Establishing a Positive Energy District: legal aspects and challenges

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June 2023

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Lead author

Dr. Daisy G. Tempelman, L.LM

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Project & document information

Grant agreement	824418
Project title	Energy efficient pathway for the city transformation: enabling a positive future
Project acronym	MAKING-CITY
Project coordinator	Cecilia Sanz-Montalvillo (cecsan@cartif.es)- Fundación CARTIF
Project duration	1st December 2018 – 30th November 2023 (60 Months)
Related work package	WP 1 – New long-term urban planning towards 2050
Related task(s)	Task 1.5 – Development of a City Vision 2050 for each city
Due date of deliverable	November 2023
Actual submission date	October 2023
Dissemination level	Public

Hanze University of Applied Sciences: Legal research report

Chapters 1- 5 were written first by DR K.C. Henckel. As a result of ongoing developments within the Making City project, as well as in the regulatory landscape, a major revision of chapters 2, 3, and 4 are performed by Dr. D.G. Tempelman. Chapters 6 and 7 are a production of both ms. Charis van den Berg, L.LM from the municipality of Groningen and Dr. D.G. Tempelman. The report is finalized by Dr. Tempelman.

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Executive Summary

This report explores several topics related to the energy transition, in particular to achieve a district with annual net zero energy import and net zero carbon emissions, working towards an annual local surplus production of renewable energy (PED district). When establishing a PED district, legal aspects and challenges have to be considered. Several legal barriers exist and might prevent (upcoming) projects from being implemented. Furthermore, it can create an unhealthy investment climate and affect business cases.

In this report, chapter 3 describes first several legal transition paths in achieving a PED, such as the legal framework related to disconnection of the gas grid, switching to district heating or dealing with net congestion. Furthermore, (upcoming) legislation is being discussed and several legal barriers are outlined. One of the legal challenges is the compartmentalized legislative agenda. Even though the upcoming Energy Act includes gas and electricity, there is still a different legislative agenda for heat and hydrogen. A more coherent approach in law will facilitate the system integration of all renewable energy sources. Furthermore, another challenge is the tension between the (upcoming) Environmental Act and the (upcoming) Collective Heat Supply Act (CHS Act). One of the concerns is that municipalities state that using the instruments from those Acts will take too much time in order to obtain local climate goals.

In chapter 4 the legislation has been discussed with regard to consumer participation. First the different types of consumers are discussed, focusing on the electricity market and the heat market. Secondly, energy exchange has been described, in particular collective self-consumption and peer to peer. Here blockchain technology and the related smart contracts are being briefly discussed. Furthermore, the technical issue of net congestion has been addressed from a legal perspective. Congestion management can be performed by dealing with capacity in an alternative way. In the Netherlands, the DSO is now able to offer alternative transport rights, laid down in contractual agreements between the DSO and the company who applies for a connection. For small end users, such as households and SMEs that have a small connection to the grid, there are alternative transport contracts available if that could lead to more flexibility in the system. When investing in storage of electricity, one needs to take into account that there is no proper legal framework. With regard to a collective battery (neighbourhood battery), there is no legislation that regulates the ownership of the electricity produced by the households that is stored in the battery. Additionally, it is not clear whether the connection to the battery falls under the scope of the Electricity Act. It could be argued that the battery becomes an integrated part of the electricity system. It could well be that a supplier must be engaged to supply electricity from this buffer if the connection falls within the scope of the Electricity Act. Other clauses in the Electricity Act can hinder the supply via the battery as well. In addition, there are legal issues with regard to taxation to be addressed.

The fifth and sixth chapter are written on request by stakeholders for a more general approach. In chapter 5 the legislative framework of intellectual property has been discussed. Here are no legal challenges identified, since this legal discipline is relevant for all types of innovations and are not directly connected to specific PED projects within this Making City Horizon2020 project. In chapter 6 a design for a district heating market model is provided for those cities that are considering to create district heating and are not yet confined by any legal framework yet. Several topics that are necessary to considered are being addressed, such as type of infrastructure and governance, and some success factors are given.

In the final chapter the key challenges for achieving a PED from a legal perspective are addressed. In short, these are: the lack of legal certainty and clarity with regard to the energy legislation, the lack of capacity on the distribution grid for electricity, and data management. The latter one being particularly important for small consumers that are willing to participate in the electricity market. Although the topic is addressed in the (upcoming) Energy Act, it is uncertain how this will finally work in practice. In this report, authors hope to provide a extensive overview of existing and upcoming legislation in the Netherlands, related to several projects within the Making City Horizon2020 project. It is worth noting that due to political changes in the upcoming months (Q4 2023), the legal framework is by no means a given fact. This is obviously an exciting time for all stakeholders in the energy sector in the Netherlands.

1. Introduction

1.1 The Making City Project

This report relates to the Horizon 2020 project entitled 'Making City'. The report was conducted by the Hanze University of Applied Sciences to the benefit of the Municipality of Groningen and other consortium partners in the Making City project and addresses the legal impediments that may arise when creating and achieving a Positive Energy District (PED).[1] In doing so, it specifically addresses the situation in the city of Groningen and the legal framework of the Netherlands

1.1.1 The PED concept

Making City is a Horizon 2020 project that was initiated in December 2018 and is coordinated by the CARTIF Technology Centre. The project centres on Positive Energy Districts (PEDs) and aims at utilising and demonstrating advanced procedures and methodologies based on these districts.

Within the project, a PED is defined as "a district with annual net zero energy import and net zero carbon emissions, working towards an annual local surplus production of renewable energy".[1] In other words, a PED is a "delimited urban area composed of buildings with different typologies and public spaces where the total annual energy balance must be positive. Therefore the district will have an extra energy production that can be shared with other urban zones. The total energy balance is the energy taken from outside the district minus the energy delivered inside the district. Even if all energy carriers can be considered as potential energy inputs and/or outputs only primary energy units make a suitable calculation of energy flows to establish the total energy balance. Finally, achieving PEDs means that the amount of energy delivered must be higher than the amount of energy supplied from outside."[2]

1.1.2 Towards a city vision 2050

At present, as part of the EU's 2030 Climate & Energy Framework, city plans for energy transition are primarily designed with a 2030 horizon. Within the Making City project a long-term strategy entitled "City Vision 2050" is used to address the transformation towards low-carbon cities.

The implementation of the PED concept developed by the Making City partners will include several applications largely based on existing (and mature) technologies.

[1] The information contained in this subparagraph is largely derived from the information available on the Making City website. For more information see: www.makingcity.eu

Examples include the retrofitting of buildings, increasing renewable energy sources and setting up public charging stations to increase electric mobility.

The PED concept will be applied in two Lighthouse cities, Groningen (NL) and Oulu (FI) and six follower cities Bassano Del Grappa (IT), Kadikoy (TR), Leon (ES), Lublin (PL), Poprad (SK) and Vidin (BG).

1.1.3 The lighthouse city of Groningen

The city of Groningen, the Netherlands, is one of two 'Lighthouse cities' within the Making City Project. The city was chosen as a lighthouse city due to its urban energy transformation strategy.[3]

With the Groningen gas field being one of the world's largest natural gas reserves,[4] the Netherlands has long relied on natural gas as the main energy source. However, recurring earthquakes caused by decades of gas extraction have caused damage to thousands of homes, giving rise to a need for sustainable energy alternatives. To achieve the transformation from a primarily gas-reliant city towards a city reliant on sustainable energy sources, the city council of Groningen has adopted a "Master Plan" which aims to make the city of Groningen energy neutral by 2035.[5] More so, Groningen committed to reduce its gas emissions by 70% in 2030 by establishing the sustainable use, consumption and production of energy.

Two Groningen districts have been selected to implement the PED concept developed in the Making City project: Groningen North and Groningen South. Within both areas, several infrastructure typologies are represented. These include e.g. residential buildings neighbouring a university campus, industrial and tertiary blocks and public facilities. Whereas the residential area in Groningen North was built in the 1960s, the vast majority of Groningen South was constructed around the 1980s.

The PED implementation within the two districts involves the use of several sustainable energy solutions, such as the retrofitting of residential buildings, the instalment of solar panels as well as the use and optimalisation of a geothermal heating system. In addition, biogas technology will be used to collect and digest waste and waste water.

As a city where the majority of all traffic movements is conducted by bicycle, a special focus will be on cycling and electric mobility. Examples include the conversion of a cycling lane into a "SolaRoad" by integrating solar panels in its surface and the instalment of smart charging stations for electric vehicles.

1.1.4 Consortium

The Making City project is carried out by a consortium of 34 partners: 9 city councils, 5 universities, 4 research centres, 4 clusters and foundations, 4 rental housing administrators, 4 SMEs, 3 energy companies, and one construction firm. Within the lighthouse city of Groningen the consortium consists of the city council of Groningen, the University of Groningen, the Hanze University of Applied Sciences, Grunneger

Power, the New Energy Coalition, Nijestee, Waarborg Vastgoed, Sustainable Buildings and TNO.

1.2 Aim and purpose

The deployment of PEDs is expected to impact the energy market as a whole. The energy transition will require new innovative energy solutions and create new roles for certain stakeholders such as the consumer turned professional, commonly referred to as “prosumer”. In deploying PEDs stakeholders will face a complex regulatory framework that is continuing to adapt to the changes and innovation required in order to effectuate the energy transition.

The aim and purpose of this report is to create insights on the legal aspects related to the establishment of a PED. The request from the municipality of Groningen was to describe the legal framework of relevant topics in order to navigate stakeholders in the existing regulatory landscape. The choice for certain topics are made based on the activities performed within this Making City project itself.

In seeking to fulfil this aim, this report outlines the legal framework that exists within a variety of areas within the private and public law arena. Issues addressed are e.g. intellectual property, product liability, energy regulations, permits and consumer participation. The primary focus of the report will be on the laws currently in effect within the Netherlands as well as upcoming changes to the regulatory regime.

At a city level, an important objective of the Making City project is to develop strategies for a long term energy transformation that will support the implementation of plans for 2050.[6] Since energy law and regulation is an area that is still very mux in flux, due in part to changing insights and the rapid (technological) development associated with the energy transition, it is difficult, if not impossible to predict the regulatory regime that will exist in 2050. This report will therefore take into account only changes to the regulatory regime that have already been announced, adopted or have reached the proposal state.

1.3 Methodology

This report is primarily aimed at outlining the legal regime that exists or may exist in the areas that are of interest to the Making City project and the Making City consortium partners. In outlining the existing and furture legal framework use is made of a black letter approach to the law under which the main sources are law and case law and to a lesser extent legal and academic writings. In addition, use is made of various preparatory works, such as proposals of law and explanatory memoranda. These sources give a valuable insight into the aims of the legislator as well as the direction of the law in future years.

In order to enhance the legibility of the report there is a sparse use of footnotes. Instead, all relevant sources are mentioned in the bibliography.

1.4 Structure

The main purpose of this report is to outline the legal impediments that exist to creating and deploying PEDs within the city of Groningen as well as to aid stakeholders in navigating the existing regulatory landscape. In achieving this aim, this report, which consists of several separate chapters including this introduction, starts with outlining the legislative framework in Chapters 2 *et seq.* In the first part, the general legislative framework is set out in chapter 2. The legislative framework is further set out through several chapters. These chapters are divided by subject matter and concern energy regulation (3), innovation (4) and consumer participation (5). In the second part, the focus goes beyond the current situation whereby a pilot with blockchain technology (6) will be discussed and a new market organization model for the heat market will be introduced (7). The final chapter sums up the most important conclusions (8).

1.5 Relation to other activities within the Making City Project

This report does not constitute a separate deliverable within the Making City project. Instead, the report is aimed to benefit solely the lighthouse city of Groningen and the Groningen' consortium partners. Still, it may also aid follower cities, other Smart Cities and Communities (SCC) and stakeholders interested in the legal framework associated with the energy transition within districts and cities.

2. Legislative framework

2.1 Introduction

A successful implementation and creation of PEDs holds challenges in a variety of areas, ranging from technological, social and urban challenges to challenges in the area of regulation and legislation. Facilitating low carbon energy supply requires, inter alia, the use of new technologies, strategies, partnerships and policies. A key factor in aligning policy with the mission of returning city and district emissions to net zero within the coming years is making sure that this policy complies with existing and future legislation. In deploying PEDs stakeholders will face a complex regulatory framework that is still in the transformational phase, continuing to adapt to the changes and innovations required for the eventual completion of the energy transition. This report is partly aimed at helping stakeholders navigate the existing (and future) regulatory landscape by describing the legal framework that exist to creating and deploying PEDs, whereby in some cases some legal impediments are addressed. In addition, the report seeks educate stakeholders on the existing legislation and regulation allowing them to tailor their activities thereto. In doing so, the report will address four key legal issues: 1. Energy regulation, 2. Consumer participation, 3. Innovation and 4. Market organisation. Furthermore, with regard to the first two issues some of the legal barriers as experienced in the Netherlands are discussed as well.

2.2 Energy regulation

When it comes to legislation and regulation in the area of energy (supply), the present framework is not (fully) equipped to deal with the changes required for the facilitation of low-carbon energy supply. As a result, the existing regulatory regime is currently undergoing significant change. This change is aimed at removing existing bottlenecks and paving the way for an energy transition in which reliability, affordability and safety are guaranteed. Whereas some changes are close to entering into force others are still in the preparatory phase. Even though there may be some alterations to the existing proposals, this report will briefly address the issues contained therein in order to give the Making City stakeholders an idea of the changes that the legislator intends to make. Chapter 3 will therefore address the key issues in the proposed regulatory changes. In doing so, the chapter will address several key questions relevant to the PED project and will provide an overview of upcoming legislation and to what extent this legislation benefits and hampers PEDs.

2.3 Innovation

Effectuating the energy transition requires a great deal of (technical) innovation. In essence, innovation is key to creating a world largely reliant on sustainable energy solutions. The path towards a low or zero carbon emitting city or district requires the rapid emergence of new technologies, such as solar and heat systems and energy storage solutions. Innovation in the area of renewable energy will help overcome existing barriers as well as contribute to the use of renewable energy solutions. Innovation not only requires the invention and introduction of new energy technologies, it also relates to improvements to existing technologies, the development of new business models and new types of finance or the stimulation of sustainable energy deployment. As such, the energy transition not only needs innovation, it likewise offers businesses the opportunity to develop innovative products and ideas that contribute to a zero carbon economy. In deploying their innovative products and ideas these businesses inherently face legal questions, in example related to intellectual property or product liability. Furthermore, the ongoing development of new innovations creates a constant friction with positive law (the law that applies at that specific moment). A specific feature of legislation in relation to innovation is that the law cannot persist with these new developments. This report will address these issues in Chapter 5.

2.4 Consumer Participation

Akin to innovation, engaging citizens and consumers and stimulating their involvement in the energy transition is imperative to realising a low-carbon energy society. Dutch municipalities are obliged to include citizens in the decision making process, under the upcoming Environment and Planning Act. Citizens play an important role in identifying and overcoming urban energy challenges. As such, citizens and consumers are stimulated more and more to actively participate in the energy transition. Examples of consumer participation are the instalment of roof top solar panels or the sharing of self-generated energy with neighbours or within energy communities. In European legislation and policy these consumers are referred to as ‘active consumers’. When actively participating in the energy market consumers may face considerable legal, technological and administrative burdens. At present, some of these legal and regulatory burdens are being removed, which should make it easier for consumers to take part in realising low or zero carbon emitting cities or PEDs. Chapter 4 of this report will answer some of the key legal questions that relate to consumer participation in the energy market.

2.5 Market Organization

How are market is organized will definitely help the energy transition and a city to become a PED. Although the European objectives are to achieve one common market for gas and electricity, including now also (green) hydrogen, the heat market is hardly regulated by European law. The consortium partners expressed their wish to provide

a greenfield case of a market organization for heat, where the organization is based on best practices within the Netherlands and to some extent also Denmark (since their heat market is very well organized). In chapter 6, which is co-authored by ms. Charis van den Berg, L.LM, we provide a brief overview of the – in our opinion – necessary elements.

2.6 Key questions

In discussing the legal framework that exist within the Netherlands in the three key areas of energy regulation, innovation and consumer participation this report does not provide an overview of the entire legal framework. Instead, the report addresses several key questions that may be relevant to the Making City partners and the realisation of PEDs. As an addition the topic of market organization is included too. These legal questions are provided per key issue:

Energy Regulation (chapter 3)

1. What are the legal transition paths in (achieving) a PED?
2. What is key (upcoming) legislation governing the energy transition?
3. What roles play municipalities?
4. What are legal barriers?

Consumer participation (chapter 4)

1. Which rules and regulations apply to citizens producing energy and local energy communities?
2. What is Peer-to-Peer (P2P) trade, blockchain technology and how does it facilitate P2P?
3. How is net congestion hindering consumer participation?
4. What are legal barriers?

Innovation (chapter 5)

1. How does one apply for a patent?
2. What are the rights of the patent holder?
3. What are the (copy)rights related to a computer program?
4. What are the (copy)rights to work created within a consortium?
5. When is someone liable for a defect product?

Market Organisation (chapter 6)

1. When designing a new market for heat, what are necessary topics to consider and elements to include?
2. What will make a good market model for district heating?

3. Energy regulation

3.1 Introduction

The energy transition holds challenges in a variety of fields, which includes regulation and legislation. The existing legislative framework is not (fully) equipped to deal with the changes and innovation required to facilitate and foster the path towards low-carbon energy supply. In an effort to remove existing bottlenecks and pave the way for an energy transition in which reliability, affordability and safety are guaranteed. Hydrogen, as alternative energy carrier, leads to more challenging questions with regard to system integration as well as the regulatory framework. Furthermore, the European legislator is rapidly adjusting existing directives and regulations within the green deal and fit for 55 package, whereby the Dutch legislator cannot keep up. As a result, while new adjustments to directives are being proposed, the Dutch legislator can barely keep up the pace: subsequently, implementation deadlines are exceeded substantially. This is one of the legal impediments that the Dutch municipalities and residents face, which cannot easily be solved.

In section 3.1.1, the legal transition paths will be discussed focussing mainly on the built environment and urban areas. For rural area municipalities different challenges might arise. Secondly, the core of energy law will be discussed whereby certain European legal developments will be taken in to consideration which will be changing the current legal landscape. In section 3.2 the focus will be on the proposed Energy Act. Section 3.3 will focus on the legal developments in the heat market, whereby the focus is on the upcoming Collective Heat & Supply Act. In section 3.4 the legal framework for bioenergy is discussed, and in section 3.5 the Environmental Act is addressed. Several legal challenges are being considered in section 3.6, whereas section 3.7 will briefly discuss the relevance for the PED-project.

3.1.1 Legal transition paths

There are several legal developments worth mentioning with regard to the process of becoming a PED. For this introductory chapter certain topics are highlighted and will be addressed in upcoming paragraphs or chapters. The list of these legal transition paths is not exhaustive; however, they all origin (implicitly) from European legislation therefore apply to a certain extent in all member states.

With regard to the built environment several steps have to be taken. First of all, the goal to disconnect entire neighbourhoods from the gas distribution grid led to several adjustments of existing legislation. The first step in this process was the prohibition for new gas connections in new neighbourhoods and housing. Starting from July 1st 2018 new houses were to prohibited to be built with a gas connection and were not allowed to be connected to the natural gas grid. Under very strict and specific conditions an exception to this rule was allowed. The latest step in this process in the upcoming legislative proposal that will adjust the upcoming Environment and Planning Act: as of

a certain date[7], municipalities can designate areas that will be disconnected from the gas distribution grid. The municipality therefore imposes the grid operator to stop gas transportation, whereby residents must find an alternative from that date, which may be a solution provided by the municipality or an alternative of their own choosing (more on this matter in chapter 3.3.3). Secondly, it will be necessary to isolate buildings, in particular the houses and buildings that are built in the 20th century. The isolation is not so much a legal transition path, yet merely actions and support based on policy.

The third legal transition path is related to the gas connection. To phase out fossil fuel and in particular natural gas for heating and cooking in the built environment, it is necessary that an alternative will be given for households connected to the distribution grids for natural gas. In 2021 natural gas accounted for 33,5% of the EU final energy consumption in households.[8] In order to switch from natural gas to an alternative gas, such as biomethane (green gas) or hydrogen, or to all electric neighbourhoods, certain legal challenges arise. In the Netherlands for example, the Dutch legislator first applied a prohibition for gas connections in newly build neighbourhoods and is now issuing a legislative proposal for phasing out gas connections in existing neighbourhoods.[9]

Fourthly, as a consequence of the upcoming prosumers (consumers that also produce their own energy i.e. by solar panels) legal redesign of the electricity market was necessary. This resulted in a fourth Electricity Directive (2019/944) by the European Commission and the Council published in 2019. Although this Directive should have been implemented by January 2020, the Dutch legislator have failed to do so. With the upcoming Energy Act this, among other European legislation, directive will be implemented in Dutch law. The prosumers or ‘active customers’ are being enabled to actively participate in the electricity market; moreover, vulnerable consumers are also better protected. Since the Electricity Directive did not achieve the desired outcomes, the European Commission published March 14, 2023 two proposals for regulations, one reforming the electricity market. Once entering into force, this regulation creates the opportunity of ‘energy sharing’ whereby households and small consumers can share their electricity with their neighbours. The new roles of the small consumers are in need of constant attention from the Dutch legislators.

Fifthly, another important aspect that needs to be addressed is the congestion on the Dutch distribution grids for electricity. Under the RES I- directive priority access was given to feed in of renewable electricity. Subsequently, and in combination with subsidy schemes in order to promote the production and use of renewable energy, the production of renewable electricity increased substantially. Also, the increasing number of households and organisations placing solar panels, the emergence of solar parks and other electricity production led to a complete locked system, on demand and supply side. In the last few months new legislation has been introduced that helps Distribution System Operators (DSOs) to perform congestion management. See more in chapter 4.6.

Sixthly, an alternative for heating and cooking on natural gas are heat grids. Especially when there is a source of waste- or renewable heat that can be used. In Groningen, the municipality together with a few other parties organized a heat production company and is installing a heat grid in several neighbourhoods. The legislation at European

level is barely developed leaving room for members states to create their own market organization. The Dutch legislator introduced the Heat Act in 2014; however, it immediately announced future adjustments and since then two revisions (2019 and 2020) took place. The desired results were a bit disappointing and the minister of economic affairs & climate (minister Jetten) published a new legislative proposal for public consultation titled “Collective Heat Supply Act”. The public consultation led to a long discussion on the authority of municipalities and conflicted somewhat to the current practice. It was difficult to achieve an agreement and after two difficult years with the gas crisis, minister Jetten announced just before the summer of 2022 that heat companies should be in public hands for at least 51 % of the shares. The current situation is that the Dutch legislation is being adjusted in order to organize this public ownership.

3.1.2 Relevance to the PED project

As outlined in the previous subparagraphs the legislative framework in the area of energy regulation is currently undergoing significant changes. These changes are primarily intended to ensure that the Dutch legislative and regulatory framework is able to meet the challenges provided by the energy transition. Changes to the legislative framework are therefore not just aimed at meeting existing challenges, but instead intended to meet the challenges still to come. With the existing and upcoming changes to various Dutch energy laws the Dutch legislator aims to make its legislation futureproof.

An important part of the Making City Project and deploying the PED-concept is the commitment to ensuring a long term vision of energy transition. In fact, within the Making City Project the so-called ‘City Vision 2050’ forms a staple used to address the transformation towards low carbon cities. With this in mind, it is important to consider future legislative impediments to realising PEDs. Given the intended larger roll out of Making City products and results in coming years as well as the city of Groningen’s intention to become energy neutral by 2035 it is imperative to consider the legislative changes on the horizon. However, not all legislative changes are equally relevant to the project. For example, given that PEDs are to exist in the urban environment the legislative changes to the Offshore Wind Energy Act are of little relevance to the Making City Project. Issues that may be of importance to the project are heat districts and the role of the municipality therein, but also consumer participation and innovation. Furthermore, in establishing a PED innovation plays a crucial role. Especially for SMEs and innovative producers of technology relevant to the energy transition, the regulatory aspects should be addressed as well.

The following paragraphs will outline the changes to the regulatory framework within these areas.

3.2 Energy Act

In light of the energy transition and the increased technical, regulatory and sustainability challenges that this is bringing in its wake, the Dutch legislator will propose a new Energy Act (*Energiewet*). This Act intends to combine the existing Gas Act and the Electricity Act 1998. These acts, as well as the European directives on which they were based, were increasingly aimed at the liberalisation and optimal functioning of the gas and electricity market. In recent times, sustainability objectives have led to a need for changes in regulation, both at a European and national level. At a national level, the Gas and Electricity Act are considered to require modernisation and simplification in order to properly facilitate the energy transition.[10] At a European level, the so-called Clean Energy Package was introduced. The Clean Energy Package, which consists of eight different legislative acts, aims to facilitate the transition away from fossil fuels towards cleaner energy and to fulfil the European Union's commitments to the Paris Climate Agreement.[11] The proposed Energy Act aims to implement these European rules and regulations.[12] In addition, the Act contains changes to gas and electricity regulation stemming from the Climate Agreement and other national policies. Due to the interconnectedness of the gas and electricity market, these markets barely differ in terms of content and extent. The same goes for the legislative approach within these areas. What is clear is that, as a result of the energy transition, the legislation in the energy market is very much in flux and is becoming increasingly complex. As such, the legislator considers it important that legislation is accessible and functional without creating unnecessary obstacles for the actors involved. More so, it is considers that legislation must not needlessly burden innovative activities that contribute to the energy transition.[13] The legislative proposal therefore converts the Gas Act and the Electricity Act 1998 into a single integrated act providing an accessible framework that is tailored to an energy market in transition. As such, the aim of the Act is to provide a future-proof regulatory framework aimed at the market for electricity and gas that optimally supports and stimulates the energy transition and, in addition, contributes to the realising a low-carbon energy supply that is safe, reliable and affordable.[14]

3.2.1 Legislative process

As outlined above, the Gas Act and Electricity Act 1998 are set to undergo significant changes in light of European legislation as well as changes in national energy policies precipitated by climate and sustainability goals. The integration and amendment of both acts will centre on issues of sustainability, functionality, accessibility and flexibility and seek to establish a modern, integrated an future-proof regulatory framework.

On 17 July 2020 the Dutch Ministry of Economic Affairs and Climate published a working document entitled "Contours of the Energy Act" and invited stakeholders and interested parties to provide their views on these contours by September 1st 2020. These contours resemble a legislative proposal and are accompanied by an Explanatory Memorandum.

On February 1st 2023 the Dutch Council of the State, department of legislative advice, published its findings of the proposed Energy Act. There were several issues that needed to be addressed, one of them being more precise in what is exactly derived from European legislation and how it is implemented in the Energy Act.

On June 14, 2023, the Dutch Minister offered the new legislative proposal to the second chamber that addressed several of the issues raised by the Council of the State. On July 13, 2023 the Council of the State published its advice. In the upcoming months the second chamber will discuss the new legislative proposal.

3.2.2 Proposed Energy Act

The following paragraphs will discuss and outline the most important elements of the proposed Energy Act on the basis of the working document “Contours of the Energy Act”. As such, the following paragraphs will centre on the information provided in this document and will largely refrain from any academic discussion or challenge of this information. The aim of these paragraphs is merely to outline the changes and provisions to the legislative framework that might be proposed. In this, one must bear in mind that the working document “Contours of the Energy Act” provides a general outline of the proposed act and does not constitute an official legislative proposal or Explanatory Memorandum.[15] It is likely that the final proposal will hold certain changes to the information provided in the working document, e.g. in light of the internet consultation of the proposal.

As described in the previous paragraphs, the proposed act seeks to integrate the Gas Act and the Electricity Act 1998 and includes changes to existing legislation arising from European regulations and national policy. Because of their interdependence, the proposal will bundle the changes in six pillars. These pillars are the following:

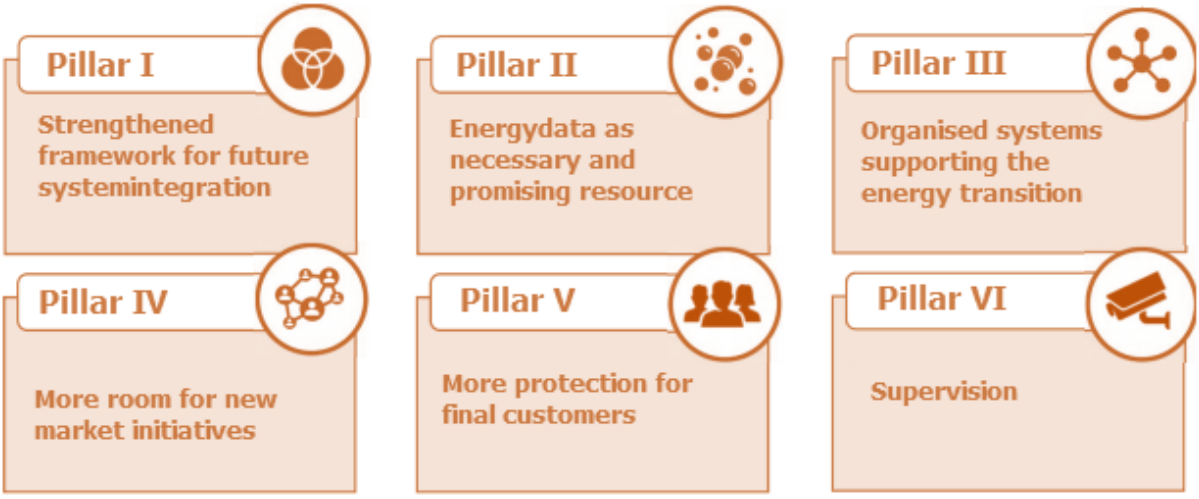

Figure 3.1: The six pillars of the proposed Energy Act (Source: Contouren van de Energiewet)

Except for the first pillar, the pillars each include changes to the existing legislative framework that are rooted in both European legislation and national policy objectives. The first pillar is primarily aimed at facilitating the integration of the Gas Act and the Electricity Act 1998 and improving the quality and accessibility of existing legislation. As such, this pillar intends to restructure and clarify the existing rules and regulations resulting in an accessible and coherent legislative framework with provisions built for the future. This pillar does not include the implementation of European rules and regulations; it solely includes changes of a national nature. Still, an important aspect of the first pillar is to secure a better alignment of Dutch legislation with European legal definitions.

3.2.3 Relevance of the proposed Energy Act in achieving a PED

The proposed Energy Act will govern the energy production, infrastructure, supply and storage for electricity and gas, either renewable or from fossil origins. The European legislation, such as the directives for the electricity market and the promotion for production and consumption of renewable energy, are being implemented in this Energy Act. Furthermore, it will govern the energy transition by including new methods of energy supply, such as Peer-to-Peer (P2P) (see chapter 5.4) as provided for by the European directives. The relevance is therefore substantial; however, it is worth noting that not all energy sources and carriers are covered by this proposed Energy Act. For instance, thermal energy has its own regulatory framework.

3.3 Legislation for thermal energy

The Netherlands has long been dependent on natural gas as a primary source of heat. A key aim in the Dutch energy transition is abolishing the use of natural gas as a heating source. By 2050, 7 million homes and 1 million other buildings must be disconnected from natural gas and be reliant on sustainable heat alternatives. Thermal systems and the use of sustainable heat sources provide an important alternative to traditional natural gas heating. As such, the use and optimalisation of district heating systems forms a key part in implementing PEDs.

Sustainable heat sources such as geothermal heat, biomass, residual heat, aqua thermal heat and heat-cold storage (ATES) can supply heat through collective heat systems. In fact, collective heat systems are considered an affordable and reliable carbon free alternative to heating systems based on natural gas and other fossil fuels.

The development of collective heat systems is strongly encouraged by the Climate Agreement. In keeping up with the needs of the energy transition and the aims of the Climate Agreement, the legislative framework for heat systems has undergone and will undergo several revisions. This legislative framework is largely embodied in the Heat Act (in Dutch: *Warmtewet)*.

3.3.1 Legislative framework

Unlike consumers of gas and electricity, consumers of sustainable heat are tied to a specific heat supplier. To counter the possible adverse effects of such a monopoly the current Heat Act includes clauses related to consumer protection.

To support the energy transition and to remove a number of bottlenecks from the Act, a proposal for a revision of the Heat Act was adopted on July 4th 2018. This revised Heat Act entered into force on 1 July 2019, with a number of revisions taking effect on January 1st 2020. As per June 22nd 2020 the Dutch minister of economic affairs and climate published for public consultation the completely revised Heat Act, with a new title “Collective Heat Supply Act” (CHS Act). The aim of this proposal is to increase support for heat as a product, to strengthen confidence in the market as well as increase the willingness to invest in sustainable collective heat. As such the proposal primarily relates to the following issues (1) market regulation (2) price transparency (3) security of supply and (4) sustainability.

3.3.2 Proposed Collective Heat Supply Act (CHS Act)

The legislative process is going extremely slow. After the introduction of the proposed CHS Act on the consultation website, a long discussion between the municipalities and the ministry on the one hand, and between the energy companies and the ministry on the other hand took place. The authority given to municipalities was not matching with their wishes and existing practices, while the energy sector had some serious concerns about their business models. Moreover, it was highly criticized for lacking sufficient protection of households with regard to tariffing.

The gas crisis, as a result of the situation in Ukraine, changed the course of the minister and just before the summer of 2022 he announced that heat companies should be in public hands for at least 51% of the shares. The core adjustments of this new CHS Act are:

1. The public majority interest in a heat company is anchored in the bill.

2. The role of public infrastructure companies has been expanded by amending the group prohibition.

3. The space for heat communities has been clarified in the law.

4. The legislative proposal contains an introductory period, which creates room to build up public realization power.

5. The transitional law focuses on the transition from predominantly private heat companies to heat companies with a public majority interest.

6. The opt-out regulation in relation to the powers of a municipality under the Environment Act and the Municipal Instruments for Heat Transition Act has been tightened.[16]

3.3.2.1 District-oriented approach

The Climate Agreement plays an important role in the Dutch energy transition. As outlined above, the current legislative reform is largely aimed at fulfilling the aims set out in the Climate Agreement. Within the Climate Agreement, agreements have been made to lower carbon emissions within urban areas. By 2050 sustainable heat sources should replace natural gas when it comes to e.g. space and tap water heating. In order to facilitate this transition, the Climate Agreement makes a plea for a so-called district-oriented approach. This district-oriented approach also forms a key part of the proposed CHS Act. Under the district-oriented approach heat systems are organised at a district level while making use of citizen participation. Municipalities have a directing role within the district-oriented approach and provide guidance on the basis of several plans, being a transition vision for heat, implementation plans and a plan on environment and planning. Citizen participation and communication with several stakeholders such as housing corporations and heat companies are considered of great importance when drawing up these plans. Via these plans and after consulting citizens and other stakeholders, the municipality will opt for an alternative to natural gas within the urban environment. The proposed CHS Act regulates the situation in which the municipality chooses collective heat supply as an alternative to natural gas. As such, the district-oriented approach does not solely apply to the supply of collective heat. In order to clarify the functioning of the district-oriented approach, the explanatory memorandum to the proposed CHS Act includes the following scheme:

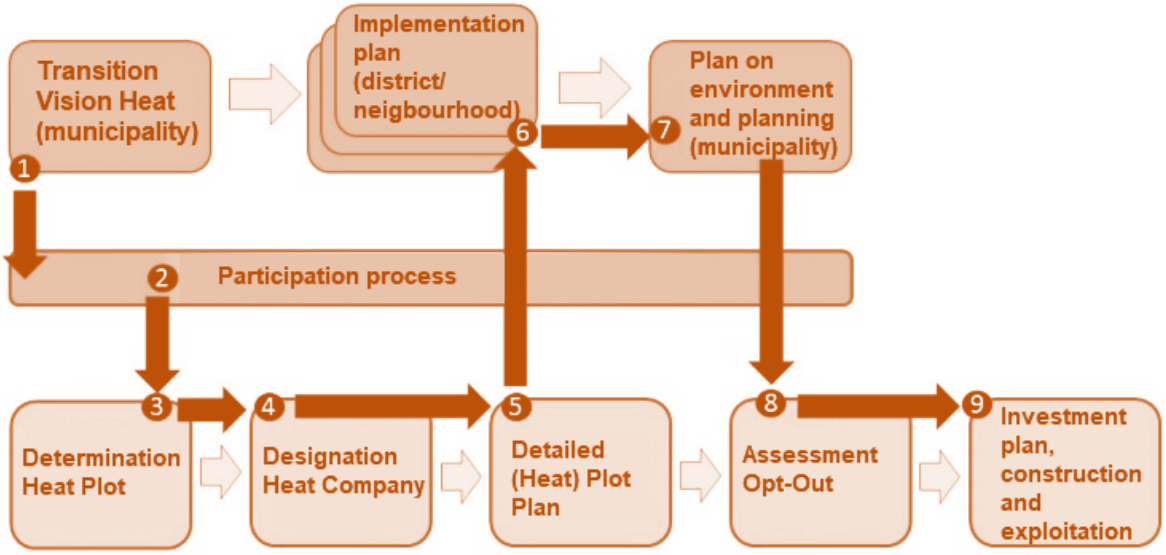

Figure 3.2 District-oriented approach and collective heat systems (Source: Explanatory Memorandum)

It is worth noting that the bottom elements (3, 4, 5, 8 and 9) are governed by the proposed CHS Act whereas the top elements (1, 2, 6 and 7) are not. Different legislation or policy applies there.

3.3.2.2 Directing role for municipalities

The proposed CHS Act contains rules on the creation, operation and exploitation of collective heat systems. A collective heat system is a system in which one or more heat sources are supplied to consumers by means of a heat network. The proposed CHS Act grants an important and directing role to municipalities. It is for the municipality to determine when and where a collective heating system is a valid alternative for natural gas heating. This determination is part of the so-called district-oriented approach. The idea behind the proposal is that public and private companies are allowed to carry out collective heat supply under clear public/ government direction. In this, municipalities play a crucial rule due to the local character of heating networks.

The primary task of the municipalities is to establish a relevant heat plot and designate a heat company. Pursuant to Article 2.22 of the proposed CHS Act, the transportation and delivery of heat is exclusively reserved for heat companies designated by the municipality (a task reserved for the Council of Mayor and Alderman).[17] These heat companies are required to install, manage and maintain a collective heat system within the relevant heat plot.[18]

The proposed CHS Act, in conjunction with the legislative proposal Municipal Instruments for Heat Transition[2], provides municipalities with instruments to directing the cost-effective installation of collective heat. Due to in this central steering role, the minister considers it important that municipalities also participate in heat companies that operate within a municipality and thus actively implement it to municipal decisions regarding the heat transition. By a good phasing in of the roll-out of heat networks, it will be possible for example to keep the so-called Overflow risk (less income due to delays in realized connections) to a minimum, ensuring more affordability and cost-effectiveness.[19]

3.3.2.3 Public ownership of heat companies

By announcement of 21st of October 2022 the minister of Economic Affairs and Climate, stated that public parties should play a more significant role in heat companies that install collective heat infrastructure and in the exploitation.[20] Currently a substantial part of the collective heating facilities in the Netherlands in the hands of private parties, without (major) involvement of public parties. That fact leads to a double task. To achieve the sustainable ambitions for the built environment can realize, it is important that current heat projects years to make their investment decision. New is also a subsidy especially for the development of infrastructure for thermal energy: Heat Investment Subsidy.

The proposed CHS Act only provides that a heat company with a (joint) majority interest of one or more public parties can be designated for new heat plots. On this way, public parties have decisive control over the infrastructure and the policy of a heat company. This makes the public management of the heat transition is strengthened and public interests are improved guaranteed. A designated heat company can also

[2] Translated from Dutch: Wet gemeentelijke instrumenten warmtetransitie.

take the form of a heat Joint Venture (JV), consisting of a heat supply company and a heat network company. The heating company with a majority share owned by public parties must have 50 % of the control in the heat JV or must have at least 50 % + 1 share in the heat JV itself.[21]

To enable municipalities to play the intended key role in the heat transition play, sufficient control options are preconditions, provided by i.e. the majority share owned by a public party. A public shareholder is able to act in the public interest when making decisions about the development of collective heating systems. With the use of heat companies with a public majority share, for example, the co-governments have an approach from the perspective of an integrated energy system the hand. Second, a public majority interest is desirable given the high degree of regulation provided for the heat market. This will make the cohesion between administrative choices in the local heat transition and business economic considerations better safeguarded.[22]

3.3.2.4 Transition phase

The proposed CHS Act proposes a transition phase of 7 years. The choice for a transition phase of seven years is prompted by the expectation that there will be sufficient realization power available to heat transition for the public party. During the transition phase, that is meant to develop capacity and expertise within the public organization, it will remain possible to designate a private heating company for the development of a heating plot, if no heat company with a public majority interest is available. After five years an evaluation report will be sent to the Second and First Chamber, or after 7 years when sufficient public realization power is proven to be present. If necessary, the transition phase can be extended by 3 years.[23]

Existing heat companies are based on transitional law with so-called delayed operation. As a result, the designation obtained on the basis of the transitional law will be in the hands of a heating company with a public majority interest. The deferred effect in the transitional law is motivated by the argument that existing heat companies have sufficient time to recoup their (ongoing) investment and that there are a sufficient number of heat companies with a public majority interest able to take over the tasks of the existing private heat companies.[24]

3.3.2.5 Exceptions to the rules for collective heat systems

There are two exceptions to the rules for collective heat systems. These exceptions are small collective heat systems with a maximum of 1500 small consumers and tenants and members of home owners' associations.[25] In many cases these heat systems will be too small to meet the criteria for the creation of an independent heat plot. It is, however, considered that the development of these heat systems may play an important role in acceleration of the heat transition. In order to support small heat projects there may be an exemption from the prohibition to transport and supply of heat in areas inside and outside a heat plot without the designation of the municipality (the Council of Major and Aldermen). In line with the directing role of municipalities the

exemption must be granted by the Council of Major and Aldermen. As such, small collective heat systems can only be developed with permission of the municipality.

In order not to overburden the owners and operators of small collective heat systems, a lighter regime applies to (administrative) obligations in the areas of rate setting, sustainability and security of supply.

3.3.2.6 Security of supply

Security of heat supply is important. In order words, the continuous availability of (in the near future only sustainable) heat must be guaranteed. To effectuate this guarantee as much as possible, the proposed Act distinguishes between measures aimed at preventing the disruption of heat supply and measures aimed at safeguarding the structural availability of sufficient heat on the long term.

Article 1 of the proposed CHS Act provides a definition of security of supply. This definition does not include incidental disruptions in heat supply that are not expected to exceed 5 days. Instead, the definition is geared towards long term heat supply and structural availability. The Article defines the security of supply as security of the continuity of the supply of heat to the extent that at least (1) the consumer's living space can be heated to 20 C (2) tap water is supplied at a temperature or an be heated to a temperature that complies with a standard set by governmental decree and (3) sufficient (potential) heat sources are available for the short and long term.

Under the proposed CHS Act the heat company will be fully (integrally) responsible for the collective heat system, which includes the security of supply. In order to ensure that the heat company can guarantee the security of supply the original proposal required the heat company to be granted economic ownership of the heat network. The revised proposal (in response to the internet consultation) introduces two new forms of cooperation under which economic ownership is granted to the heat network operator. These forms of cooperation are the following: (1) a heat company can cooperate with a heat network operator that has economic ownership of the heat network under which the latter carries out the construction, maintenance and management of the heat network or the transport of heat while other activities may be outsourced to third parties, (2) the heat company may enter into a joint venture with a heat network operator and other parties. The introduction of these forms of cooperation enables existing heat network companies that are part of a corporate group which includes a network operator within the meaning of the Electricity Act 1998 and the Gas Act to participate in a collective heat system without creating the unacceptable risk of cross-subsidisation and unfair competition.

3.3.2.7 Sustainability

Sustainability is a key aspect of the proposed CHS Act. As such, the Act includes provisions on limiting carbon emissions and ensuring sustainability in the most effective way. Heat companies will be required to comply with a maximum standard for carbon emissions. In addition, heat companies are expected to make sustainable

choices in grid design, heat source selection and system optimalisation. Moreover, to ensure sustainability as much as possible, the Act introduces certain information requirements. Heat companies will be required to annually inform their consumers on the sustainability of the heat supplied to the consumer. A similar requirement exists for their annual reporting: the annual report of heat companies must include information on the sustainability of the annually supplied heat.

3.3.3 Proposal Municipal instruments for heat transition (MiHT)

This legislative proposal aims to empower municipalities to set local rules for the transition to implement the built environment from natural gas to sustainable alternatives, including: the municipality has a designation authority. With this the municipality designate certain districts where an energy supply with sustainable energy will become available to replace natural gas.[26] This designation authority extends therefore beyond the competence in art. 10 paragraph 7 under b Gas law. For those districts, the municipality determines in the environmental plan (see paragraph 3.5.3) that in a specific time in the near future natural gas will be replaced by a sustainable alternative and that the network operator will stop all transport of natural gas. Households and other users of natural gas can either decide to accept the proposed alternative which municipalities are obliged to offer, or they can choose a different alternative. In example, if the municipality wants a heat grid in a neighbourhood and is installing this heat grid, the users (such as households and organisations) can either get connected to this heat grid or decide to go for an all-electric option.

The MiHT then proposes an amendment to the Environment and Planning Act (see chapter 3.5) with regard to making the basis explicit basis on which the government sets rules on construction works, draft Article 4.21 paragraph 1 under e Environment and Planning Act. Article 4.21 gives a further, more specific interpretation of the more general basis in article 4.3 Environment and Planning Act. Article 4.21 Ow is expanded in this MiHT, to embed that government rules can be set about making the heat supply more sustainable in and around buildings and therefore rules for instrumentation the district-oriented approach. All in all, the Environment and Planning Act makes it possible to determine that:

– the municipality, through tailor-made rules, can determine that can no longer be used at a certain point are made from natural gas in and around buildings;

– instead buildings are connected to a sustainable alternative;

– a switch to other fossil fuels is prohibited; and

– if a building is heated, one before it suitable (indoor) installation must be present.

The tailor-made rules that the municipality can set on the above topics then end up in the environmental plan (see chapter 3.5.3). The environmental plan therefore contains the legally binding elaboration of the policy from the heat program and the implementation plan.[27] If a municipality makes use of the designation power from this bill, is stated in the environmental plan in any case the chosen alternative to natural gas as a heat source the district and the date on which the district goes off natural gas

(following from the district implementation plan). It will continue environmental plan must make the necessary energy infrastructure possible, such as the construction of a heating network or a reinforcement of the electricity grid.[28]

3.4 Legislation for bioenergy

Biomass, organic material such as wood, pruning waste, sewage sludge, manure and seed oil, may be used as fuel, combusted to generate heat or electricity or fermented in order to create combustible biogas. Biogas can in turn be upgraded to biomethane and for example used in the natural gas network or transport vehicles. Both biomass and biogas play an important part in the transition towards a low-carbon or carbon-free economy. At present, 59% of the European Union's renewable energy is provided by bioenergy.[29] Where it concerns the Netherlands, the Dutch government considers biomass a necessary tool in making our economy more sustainable and achieving climate change. The government seeks to stimulate the use of sustainable biomass to replace fossil fuels with the aim of reducing carbon emissions. This requires optimal and efficient use of the available amount of biomass.

3.4.1 Climate agreement and legal framework

Within the Dutch Climate Agreement a specific task is attributed to biomass when it comes to reaching the intended climate goals for the Netherlands. In fact, the use biomass is considered necessary to solving the existing climate challenge, both now and towards 2030 and 2050. The Climate Agreement signalled a need for the development of a sustainability framework for biomass. This framework should hold sustainability criteria for the production of biomass as well as all other applications thereof.

When it comes to biomass, the legal framework (aside from permits) largely consists of sustainability criteria that apply to various biomass flows and applications. At present, these sustainability criteria stem from the Renewable Energy Directive (RED) and the Renewable Energy Directive II (RED II).[30] As part of a package to deliver on the European Union's Green Deal, the European Commission recently proposed a revision of the latter directive.[31] The proposal seeks to tighten the sustainability criteria for forest biomass and intends to close a number of existing loopholes. As such, the proposal prohibits the use of biomass from primary and highly biodiverse forests as well as the use of stumps and roots. In addition, it extends greenhouse gas emission-saving criteria to existing biomass-based installations and lowers the threshold for applying sustainability criteria from 20MW to 5MW for small-scale installations.

In addition to the sustainability criteria stemming from legislation, many Dutch parties voluntarily use private certification programmes to demonstrate the sustainability of biomass. For example, within the energy sector, national agreements on sustainability have already been developed. Within the Climate Agreement, the Dutch government states its intention to develop similar sustainability frameworks with other climate sectors.

Pointing towards the potential future scarcity of biomass, the Agreement marks an existing untapped potential of inter alia, roadside grass, pruning waste, sewage sludge and residual flows from the food industry. The Agreement seeks to double the domestic supply of biomass in future years, recognising that knowledge development and innovation are part of this. The aim of the parties to the Climate Agreement is to work towards the highest use of sustainable biomass and prioritising its use in the Netherlands towards 2050.

In implementing the Renewable Energy Directive II (RED II) several changes to the existing legislative framework are currently being developed, such as e.g. the proposal for an Energy Act (see chapter 3.2). Where it concerns bioenergy the recently adopted revision of the Environmental Management Act (*Wet Milieubeheer*), which partly intends to implement RED II is especially relevant. This Act[32] inter alia seeks to extend the powers of the Dutch Emission Authority (*NEa*) with regard to so-called links of supply chains of sustainable biofuels and renewable fuels as well as the conformity assessment bodies of recognised voluntary international systems that certify links in the chain of sustainable biofuels. Where the supply chain is located in the Netherlands, especially where it concerns biofuel manufacturers, it will be subject to public supervision. Where it concerns biofuel manufacturers, the NEa will have the authority to check the nature and quantity of raw material received, the ratio between the raw material used and the biofuel produced as well as the quantity of biofuel supplied per customer. The aim of this supervision is to strengthen the assurance of sustainability and the system as a whole.[33] The extended supervision by the NEa will enter into force as from 1 January 2022.

3.4.2 Circular value chain

The Dutch government considers biomass necessary for a cost-efficient approach to carbon reduction and the transition towards a circular economy. Within a circular economy the exhaustion of raw materials is prevented as much as possible and residual materials are largely reused. In essence, in a circular economy waste is reduced to a minimum, thus extending the life cycle of products and materials. The aim of the Dutch government is to make the Dutch economy circular by 2050. This aim aligns with the aims and policies of the European Union. In February 2021, the European Parliament adopted a resolution on the circular economy action plan, which demands additional measures to achieve a carbon-neutral and fully circular economy by 2050. In an effort to securing circularity by 2050, the Dutch government has set three primary goals: (1) making sure that existing production processes make more efficient use of raw materials, (2) ensuring that sustainably produced, renewable (inexhaustible) and generally available raw materials, such as biomass, are used as much as possible whenever new raw materials are needed and (3) developing new production methods and designing new products in a circular manner.

Together with the signatories to the Raw Materials Agreement (*Grondstoffenakkoord*) the Dutch government has drawn up 5 so-called transition agendas that should aid in securing a circular economy by 2050, one of which is “biomass and food”. Each transition agenda sets out how the relevant sector can become circular by 2050 and

what actions are needed to achieve circularity. The transition agenda for biomass and food holds several action points such as increasing the supply of sustainable biomass; the circular and regenerative use of nutrients, optimal valorisation of biomass and residual flows into circular and biobased products as well as the reduction of food waste.

3.4.3 Permits for bio energy

In certain cases, the use and combustion of biomass may require a license or permit. Under the Environmental Law Decree *(Besluit Omgevingsrecht)* the burning of biomass and wood pellets in a combustion plant with a thermal capacity of less than 15 MW does not require a permit. In establishing whether a permit is required the classification of the materials used is of crucial importance. Once biomass is classified as waste, a permit is, in principle, required. However, the combustion of biomass that classifies as waste does not require a permit in the event of its useful application provided that the installation does not exceed a capacity of 15 MW.

All installations are subject to the rules set out in the Activity Decree Environmental Management *(Activiteitenbesluit mileubeheer).* Both installations with a capacity between 15 and 50 MW and a capacity larger than 50 MW require a permit. These installations are respectively subject to section 5.1.5 and 5.1.1 of the Activity Decree Environmental Management. As of 1 January 2024, when the new Environment and Planning Act enters into force, large parts of the Activities Decree will transfer to this new legal system. In chapter 3.5 this will be discussed in more details.

3.5 Environment and Planning Act

As per January 1st 2024 a new legal system will enter into force in the Netherlands. The Environment and Planning Act combines 26 laws and numerous rules and regulations on our physical environment into one law. Procedures will be streamlined, regulations harmonised and, in many cases, decision deadlines accelerated. The Environment and Planning Act further regulates a digital system and a digital counter. The digital system helps clarify which rules apply in a certain area and provides a counter where permits can be applied for.

3.5.1 Key points of the Environment and Planning Act[34]

The new law ensures a coherent approach to the living environment, room for local customisation and better and faster decision-making. The Environment and Planning Act ensures fewer rules, more coherence, more overview for the cooperating parties (such as municipalities, provinces, water boards, competent authorities). Furthermore, there will be one digital Environment Counter. This is a place where all rules of municipalities, provinces and water boards, all plans and all rules for a location or area are to be found. Although it has been used in practice for a while now for local

governments and stakeholders to get used to, there will also be one environment permit for all activities. This means that there is one permit required for a plan, even if more authorities are involved in the plan. The decision on a plan is made more quickly, an award or rejection follows within 8 weeks after application (instead of 26 weeks).

The Environment and Planning Act provides also more room for own initiative and direction. Citizens and organisations will have more opportunities to implement a plan. Certain conditions apply: in example, this plan must not be in conflict with the municipality's environment plan and the initiator must share the plan with those directly involved. Local governments must involve local residents, businesses and organisations in environmental plans. The Environment and Planning Act provides certain rules for authorities how to organize this participation. The first step in the process of achieving an integrated environmental plan is the create the environmental vision.

3.5.2 Environmental vision

The environment vision is a strategic instrument. The environment vision contains the municipality's long-term policy, which does not necessarily is orientated on the area alone. It can, for example, also focus on sectors such as waste, health or circular economy. There is not a prescribed form for the vision: municipalities can choose their own interpretation of the vision.

In the environmental vision, the municipality lays down its long-term ambitions and policy goals for the physical living environment. The municipality adopts one environmental vision for the entire territory. In addition, the municipality can draw up a joint or regional environment vision together with another municipality or with the province. Especially for small municipalities closely located to each other this might be an outcome. Municipalities must have adopted their environmental visions by 1st of January 2027.

An environmental vision addresses the relationship between space, water, environment, nature, landscape, traffic and transport, infrastructure and cultural heritage. The environment vision is form-free: the municipal council determines level of detail, areas, sectors and themes. Municipalities need to lay down in their environmental vision how it will carry out tasks to achieve its ambitions and policy goals. It states how the policy will be implemented and what resources it will deploy to this end. Certain principles need to be taken into account, such as the precautionary principle, principle of preventive action, the principle that the polluter pays and the principle that environmental damage should as a priority be rectified at source (art. 3.3 Environment and Planning Act). Because the Environment and Planning Act is not only about the environment, the effect of the precautionary and preventive principles is broader than in European law.

In short, the environmental vision contains outlines for the quality of the physical living environment, the intended development, use, management, protection and preservation of the territory (which includes subsoil, topsoil and water). Furthermore, it includes also the main points of policy in all relevant areas of the physical living

environment (art. 3.2 Environment and Planning Act). The intended ‘development’ includes the construction of residential areas, business parks and infrastructure, but also, for example, underground construction, wind turbines, energy transition, climate resilience and the like are part of the environmental vision.

3.5.3 Environmental plan

In the environmental vision, the municipality states how it intends to develop and protect the habitat. It elaborates these choices in the environmental plan. The environmental plan thus contains the rules for the physical living environment. The municipality can designate certain activities to certain areas, for example living, recreation or business. In its environmental plan, the municipality has a certain margin of discretion how to formulate the rules for the physical living environment. It is possible to opt for a more general description with preconditions for a development area; however, a more detailed plan or indication what specific rules apply to what activities is also possible. It is stressed by the Dutch legislator that the municipality ensures that the rules in the environmental plan together lead to a balanced allocation of functions to locations (article 4.2, Environment and Planning Act).

When setting rules, the municipality takes into account all the interests involved, whereby it has its own scope for weighing up those interests. Within this scope, the municipality can set specific rules for different parts of the territory, designate functions or characteristics of locations or areas or attach rules to this designation for the use of that place or area.

The rules for activities laid down in the environmental plan may have consequences for the physical living environment. In example, the construction of a residential area, which changes the spatial design of an area or cutting down trees, building a construction or paving a road. The rules can also be more specific, such as quality of the territory or what specific waste rules apply.

3.5.4 Environmental Permit

For certain activities it will be necessary to have a permit. Activities that require a permit are designated by the State in the Environment and Planning Act, the Environmental Activities Decree (Bal) and the Environmental Buildings Decree (Bbl). In example, technical activities or activities that are environmental harmfully, chemical dump in water or construction activities. One of the principles of the Environment and Planning Act is to regulate as many activities as possible with general rules. In some cases, an initiator must make a notification before the activity can be carried out. An initiator can be a citizen, company or government. A limited number of activities still require a permit. In those cases, the initiator must apply for an environmental permit. The environmental permit applies to anyone who carries out the activity for which the permit is intended (article 5.37, paragraph 1, Environment and Planning Act). This may be the person to whom the permit has been granted, but also his successor.

The competent authority may include regulations in the environmental permit. In permit regulations, the competent authority regulates under which conditions the permit holder may carry out the licensed activity. Permit regulations differ from general rules and duties of care. Acting contrary to the permit regulations is prohibited. Permit requirements come in 2 forms: goal regulations and means regulations. Goal prescriptions express the goal to be achieved in objective terms, such as units to be measured or calculated. It is up to the person performing the activity to determine how the goal is achieved. Means regulations immediately oblige the permit holder to take certain measures. These can be both technical and, for example, organizational measures.

When including permit conditions in the permit, the competent authority takes into account the general rules that apply to the licensed activity. The competent authority prevents conflicting or abrasive regulations. However, it is often possible to deviate from the general rules under certain conditions. The competent authority may include regulations in the environmental permit, whereby the competent authority can regulate under which conditions the permit holder may carry out the licensed activity. Permit regulations differ from general rules and duties of care. Acting contrary to the permit regulations is prohibited.

If the competent authority has set specific general rules or permit conditions for an activity (with a view to a specific interest), the general duty of care is withdrawn. This means that if someone complies with general rules or regulations from a permit, the government cannot enforce the general duty of care. Specific duties of care from the always apply, even if there are also rules for a certain activity in the Environmental Activities Decree (Bal) or the Environmental Buildings Decree (Bbl) or if there are permit regulations. The applicable rules or permit requirements are, however, included in the assessment of whether the specific duty of care has been complied with.

Types of permits[35]

I. Integrated environmental permit

An integrated environmental permit can be issued for all activities, such as demolition, construction, felling trees, establishing a facility et cetera. One applies for one environmental permit within a project. If permission cannot be granted for one of the activities, the entire environmental permit will be refused.[36]

II. Partial environmental permit

In this case the project is cut into parts and for each individual activity has applied for a partial environmental permit. Depending on the type of isolated sub-activity, different procedures can apply (i.e. the regular preparation procedure vs. the public procedure). If activities are not separable, the activities cannot be split for issuing a partial environmental permit.

III. Phased environmental permit

An applicant can also apply for the environmental permit in two phases, whereby the applicant declares which activities concerns the first phase. It is necessary that the applicant declares directly to which activities in the second phase these activities of the first phase relates to, in order for the municipality to determine which procedure applies.

3.6 Legal challenges

3.6.1 No integrated legal system

As seen above, the different legal transition paths are complex and challenging on their own, even more when considered all together. It is the national legal agenda on energy that calls for a thorough review of market regulation and for legal instruments that facilitate integration of energy systems. From a general perspective, the markets for electricity, gas, and heat experience the same kind of overall challenges: the need for increasing sustainability in supply and generation of energy, transparency in tariffs, updating the market structure towards future needs, consumer protection and prevention of energy poverty, facilitation of participatory market models and ensuring the reliability of supply. In addition, the type of stakeholders partly overlap: network companies, energy supply companies, ACM, consumers ('prosumers'), and government (municipalities and regional partnerships). These previously separate energy markets should now be increasingly seen in the perspective of a future vision in which systems for electricity, (green) gas, hydrogen, and sustainable heat will become interdependent. This integrated energy market also calls for a governance shift from centralized, top-down decision-making towards regional and local decision-making, a coordinating function by municipalities as well as an increased role of consumer participation. In this context it should be considered to what extent aspects of energy law or regulation are interrelated and how they contribute to a cumulative burden on stakeholders, such as municipalities and network operators, in their daily practices.

This lack of vision becomes clear when considering that legislature has adopted a compartmentalized view in reviewing the energy legislative agenda. Each commodity in the energy market, such as heat, (green) natural gas, hydrogen, and electricity, has been and will be served with individual law and regulation, while it is important to increase coherence in the legislative agenda for the energy market. It is worth mentioning that this desired coherence in law will facilitate the system integration of all renewable energy sources. A (Dutch) attempt to integrate the different acts is made by the legislative proposal "Energy Act", whereby the Gas Act and Electricity Act are transposed into one piece of legislation. This proposed Energy Act aims to implement the European rules and regulations from the Clean Energy for all Package and EU's commitments to the Paris Climate Agreement. This Energy Act, however, is also ambiguous. Various stakeholders have expressed their concerns with regard to several clauses in this Energy Act and it is not clear if, and to what extent, the clauses of the proposed Energy Act will enter into force.

Moreover, no substantive connection is made between the Energy Act and the upcoming revision of the Heat Law, whereas both laws cover aspects of an increasingly interconnected energy market. For municipalities such as Groningen, this compartmentalized approach to the energy legislative agenda may lead to confusion and unnecessary complexity in navigating the rules and responsibilities of stakeholders, and may therefore hamper decisiveness and effectiveness in leading the energy transition locally.

In addition, regarding the development of a market for (green) hydrogen, it is necessary to regulate certain aspects of this market. A few of the legal barriers identified are related to market organization, namely the risk of abuse of (monopolistic) market power, the vital nature of the hydrogen network and the desire to be able to manage 'non-contractual interests'. In the absence of specific legislation regulating the hydrogen market, the roll-out of a hydrogen infrastructure will be difficult. Hydrogen is considered to be, however, an alternative for natural gas for large end-users and not so much on household level. It will contribute to greening the industry where the (in this case sustainable) waste heat can be extracted from and used for the heating and cooling district in the urban areas. As such, the use and optimisation of district heating systems forms a key part in implementing PEDs.

3.6.2 Environmental Act vs. CHS Act[37]

The idea behind the upcoming Environmental act was to simplify the amount of laws that concerned the environment and spatial planning. However, it has been postponed five times before the final date of 1st of January 2024 was set. Based on this Act, municipalities should establish an environmental plan by 2029 at the latest. This environmental plan will, inter alia, provide the legal basis for municipalities to designate natural gas-free neighbourhoods (including existing constructions), which may be a vital step in furthering the development of a district heating network in this part of town. It is important to note that the municipality may decide to utilize instruments deriving from both the Environmental Plan and the Collective Heat Supply Act (hereafter: “CHS Act”) on the same geographical plot or neighbourhood. If so, the environmental plan will also legally embed aspects of the upcoming CHS Act, such as the designation of heat plots and the plans of the heat companies. Furthermore, the role of the municipality will change due to the announcement in 2022 of minister Jetten to create public ownership of at least 50+1 share. The municipality can now participate in the development of a heat grid and the exploitation of it. If a municipality wants to get a certain area (i.e. a neighbourhood) disconnect from the gas grid and replace the gas grid for a heat grid, it needs to have a substantial number of consumers (households and small end users) in order to recoup all investments and have a solid business model. Currently, a municipality cannot intervene in gas contracts, except by enticing homeowners to voluntarily switch from gas to an alternative heat source. However, when the “Municipal Instruments for Heat Transition Act” enters into force by July 2024 (expected), the municipality has the authority to designate an area and end gas transport by a specific date: hence, forcing the consumers to find an alternative energy source for their heating and cooking. This can well be the (planned) heat grid, as an

electric alternative. Consumers might be reluctant to join the heat grid, if they are being forced and can still choose not to get connected to the heat grid. Subsequently, the consumer participation is subordinate to the heat transition, while consumer participation is a strict condition under the Environmental Act. Please note that participation has been a part of the consolidation of the Heat Plan that is a necessary first step before making the announcement that the neighbourhood will be closed off from gas.

It is also worth noting that the current outline of the upcoming CHS Act also creates a few barriers for stakeholders in the energy transition. These barriers are mostly related to market organization and the investing private stakeholders. For instance, the CHS Act will accommodate public ownership of heat networks, or an active public role in construction, transmission and distribution of sustainable heat, also for the existing heat grid that are currently fully privately owned. For those grids, the CHS Act has a transition phase built in. Furthermore, the most recent concept of the CHS Act, presenting a mandatory public majority share in district heating grids, caused a stagnation of investments and withdrawals of private investors in the heat market. Without the private investments, the municipalities might not have sufficient financial means or expertise to establish a heat grid.

When establishing a PED, challenges are mainly related to timing and to anticipating regulatory gaps. First, the two Acts take effect at different times, whereas instruments from each Act partly overlap. Using instruments from one Act without the other Act that holds complementary instruments being in effect, will present delay in investment or governance decisions. In addition, the trajectories for the Energy Act, Heat Act and Environmental Acts experienced considerable delays, due to which their entering into force were also postponed. Now that their dates have been set, the municipality states that using the instruments from those Acts will take too much time in order to obtain local climate goals. Last, many aspects of the CHS Act have not yet been made clear by the regulator, such as the degree of policy freedom that our municipality will have to ensure politically established CO2 reduction norms, a strategy concerning sustainable heat sources, or providing leeway to residents' initiatives in favour of large public heating companies.

3.7 Relevance to the PED-project

As outlined above, the existing legal and regulatory landscape within the Netherlands is, at present, still very much in flux, which makes it difficult to outline real and lasting legal impediments to realising PEDs. More so, some of the proposed acts are likely to enter into force after completion of the Making City Project. Still, the project may take account of some of these future changes and may gear certain experiments, business models and policies towards future legislative changes with a view to making the Making City output as futureproof as possible. When it comes to the upcoming changes, issues that may be of particular relevance the Making City Project are heat districts and the role of the municipality therein, consumer participation, energy data and smart metering systems.

In the future, a larger roll out of heat networks is required for the realisation of Positive Energy Districts as well as fulfilling the ambition of creating a carbon neutral city by 2035. As such, the upcoming changes to the Heat Act (the proposed CHS Act), play an important role in creating future PEDs. The proposed CHS Act contains an important extension of the role of municipalities and includes public ownership. Under the intended revision, municipalities have a directing role when it comes to realising heat districts. It is for the municipality to determine when and where a collective heating system constitutes a valid alternative to natural gas heating. This determination is part of the so-called district-oriented approach. The idea behind the proposal is that public and private companies are allowed to carry out collective heat supply under clear public/ government direction; furthermore, they can own at least 51% of the shares. In this, municipalities play a crucial rule due to the local character of heat networks.

4. Consumer Participation

4.1 Introduction

Consumers[3] and local energy communities play a crucial role in completing the energy transition. In 2021 households represents 27% of the final energy consumption. Electricity accounted for 24,6% of the final energy consumption.[38] The revision and consolidation of the Electricity Act and the Gas Act (into the proposed Energy Act, see chapter 3.2) will allow consumers to take on a more active role in the energy transition, for example by enabling consumers to sell or share the electricity that they have produced themselves. Engaging consumers and stimulating their involvement in the energy transition is imperative to realising a low-carbon energy society as well as PEDs. It is important to note that not all citizens will be capable (i.e. for financial reasons) to participate actively and become involved in the energy transition. Those consumers are protected under European law as well. It will be necessary for municipalities to involve those consumers to some extent, for instance, by providing financial support for the installation of solar panels. In Groningen and other municipalities in the Netherlands several financial supporting schemes are available for these more vulnerable consumers. Hence, their contribution in achieving a PED is provided for as well.

Citizens play an important role in identifying and overcoming urban energy challenges. As such, the Making City Project, in part, focusses on citizen participation. Participation, ranging from citizen-led projects to co-creation of strategies intended to tackle urban energy challenges, may offer paths or solutions not considered by other actors or stakeholders. More so, the empowerment of consumers is considered an essential part of the energy transition. Rapidly falling technology costs will enable more consumers to invest in e.g. rooftop solar panels and batteries. However, self-generation and the sale or share of energy surplus are hampered by legislation and regulation. The same goes for sharing self-generated energy within energy communities. In the Netherlands, long after the implementation date of the relevant EU legislation is expired, is planning to lay down the necessary rules in the upcoming Energy Act (as discussed in chapter 3.2).

New regulations and enhanced digitalisation will allow consumers to become active market participants, e.g. by producing, selling and storing energy. By combining their efforts in local energy communities consumers will be able to participate in the renewable energy trend in a flexible manner by balancing production and consumption at a local level. Consumers may become so-called prosumers (or self-consumers) engaged in the production and consumption of electrical energy. An example is a situation in which residents with solar panels sell their surplus energy to consumers within their local community. By joining energy communities consumers may be able

[3] Although all end users can be considered to be consumers, this chapter focuses on the small end users such as households and small organizations. Consumers here refers to small households or citizens.

to participate in the energy transition by creating decentralised energy systems that promote self-consumption and the use of local resources.

Within the Making City project, a pilot project exists that allows the sharing of (surplus) energy throughout a local community. Since the sharing of surplus energy can contribute to realising a low-carbon energy society, the pilot project enables local residents with solar panels to share their surplus in energy within their community. This is done on the basis of a peer-to-peer (P2P) trading model that allows the integration of distributed energy sources into the existing power system. In essence, consumers become active consumers by producing and consuming electricity. However, it is not only the energy regulation dealing with this new situation of P2P, since it makes use of blockchain technology, other legislation applies as well. In the following paragraphs the development of consumers' role will be briefly discussed. Furthermore, the option of P2P, the technology and the legal framework in the Netherlands will be examined, followed by a discussion how this is relevant when establishing a PED.

4.2 Active Consumers

The Clean Energy Package is a set of measures that is part of the energy union, a large-scale plan for more far-reaching cooperation between Member States in the field of energy and climate change mitigation. Citizens and consumers will benefit from their increasingly active role. The European Commission unequivocally states *'[…] the most important thing: in our vision of the energy union is citizen-centred, he has a say in and control over the transition, he the fruits of the new technologies in the form of a lower energy bill, he is an active market participant and vulnerable groups receive protection*.'[39]

In short, the active customer (or consumer), also called prosumer, is any end user, or group of end users who generate energy and feed the surplus of electricity into the distribution grid.[40] It is also possible that active consumers who, as an ancillary activity, offer energy or participate in energy efficiency or flexibility schemes. The different levels of being 'active', however, are not defined in European legislation, nor in Dutch legislation. The minimal activity an active consumer must perform is to feed in the electricity and sell this electricity to a supplier: hence, becoming 'active' on the electricity market and not limited the participation to demand only. Currently, under Dutch law, it is not allowed to sell or share electricity without the middle man: the supplier who has a license (given by the National Regulating Authority: NMa) to supply to small end users. Under the proposed Energy Act this will no longer be an issue. Supplying or sharing energy should be made possible for small households without being confronted with difficult regulations and requirements. In the proposals for two regulations, where one is focused on improving the electricity market, a new definition of 'active customer' is included. It will also be possible to generate electricity at other locations than the own domestic place. [41]

4.3 Local energy communities

In practice, however, the Netherlands has a long history of energy communities, often legally established as a cooperative. The first energy cooperative was established in 1986: however, the number got skyrocket to over 700 energy cooperatives, representing over approximately 120.000 citizens, participating in 1093 collective solar projects.[42] European (or Dutch legislation) was failing behind on this development. However, with the introduction of the Clean Energy Package, the European Commission.

Citizen Energy Communities (CEC) were introduced by the European Union in its Clean Energy Package. The European Directive on common rules for the internal electricity market (EU 2019/944) is geared towards enabling consumer participation either at an individual level or at the level of citizen energy communities. The directive aims to improve a growth of citizen energy communities that allow consumers to actively participate in the energy transition. Within this directive citizen energy communities are described as legal entities that may engage in the generation, distribution, supply, consumption, aggregation and storage of renewable energy sources. In addition, the revised Renewable energy directive (2018/2001/EU) seeks to enable consumers to share self-produced energy between themselves through renewable energy communities.[43]

Citizen Energy Communities and consumer-led community initiatives play an important part in the energy transition. The directive aims to improve a growth of citizen energy communities that allow consumers to actively participate in the energy transition. Within this directive citizen energy communities are described as legal entities that may engage in the generation, distribution, supply, consumption, aggregation and storage of renewable energy sources. In addition, the revised Renewable energy directive (2018/2001/EU) seeks to enable consumers to share self-produced energy between themselves through renewable energy communities.

Despite some key differences between both types of energy communities both definitions require communities to be set up as a legal entities controlled by their shareholders or members and aimed at providing environmental, economic or social benefits rather than financial profits. It is considered that the participation of citizens in local energy communities may lead to the creation of local markets which in turn may lead to a more decarbonised and flexible energy system. In essence, the Clean Energy Package allows consumers to share energy directly without the active involvement of the supplier of remaining energy. In order to make sure that such energy communities can generate, share and sell self-generated energy within their community Directive (EU) 2019/944 stipulates that active consumers and energy communities are free to supply energy to final customers. At a European level, both Directive on common rules for the internal electricity market (EU 2019/944) and the revised Renewable energy directive (2018/2001/EU) provide various provisions aimed at fostering local energy communities and allowing them to engage in the generation, distribution, consumption, supply and sharing of renewable energy. Although the idea of sharing energy and the empowerment of self-producing consumers was included in the Clean Energy Package, the European Commission published on March 14, 2023 two proposals for

regulations.[44] These proposals include a more clear definition on energy sharing whereby active citizens and energy communities are being enabled to share their self-produced electricity with other persons behind the meter.

Within the Netherlands, these directives will be implemented in the newly proposed Energy Act (see chapter 3.2). This Act will include several provisions that are tailored to local energy communities. As a starting point the Act will include a definition of local energy community that encompasses the definition of citizen energy community and renewable energy community that exist within EU legislation. Making use of a single definition, the proposed Act defines a local energy community (in Article 1.1.) as 'a legal person that pursues activities on the energy market on behalf of its members or shareholders and which main purpose is to provide environmental, economic or social benefits to its members or shareholders or to the local communities in which it is active, while not making a profit'.

In addition, the proposed Energy Act provides a number of rights to members and shareholders of energy communities. These rights are drawn from the Electricity Directive and Directive (EU) 2018/2001. It is required that an energy community has an open and voluntary character; that control of the energy community rests with its members or shareholders; and that members and shareholders can are entitled to leave the energy community. These rights should be included in the articles of association or statutes of any energy community.

4.4 Consumers in the Heat Market

In the current Heat Act, the consumer is defined as "a person who purchases heat from a heating network or an indoor pipe system and: (i) has an individual connection of a maximum of 100 kilowatts, or (ii) has a central connection, supplies heat to a consumer as referred to under i and also: (a) acts as lessor for a consumer as referred to under i, or (b) is an association of owners or a comparable legal form to which a consumer as referred to under i is affiliated". Hence, similar to the gas and electricity legislation, the consumer is defined by the type of connection to the grid. Heat supply that is supplied to connected parties, where the heat is supplied by the Owners' Association (VvE) or cooperative associations, is exempt from the Heat Act. This exception is justified because the members are not tied users that the Heat Act aims to protect. Furthermore, the landlord that supplies heat to its tenants is not considered to be a supplier either.

Under the upcoming CHS Act (see chapter 3), the consumer enjoys more protection. The new law offers better protection for heat consumers, contains improvements in the field of disruptions in the heat supply and provides clarity about the rules that apply. In addition, the CHS Act ensures that maximum heat rates are no longer based on the gas price, but on the actual costs incurred by heat suppliers. In the coming years, more and more households will be connected to a heating network. According to the Dutch national regulating authority (ACM), it is therefore important that consumers can rely on the services of their heat supplier and that the rates follow logically from the costs

that the heating company has to incur. It is worth noting that in contrary to the consumers rights under the Gas, Electricity or proposed Energy Act, the consumer is not allowed to get disconnected from the heat grid once the object (house, building) is connected to this grid. This prohibition is necessary in order for heat companies to have sufficient revenue to recoup their investments. In addition, under the proposed Energy Act article 12 of the Heat Act will be adjusted. Consumers will receive one full or partial compensation in connection with the costs of the connection to the gas transmission or distribution system.

4.5 Energy exchange

Currently, the Electricity Act does not facilitate in the option for energy exchange other than via licensed suppliers.[45] Here the option of sharing energy without making use of the energy system is not even considered: hence, connecting houses with a direct cable is not allowed. Under the proposed Energy Act, however and in line with the European Clean Energy for All package and the draft regulations (as published on March 14, 2023), this situation will change.[46] To understand what is possible we have to make a distinction between the exchange without making use of the energy system and the exchange while making use of the energy system. The borderline here is determined by the meter. It will become possible to share energy and as already outlined in the Clean Energy Package. In this chapter we discuss collective self-consumption briefly and focus on peer-to-peer, as being part of the Making City pilot projects.

4.5.1 Collective self-consumption

In the Netherlands it is possible to offset energy supplied against energy consumed energy, through or so-called netting scheme. From 2025, households and small businesses will be able to gradually pay less. From 2031 onwards, netting will no longer be possible. Every year, households and small businesses can offset slightly less, up to 0% in 2031.

With collective self-consumption, a consumer has a certain share in a collective generation unit. The sharing takes place virtually behind the meter, aligning with the situation of a f a consumer with generation behind his own connection, for example a PV installation on his own roof. Hence, the generation of this installation corresponds to its share, and is therefore considered to be its own generation.[47]

In the Clean Energy Package, the option for collective self-consumption is giving in the definition of ‘active customer’ (art. 2 paragraph 8 Directive 2019/944), whereby consumption or storage of self-generated electricity is possible if it is within confined boundaries or – if permitted by Member States – within other premises. According to the Renewable Energy Directive II[48], consumers have the right to self-consume renewable energy. They may not be subjected to discriminatory or disproportionate procedures and tariffs with regard to the electricity they consume or feed into the

distribution grid. Under the proposed Energy Act, collective self-consumption is not particularly clear. The right for self-consumption is allocated to individuals and extended to groups of collective self-consumers. If this group is not represented as a legal entity, then they are considered as one active customer if:

a. the group consists of final customers of electricity who are in the same building are located;

b. the group has a joint connection;

c. electricity is generated behind the joint connection;

d. this activity does not constitute the main commercial activity of the group;

e. the representative of the group has permission to representation of the end customers involved.[49]

4.5.2 Peer-to-Peer (P2P)

In the Netherlands there is a severe problem of net congestion. Not only for feeding in electricity, but also on the demand side of it. One of the biggest tasks for distribution system operators is to deal with this net congestion by performing congestion management. Market parties can contribute to this congestion management by performing flexibility services. Consumers can also contribute to this as well. A solution is peer-to-peer trade, whereby supply of (renewable) electricity produced by an active consumer takes place by automatic implementation and settlement of supply, directly or via a market operator who realizes the automatic implementation and settlement.[50]

Recital 43 of the Directive on common rules for the internal electricity market (EU 2019/944) recognises that 'distributed energy technologies and consumer empowerment have made community energy and effective and cost-efficient way to meet citizens' needs and expectations regarding energy sources, services and local participation.' In accordance with this model, participants can either sell or buy electricity within their community (see Figure 4.1, below).

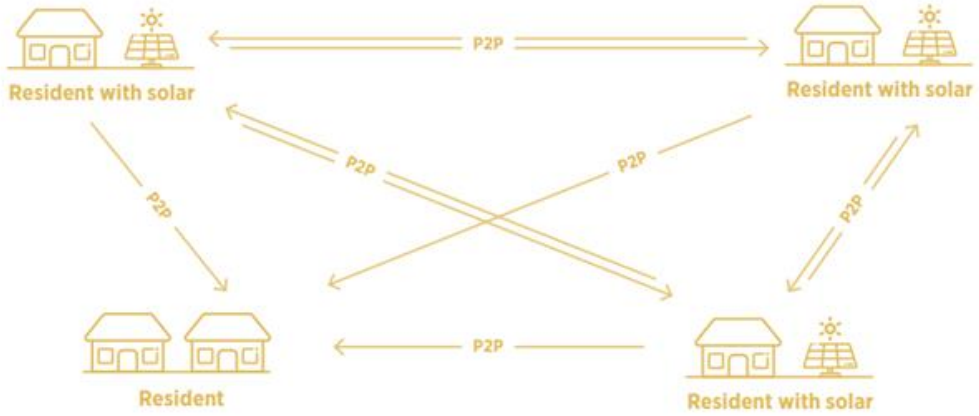

Figure 4.1: P2P electricity trading model (Adapted from IRENA 2020)

The benefits of peer-to-peer energy trading include giving end-users more opportunities to consume renewable energy, reducing the peak demand for electricity, reducing maintenance and operation costs and improving the electrical system's reliability.[51] In order to create a peer-to-peer system producers and users of electricity are playing a role, but also the National Regulating Authority, ICT providers, the facilitator and the Distribution System Operator. Under the upcoming Energy Act this process is not facilitated properly; however, with the upcoming new European legislation (as published in March 2023) this will most likely cause no hindrance anymore.[52]

4.5.2.1 Blockchain technology to facilitate P2P

Although EU legislation does not directly mention blockchain technology in relation to local energy communities it is considered that the existence of this technology will foster the creation of such communities.

In general, P2P trading models tend to make use of an interconnected platform that offers a marketplace which allows participants to trade electricity directly. Within the pilot project, each household/ participant is outfitted with a blockchain ledger which tracks and facilitates all exchanges through smart contracts. In this system, all participants are part of the main distribution grid (rather than an isolated mini-grid). This means that the system interacts with system operators and the general electricity grid (See Figure 4.2, below).

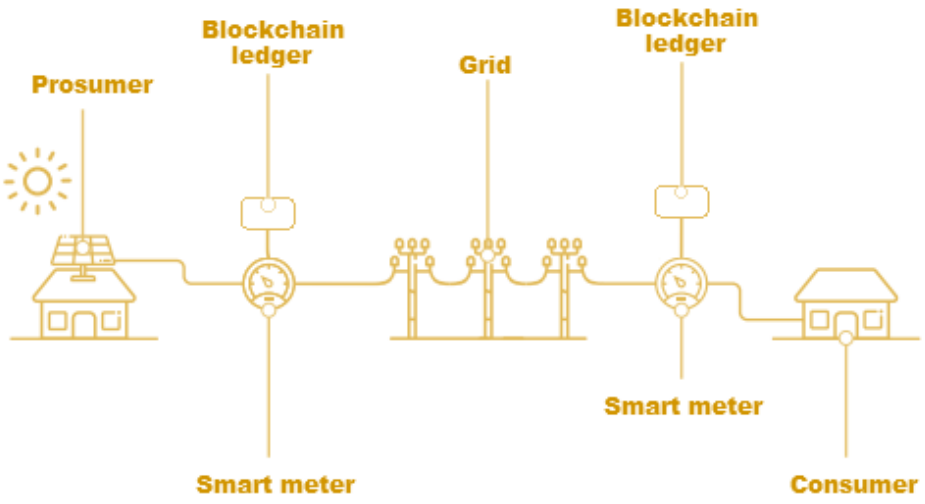

Figure 4.2: P2P model within the Making City Pilot Project[53]

New digital technologies are bringing new opportunities to the energy sector. Blockchain or distributed ledger technology (DLT) offers the possibility to secure the automatic transfer of energy between prosumers and consumers without the use of a centralised intermediary. Although there are many functions and applications of blockchain technologies, blockchains generally operate as ledgers. In essence, blockchains are distributed data structures or ledgers that document digital

transactions. When coupled with smart contracts blockchain technology may facilitate automated digital transactions. In such a setting, all transactions and documentations are virtualised and automatically stored in each blockchain ledger.

4.5.2.2 Consumers and smart contracts

Within the P2P electricity model participants make use of a specialised blockchain device that is connected to the participant's smart meter. This device contains the blockchain software which includes embedded smart contracts. As a result, the blockchain allows for the automated execution of smart contracts within the P2P network.

In simple terms blockchain technology works as follows: a consumer requests to buy electricity from a local prosumer. Once this request is made a block representing that transaction is created. This block is subsequently shared with all the users (within the blockchain users are called nodes) in the network. After the nodes verify the block it is added to the chain (in chronological order). Once this step is completed the transaction is verified and executed (See Figure 4.3, below).

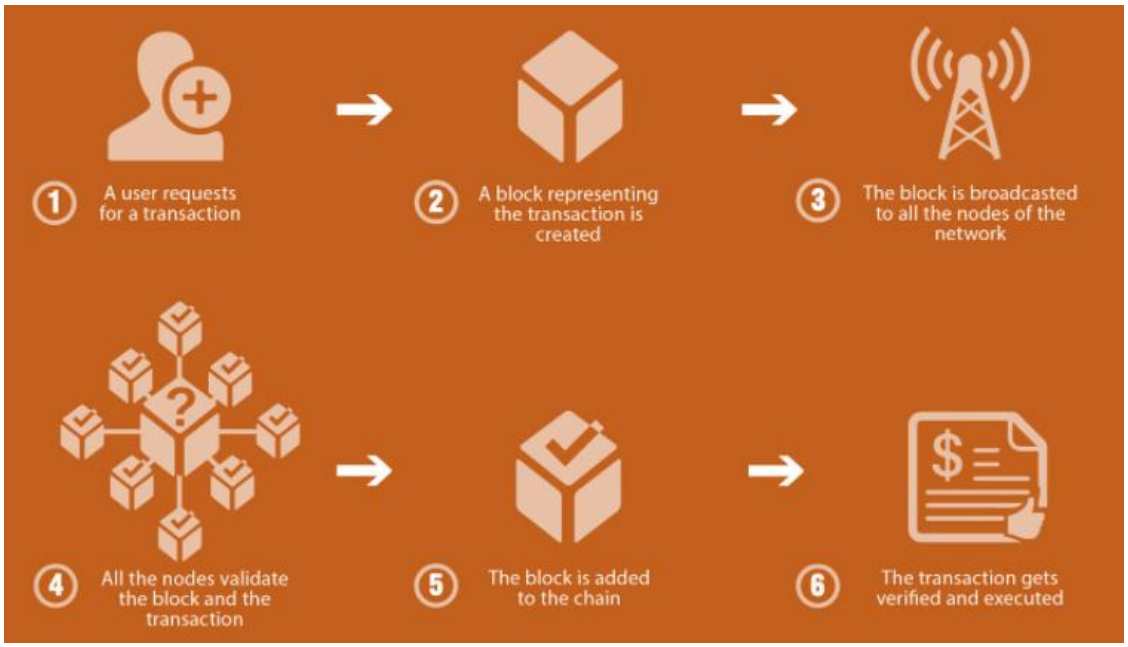

Figure 4.3: How does Blockchain operate? (Source: www.blockchain101.com)

When accompanied by a smart contract a transaction is not physically requested, instead the transaction is executed once a specific condition is fulfilled. Smart contracts tend to be written in simple codes an embedded onto the blockchain. These codes contain certain conditions that are present on the ledger. When a condition is fulfilled, e.g. a neighbour has a surplus in energy that is offered at a target price, the transaction is automatically executed and a record of the transaction is recorded on the blockchain.

At present, Dutch energy regulation protects final customers and micro-enterprises by including a requirement that electricity may only be supplied by a supplied with a supply license. In Article 15, Directive EU 2019/944 ensures that final customers have the right to actively participate in the energy market without being subject to disproportionate or discriminatory technical requirements, administrative requirements procedures and fees. The newly proposed Dutch Energy Act, which seeks to implement this Directive, therefore provides an exception to the prohibition to supply electricity to households and micro-enterprises (small customers) without a license. It is considered that the existing license requirement may act as a barrier for active customers and energy communities to supply directly to households and micro-enterprises. Although the newly proposed exception is similar to the exception currently provided in the Electricity Act 1998, it is considered that a clarification of the rules regarding more suppliers per connection, the (virtual) splitting of allocations points, the correction of the balancing responsibility and the improved access to central messaging will enable more actors, such as energy communities, to make use of the exception. When making use of the exception energy communities will be able to share electricity with their members, either directly or through an intermediary.

Given the importance of security of supply, the proposed exception to the supply license only applies to supply on a non-primary allocation point. At the primary allocation point, only a licensed supplier is allowed to supply electricity. Where it concerns a secondary allocation point, the final customer is free to choose supplier that is exempt from the licensing requirement.

4.6 Net congestion

Besides the empowerment of the small consumers, the abovementioned types of energy exchange can help solve the DSO's problem of net congestion, partially caused by an increasing number of prosumers at household level affecting the capacity on distribution grids. The peak of the injected electricity produced by households is at the highest when the demand is at the lowest. Congestion management is a tremendous task and DSOs are facing difficulties to fulfil their tasks. In rural areas where the grid capacity is low, the DSOs are not able to connect solar parks; however, the requests for connection to solar parks are mostly in the rural areas. The DSO is obliged to comply with this request and to realize the connection. The legitimate excuse provided in the Electricity Act "for as long this can be requested in all equity and fairness" does not apply here. Courts have ruled in several procedures that it is a core task of the DSO to create connections to its grid. This obligation also applies in urban areas; hence, the DSO is facing new challenges when the production capacity of renewable electricity in a region increases. The system can be the weakest link in achieving the PED; therefore, it is therefore necessary to have an integral view on system integration.

Congestion management is defined in Regulation 2019/943, art. 2 (4): *means a situation in which all requests from market participants to trade between network areas cannot be accommodated because they would significantly affect the physical flows on network elements which cannot accommodate those flows.* Member States have to

‘provide the necessary regulatory framework to allow and provide incentives to DSO to procure flexibility services, including congestion management […], in order to improve efficiencies in the operation and development of the distribution system’.[54] Flexibility services are not defined in either the Regulation or the Electricity Directive from the fourth energy package; however, it is implicitly described in other articles.[55] Flexibility in the electricity system can be generated i.e. by creating flexible generation, demand management or by storage.[56]

Besides flexibility created by consumers via P2P or collective self-consumption, another solution for this problem is for DSOs to invest in the expansion of capacity and infrastructure. However, these projects are timely and costly, whereby the costs incurred by the DSO will be passed on to the end-users. Subsequently, energy poverty will increase as well. Flexibility in the electricity system can be created by storage, in example, a large battery at neighbourhood level. This local storage device offers the possibility to deal flexibly with the supply and demand of electricity produced by self-producing consumers (prosumers). It would relieve the electricity grid of the input of green electricity at times when demand is lowest. Legally speaking, however, this solution has several snags (see chapter 4.7). Furthermore, it will remain a governance question whether to invest in the expansion of the grid’s capacity or to invest in alternative local solutions. The municipality of Groningen has to take this into consideration when organizing the final energy mix, and switching whole neighbourhoods to an all-electric neighbourhood. However, the announcement of the DSO that both supply as demand capacity is marked as insufficient in the near future, the investment climate is not auspicious. Lack of grid capacity will hamper the establishment of new organizations and therefore, will negatively impact the local economy.

4.7 Legal Barriers

Net congestion is a serious bump in the road of the energy transition. Currently, the DSO is being challenged to facilitate all requests for connections, with hardly or no capacity in the major part of the Netherlands both at demand and supply side. Congestion management can be performed by dealing with capacity in an alternative way. In the Netherlands, the DSO is now able to offer alternative transport rights, laid down in contractual agreements between the DSO and the company who applies for a connection. For small end users, such as households and SMEs that have a small connection to the grid, there are alternative transport contracts available if that could lead to more flexibility in the system. When a small consumer has a second connection, such is the case with a charging device for Electric Vehicles, the option for flexibility is substantial. It is possible to set charging device in a way that it creates capacity during peak hours. Once a DSO concludes a contractual agreement about alternative transport rights with a consumer, this is legally binding. The “Use-it-or-lose-it principle” does not apply since the profit on the capacity will be relatively small with these connections.[57] These alternative rights can solve the issue of net congestion, due to the fact that it creates more flexibility in the energy system, however, it is in the

beginning of a new legal stage and can lead to more diverse applications and inequality among consumers.

With regard to electricity storage, such as the battery in a neighbourhood, there is no legislation that regulates the ownership of the electricity produced by the households that is stored in the battery. Will the electricity, stored in the battery, become a shared ownership of all the prosumers? In this case, a contract should be drafted between all connected households and the owner or operator of the battery. It is arguable to exploit the storage device as well and run it commercially. Hence, it is necessary to make further agreements on how ownership should be regulated. Additionally, it is not clear whether the connection to the battery falls under the scope of the Electricity Act. It could be argued that the battery becomes an integrated part of the electricity system. It could well be that a supplier must be engaged to supply electricity from this buffer if the connection falls within the scope of the Electricity Act. Other clauses in the Electricity Act can hinder the supply via the battery as well. In addition, there are legal issues with regard to taxation to be addressed.

4.8 Relevance to the PED project

As outlined above, the role of the consumer is not to neglect in the shift towards a PED. For the vulnerable consumers the European legislation provides protection; however, it is necessary to enable them to contribute to the energy transition as well. This can be achieved by providing in financial support schemes for those consumers to become active customers as well. This will decrease their level of dependency, creates more awareness of their energy consumption and lower the energy bills. One of the options is to participate in P2P trade. Once the contracts are concluded with the stakeholders for the supply (and demand) of energy, the blockchain technology will automatically organize the trade. Blockchain is one way to organize smart systems; however, in Groningen this pilot was started to understand how it operates in practice and how to get consumers involved.

As discussed above, the consumers that are more active, who are producing their own electricity, have several options to participate in the market. First of all, it will be possible to share energy with others via the model of collective self-consumption. Secondly, consumers can sell their produced energy via P2P trade. Consumers are empowered to become market participants and are being facilitated to trade the electricity they produced.

Under the Heat Act and the proposed CHS Act consumers' rights are different. Consumers cannot end their contract and get disconnected from the Heat Grid. This is possible with electricity and gas: there is no legislation prohibiting this. Although the municipality can designate certain areas to end all gas transport, forcing consumers to choose an alternative: in example, going all electric or get a connection to a heat grid that is (being) developed. Hence, consumers' right are not unlimited.

The relevance for this PED project is that consumer participation can be created via different methods. One of the least drastic ways is to use electricity produced by own

solar panels (or as an collective group of active consumers or as a member of a local energy community), followed by the option sell own energy via P2P. These methods, however, are only including the consumers that are able to produce their own energy. For a substantial group of consumers this is not possible due to the lack of means. Hence, for an inclusive energy transition it is relevant to not forget this last group of consumers and try to find solutions to reduce energy poverty as well.

For the municipality of Groningen and the consortium partners, the energy transition cannot become a matter for civil servants alone. Citizens can be considered maybe as the key factor for the acceleration of the energy transition: if they are not willing to cooperate, not willing to participate, the process can be hindered. When including citizens and investing in the participation of citizens in the decision making process, a municipality has either the carrot or the stick. If compensation for costs or subsidies are not leading to the desired result (such as a disconnection from the gas grid, the Act “Municipal Instruments for Heat Transition” might be the necessary stick for municipality to get citizens disconnected from the gas grid.

5. Innovation

Innovation lies at the heart of decarbonising the energy sector. The energy transition process requires a rapid deployment of renewable energy technologies. Such technologies do not (always) readily exist and cannot be deployed without systemic innovations across all sectors. These include changes to and innovations in technology, policy, legislation, market design, business models and infrastructure. In essence, the energy transition primarily relies on the deployment of new and sustainable technologies, e.g. technological breakthroughs that provide renewable solutions to sectors where no cost effective alternatives to conventional energy solutions existed. However, as outlined above, the path towards a low or zero carbon emitting economy, or even a city or district, requires much more than just technical innovation. It also requires improvements to existing technologies, the development of new business models and new types of finance or stimulation of the deployment of renewables.

The Making City project makes use of mature and innovative technologies in realising PEDs. In addition, the project contributes to the development of business models and new ways to aid the energy transition within an urban environment, while also fostering social innovation aimed at creating sustainable business opportunities. In developing and deploying these innovative products and ideas businesses as well as the Making City Consortium partners will face questions of intellectual property and product liability. The following paragraphs will address these issues, starting with intellectual property.

When it comes to discussing the issues of intellectual property and product liability, this report provides a brief overview of the existing legislative framework. This overview is not comprehensive nor does it depict any academic discussion; it merely intends to give the Making City Consortium partners and any additional interested parties a brief overview of some issues that may be of relevance when creating and deploying innovative energy solutions.

5.1 Intellectual property

Intellectual property law governs the rights associated with various creations that stem from the human mind. Intellectual property law generally grants the author of an intellectual creation the exclusive right to exploit his creation and benefit therefrom. However, the rights of the author over his creation are not all-encompassing: they may be subject to limitations in terms of scope, duration and territorial application. As such, intellectual property law aims to strike a balance between the interests of the author and the public thus creating an environment that fosters creativity and innovation.

Intellectual property rights are generally divided into two separate categories or branches: industrial property and copyright and neighbouring rights.

Industrial property

- Patent (*octrooi*)
- Trademarks (*handelsmerken*)
- Industrial design rights (*tekeningen- en modellenrecht*
- Trade name rights (*handelsnaamrecht*)
- Plant variety rights (*kwekersrecht*)
- Chips rights (*chipsrecht*)

Copyright and neighbouring rights

Copyright relates to literary and artistic creations, such as books and paintings, but also extends to computer programmes and databases.

Neighbouring rights (*naburige rechten*) are rights neighbouring to copyright and relate to the protection of performing artists, producers of phonograms, and those involved in radio and television broadcasting.

Figure 5.1: Categories of intellectual property

The following (sub)paragraphs will discuss both categories of intellectual property and will address the intellectual property rights that are most relevant when it comes to the Making City project and innovation associated with the energy transition. Examples include rights relating to computer platforms allowing consumers to share their energy surplus or the rights relating to business models (e.g. social, technical or financial) intended to accelerate the energy transition., The following paragraphs will focus on the most important aspects of intellectual property rights such as their creation, durability, transferability and enforceability.

Intellectual property rights are generally viewed as an exception to the freedom of competition. The freedom of competition is an important principle that exists within many countries including the Netherlands. Under the freedom of competition anyone is free to produce and has the freedom to trade what he has produced for his own interests and profit. Intellectual property rights form an exception to this principle by granting someone exclusive rights over certain creations.

5.2 Patent

Patent law relates to inventions. A patentholder (inventor) has the exclusive right, sometimes called a monopoly, to stop others from using or exploiting his patented invention. As such, the law provides the patentholder with certain exclusive rights for a limited period of time. During that time the patentholder can prohibit (or allow) others from using or otherwise exploiting his invention. When it comes to innovation within the energy sector, several technical novelties may be patentable. Generally, patents within the renewable energy sector are divided into four categories: solar power, fuel cells, wind energy and geothermal energy. The figure below shows the patent applications in these categories in recent years (according to the World Intellectual Property Organisation)

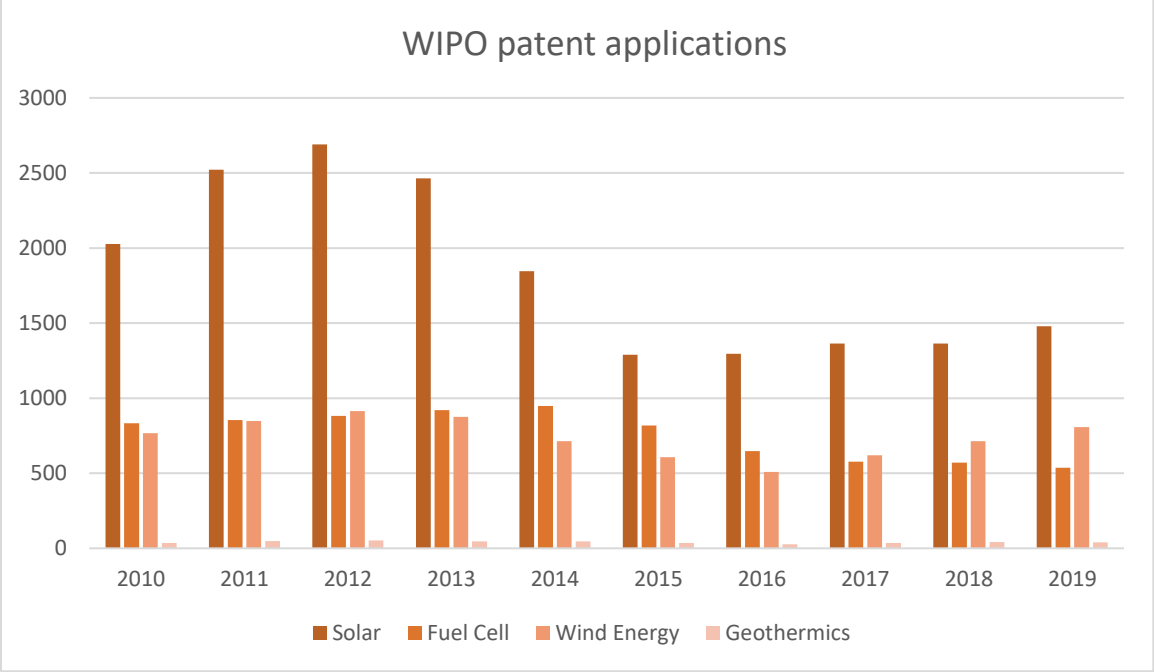

Figure 5.2 Patent applications in the renewables sector (*Source: WIPO)*

Within these categories parents play a prominent role as they may attract investors and allow inventors to profit from their inventions as well as grant them recognition. In essence, patents play and important role within the entire life cycle of new inventions and technologies, from the initial research and development to market introduction.

5.2.1 Patent creation

A patent is not created automatically at the time of creation of the invention (this is different where it concerns copyright, see below, para 4.4). A patent can only be obtained by the creator of an invention upon his request. In this sense two application processes can be distinguished. First a process where there is a preliminary

examination of the application and second, a process without preliminary examination. In the first process the patent is granted only after certain substantive requirements have been met. In the second process a patent is granted after a formally valid application.

Here, a distinction can be made between a European patent (a bundle of national patents for which a single application procedure exists) and e.g. a Dutch patent. A European patent requires a preliminary examination, whereas a Dutch patent does not require such examination. The rights associated with a European patent arise at the time of publication of the patent grant whereas the right associated with a Dutch patent arise on the day that the patent is granted. A European patent comes with a presumption of validity, since it is subject to preliminary examination. Such a presumption does not exist for Dutch patents since the validity of the patent is not substantially examined within the Netherlands. As such, the risk that a patent turns out to be invalid is greater where it concerns a Dutch patent than where it concerns a European patent. In practice the European patent is considerably more important.

The application for a patent must be made to an official body charged with granting such patents. Where it concerns European patents applications must filed with the European Patent Office (EPO). European patents are patents granted under the European Patent Convention. In accordance with this Convention it is possible to obtain a patent in all Contracting States via a single application. In accordance with Article 2 of this Convention “the European patent shall, in each of the Contracting States for which it is granted, have the effect of and be subject to the same conditions as a national patent granted by that State, unless this Convention provides otherwise.” As such there does not exist one European patent. Since patent, like other intellectual property rights, is territorial in nature, a European patent in essence covers several national patents. As of 1 October 2010 there are 38 Contracting States to the European Patent Convention. As such the application of the European Patent Convention is not limited to the Member States of the European Union.

The Dutch patent-granting authority is the Dutch Patent Office.[58] In accordance with Article 24 of the Dutch Patent Act (*Rijsoctrooiwet)* applications for Dutch national patents must be submitted to the Dutch Patent Office. This office is also the receiving office charged with receiving applications under the Patent Cooperation Treaty.[59] Where it concerns European patents the Dutch Patent Office acts as the body that is responsible for recording the relevant date in the patent register.[60]

5.2.1.1 Patentability

Not all inventions, even within the renewables sector, can be the subject of a patent. Articles 52 *et seq.* of the European Patent Convention relate to the patentability of inventions. This Article reads as follows:

1. *European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application.*

2. *The following in particular shall not be regarded as inventions within the meaning of :*
   a. *discoveries, scientific theories and mathematical methods;*
   b. *aesthetic creations;*
   c. *schemes, rules and methods for performing mental acts, playing games or doing business, and programs for computers;*
   d. *presentations of information.*
3. *shall exclude the patentability of the subject-matter or activities referred to therein only to the extent to which a European patent application or European patent relates to such subject-matter or activities as such.*

Accordingly, patents for inventions in all areas of technology will be granted if four conditions are met. First, there must be an invention, second the invention must be new, third the invention must be inventive and fourth one must be able to apply the invention within the field of industry.[61] An additional requirement, that follows from Article 83 of the European Patent Convention as well as Article 25 of the Dutch Patent Act, is that the patent application has to disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. In other words, the invention must be reproducible.

Neither the European Patent Convention nor the Dutch Patent Act provides an express definition of invention. What is clear is that the invention must be technical in nature. Article 52(2) provides a list of exclusions, such includes under a. discoveries. Discoveries such as the conduction electric current are therefore not considered inventions and not patentable. However, new and inventive technical applications of electricity can be subject to patenting.[62]

As outlined above, a patent will only be granted if certain conditions are met. The first condition is novelty. As such, the invention must be state of the art and not exist within the public domain within any form. In accordance with Article 54 of the European Patent Convention an invention is considered new if it does not form part of the state of the art at the time of filing the application. State of the art comprises everything made available to the public by means of a written or oral description, by use, or in any other way.[63] Previously filed patent applications which were published on or after the patent application in question are considered to be part of the state of the art.[64] Novelty means that the invention must not have been made public anywhere in the world. As such publication on a website, in a publicly available brochure, newspaper or PowerPoint presentation is sufficient to harm the novelty requirement. If the invention has been made public at any time, it is no longer available for patenting. However, the publication must cover the full invention in order for it to harm the novelty of the invention for which patent is sought.

In line with the Dutch saying “who is claiming, should be proving” (*wie stelt moet bewijzen)* the burden of proof lies with the party who claims that the invention is not novel.[65] In other words, anyone who claims that a patent is invalid because the invention described therein is not new bears the burden of proof.

In addition to the novelty requirement, the invention must be inventive.[66] This requirement is sometimes called the requirement of non-obviousness since the invention must not be obvious. It is the requirement that someone would not easily be

able to create the invention by looking at what has already been invented. Here, again, the state of the art is an important starting point. If the invention or solution to the problem was obvious to those skilled in the art (with access to the full state of the art) on the date of application, the invention lacks inventiveness. To avoid speculative patents, the patent application must also make it plausible that the technical effect needed to solve the problem is achieved by the invention. If the patent application does not make the achievement of the envisaged technical effect sufficiently plausible the patent may be invalid or denied because it cannot be reproduced[67] or because it lacks inventiveness.[68]

The third requirement for granting a patent is that the invention must be susceptible to application within the field of industry. As per the definition provided in Article 57 of the European Patent Convention and Article 2 of the Dutch Patent Act An invention shall be considered as susceptible of industrial application if it can be made or used in any kind of industry, including agriculture. As such there is a broad application of this requirement. The requirement distinguishes technical inventions that are subject to application to inventions that are purely aesthetic. What is required is that the application of the invention improves upon the technical solutions and inventions that already exist.

5.2.1.2 Application

The requirements for the application of a European Patent are provided by Art. 78 *et seq.* of the European Patent Convention. In accordance with Art. 78 a European patent application may be filed with the European Patent Office, or, if permitted by the law of the Contracting State with the central industrial property office or other competent authority of that state. The patent application itself serves as the basis for the patent if granted. The application must contain a description of the invention, one or more claims, any drawings referred to in the description or the claims as well as an abstract and must comply with the Implementing Regulations.

The description must provide an overview of the state of the art relevant to the invention and clarify which technical problem the invention aims to solve as well as the solution to that problem. The invention should be disclosed in a manner clear and complete enough for it to be carried out by a person skilled in the art.[69] The patent application must, in addition, contain one or more claims. These claims shall be clear and concise and be supported by the description. The claims are considered the most important part of the application and define the matter for which protection is sought.[70] As a rule, the application shall only relate to one invention. It is however permitted to submit an application that relates to a group of inventions that are linked to such an extent that they form a single inventive concept.[71] The application can be amended after it has been filed, but not beyond the content of the original application or beyond the scope of protection sought in the original application.[72]

5.2.1.3 Application process

The application process or grant procedure consists of several steps. After the application there will be an examination of the filing and formal requirements, followed by a novelty search. The European Patent Office carriers out the novelty search *ex officio* or automatically. Publication of the application will take place eighteen months after the application or priority date.[73] It is possible to speed up this process. This generally occurs if the applicant discovers that third parties are already using his invention, providing him with any interest in the speedy grant of the patent. In order for the substantive examination of the application to begin, the applicant must file a request for examination. This request is deemed not to be filed until the examination fee has been paid and must be filed within six months after publication of the search report in the European Patent Bulletin.[74] After the substantive examination the patent will be granted or rejected. According to Article 97 of the European Patent Convention the decision to grant the patent will take effect on the date on which the mention of the grant is published in the European Patent Bulletin. After publication interested parties have nine months to start the opposition procedure. This follows from Article 99 *et seq.* of the European Patent Convention.

The figure on the following page clearly outlines the separate steps in the application progress:

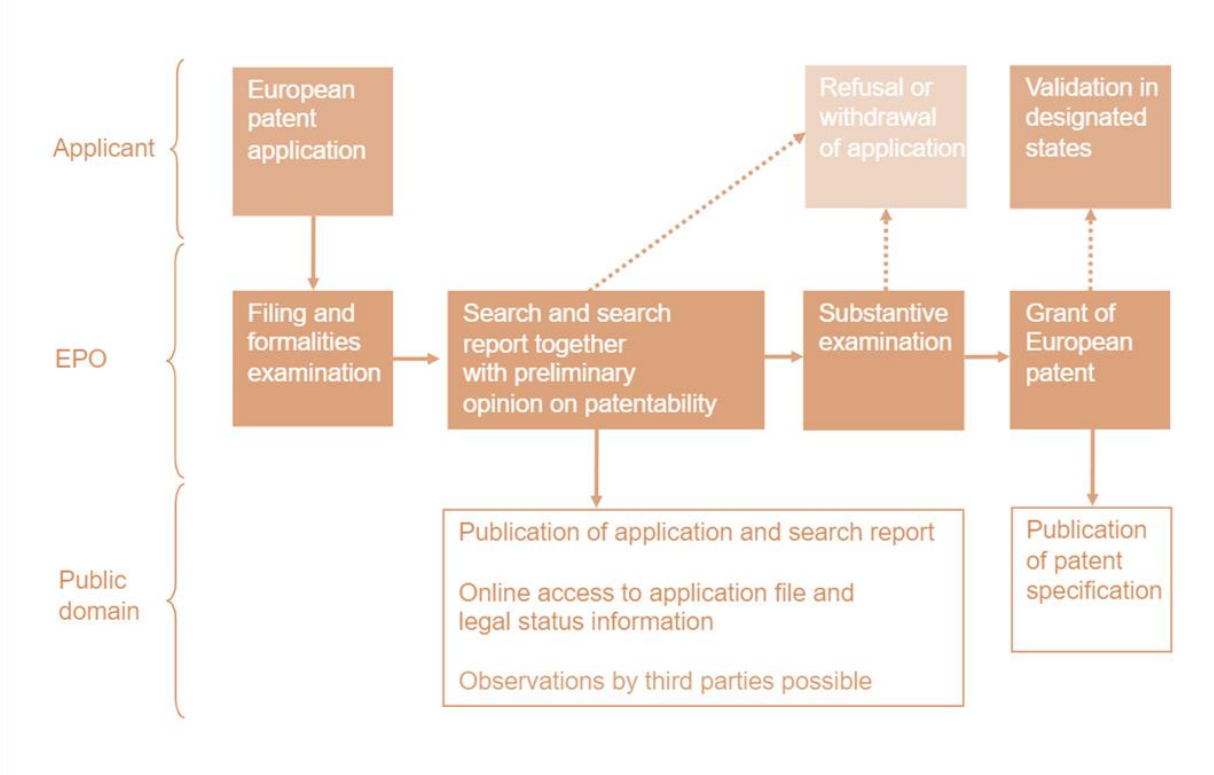

Figure 5.3: Application procedure for a European Patent (Source: European Patent Office)

The requirements that exist for Dutch patents do not differ from the requirements that exist for European patents. However, the application procedure does differ. The most important difference in procedure is that under the Dutch patent application procedure, there is no preliminary investigation into the validity of the application. As such, a Dutch patent is granted upon registration. The substance and validity of the patent is tested only in infringement proceedings.

5.2.1.4 Party entitled to the patent

Article 60 of the European Patent Convention and Article 8 of the Dutch Patent Act both state that the inventor has entitled to the patent. In general, the applicant is considered the inventor unless there is evidence to the contrary.[75] As a rule of thumb, the right to the patent is attributed to the first to file the patent and not to the first person to have made the invention. Thus the applicant is not necessarily the inventor, he may e.g. also be the person who bought the invention or the employer of the inventor. Where it concerns the rights associated with a patent as well as the rights to the patent itself it is important to remember that a European patent is not a patent itself, but resembles a bundle of patents from various Contracting States. As such, the laws that govern these separate patent are of a national nature. For example, a Dutch patent is governed by Dutch patent law. In discussion these issues below reference will therefore be primarily made to Dutch patent law.

5.2.1.5 Employment

If the invention occurs while the inventor is in the employment of another is conducting research at a university, university of applied sciences or other research institute the invention is attributed to the employer. Employment contracts frequently include clauses that attribute all intellectual property created within the course of employment to the employer. These clauses generally refer to Article 12 of the Dutch Patent Act which, in paragraph 1, states that the employee is entitled to a patent, unless the nature of the employment relationship requires the employee to use his special knowledge and skills to create inventions within the same area and of the same kind as the patent under application. The employer is not entitled to inventions outside of this area. This provision equally applies to public law relationships, as such where public officials create an invention within the course of their work/ employment the right to patent that invention belongs to government agency for which the public official conducts his work. If the invention is made as part of an internship or a traineeship the patent will belong to the person for whom the activities are performed. The same goes for inventions made by someone who carries out research in the service of a university, university of applied sciences or other research institute. There the right to a patent belongs to the institution.

What is clear from Article 12 of the Dutch Patent Act is that the right to patent inventions made within the course of employment tends to belong to the (legal) employer. To determine whether an invention was created during employment it is important to establish the time of the creation. It is generally considered that this time equates to

the moment at which all the conditions for filing a valid patent application have been met. What is important is that the invention must be able to be described in a reproducible manner.

5.2.1.6 Independent contracting

If the (invention) activities are carried out outside the scope of employment, e.g. by an independent contractor, Article 12 of the Dutch Patent Act does not apply. In that case, on the basis of the general rules, the actual inventor is entitled to the patent.[76] Parties can agree to deviate from these general rules and (sub)contracting and service agreements generally include clauses on (the rights to) intellectual property.

5.2.1.7 Joined invention

As a general rule, if an invention is created by a joined effort of several people the agreement concluded between the parties determines their individual entitlement to the patent.[77] If no agreement has been concluded the parties are all jointly entitled to the patent. In order to be entitled to the patent each party must have made an inventive contribution. Mere financing or craftmanship do not provide a right to the patent. Unless agreed otherwise, all parties are entitled to exploit the invention. However, licensing the invention to third parties is only allowed by the joined agreement of the patentholders.[78] Here too, the joined inventors or inventors who work together in a consortium can agree to deviate from these rules by contract.

5.2.2 Patent rights

The most important right of the patent holder lies in his right to prevent others from using his invention. As such, patent primarily boils down to a so-called right of prohibition. As per Article 70(1) of the Dutch Patent Act the patentholder may enforce his patent against anyone who, without having the right to do so, performs any of the acts exclusively reserved for the patentholder, such as reproducing, selling or using the invention.

Where it concerns the rights and actions relating to patent a distinction is made between two different patent categories: patented products and patented work processes. Article 53(1) a of the Dutch Patent Act relates to patented products and provides the patentholder with the exclusive right to manufacture, use, market, resell, rent, deliver or otherwise trade the patented product. Per Article 53(1)b of the Dutch Patent Act the patentholder of a patent relating to a work process has the right to apply, market or resell, rent, deliver or supply the product directly obtained by applying that process or to trade it, import it, or have it in stock.

5.2.3 Scope of protection

It is important to determine the extent or scope of protection. In discussing the patent application, it has already been pointed out that the claim forms the most important part of the application. It is this claim that also determines the scope of protection of the patent. In accordance with Article 69 of the European Patent Convention the extent of the protection conferred by a European patent or a European patent application shall be determined by the claims.

5.2.4 Length of protection

For reasons of fairness the protection granted by any patent is temporary. Both Dutch and European patents provide protection for a duration of 20 years.[79] The starting point for calculating the length of protection is the filing date of the application.

5.2.5 Enforcement

The rights that relate to the enforcement of a patent are the most important. These rights allow the patentholder to enforce his exclusive rights against anyone who may wish the infringe upon these rights, for example, by selling or reproducing his invention. The rules concerning the enforcement of patent rights are incorporated in Articles 70 to 74 of the Dutch Patent Act. The rules and procedures described in these provisions concern the civil law enforcement of patent rights. Even though a criminal enforcement procedure exists, such enforcement is not common in practice.[80]

As a general rule, patents can only be enforced after they have been granted. It is the patent holder who has the right to enforce his patent.[81] As such, those with a derivative right such as licensees do not possess the independent right of patent enforcement.

Per Article 80 of the Dutch Patent Act the district court of the Hague has exclusive jurisdiction over patent disputes. In cases involving the infringement of a patent, fault or liability is not required. This is different in cases that involve a claim for (compensatory) damages. Article 70(3) of the Dutch Patent Act clarifies that compensation can only be claimed from the person who know or should reasonably have known that his actions were infringing.

5.2.6 Transfer of the patent and related rights

An important question when it comes to patents is whether a patent equals ownership in the sense that a patent can be held and transferred or sold to others. A patent constitutes a property right within the meaning of Article 3:6 of the Dutch Civil Code. For the purposes of property, the right to the patent is equated with the patent itself.[82]

As outlined above patent rights can belong to one or more people and can be transferred to third parties. Similar to other property, the patentholder, can sell patent rights, exchange them, give them away or lend them.

An example of exploitation of patent rights is licensing.[83] In the case of licensing the patent holder grants third parties the right to perform acts that are normally exclusively reserved for the parent holder. The grant of a license usually occurs against the payment of a sum of money, either a through lump sum payment or periodic payments. An important distinction in licensing is the difference between an exclusive license and an ordinary license. An exclusive license concerns the situation in which the patent holder promises not to grant the license to anyone else. He may even promise not to make use of the patent himself. By contrast, ordinary licenses may be granted to multiple parties.

5.3 Copyright

Within the Netherlands, the laws on copyright are codified in the Copyright Act (*Auteurswet)*. Article 1 of the Copyright Act defines copyright as the exclusive right of the author of a work of literature, science or art, or his successors in title, to publish and reproduce it, subject to the restrictions imposed by law. As such, the Act intends to protect work that is a creation of the mind. Copyright protects a variety of creations, ranging from books and journal articles to computer programmes and databases.

As with patent, copyright provides the author with a monopoly over the use and reproduction of the work. As such, the use of the work is prohibited without the express consent of the author of the work. When it comes to technologies and innovations in the energy sector works that hold a copyright may be computer programmes enabling the sharing of energy, computer codes and algorithms that allow devices to communicate within a smart grid that may be intended to regulate consumption peaks and manage the priority of domestic appliances or documents describing and outlining certain business models.

5.3.1 Copyright creation

Copyright comes into existence automatically, by operation of law, through the creation of a work of literature, science or art. As such, protection of the work is not subject to any formality, such as registration. The Berne Convention, which was adopted in 1886, counts as an important Convention where it concerns copyright. It grants authors the means to control how their works are used, by whom and under which conditions. The Berne Convention does not allow the existence of formal requirements for the creation of copyright protection.

5.3.1.1 Definition of work

Copyright protection exists with regard to all works of literature, science or art. As such, it is important to define what constitutes such a work. In this determination the definition of work decisive. This definition is not defined at a national level. Instead, it is harmonised throughout the European Union. The concept of work is an autonomous concept of European law that must be interpreted and applied uniformly throughout the

European Union. For a “work” to be created two conditions must be fulfilled. First, the concept of work entails that there exists an original subject matter in the sense that it is the author’s own intellectual creation. Second, the classification of work is reserved for the elements that are the expression of such a creation. The first condition can be demonstrated by the fact that the work includes the author’s free and creative choices. Since the existence of a copyright does not require prior examination it is for the court to determine whether a work entails the intellectual creation of the author. The party that invokes the copyright has to prove that his creation or object constitutes a work.

Article 10(1) of the Dutch Copyright Act contains a list of categories of works with regard to which a copyright may arise. This list includes e.g. books, brochures, magazines, newspapers, theatrical works, oral presentations, drawings, paintings, sculptures, geographic maps, designs, photographic works, industrial drawings and computer programs.

5.3.1.2 Computer programs

Computer programs were not traditionally covered by copyright or the Copyright Act. Copyright is extended to computer programs on the basis of the European Directive on the legal protection of computer programs (2009/24/EC), also known as the Software Directive. In accordance with Article 1(3) of the Directive a computer program shall be protected ‘if it is original in the sense that it is the author’s own intellectual creation. No other criteria shall be applied to determine its eligibility for protection.’ As such, the intellectual ideas of the author embodied in the computer program shall be protected on the basis of copyright. Other considerations related to the computer program such as concrete problem solutions, programming language and the format of data files are outside the scope of copyright protection. In accordance with the case law of the Court of Justice of the European Union the directive only protects those expressions of a computer program that can lead to reproduction of the program, such as the source code, the object code and preparatory material.[84] As such, the user interface, the programming language and data files are not protected by the special rules on copyright for computer programs. However, this does not mean that these remain unprotected: they may be protected by the general rules on copyright.

5.3.1.3 Databases

Akin to computer programs, databases are protected by copyright. This protection stems from the European Directive on the legal protection of databases (96/9/EC) and is incorporated into Article 10(3) of the Copyright Act. This paragraph states that databases are protected as independent works. Additional protection for databases is laid down in the Database Act. This Act protects any collection of works, data or other independent elements, arranged systematically or methodically and individually accessible by electronic means or otherwise. An important criterion for the protection of databases is that the compilation or maintenance of the collection requires a substantial investment.

5.3.2 Party entitled to the copyright

In general, the author of a work is considered the party that owns or is entitled to a copyright. However, akin to other rights and forms of property, copyright may be transferred to others and the author may grant derivative rights, such as licences to third parties.

5.3.2.1 The author

Under Article 1 of the Copyright Act the copyright or exclusive rights to a work are attributed to the author or his successor in title. The Article itself does not contain a definition or author. It is the definition of the work that is decisive. This work is a creation of the mind and not a tangible object in which this creation is embodied. The author is the creator of this “creation of the mind” and not the creator of the tangible object. For example, it is not a book itself that is protected, but the ideas that are embodied within the book.

As a general rule, the author is considered the copyright holder at the time that the work is created. However, he does not necessarily hold the copyright indefinitely. The right of the author can transfer to his successors in title. As such, the author may transfer, e.g. sell, his copyright to a third party.[85] In that scenario the author will continue to be the author to which the personality rights of Article 25 are attributed. However, the copyright, as well as the right to exploit this right, will belong to the third party. As a result of the transfer the third party, or new copyright holder, will have the right to exploit the work, which includes the right to provide third parties with licenses.

5.3.2.2 Works created under supervision

Under Article 6 of the Copyright Act the author of a work that has been created under the (direct or indirect) supervision of another is not granted copyright of the work. Instead the copyright belongs to the person under whose supervision the work was created. In part, this is the embodiment of the general rule that the copyright is granted to the author of the creation of the mind. If works are created under the direction and supervision of another, the latter is considered the creator of the work.

5.3.2.3 Works created during employment

For works created in the employment of another a legal fiction exists. In accordance with Article 7 an employer is considered the author of the work created by his employees. This forms a deviation from the general rule that the copyright is granted to the author of the creation of the mind. The application of Article 7 requires that the employee creates his own work in the service of another. For Article 7 to apply, the work must be created within the employment relationship. It is not required for the employer to have provided the employee with detailed instructions regarding his creative task. It is not required that the work is the product of the employee’s contractual tasks. Even if the employee was provided with an incidental tasks that goes beyond his regular duties, will the copyright transfer to the employer.

In situations where the employee merely produces the work created by his employer, Article 7 does not apply. In that situation the employer was already considered the author of the work.

Parties can agree to deviate from Article 7 of the Copyright Act. As such, the parties may e.g. contractually agree that the employee is entitled to all copyright stemming from his work.

5.3.2.4 Multiple authors

When multiple authors create a single work, each contribution may not be considered a separate work granting a separate copyright. There exists an undividable work created multiple authors whenever the individual contributions of the cooperating authors cannot be divided or separately considered. As a result, these exists a single work to which there exists a single undividable copyright. Only contributing authors will become holders of this undividable copyright. In accordance with Article 26 of the Copyright Act the conjoined copyright may subsequently be enforced by each copyright holder.

In situations where multiple authors have created separate works that belong together but are not undividable, each author will hold a separate copyright that relates to his (part) of the work.

5.3.3 Evidence presumption

The Copyright Act contains certain presumptions of evidence in Article 4. Of these, the mention of the author is the most relevant. Subject to any proof to the contrary, the person who is mentioned as the author of the work is considered its author. This only applies where the mention or indication is part of (a copy) of the work. For example, if a book lists an author or a pseudonym that person is considered the author of the work. Any evidence to the contrary may serve to demonstrate that the indicated author is not the actual author or creator of the work.

5.3.4 Transfer of the copyright and related rights

Copyright may be transferred similar to other types of property. As such, the holder of a copyright may transfer or sell the whole or part of a copyright to a third party. In addition, copyright will transfer to the heirs of a deceased copyright holder or be transferred as part of a merger or acquisition. The full or partial transfer of a copyright can only take place by means of a dead intended for that particular purpose (Art. 3:95 Dutch Civil Code). This deed is a signed document that has been drawn up to serve as proof of the transfer. This deed may be public or private. An example of a private deed is a letter or confirmation of transfer by the author. In many cases, part of a copyright is transferred or a license is granted. A partial copyright may relate to publication, reproduction or translation. A transfer may also relate to a future copyright, provided that the future work is sufficiently described.

5.3.5 Licensing

The transfer of copyright differs from the derivative rights that a copyright holder may bestow on a third party. An example of such a right is a license. A copyright holder may provide a third party with a license to perform certain acts that are exclusively reserved for the copyright holder, such as the disclose and reproduction of the work.

In most cases the copyright holder (licensor) grants a license against the payment of a fee or royalty. This license or the associated agreement provides a description of the acts that the licensee is allowed to perform with regard to the work, such as producing or showing the work.

In general, licenses are subject to the general rules on contract law that exist within the Dutch civil code. Only exclusive licenses have to be granted via a deed whereas no formal requirements apply to non-exclusive licenses. Exclusive licenses are licenses that are granted to a single licensee. In these cases, the licensor promises not to grant the same rights to other parties, nor is he allowed to perform the acts permitted to the licensee himself.

5.3.6 Duration

Pursuant to Article 37 of the Copyright Act a copyright ends 70 years after the author's death starting the 1st of January following the year of the author's death. A copyright that has more than one author lasts until 70 years after the death of the last deceased author. This is different where the author is e.g. a legal person. For works of which the duration of protection cannot be calculated on the basis of the death of the author the copyright lasts until 70 years after the first lawful publication of the work, starting the 1st of January of the year following publication. This stems from Article 38 of the Copyright Act. However, if the work or copies thereof publicly identified the natural person who created the work, the general rule of Article 37 still applies.

5.4 Product liability

Any product, even innovative products, may potentially hold a defect that results in damage to a person or to property. Product liability refers to a manufacturer or seller's liability for putting a defective product into circulation. Examples of such defects are a defective design or manufacturing defects that cause injury or business interruption. This paragraph discusses some of the main rules that exist within the Netherlands when it comes to product liability.

5.4.1 Legislative framework

Within the Netherlands the legislative framework regarding product liability has its basis in the Dutch Civil Code. This Code holds a section on product liability (Article

6:185 DCC *et seq.)* as well as a general section on tort (Article 6:162 DCC *et seq.*). Both sections may apply in the event of product liability. Application of the Dutch Civil Code is however largely limited to situations in which the product was used, marketed or put into circulation in the Netherlands and/or the Dutch courts have jurisdiction over the claim for damages. Once a product is sold and marketed beyond the Netherlands other laws on product liability are likely to apply.

5.4.2 Product liability

Article 6:185 of the Dutch Civil Code imposes a strict liability on the producer of a product in the event that a product that he put into circulation shows a defect that has resulted in damage. There exist six limitative exceptions to this rule: (1) the product was not put into circulation, (2) the product was initially not defective, (3) it involves a non-commercial product, (4) there was government permission, (5) it involves a development risk and (6) it involves a non-defective component:

(1) A product enters into circulation once is has is offered to the public for the use or consumption. In most cases a product will be put into circulation by sale. A producer is not liable in the event that the product had not entered into circulation or if the product entered into circulation against his will, for example by theft. \

(2) A producer is not liable if he is able to demonstrate that the product was not defective at the time that is was put into circulation.

(3) Only professional and commercial producers are subject to the strict liability that exist for damages resulting from a defective product. A product is not professionally or commercially produced if it is not disseminated with an economic purpose and the manufacture or distribution does not occur for commercial purposes.

(4) Simple governed permission is not sufficient for a producers release from liability. In order not to be liable a producer needs to demonstrate that the design of the defect is a direct result from the need to comply with government regulations.

(5) A producer is not liable for damages caused by a defect that was present at the time that the product was put into circulation, but that was not detectable in accordance with the most advanced scientific and technological possibilities of the time.

(6) The producer of a component that is not itself defective is not liable for a defect in the final product that is the result of product design or the manufacturer’s instructions.

If none of the exceptions apply, the producer is, in principle, liable for the damage caused by the defect. The injured party’s own fault may reduce or limit the producer’s liability.

5.4.3 Defect

In accordance with Article 6:186 DCC a product is considered defective if it does not offer the safety that can be expected from it, taking into account all circumstances, in particular the presentation of the product, the reasonably foreseeable use of the

product and the time when the product was put into circulation. The advertising, packaging or instructions of use of a product should warn of its possible dangers, even if the product itself is not unreasonably dangerous. An incorrect or incomplete instruction manual can make a product that is not in itself defective, defective within the meaning of this provision. In addition, the question is whether an average user, that belongs to an intended group of users, would, in principle, have used the product correctly, taking into account the purpose for which the product was made. The idea behind this is that a product should not cause damage during normal use for a purpose for which it was intended. Products that may be considered defective are generally movable products. include Electricity is considered a product within the meaning of this section, as is gas and water.

5.4.4 Damage

Article 6:190 DCC provides an exhaustive list of damages. The producer is not liable for damage to the defective product itself. He is however liable for personal damage and property damage. Damages include damage caused by death or physical injury as well as immaterial damages. In addition, the producer is liable for any damaged caused to property intended for private use other than the defective product itself, with the application of a franchise of € 500,-. This means that the damages must exceed an amount of € 500,-.

5.5 Relevance to the PED project

Consortium partners expressed the need for more insights on the legislation related to innovation. Subsequently, this chapter provides the necessary overview in particular for those involved in designing and producing innovative products that contribute to the acceleration of the energy transition. As outlined above, innovation and the use of innovative ideas are imperative to realising a low carbon economy or district. Within the Making City project mature and innovative technologies are used to realise PEDs. In addition, business models and other ideas are developed with a view of making the urban environment more sustainable.

Absent any agreements to the contrary, the Consortium partners, as creators of a work to which a copyright exists hold the exclusive right to exploit that work e.g. by producing, selling or licensing it. Examples include software, algorithms, databases, user manuals and descriptions of business models. Work created within a consortium does not automatically create a copyright for each contributing partner. Instead, copyrights may exist with regard to separate, distinguishable parts of a work. There are only multiple copyright holders to a single creation if a work is considered undividable.

Most rules on the creation of and ownership of intellectual property are regulatory in nature. This means that parties are free to agree otherwise. In any legal relationship that requires innovation and the creation of works it is advisable to conclude an

agreement on the rights to intellectual property, especially where it concerns copyright as this arises automatically upon the creation of the work.

Patents do not arise automatically; these only arise after application under which the applicant is generally considered the patent holder. Still, even where it concerns patentable research output or technical innovation it is desirable to conclude an agreement on the rights to the patent, especially where multiple parties are working together to create an invention. After all, where an invention is created by a joined effort, the agreement concluded between them determined their individual entitlement to the patent.

In order to avoid competition as much as possible, it is advisable to register a patent a soon as possible, e.g. once the invention and its state of the art of the can be sufficiently described. When it comes to patent, it is additionally important to realise that patents have a territorial effect. For example, a Dutch patent can only be enforced within the territory of the Netherlands. As such one might consider applying for patents throughout several countries, e.g. by making use of the European patent, especially once one considers an international sales market or competition from other countries.

6. Market Organization

6.1 Introduction

This chapter provides a concise blueprint for organizing a national heat market in any European Member State in an early stage of development. It outlines multi-disciplinary choices to be made in market regulation and governance, based on experiences in the Netherlands and lessons learned from the fully developed market for district heating systems of Denmark. This chapter can be used as a topic starter for discussions at (sub-)national level to organize economic, social and governance-related aspects of a heat market. Several suggestions will be made, thereby acknowledging that there is no one size fits all solution. What works for one member state, can be a failure in the other, due to different (local) implementation circumstances. Hence, this chapter offers a set of basic insights or conditions for effective and efficient market structures for district heating systems. Rather than being a research-based analysis, this chapter provides an outline of a heating market system, thereby assuming that there are no regulatory constraints for building a national district heating market in the member state concerned. In a nutshell, this chapter proposes disentanglement of a national energy system into local systems which are interconnected and governed by local decision-making processes and ownership structures.

The current energy markets in the Netherlands are squeaking and creaking, due to various (geo)political developments, as well as, in some situations, rules and policy that influence free markets and (may) hinder innovations and investments. It may, to some extent, also be suggested that national district heating markets suffer from a lack of central regulatory guidance from the European Union. Contrary to current national legislation and EU energy regulations, which are based on the assumption that each energy product is best served by its own set of rules and definitions of the roles of market participants, this chapter introduces an alternative market model for heat which could be integrated with other energy systems. Unlike the current top-down market models (including sustainable heat), which are largely dominated by national commercial or public parties, this chapter proposes a bottom-up model with a decentralized design of the heat system with local heat networks driven by a public-private management. The latter model assigns a central position to professional and local energy councils to represent the member citizens. In this approach, the national government adopts a minimalist oversight, providing regional and local governments and professional district councils with necessary framework legislation, financial, technical and organisational support, as well with support to observe European affairs,

Designing a heat market requires considering a range of factors, which are outlined in this chapter with respect to, first, technical aspects of a district heating market, second, social and, third, financial and governance aspects, including the role and organization of district councils.

6.2 Technical aspects

6.2.1 Three situations

When it comes to building a district heating market, there are roughly three starting points to distinguish: 1) there is already existing heat grid infrastructure, 2) the location has no heat infrastructure and 3) at the location some preparatory steps have already been taken for establishing a heat grid. As situations 1 and 3 already describe a preliminary or an advance system, the second option describes best the starting point for our discussion on the new market organization model. For the situation where there is an existing heat grid or the situation that is in progress, the market model might be conflicting with current contractual agreements, and might need a transition phase for the market model to be implemented in a different section. This section will discuss the new market organization model at a location according to situation 2 above. By including current and upcoming legislation in the approach, it can be illustrated that this situation requires the least of modifications of the existing situation. In the succeeding sections suggestions will be made that could shape the transition phase.

6.2.2 Location

In the current Dutch system, heat grids are being developed if a) there is a sustainable heat production site nearby which can sustainably deliver heat, b) sufficient investors are available to cover most of the costs, and c) the typology and number of houses to be connected to the heat grid fits the design of the infrastructure and business case. Heat grids are typically suitable in places where there is high demand for heat in a relatively small area, i.e. often (densely populated) urban areas. The typology of houses, as well as the availability of sufficient heat and demand, are important factors in determining the size of the grid. This could vary from local (comprising only a few buildings) to regional (encompassing several municipalities) networks. The legislative proposal (as discussed in chapter 1) creates the authority for municipalities to designate plots suitable for a heat grid. In this new market model, this authority is best allocated to the municipalities, since they have most information about the typology of houses in different districts, as well as related energy needs. However, in this market model, there should also be an advisory role for regional or sub-national governments in ensuring that the best strategic long term choices are made when it comes to building future-proof heat grids. How the circles of influence work will be further discussed in section 4 (governance).

6.2.3 Different types of grids

There are essentially four types of heat grids with corresponding heat levels and required insulation performance of buildings/dwellings: high temperature grids (HT), with an output temperature between 75 and 90 degrees Celsius; mid temperature grids (MT), between 55 and 75° C; low temperature (LT), 30 to 55° C; and very low temperature (VLT), between 10 to 30°C. The latter are usually combined with cooling

grids. Both LT and VLT grids depend on an individual or collective heat pump to upgrade the temperature of the water flowing into the heating system of a dwelling.

In this market model we consider the (V)LT heat grids, which is suitable when there are i.e. low temperature sources available and relatively recent buildings (20 years or newer) to be connected to the grid, or whenever there is a need for additional cooling. Furthermore, these relatively new dwelling may be even more attractive for all-electric solutions, as their insulation levels are sufficient. District heating in NL is often done for dwellings that are not suitable for all-electric. Low temperature matches a diversity of heat grids, prevents large energy losses and is easy to combine with heat and cold storage pits. (V)LT grids are excellent for meeting climatization needs in individual buildings in times of changing climate. In addition, choosing this type of grid connects to the principle of local production and consumption of energy. It could be coupled with local electricity production. Thus, electrification of heating and cooling solutions may be aligned so that production and consumption of both commodities (electricity and heat) depend, interact and build upon each other. Especially when (V)LT grids are coupled with heat and cold storage pits, they are suitable to build upon the collective ownership model that will be presented below (paragraph 2, social aspects). This alternative market model could be coupled with other energy commodities, such as providing electricity needed for heat pumps from locally owned solar production, in combination with software to balance optimal use and production and demand. It could also prove effective as a tool in educating the members of the district council about effective and efficient energy use. It is possible that neighbourhoods already have existing councils (so called neighbourhood's council or in Dutch *wijkraad*). In those situations it is well possible that energy related matters can be included in their jurisdiction, in particular when these existing councils cover the households and/or organizations connected to the heat grid.

6.3 Social aspects

6.3.1 Public-private ownership of infrastructure

In this new market model we recommend that all heat infrastructure should, at least for 50% + 1 share, be publicly owned, for the sake of public control in the heat transition. The other shares are divided between the connected end users. A public-private ownership model could have different ownership structures varying from 100% ownership by a residents collective or full ownership by the municipality.[86] The latter is common practice in Denmark. In addition, the shares are linked to the building connected to the heat infrastructure and not to the individual owner of the object. This public-private construction has an important social and financial dimension. First of all, residents connected to the grid will feel more involved with the energy system and matters related to it. The share connected to their object (house or small business) adds value to their property. Furthermore, the shares divided among the connected objects correspond to a vote in the decision making process with regard to the operation of the system.

For the actual technical operation of the system, the owners employ a system operator. Participation of public and private shareholders mainly concerns the establishment and management of the system, such as determining energy rates, investments to be made for operation and maintenance and coping with policy and legal issues. Furthermore, the option for residents to participate in a district heating council could increase social cohesion due to closer social connection with other residents in the neighbourhood where the heat infrastructure is developed, while it could also strengthen the bond between citizens and their local authority. Obviously, this construction demands constant effort on both sides for this council to function properly, whereby in particular support to empower residents' participation is of fundamental importance. Yet, if organized correctly the benefits of citizens' engagement would outweigh the costs. Finally, by placing the heat infrastructure in public or collective not-for-profit property, the profit margins in tariff structures will be low with the main goal to build up reserves for investments and maintenance. Hence, prices for heating will be mainly set to cover the system's costs, thereby benefitting social support for district heating networks in general.

It is worth noting that the necessary investments for building a heat system in a designated plot may also be borne by private parties, but under different conditions than in a fully liberalized market model. For example, commercial investors may enter into a joint-venture relationship with a local government and thus guarantee that investments made can be recovered over a period of time, e.g., by providing an exclusive right for activities in the value chain (see also chapter 6.4). This, however, should be arranged according to the regime of competition law and other applicable regulations.

6.3.2 District heating council

First, not all neighbourhoods are able nor willing to be involved, let alone establish a district heating council, which correlates with different socio-economic factors (Bouw 2023). Therefore, the installation of such a council should be optional, not compulsory. Should a residents' district heating council not be desired or suitable, the municipality could alternatively implement a system whereby residents are actively informed about issues which are normally subject of discussion in the district heating council. Furthermore, residents should be actively invited to let their interests be considered and to provide their views on the matter. The option to install a district heating council should always be available at a later point in time.

Once a district heating council is established, a certain number of residents should take part in this council, as well as representatives of and experts appointed by the municipality. These experts can help resident members on the council improve their knowledge of the network, so that they can partake in council discussions on an equal footing with, e.g., large energy companies. Without that, the complexity of matters that are related to the heating system could cause an unequal situation.

Finally, there is no one-size-fits-all approach to establishing a district heating council. It is advisable to use one of many existing models to shape a council that is in line

with socio-economic characteristics of the district. Moreover, it is also recommended to examine whether there are already certain committees within institutions or organizations that can be suitable for this purpose, such as a committee within a city council.

6.4 Financial matters

For a solid business model for district heating in the discussed market model, the financial aspects are extremely important. First of all, it is necessary to distinguish the fixed costs and variable costs. Secondly, the revenue streams should also be taken into account. Several tariff models are possible. One of the models is a bit similar to the current model for gas, whereas the fixed costs for system operation are separated from the variable costs of consumption. Depending on the organization model that is chosen, it depends on who is responsible for what part of the infrastructure and making which costs? It goes beyond the scope of this chapter to discuss several system- and economic models; however, when starting with the design of the market all shareholders – but in particular the minority shareholders – need to have a financial benefit, in order to make this model easily accepted and implemented in society. Hence, a thorough cost and benefits analysis is the starting point.

6.5 Governance - Role of the national, regional and local governments

In this approach, the national government adopts a minimalist supervisory stance, providing regional and local governments with a necessary legal framework. The national government manages financial support to a local government (the municipality), and is responsible for monitoring, and providing technical or organizational support to professional district councils. Naturally, the national government creates a framework that facilitates the municipalities to install a district heating grid on the one hand and protects end users on the other hand. For this it is necessary that the current legal framework is adjusted in a way that does not match the legislative proposal of the Heat Act (as referred to as the CHS Act, see chapter 3).

While drafting this chapter, in 2023, Climate Minister Jetten (in The Netherlands) announced that municipalities or provinces should at least have a 50%+ 1 share in district heating systems. For existing heat grids, a phasing out system will be designed whereby private ownership should be transferred to at least 50%+ 1 public ownership during a period of seven years. This matches with the discussed market organization model of this chapter. The same applies for the directing role in the development of heat grids that is allocated to municipalities.

Regional governments, such as federal states or national provinces, could play an active role in building regional or local district heating networks. As a nexus between the national government and municipalities, they are uniquely positioned to put local

needs onto the national lobbying agenda and to translate these into regional solutions. In addition, they may take an advisory role in keeping a long-term and interdisciplinary perspective on investments made in building a heat infrastructure. This will increase the likelihood of a regional heat strategy thereby mapping out sources of heat and connecting them to potential heat neighbourhoods.

When it comes to planning and organizing a local district heating network, municipalities are most suitable to lead this process due to their information advantage. If a neighbourhood is deemed to be suitable for a heating grid, the municipality may take a leading role in realizing the grid. In this role the municipality formally designates the plot, actively searches for investors and funding and engages with the residents of the neighbourhood that will be connected to the heat grid. Furthermore, the municipalities can investigate if the residents are willing and/or able to establish a district council and they can facilitate the process of establishing one. Also in organizing district councils, a municipality will lead and inform citizens about business models, technical feasibility of different solutions, and policy. An expert third party should also accompany the process of decision making by the district council.

6.5.1 Circles of Influence

The figure below illustrates the discussed model. It shows how the European Union influences national, regional and local governments, but also the civilians. From a bottom up perspective, a municipality is not likely to influence European policy and legislation; however, this can be established via the national government. The national government sets the general guidelines, municipalities implement, and regional government (i.e. provinces or federal states) observe consistency of municipal systems and have a seat in the assemblies of the regional energy strategies, similar to the water service companies and municipalities (and other stakeholders). Municipalities are seated in district councils, together with civilians, a network operator and optionally also an independent expert. Their level of influence will be at a local or regional level, and in some cases they might be able to influence national policy (i.e. when a pilot project is very successful). Again, as mentioned in the beginning of this chapter, it can differ per case, per Member State or per region how the market is organized and what the circles of influence will be.

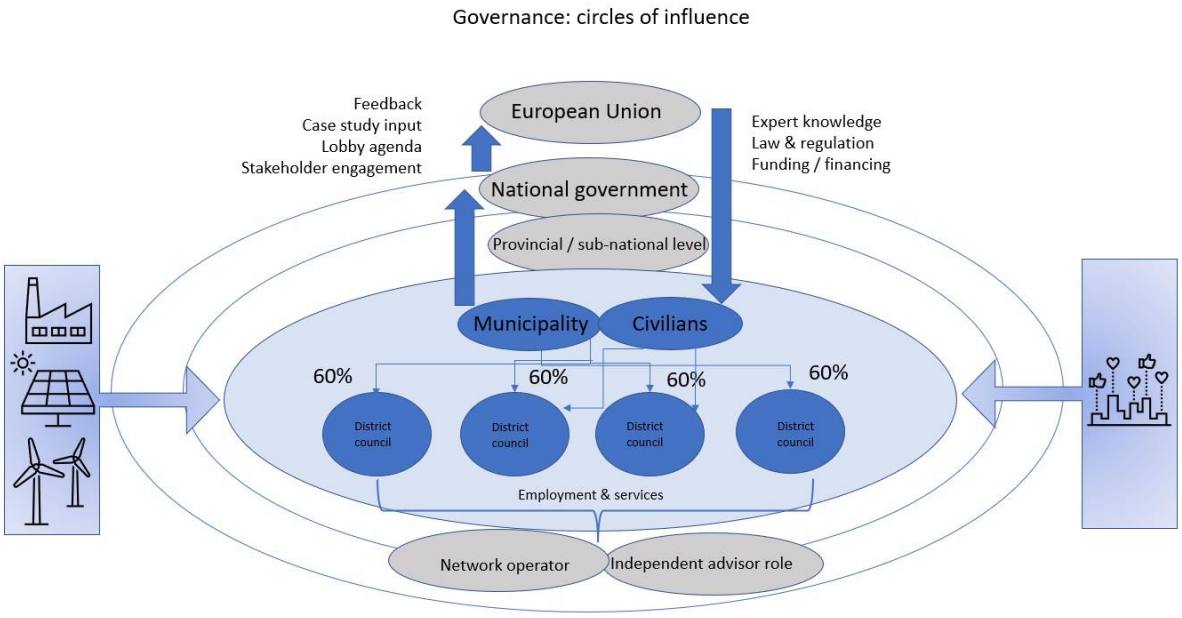

Figure 6.1 Circles of influence

7. Key challenges

In conclusion, when establishing a PED it is extremely important to focus on a solid legal framework that facilitates the energy transition. For this it is necessary that the national legislative body is able and willing to be involved and to implement legislation that facilitates the energy transition and the establishment of a PED. In the Netherlands several legal transition paths exist. These legal paths have all their own legal framework and there is no integrated legal system. In particular in Groningen this can be difficult since the municipality is participating in the development of a heat grid. At this moment, municipalities, public and private partners experience legal or financial uncertainty which may prove to be of decelerating effect on political or investment decisions. We identified three legal and regulatory challenges concerning the energy transition in the Netherlands, which are relevant for Groningen municipality.

Lack of legal certainty and clarity with regard to the energy legislation.

As long as energy legislation is neither complete, nor clear, nor certain, the investment climate is not ideal and critical political decisions are being postponed. Since the national government has not invested properly in one integrated legal system for all energy sources, the municipality of Groningen often faces challenges when the Environmental Act and the (current) Heat Act apply to the same market. It is not certain that the upcoming Collective Heat Supply Act (CHS Act) will address all these issues, mainly because the municipality of Groningen differs from other municipalities in the Netherlands. The challenges of the municipality of Groningen are mainly related to timing and to anticipating regulatory gaps. First, the individual Acts (Environmental Act and CHS Act) take effect at different times, whereas instruments from each Act partly overlap. Using instruments from one Act without the other Act that holds complementary instruments being in effect, will present delay in investment or governance decisions.

In addition, the trajectories for the Energy Act, CHS Act and Environmental Act experienced considerable delays, due to which their entering into force were also postponed. Now that their dates have been set, the municipality states that using the instruments from those Acts will take too much time in order to obtain local climate goals. Last, many aspects of the CHS Act have not yet been made clear by the regulator, such as the degree of policy freedom that our municipality will have to ensure politically established CO2 reduction norms, a strategy concerning sustainable heat sources, or providing leeway to residents' initiatives in favour of large public heating companies.

Lack of capacity on the distribution grid for electricity

DSOs have difficulties of dealing with all the requests for connections (i.e. solar parks, wind mills). The lack of capacity is a nationally acknowledged problem; however, the answer to this problem should be found in local solutions. In order to implement a storage device like a battery and integrate it in the energy system, several legal issues need to be addressed. Furthermore, it will remain a governance question whether to invest in the expansion of the grid's capacity or to invest in alternative local solutions. The municipality of Groningen has to take this into consideration when organizing the final energy mix, and switching whole neighbourhoods to an all-electric neighbourhood. However, the announcement of the DSO that both supply as demand capacity is marked as insufficient in the near future, the investment climate is not auspicious. Lack of grid capacity will hamper the establishment of new organizations and therefore, will negatively impact the local economy.

Data management

Another important aspect to mention with regard to the role of the DSO is the responsibility for the smart metering and energy data. They both play an important role in realizing a PED and moving towards an urban environment in which a sustainable energy surplus might exist. First, the proposed Energy Act seeks to complete the transition from analogue metering systems to smart metering systems. This may aid end users final customers in monitoring their use and contribute to easing the (virtual) sharing of energy among consumers. Increased digitization and use of smart communication systems may provide users with faster and more detailed insight into their consumption and energy costs. At the same time, the transition to self-determination for final customers requires better and faster access to and more control over their data. The proposed Energy Act therefore holds rules on guaranteeing the access to and enabling the exchange of necessary data. End users will have the right to view their data and to share it with third parties. It is considered that this will allow the final customer to become (more) active within the energy market and purchase services at his own discretion.

In order for small end-users and household consumers to participate in energy trade and become active market players, it is necessary to have access to relevant energy data. Not only to their own consumption and production data, but also to the necessary data for becoming a trader or aggregator. The transition to self-determination for final customers requires better and faster access to and more control over their data. Even though this issue is dealt with in the upcoming Energy Act, it is yet not clear how and when the Energy Act will enter into force due to political developments.

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[1] A definition provided by the European Strategic Energy Technology Plan (SET Plan).
[2] Derived from the Positive Energy Block (PEB) definition established by the European Innovation Partnership on Smart Cities and Communities (EIP-SCC).
[3] See: (the majority of the information within this subparagraph is derived from this webpage).
[4] See e.g. J. Whaley, 'The Groningen Gasfield', *GEOExPro* 2009, Vol. 6, No. 4; <https://www.gasterra.nl/en/gas/vision>; K. Savcenko, G. Hornby, 'Europe's largest gas field is winding down, but market has plenty of alternatives', 5 March 2020, available online at: < https://www.spglobal.com/platts/en/market-insights/blogs/natural-gas/030520-europes-largest-gas-field-is-winding-down-but-market-has-plenty-of-alternatives>.
[5] The Master plan was followed by "Groningen Energises 2015-2018 " and the "Next City" plan as well as the objective to turn Groningen into a real-life lab for energy transition.
[6] C. de Torre, C. Sanz-Montalvillo, D9.1 Kick-off Meeting Result Report, Financial and Technical Agreements WP9, T9.3 January 2019 [M2], p. 17.
[7] The new Environment and Planning Act will be entering into force per 1st January 2024. It will be expected that this legislative proposal "instruments for municipalities in the heat transition" will be joining or follow soon after this date.
[88] See
[9] According to the legislative proposal 'Municipal Instruments for the Heat Transition'.
[10] *Cf.* R. de Vlam, 'Op weg naar een nieuwe Energiewet', *JutD* 2020/0138; Contouren van de Energiewet (Algemene Toelichting).
[11] Directorate General for Energy, *Clean energy for all Europeans,* May 2019, available online at < >
[12] Specifically Directive 2019/944 and Regulation 2019/943.
[13] Parlementary Documents, Contouren van de Energiewet (algemene toelichting) , p. 4.
[14] Parlementary Documents, Contouren van de Energiewet (algemene toelichting) , p. 6.
[15] Parlementary Documents, Contouren van de Energiewet, p. 3, which describes the working document as a starting point for a future Explanatory Memorandum.
[16] Kamerbrief 6 juli 2023, met kenmerk DGKE-DE / 27245405.
[17] These exclusive right(s) of heat companies only pertain to the transportation and the supply of heat. The regulation of the production of heat is not included in the Heat Act. Instead, heat production is regulated by separate laws and regulations. As such, the production of e.g. geothermic energy is governed by the Mining Act (*Mijnbouwwet*) whereas the production of aqua thermal energy is governed by the Water Act (*Waterwet*).
[18] See Article 2.8 of the proposed Act.
[19] Parlementary Documents, Kamerbrief 6 juli 2023, met kenmerk DGKE-DE / 27245405, p. 8
[20] Parlementary Documents, 2022-2023, 30 196, no. 800.
[21] Parlementary Documents, Kamerbrief 6 juli 2023, met kenmerk DGKE-DE / 27245405.
[22] Ibid, p. 6.
[23] Ibid, p. 7.
[24] Ibid, p. 7.
[25] In the original proposal this number was 500. This changed in response to the internet consultation.
[26] Parlementary Documents, 2022-2023, no. 36 387 - 3, p. 3
[27] Parlementary Documents, 2022-2023, no. 36 387 - 3, p. 21.
[28] See Tempelman, Gazendam & Den Uijl, Journal Consumentenrecht en Handelspraktijken, TvC 2022, no. 5, p. 226 et seq.
[29] <https://ec.europa.eu/info/news/commission-presents-renewable-energy-directive-revision-2021-jul-14_en> ; The European Commission's Knowledge Centre for Bioeconomy, 'Brief on biomass for energy in the European Union', 2021
[30] Directive 2009/28/EC of the European Parliament and of the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC; Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources.
[31] Proposal for a Directive of the European Parliament and of the Council amending Directive (EU) 2018/2001 of the European Parliament and of the Council, Regulation (EU) 2018/1999 of the European Parliament and of the Council and Directive 98/70/EC of the European Parliament and of the Council as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652, COM/2021/557 final.

[32] Parlementary Documents, 2020-2021, 35 626, nr. 2 (Wijziging van de Wet milieubeheer in verband met de implementatie van Richtlijn (EU) 2018/2001 van het Europees Parlement en de Raad van 11 december 2018 ter bevordering van het gebruik van energie uit hernieuwbare bronnen en ter uitvoering van het Klimaatakkoord).
[33] Parlementary Documents, 2020-2021, 35 626, nr. 3 (Memorie van Toelichting) (*Explanatory Memorandum*).
[34] Most information is extracted from the website www.iplo.nl.
[35] See for a more detailed overview: Smeltekop, Tempelman, Ubbens-Elings & Den Uijl, "*Juridische Handvatten voor innovatieve ondernemers in waterstof",* Groningen: april 2022, p. 60 et seq..
[36] Art. 2.2 provides the opportunity to get a permit for some of the activities (not all) under certain conditions.
[37] This paragraph is based upon ideas and discussions with ms. Charis van den Berg (municipality of Groningen).
[38] See https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Energy_consumption_in_households.
[39] COM(2015)80 def., p. 1.
[40] Tempelman & Vedder, Journal Consumentenrechten en Handelspraktijken, TvC 2020, no 3, p. 139.
[41] Considerations on COM(2023)148 - Amendment of Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design.
[42] Local Energy Monitor 2022, available via www.hieropgewekt.nl.
[43] The Dutch legislator failed to implement both directives in time. Both directives are mostly being implemented in the proposed Energy Act (see chapter 3.2). Currently, the European Union already announced amendments to these directives.
[44] Considerations on COM(2023)148 - Amendment of Regulations (EU) 2019/943 and (EU) 2019/942 as well as Directives (EU) 2018/2001 and (EU) 2019/944 to improve the Union's electricity market design.
[45] Article 95a Electricity Act.
[46] Since the draft regulations are still under discussion, the text can be altered. Therefore, it will not be discussed in detail.
[47] Whitepaper TKI Urban Energy, *Collectieve zelfconsumptie: een bouwsteen om het maatschappelijk draagvlak voor de energietransitie te vergroten?",* DNV & TNO in opdracht van RVO, February 2022.
[48] Directive (EU) 2018/2001.
[49] Art. 1.5 of the legislative proposal Energy Act.
[50] Article 1.1 of the legislative proposal Energy Act.
[51] Soto et al, "Peer-to-peer energy trading: A review of the literature", Applied Energy, vol 283, 2021.
[52] See note 74. It is worth noting that these two regulations are still subject of discussion in the European legislation process and can be altered over time.
[53] Adapted from: IRENA, 'Peer-to-peer electricity trading innovation landscape brief' 2020, p. 10.
[54] Art. 32 Directive (EU) 2019/944.
[55] See for example art. 32 Directive (EU) 2019/944 or art. 13 paragraph 4 (c) Regulation (EU) 2019/943.
[56] European Commission, Directorate-General for Energy, Antretter, M., Klobasa, M., Kühnbach, M. et al., Digitalisation of energy flexibility, Publications Office of the European Union, 2022, https://data.europa.eu/doi/10.2833/113770.
[57] ACM, Alternative Transportrights and UIOLI, paragraph 5.2, no. 86 available via < https://www.acm.nl/system/files/documents/consultatie-alternatieve-transportrechten-en-use-it-or-lose-it.pdf>.
[58] In Dutch: *Octrooicentrum Nederland* see Art. 15 of the Dutch Patent Act.
[59] Verdrag tot samenwerking inzake octrooien, Washington, 19-06-1970, *Trb. 1973, 20*.
[60] See Article 51 of the Dutch Patent Act.
[61] Also see Art. 2 of the Dutch Patent Act.
[62] Example provided by Geerts & Verschuur in *Kort begrip van het intellectuele eigendomsrecht 2020* no. 39.
[63] Art. 54(2) European Patent Convention.
[64] See Article 54(3) European Patent Convention, Article 4(4) Dutch Patent Act.
[65] After the patent has been granted.
[66] See Article 52 and 56 European Patent Convention and Article 2(1) and 6 *Rijksoctrooiwet.*
[67] See Article 83 European Patent Convention.
[68] See Article 56 European Patent Convention.
[69] Art. 83 European Patent Convention.

[70] See Art. 69 and 84 European Patent Convention.
[71] Art. 82 European Patent Convention.
[72] See Article 123 European Patent Convention.
[73] Art. 93 European Patent Convention.
[74] Art. 94 European Patent Convention.
[75] There are some exceptions to this general rule: see e.g. Art. 9-14 Dutch Patent Act.
[76] Article 13 Dutch Patent Act.
[77] Art. 66(1) Dutch Patent Act.
[78] Art. 66(2) Dutch Patent Act.
[79] See Art. 63 European Patent Convention and Art. 49(2) Dutch Patent Act.
[80] See Art. 79 Dutch Patent Act.
[81] Art. 70 Dutch Patent Act.
[82] Art. 64(1) Dutch Patent Act.
[83] See Art. 56 Dutch Patent Act.
[84] See e.g. Case C-406/10 *SAS Institute Inc. v World Programming Ltd* [2012] ECLI:EU:C:2012:259
[85] Art. 2 Copyright Act.
[86] With municipality we refer to the local government in the Netherlands. In other countries the governance model can be different, where the local governance is known as county's, districts, local governments, or communes.