municipal organization and in municipal instruments.

KplusV (2010) also concludes that in the period between 2004-2008 the budget for sustainable energy and climate policy increased and that there is a strong correlation between economic ambitions and climate ambitions.

The new partnerships, between the private, community and public sector, in the field of energy, are realized in various ways:

3. Initiatives focused on energy savings are called energy saving companies (ESCOs). They are focused on realizing energy savings in buildings and industrial installations, or focused on realizing sustainable energy production capability.
4. New partnerships focused at energy production are called local sustainable energy companies (LSECs). Examples of municipalities who in the last 6 years have been involved in plan for a LSEC are Apeldoorn, Tilburg, Texel, Veenendaal, Heerhugowaard and many others. These LSECs have a wide variety in used technologies, institutional designs and types of stakeholders involved (Velthman 2010).

In this research the focus lies on LSECs. A LSEC is defined as an organization that initially strives towards the realization of the local production and supply of sustainable energy, in their own region, for local customers. The arise of these local sustainable energy companies and their relationship with its municipality is the central theme in this paper

Purpose

Municipalities who are involved in the creation of local sustainable energy companies have certain ambitions or ideas. As a result municipalities can use a variety of instruments, particularly in the field of facilitating and financing management. But at the moment there is a lack of comprehensive information on how widespread these LSECs are in local municipalities and which instruments are mainly used to makes these LSECs a success.

The purpose of this paper is to survey the prevalence of a selected set of instruments, ambitions and stakeholders that are related to LSECs within local municipalities. Given the common perception that local municipalities are getting increasingly involved in local energy companies, a significant use of instruments related to LSECs would be expected. The main research question in this paper is therefore:

To what extent are Dutch municipalities involved in (the development of) local sustainable energy companies and how are they involved?

Methodology

In this explorative research, a survey questionnaire was mailed to all 418 Dutch municipalities. Municipalities were asked to answer questions regarding their ambitions, roles, used instruments and partners within these LSECs.

In the first part of the survey the municipalities were asked to indicate how important several ambitions were to them using a five point scale per ambition. The ambitions were the following:

1. Employment: A decentralized production unit must be build, maintained and operated; this will stimulate the demand for local labour en thus can create jobs within the municipality (Leeuwarden 2010).

2. Security of Supply: In the external trends of some sustainable policies it is reasoned that fossil fuel supplies are ending, an effect is that our society must mitigate away from these fossil fuel in order to secure our supply of energy. This “fear” is called security of supply (EZ 2008).

3. Affordable energy: The ambition to supply citizens with an affordable (cheap) energy bill is often stated (EZ 2008).

4. Innovation and education: The building of new decentralized energy production facility with the use of new technologies and innovative design can stimulate the need for high skilled workers and provide research opportunities for academic institutions (Harderberg 2008).

5. Acceptable “Clean” energy: Another argument to have a high ambition on the share of renewable energy is the goal to achieve substantial Greenhouse gas emission reductions. The ambitions can be a local translation of the formal nationwide ambitions of the VNG

agreement (VNG, 2010) as discussed in 2.1.3.

6. Sustainable image: A high share of renewable energy can give a municipality a positive image toward their citizens and the outside world (Leeuwarden 2010).

7. Create environmental awareness: The presence of a local sustainable energy company can stimulate the awareness of local citizens and business on the importance of climate change, energy savings and sustainability (Harderberg 2008).

8. Support of local business: Local economic wealth can be increased by stimulating local entrepreneurs and stimulating the growth of existing businesses.

A first indication of the roles municipalities are dealing with building a plan for a LSEC is given in the documentation of AgentschapNL (AgentschapNL 2010) (an agency of the ministry of economic affairs). The roles are based on municipal experiences with LSECs They state three possible roles that contain an overlap with the five roles (excluding the regulator) sketched by Ten Heuvelhof (2004), in two occasions roles are combined (facilitator & initiator and financer & owner):

4. Financer or Owner: A municipality can choose to actively support and cooperate with a LSEC via financial support. This financial support can be with actively influence via shares, becoming a member in a cooperative, or it can be without formal influence via a grant or financial guarantees. The financing role can be the most risky in term of financial losses.

5. Facilitating or initiator: When a municipality actively uses its formal and informal powers that are non-statutory in order to facilitate the process of the formation of a LSEC it is using this role. The role can be performed in partnership with other stakeholders (AgentschapNL 2010)(AgentschapNL 2010)(AgentschapNL 2010)(AgentschapNL 2010).

6. Customer: The municipality can for instance act as a regular customer buying electricity or heat for its own organization use. It can also act as a "launching customer" where the municipality acts as a principal who gives a concession to consortium or actor to deliver sustainable energy to a new building project or it can act as the first large customer.

These roles are tested in the second part of the survey. The instruments that were test in the third part of the survey can be arranged on the three roles. The instruments are divided per role:

Financial instruments:

- Shareholder
- Subsidies
- Guarantees
- Direct loans
- Loans from a revolving fund
- Membership of a LSE cooperative
- Provision of municipal lands

Facilitating instruments

- Performing feasibility studies
- Support for small services
- Matchmaker between stakeholders
- Providing information
- Provision of administrative support
- Assistance in (inter)national grants applications

Customer instruments:

- Acting as launching customer
- Acting as matchmaker between potential customers

- Regular customer

The survey was mailed in June 2011 to all 418 Dutch municipalities. A reminder was sent in August 2011. A total of 117 municipalities responded, this leaves us with a response rate of 28 percent. In order to test whether the results of the questionnaire were representative a comparison test has been performed. The distribution of municipalities according to the number of residents of the response group has been compared to the known distribution of all 418 municipalities. The results show that the percentages of the response group align with the percentages of the control group (all 418 municipalities). This shows that there is a strong indication that the response group is repressive for the total population (table 2).

Table 30: Comparison test on number of residents

Number of residents	Netherlands (Percentage) Source: CBS	Response group
0 – 20.000	145 (34,6 %)	30 (25,6 %)
20.000 – 50.000	202 (48,3 %)	47,9 %
50.000 – 100.000	46 (11 %)	17,9 %
100.000 – 200.000	19 (4,5 %)	6,0 %
200.000 +	6 (1,4 %)	3 (2,6 %)
Total	*418 (100%)*	*117 (100 %)*

Results

The results show (table 3) that only 16,2 % of the respondents has an actual active LSEC in their municipality. 40.2 % of the municipalities is has plans for a LSEC and 43,6 % has neither of both. In total 56,4% (66 respondents) of all respondents are in some way involved in a LSEC.

Table 31: Number of LSECs and plans for LSECs

	Municipalities in % (based on 117 respondents)
Active LSEC	16,2% (19)
Plans for a LSEC	40,2 % (47)
No plans for a LSEC	43,6 % (51)
Total	*100 % (117)*

Ambitions

All mmunicipalities have indicated that the ambitions on innovation and education are the least important. The results also showed that municipalities without (plans for) a LSEC find innovation and education on sustainable energy not very important as well as a sustainable image. Municipalities with (plans for) a LSEC scored high on security of supply and to support local business.The most important ambition for both groups was employment. Overall the importance of all ambitions were rated higher by municipalities (with a plan for) a LSEC.

Table 32: Importance of ambitions

Ambition	Municipality without LSEC	Municipalities with (plans for) a LSEC	Difference
9. Acceptable "Clean" energy	6,41	7,33	0,92
10. Affordable energy	6,87	7,73	0,86
11. Security of Supply	7,71	8,13	0,42
12. Employment	7,84	8,33	0,49
13. Support local businesses	6,93	8,03	1,1
14. Awareness	7,06	7,68	0,62
15. Innovation and education	5,43	6,97	1,54
16. Sustainable image	6,21	7,17	0,96

Roles

For the results of the roles only the municipalities with (a plan for) a LSEC are taken into account.

It shows that a large majority (83,3 %) of the municipality that is involved in (plans for) a LSEC used some of the facilitating instruments and in this way were in the role of facilitator (see table 17). A slight majority (57,6%) also used financial instruments and acted as a financer. Only 43,4 % of all respondents used customer related instruments, acting as a customer.

Table 33: Used roles within Municipalities

Roles of municipalities that are involved in LSEC *(only of those municipalities with (plans for) a LSEC (based on 66 respondents)*		
Roles	*Some*	*None*
Facilitating instruments	83,3 %	16,7 %
Financing instruments	57,6 %	42,4 %
Customer instruments	43,4 %	57,6 %

Instruments

When we take a closer look at which financial, facilitating and customer related instruments are being used by municipalities, a few thing are notable. All instruments that are used by municipalities, but only a few are used by more than 15% of the municipalities that are involved in (plans for) LSECs.

Performing or paying for feasibility studies, administrative support were the most popular instruments. Followed by public support in the media.

The other instruments all scored between 15,2 % (funding of small expenses and 19,7 % (subsidies and matchmaking between potential customer).

Tabel 34: Most used instruments

Municipalities that used the instruments *(only of those municipalities with (plans for) a LSEC (based on 66 respondents)*	
Facilitating instruments	
- *Feasibility studies*	47 %
- *Administrative support*	56,1 %
- *Public support in the media*	28,8 %
- *Funding of small expenses*	15,2 %
- *Support in grant application*	18,2 %
Financing	
- *Shareholder*	21,2 %
- *Subsidies*	19,7 &
Customer instruments	
- *Matchmaking between potential customers*	19,7 %

Stakeholders

The respondents indicated that in 66, 7% of the (plans for) LSECs the municipality acted as the prime start initiator, but they all also indicated that there are more stakeholders involved in the creation of a LSEC. In 66,7% of a LSECs the municipality is the main initiator. Other parties that are often the initiator of (plans for) a LSEC are Local Businesses (28,8%) and local citizens (16,7%). A notable difference is that large energy companies are not often involved as main initiator (9,1%) but are in 21,2% of all cases involved as co-financier. The water board as initiator is the least used (3,0%). The other stakeholders score between 10,6 % (agricultural businesses) and 15,2 % (provinces).

Table 35: LSEC stakeholders

	Initiator	**Co-financer**
Local Businesses	28,8%	25,8%
Agricultural businesses	10,6%	13,6%
Citizens	16,7%	21,2%
Large energy company	9,1%	22,7%
Province	15,2%	16,7%
Water board	3,0%	7,6 %
Housing corporation	13,6%	9,1 %

Project developer	13,6%	13,6%

Respondents were also asked to indicate which type business forms and which type of technologies the active LSECs in their municipality are using. Since only a small percentage of respondents (16,7%) (19 respondents) answered the question no significant result can be concluded from the data. Including the municipalities that have a plan for a LSEC we can see that solar power and biomass are the most researched technologies considered interesting for a LSEC. Geothermal energy is the least popular technology.

Conclusions and Discussion

The overall result shows that a majority of Dutch municipalities is involved in the realization of a LSEC and thus has some active ambitions, defined in roles and translated into instruments related to a LSEC. The most important reasons to start an LSEC are to create security of supply, employment and to support local businesses. Municipalities with plans for a LSEC score higher in importance in all ambitions indicating that they are more aware of their ambitions and how to fulfil them

In almost all cases municipalities act as facilitator in the realization of a LSEC. The majority also uses financial instruments but only a minority acts as customer.

The facilitating instruments mainly used are feasibility studies and administrative support. Other instruments used are public support in the media, funding of small expenses, support in grant application, shareholder, subsidies and matchmaking between potential customers. The non-financial instruments are the most common used instruments within Dutch municipalities when they are confronted with a plan for a LSEC. Within the setup of a LSEC the municipality acted in two third of the cases as the prime start initiator. Other parties that are often the initiator of (plans for) a LSEC are local businesses and local citizens. The larger energy companies are often not involved as main initiator but are often involved as co-financier in a later stage.

Various authors reason that municipalities must safeguard public values, which in the case of energy means making energy available and affordable in an acceptable way. The empirical study confirms that municipalities have ambitions on these public values.

Recommendations

As the research suggests there are several possible business forms. Due to the small percentage of current active LSECs this could not be explored further. Future research is necessary and valuable on this matter.

The majority of the plans for LSEC is not yet in the phase where actual energy is produced. It would be usefull to follow the development of these plans and indicate which plans are successful in realising actual production and what their key success factor were.

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