NEW URBAN ENERGY

Report on the (vulnerable) citizen

D4.8

This project has received funding from the European Union's Seventh Programme for research, technological development and demonstration under grant agreement No 608702.

PROJECT INFORMATION

Project Acronym and Full title	City-zen, a balanced approach to the city of the future
Call Identifier	FP7-ENERGY-SMARTCITIES-2013
Grant Agreement	n° 608702
Funding Scheme	Collaborative Project
Project Duration	60 months
Starting Date	01/03/2014

MAIN COORDINATOR

Name	Virginia Gómez Oñate
Organisation	VITO
Address	Boeretang 200, 2400 Mol (Belgium)
Phone	+32 14 33 59 78
E-mail	virginia.gomezonate@vito.be

CONSORTIUM PARTNERS

N° DoW	Organisation	Acronym	Country
1	Vlaamse Instelling voor Technologisch Onderzoek	VITO	BE
2	Stichting Amsterdam Economic Board	AIM	NL
3	Universiteit van Amsterdam	UVA	NL
4	Westpoort Warmte B.V.	WPW	NL
5	Alliander	LIAN	NL
6	HESPUL Association	HESP	FR
7	The Queens University of Belfast	QUB	UK
8	Th!nk E	THNK	BE
9	DNV GL Netherlands BV	DNV GL	NL
10	Technische Universiteit Delft	TUD	NL
11	Stichting Waternet	WAT	NL
26	Greenspread Projects BV	GREE	NL
24	Sanquin	SANQ	NL
14	AEB Exploitatie BV	AEBE	NL
15	Daikin Airconditioning Netherlands B.V.	DAIK	NL
16	Siemens Nederland NV	SIEM	NL
17	Universita'degli Studi di Siena	UNIS	IT
18	Ville de Grenoble	MUNG	FR
19	Commissariat a l'Energie Atomique et aux Energies Alternatives	CEA	FR
20	Compagnie de Chauffage Intercommunale de l' Agglomeration Grenobloise	CCIA	FR
21	Gaz Electricite de Grenoble	GEG	FR
22	SAS ATOS Worldgrid	ATOS	FR
23	Clicks and Links Ltd&L	C&L	UK
25	Grenoble-Alpes Métropole	METRO	FR
27	Agence Locale de l'Energie et du Climat de La Métropole Grenobloise	ALEC	FR
28	Universiteit Utrecht	UU	NL

DELIVERABLE INFORMATION

Number	D4.8
Title	Report on the (vulnerable) citizen
Lead organisation	Utrecht University / Center for Energy Postbox Utrecht www.uu.nl/cve f.j.otte@uu.nl
Main author(s)	Eva Winters (UU) Frits Otte (UU)
Reviewers	Han van de Vijvere (VITO) Marjolein Bot (Amsterdam Economic Board) Andy van der Dobbelsteen (TU Delft)
Nature	R – Report
Dissemination level	PU – Public
Delivery Date	February, 2019

VERSION HISTORY

Version	Date	Author/Reviewer	Description
0.1	31/10/2018	Eva Winters e.a.	Draft version
1.0	06/12/2018	Eva Winters e.a.	Version for review
2.0	20/02/2019	Frits Otte	Amended after reviews

Report on the (vulnerable) citizen; *the rights and roles of the (vulnerable) consumer in City-zen projects.* *A desk study*

TABLE OF CONTENTS

CHAPTER 0 – SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

0.1. CITY-ZEN AND CITIZENS

Today we are beginning to see how our direct environment will be transformed by the energy transition and its the new (technological) developments. The full implications these changes will have on our lives are still unknown. However, by experimenting with new systems like in the City-zen project, we do get a glimpse of where these developments may take us and what we learn from these demonstrations. The City-zen projects give us the opportunity to study the choices to be made and provide insights on how these choices will eventually create our future energy system. “WE” include governments making policies, companies developing business and end-users acting to their best believe in this new environment.

The different City-zen demonstration projects show how this might affect small end-users (energy consumers and citizens) in the future and what lessons can we learn from these demonstrators that may help us to develop such an energy system?

The objective of the City-zen project is to demonstrate how technical innovations can be applied and contribute to a sustainable energy system in the urban context. The project focuses on the urban context, and more specifically the cities of Grenoble and Amsterdam. The aim is to develop sustainable energy projects that can be replicated in other European cities.

The project explores different aspects of the energy system, like using a water network to supply customers with heat or cold, as well as connecting end-users to an innovative sanitation system, placing batteries in people’s homes, retrofitting social housing and using innovative financial schemes. Although the projects vary on many levels, from energy source to type of participant, the common dominator is that the projects affect citizens and the environment of the citizen directly.

0.2. BACKGROUND AND SCOPE OF THIS REPORT

Given that many of the demonstration projects stand or fall by the willingness ànd the possibility of consumers to participate, this report takes a closer look at the citizens and how they are involved in the different demonstration projects. Emphasis is put on the more passive, possible vulnerable citizens.

This report stems from an additional study to the “Report on Energy policy, legal context and on financing and ownership”, published in November 2017. As this study was not budgeted, the funds were limited and the scope was inevitably limited to the Amsterdam demonstration projects of City-zen. Reference to Grenoble projects is made only where information on these projects was available from the above-mentioned main study or from incidental contact with the French counterparts.

0.3. THE NEW EUROPEAN LEGISLATIVE PACKAGE

The so-called ‘the Winter Energy Package’, published in November 2016 by the European Commission (’Clean energy for all Europeans - unlocking Europe’s growth potential´), consists of a view on the EU

energy policy and includes concrete proposals for a new directives and regulations on electricity, gas, renewable energy, energy efficiency and the energy performance in buildings.

The foremost element in proposed Electricity Directive is further integration of the European Energy market aimed at a sustainable and affordable energy supply to all Europeans. This package has its focus on establishing one European market at all levels.

The European citizen is the focal point in this ´Winter Energy Package´. Not only does the package enable and stimulate citizens to actively participate in the market, the European Commission also puts emphasis on the need that all Europeans will profit from the energy transition with special attention to the protection of vulnerable consumers and the struggle against energy poverty. Hence, the end-user is an important actor to achieve specific policy objectives.

0.4. THE DIFFERENT ROLES OF THE ENERGY CONSUMER

Transitioning from a fossil fuel-based system to a system based on renewables will have an impact on the stability of the energy supply, on the design of our new production units, our buildings and the city as a whole. All of us will be affected by these changes.

The EU Commission sees a role for the household consumer in actively supporting the energy transition through their consumer behaviour. On the other hand, the EU is more concerned about the position of the vulnerable household consumers and it sees the need to protect vulnerable consumers against negative impacts from the energy transitions.

Introducing new innovations, like those tested in the City-zen projects, tend to focus on technology with limited attention to the effects on passive and vulnerable consumers. Adoption of new technologies may require financial stimuli for active consumers and these may lead to a higher base price or tariff. Passive consumers are charged these higher costs, thus unintentionally increasing the problem of energy poverty.

Recommendations

In the approach of the vulnerable consumer, thresholds should be lowered. To make them a more active consumer, the steps a consumer should take must be made transparent, easy and attractive. Transparency and honest risk statements are key to convince the majority of end-users.

Furthermore, new services focussed on vulnerable consumers should be developed, stimulated and supervised by government.

0.5. THE VULNERABLE CONSUMER IN THE NETHERLANDS

Dutch national policies aimed at preventing energy poverty rely on general policies on financial weak households. Also stimulating energy conservation is believed also to address energy poverty. One specific instrument addresses energy-poor households: by Ministerial Decree energy suppliers are not allowed to disconnect households, with exception of households that refuse participation in a debt control programme. Disconnection during winter months is only allowed in clearly fraudulent cases.

Municipalities, that know directly the social effects of energy poverty, have developed many initiatives to prevent vulnerable households to fall into energy poverty. These range from financial support, expenditure coaching, energy coaching and prepaid energy contracts.

Recommendations

To implement the 'Winter Energy Package', Dutch national government should develop a view on energy poverty.

Especially when introducing new, innovative technologies, consumer agreements like dynamic price agreements, and other energy related services in the Dutch energy system, government (including the Regulator) should take into account that a large group (more than 10%) of energy consumers are in a vulnerable position. Thus, every step in the energy transition must at least be scrutinised on its effects on energy poverty.

More active policies should use the opportunity of present changes in the energy system to lower the risks of the vulnerable consumers and structurally redress energy poverty.

0.6. DEMAND RESPONSE AND THE UNIVERSAL SERVICE

Digitisation plays a crucial role in the integration of sustainable electricity sources and allows household consumers to get insight in their consumption patterns and allows them access to the market. That the digital market is more easily accessible is also reflected in the creation of new platforms that allow new market participants to trade.

The City-zen projects are showing the early stages of the potential of a digital energy system. Distribution network operator Alliander studies whether demand response can be an alternative to grid reinforcement and, if so, under which conditions. The question is how Alliander can get flexibility from the retail market, either by adjusting network tariffs or by purchasing such services in the market. The projects also underline the evolution of the role of the distribution network operator, entering into new areas as system services.

Overall the transition to a digital energy system puts emphasis on the regulation of consumers' rights. The new EU-proposals do not sufficiently address how to tally on the one hand access to universal service of electricity and on the other hand supporting financially incentivizing households to not use electricity. Member States should carefully consider which measures lead to the energy resilience and independency of vulnerable households, so that also these household consumers maintain access to the energy market in a digitalised world. Easy access to the energy system remains important and this access will in the future also encompass access to flexibility platforms and demand response offers. Especially for vulnerable consumers this may require governmental attention.

Current developments show that the level of flexibility of the end-user will more and more determine the final energy bill. It is precisely in this area we should focus to support vulnerable and energy poor consumers.

Finally, financial stimuli in network tariffs or market prices will unarguable lead to lower payments from those stimulated and to higher payments from those not reacting to the stimulus. This shows a friction between the targeted change of behaviour and the concerns about energy poverty.

Network operators experiment with demand response in order to solve capacity constraints in the local grid. Network reinforcements could be postponed if incidental peak flows are avoided. This approach poses legal questions as it involves discrimination in tariffs and it may result in an infringement to the non-discriminatory access to the energy system. The legal and technical means to effectively constrain the use of the network are still to be tested.

These limitations in flexible tariffs illustrate the need for a national policy on inefficient network investments, that reconciles the different interests at stake. Recently, the network operators formulated a framework (Overlegtafel Energievoorziening: 'Afwegingskader verzwaren tenzij', mei

2018), that is limited to the economical, non-political aspects. A broader policy framework for decision making can guide network operators in avoiding inefficient investments and in the mean time avoiding ending with local sub-optimal solutions.

Recommendations

In setting up digital trade platforms, government should ensure that also vulnerable consumers have in practise access to these new market floors.

The regulator should supervise network tariffs and price propositions as providing financial stimuli for active consumers, poses a risk for undesirable higher general tariffs for passive consumers.

National government should support network operators by formulating a broad policy framework for decision making when flexible network tariffs can avoid inefficient local network investments.

0.7. HEATING: COLLECTIVE SOLUTIONS AND INDIVIDUAL FREEDOM

Municipalities are given the task to formulate plans at neighbourhood level on how to phase out natural gas in our built environment. The current market for district heating is dominated by existing heat suppliers that often enjoy an exclusive right to build and exploit a heat network in an area. These rights affect both newcomers in this market and citizens. The paragraph above shows the tensions in this market, namely: who gets the right to claim the area and supply inhabitants with heat and to what extend are homeowners, individually or collectively, offered the freedom to find a solution.

Furthermore, it is noted that municipalities seek solutions in proven approaches they are familiar with, such as high-temperature district heating. For the administration is it efficient (they can address many citizens with one measure), but in a sound climate policy more energy efficient approaches should be explored.

The heat market is drastically changing. New developments in building energy efficiency make it possible to use innovative heat technologies as low-temperature heat for small-scale or individual solutions. Nevertheless, developing innovative projects is challenging, due to the fact that the appliance of this type of heat is still in an experimental phase.

In addition to this, the current market for heat shows barriers to new entries due to existing (concession) agreements. The choice of the municipality to award exclusive and excluding rights to one private party is often based on the assumption that the service would otherwise not be provided and that the provision of one system for all is more efficient and affordable than small-scale collective or individual solutions.

The last two decades there have been developments in competition and public procurement law, especially concerning so-called scarce public rights. Awarding everlasting exclusive and excluding rights without a transparent tendering procedure is no longer possible and desirable in this market.

Not only in Amsterdam, but also in Grenoble the municipality uses such agreements to develop high-temperature heat networks. We have no insight in the content of these agreements as the municipality treats these as confidential, but they might face similar issues on the level of exclusiveness of these agreements.

An important aspect is the freedom of choice for households on heating their houses. Recent legal changes in building regulations also support the freedom of choice of consumers. In this the Netherlands follow other countries in Europe like Sweden and France.

Recommendations

Local governments should show restraint in respect of granting exclusive rights in new-built areas, but also in the future in existing built areas

In the near future the right to remain connected to a fossil gas network may eventually be abolished. In the process of revising the right to be connected the gas network, the national legislator should safeguard the freedom of households to choose an appropriate heating solution, which should include an individual solution, small collective solutions and a large collective solution.

0.8. FINANCIAL SUPPORT FOR RETROFITTING IN AMSTERDAM AND GRENOBLE

In the City-zen programme the objective is in the first place to experiment and generate information about retrofit projects in various dwellings. The funds are used to finance the measures that improve the energy efficiency of the building.

Financial support from governments is limitedly available and that brings the responsibility to allocate these financial resources in fair and transparent manner. The design of a subsidy programme largely determines who can apply and how resources are allocated.

The City-zen subsidy in Amsterdam did not discriminate between incomes or the size of a home. Both individual home owners as well as two social housing corporation and the district Amsterdam West applied for the subsidy. With regard to the individual home owners, the funds appear to be awarded to mainly high-income households in larger homes. As the subsidy was defined in terms of € per square meter habitable space, only a relatively small part of the subsidies were used in smaller homes. An alternative way to design this subsidy would have been to safeguard low-income households from energy poverty.

One of the objectives of distributing the subsidy is that the funder gained information about how the subsidy is used and what results have been achieved. In Amsterdam the funder received information from the participants about their social background, financial situation and the effect of the measures on the energy efficiency of the household. This information will be used for the analysis of social aspects in relation to the subsidy (City-zen WP8 social monitoring).

The programme in Grenoble shows that a more all-round programme (f.i. including free advice on financing and energy efficiency measures) can take up a more diverse group of households. From the first programme, local government gained insights in the financial barriers for households to participate in retrofit projects. They learned that middle-income households struggle to get an affordable loan and the municipality developed new policies to address this barrier.

Recommendations

Governments should investigate the design and procedures of financial support schemes to ensure these are sufficiently open to different income groups and support those groups the funder has in mind. Furthermore we recommend that funders identify the information needed to evaluate their policies and set up an evaluation accordingly.

Subsidizing low-income households for an energy retrofit of their home supports vulnerable consumers to become more resilient to the future changes in the energy supply. It is important to support the so-called frontrunners, but it must be realised that frontrunners also can be found in lower income groups, provided they receive appropriately structured financial support.

A policy view on energy poverty and targets to reduce the number of energy poor will contribute to new subsidy schemes that not only aim at technical targets as the reduction of energy use in terms of kWh/ m^2, but will also address the social issues at stake.

Furthermore, subsidy schemes should be evaluated on the achieved retrofitting measures but also on households that did not proceed with their project. These cases will reveal the barriers experienced in this market. A one-stop-shop as used in Grenoble is a way to get in contact with these households. Solely evaluating the process of allocating subsidies will not generate this type of information.

Finally, subsidies should focus on retrofitting houses that results in the best overall energy improvement, based on their technical (construction year, construction type) and social properties (income of inhabitants, ownership of the dwellings).

CHAPTER 1 – INTRODUCTION

1.1. INTRODUCTION

Today we are beginning to see how our direct environment will be transformed by the energy transition and its the new (technological) developments. The full implications these changes will have on our lives are still unknown. However, by experimenting with new systems like in the City-zen project, we do get a glimpse of where these developments may take us. The City-zen projects give us the opportunity to study the choices to be made and provide insights on how these choices will eventually create our future energy system. "WE" include governments making policies, companies developing business and end-users acting to their best believe in this new environment.

This report focuses on what is explored today in the different demonstration projects and how this might affect small end-users (energy consumers and citizens) in the future. If we aim to strive for a sustainable, secure, affordable and accessible energy system for all citizens, what lessons can we learn from these demonstrators that may help us to develop such an energy system?

1.2. LIMITED SCOPE: ONLY AMSTERDAM PROJECTS

The City-zen project encompasses a number of energy demonstration projects in two cities: Amsterdam (the Netherlands) and Grenoble (France). Part of the City-zen project is an analyses of the policy and economical backgrounds of these demonstration projects, to be conducted by Amsterdam University, a task transposed in 2017 to Utrecht University. This analysed has resulted in the "Report on Energy policy, legal context and on financing and ownership", published in November 2017. [1]

After completion of this report, a part of the allocated City-zen funds remained and this allowed Utrecht University to perform an additional study on the position of household as energy consumer with special focus on the more vulnerable households. This study is presented in this report.

As these remaining funds were limited, the scope needed to be limited too. In dialog with the project management, it was recognized that the budget and timing of work packages did not allow for a role for the Grenoble partners. Thus, the study is limited to the Amsterdam demonstration projects of City-zen. Reference to Grenoble projects is made only where information on these projects was available from the above mentioned main study or from contact with the French counterparts.

---

[1] *The "Report on Energy policy, legal context and on financing and ownership" can be found at the website of the City-zen project (http://www.cityzen-smartcity.eu/city-zen-demonstration-projects-crucial-role-in-pushing-new-regulatory-frameworks/):*
The summary: http://www.cityzen-smartcity.eu/wp-content/uploads/2018/04/energy_policies_legal_context_financing-summary-city-zen.pdf
The full report: http://www.cityzen-smartcity.eu/wp-content/uploads/2018/04/20180517-city-zen_d4-1-4-2-full-report_-1.pdf

1.3. METHOD

In this study we will research how the energy transition impacts and changes the role of households as energy end-user, and we will pay special attention to the vulnerable end-user[2]. The foreseen theoretical changes are studied in the legislative framework, both EU and national. The outcomes and objectives will be compared to the practical application of these objectives in the different City-zen demonstration projects.

The analyses of the different projects started during the first 'Report on Energy policy, legal context and on financing and ownership'[3] with a round of interviews with key people in the different demonstration projects. This report builds further on these results. Additional interviews were held with stakeholders from in- and outside the demonstration projects that could provide valuable information for our analyses. A list of interviewed people is presented in Appendix I.

1.4. RELATION TO OTHER WORK PACKAGES

The report falls under work package 4 of the City-zen project. This work package focuses on studying context of the demonstration projects by looking at the processes, stakeholders and regulation. This specific report also has a link to the work package 8, which monitors the social and economical effects of the demonstration projects on households. Both in Grenoble and Amsterdam different universities and research institutes collect data of the household consumers and study the results.

In Amsterdam, TU Delft together with other City-zen partners developed a questionnaire for a social-economic evaluation of the retrofit projects in Amsterdam. On our request the TU Delft added some more questions to this questionnaire. The results are discussed in paragraph 6.3.[4]

The main difference between the studies that fall under work package 8 and this report is that this report describes mainly the general role of the household consumer in energy policy. The studies in work package 8 focus of the effects directly related to the innovations tested in the different demonstration projects.

1.5. NEW EUROPEAN LEGISLATIVE PACKAGE

In November 2016 the European Commission published an impressive legislative proposal, called 'the Winter Energy Package', under the title 'Clean energy for all Europeans - unlocking Europe's growth potential'.[5] The proposals are currently discussed and in different stages of approval by Member States and EU Parliament before implementation. The entire package will be adopted in the beginning of 2019. The package includes proposals for a new electricity directive and regulation, and also new

---

[2] *See paragraph 2.4.1 for the definition of the vulnerable end user.*

[3] *See footnote* ***Fout! Bladwijzer niet gedefinieerd.****.*

[4] *The questionnaire can be shared on request, please contact: R. Fransman: r.r.fransman@tudelft.nl or E. Winters: e.winters@tno.nl*

[5] *Clean Energy For All Europeans, November 2016, COM(2016) 860 final/2. The recast of the Electricity directive is currently under Trialogue negotiations along with other proposals in the package: Briefing EU Legislation in Progress, Common rules for the internal electricity market from 05-06-2018. Different proposals of the package are in different stages. The Energy performance of Buildings directive for example is adopted and already published L 156/75, 19.6.2018*

directives regulating renewable energy, energy efficiency and the energy performance in buildings.[6]

The foremost element in proposed Electricity Directive is further integration of the European Energy market that provides sustainable and affordable energy supply to all Europeans. Where earlier packages were mainly focusing on unlocking and liberalizing the national markets, this package has increased focus on establishing one European market at all levels, considering that there are still many obstacles preventing this.

The European citizen is the focal point in this ´New legislative Energy Package´. Not only does the package enable and stimulate citizens to actively participate in the market, the European Commission also puts emphasis on the need that all Europeans will profit from the energy transition with special attention to the protection of vulnerable consumers and the struggle against energy poverty. Hence, the end-user is an important actor to achieve specific policy objectives.[7]

1.6. CITY-ZEN AND CITIZENS

The objective of the City-zen project is to demonstrate how technical innovations can be applied and contribute to a sustainable energy system in the urban context. The project focuses on the urban context, and more specifically the cities of Grenoble and Amsterdam. The aim is to develop sustainable energy projects that can be replicated in other European cities.

The project explores different aspects of the energy system, like using a water network to supply customers with heat or cold, as well as connecting end-users to an innovative sanitation system, placing batteries in people's homes, retrofitting social housing and using innovative financial schemes. Although the projects vary on many levels, from energy source to type of participant, the common dominator is that the projects affect citizens and the environment of the citizen directly.

Given that many of the demonstration projects stand or fall by the willingness ànd the possibility of consumers to participate, we take a closer look at the citizens and how they are involved in the different demonstration projects. The goal of this research is to map the role of the energy consumer as citizen in the demonstration projects, with emphasis on the more passive, possible vulnerable citizens, and explore the implications of the technical and sustainable developments on the future energy consumer.

[6] *The analyses of the proposal for a new electricity directive is based on COM(2016) 864 final/2, February 2017.*

[7] *COM(2015)82 final, C383/84*

CHAPTER 2 – THE DIFFERENT ROLES OF THE HOUSEHOLD CUSTOMER

2.1. CITIZENS

If we talk about citizens, customers, households, we distinguish different types of energy users, which can be wholesale customers, household customers, vulnerable customers, or customers that not only use energy, but also are active producing energy, the so-called prosumers.[8] In this chapter we will in the first place focus on the household customers (consumers of energy). The current Electricity Directive 2009/72/EC defines household customers as: *´a customer purchasing electricity for his own household consumption, excluding commercial or professional activities´.*[9] In the remainder of this report we will use the term consumer instead of customer or end-user, unless the context calls for the use of these terms.

2.2. PASSIVE OR ACTIVE?

The present and upcoming new EU energy legislation aims to protect the passive consumer, but also supports the more active energy consumers. In this paragraph we will have a closer look at what an active or passive household consumer is and what role they can play in our energy system.

In many of the City-zen demonstration projects household consumers are involved. In the renovation and smart grid projects especially, the participating household consumers are supposed to take a more active role. In other projects, like developing new heat systems, consumers are expected not to act, but behave as a more passive user.

The active household consumer especially has an important role in reaching the European energy goals of a competitive, affordable, secure and sustainable energy system. We will shortly discuss the different objectives of the energy packages and how the consumer is supposed to contribute to these objectives.

2.2.1. Competition and affordability

The second electricity and gas directives liberalised the electricity markets for consumers from 2004 onwards. From the 1st of July 2007 all household consumers could freely choose their supplier.[10] A fully functioning system, in which the consumers can freely choose their supplier, is according the Commission inevitable to achieve a more efficient energy system and would contribute to more affordable energy with lower energy prices. Reports by the European Commission in 2010 and in 2016

[8] *S. Pront-van Bommel, De Energieconsument Centraal, in De consument en de andere kant van de elektriciteitsmarkt, Centrum voor Energievraagstukken 2010, pp. 24*

[9] *Article 2 sub 10 of Directive 2009/72/EC*

[10] *Article 21 sub1(c) of Directive 2003/54/EC and article 23 of directive 2003/55/EC.*

on the retail electricity markets for consumers in the EU[11] have shown that competition in the market is increasing[12], but not yet functioning optimally and competition has not led to much lower prices.[13] Despite that the retail market is not completely functioning effectively, consumers are described as one of the most important instruments to bring about competition in the electricity market through their ability to switch supplier.

2.2.2. Sustainability

Beside the objective to create an efficient and affordable energy system through competition, the sustainability objectives have increasingly gained importance. Where the first two Energy Packages predominantly focussed on developing an internal energy market, the third and especially the new proposals in the Winter Energy Package focus on CO_2-reduction. In combination with technological developments, like the smart meter, the envisaged role of the household consumers has changed tremendously over the last years and the consumer has become a crucial element in integrating the growing amount of renewable energy sources.

Both the third Energy Package and the new proposals in the fourth Energy Package support the active role of the end-user and this role is further anchored in law. The new proposal for the Electricity Directive even includes a new definition to define active customer, which means *´a customer or a group of jointly acting customers who consume, store or sell electricity generated on their premises, including through aggregators, or participate in demand response or energy efficiency schemes provided that these activities do not constitute their primary commercial or professional activity´*.[14]

The definition shows many of the different areas in which consumers are expected to become active: generation and consumption of renewable energy, storing, selling this energy and participating in demand response and efficiency schemes. Both individual or joint activities are covered by this

---

[11] *The functioning of the retail electricity markets for consumers in the EU, final report November 2010, EAHC/FWC/2009 86 01 by the ECME Consortium and Second consumer market study on the functioning of the retail electricity markets for consumers in the EU, final report, Ipsos-London Economics-Deloitte consortium September 2016*

[12] *The first report shows that in 2010 only 6.2 % of EU consumers had changed energy supplier in the last 2 years. In 2016 this percentage was 14 in the past 3 years, from First and second consumer market study on the functioning of the retail electricity markets for consumers in the EU.*

[13] *The second consumer market study on the functioning of the retail electricity markets for consumers in the EU, final report, from September 2016 shows that the energy component in the electricity prices paid declined by 15% between 2008 and 2015. According to the monitor the changes are small in comparison to the changes in the wholesale market. The report concludes that the competition in the retail market may not be ´completely effective´. In contrast to the electricity component, other price elements like taxes and network costs increased significantly and as a result consumers pay much higher electricity prices today than before the liberalisation. See also Explanatory Memorandum of the proposal for an Electricity Directive, COM(2016) 864 final/2, February 2017, pp. 13*

[14] *Article 2 section 6 of the proposal for a Directive of the European Parliament and the Council, on common rules for the internal market in electricity, COM(2016) 864 final/2, February 2017. Proposed amendment by September 10th 2018, which takes into account the proposed changes, by CEER White Paper on Renewable Self-consumers and Energy communities, July 2017, shows that the definition is still under discussion.*

definition. The role of the active consumer will be further studied in paragraph 4.2 in relation to the smart grid projects.[15]

Looking at this new definition, it implies that technical developments should make new devices available to household consumers, like storage and small-scale production units. According to the Commission all consumers should be able to become active and benefit from directly participating in the market.[16] The definition also suggests that there are active and non-active consumers and that the latter are to be stimulated to become active through new schemes that promote active behaviour. The definition raises many questions like: to what degree are household consumers expected to become active and what determines whether they become active? And further, how will the new framework support all Europeans to become active? Is this just cut out for a small percentage of the EU population or is eventually everybody supposed to become active? And how are we going to prevent that passive consumers are not suffering the consequences of in-active behaviour?

Another area in which the consumer is stimulated to become active is in retrofitting the home by investing in energy efficiency measures.[17] Both by becoming active in producing renewables, becoming flexible in energy use by participating in demand response agreements (using energy when it is available) and by reducing the energy demand (by improving the energy performance of the home) household consumers are expected to contribute to a sustainable energy system.[18]

Especially in relation to investing in production units and energy conservation measures, the level of activeness of consumers is among other things strongly depending on the capabilities of the consumer and its financial possibilities. This will be further discussed in paragraph 6.5 in relation to the retrofit projects.

2.2.3. Security of supply

The transition towards a sustainable energy system leads to the increased reliance on renewable energy sources. The use of renewable energy sources, which are intermittent, might lead to energy supply interruptions. The third key policy objective is to ensure security of supply.

The consumer can again be an instrument to assist security of supply. Security of supply can be supported through becoming less energy dependent, increasing efficiency, or - as shortly mentioned above – becoming more flexible in demand, either through self-supply or by adjusting consumption. Flexibility or demand response can be used to increase grid stability, but also to enhance full benefits of the sustainable intermittent energy sources. This will be further discussed in paragraph 4.4.

The conclusion is that especially the active consumer is an important instrument to achieve all these different energy policy objectives. Yet, the question remains if consumer's behaviour has a successful

[15] *For more information on the definition of a consumer and the energy consumer, read: Katie J. Cseres, The active energy consumer in EU law, European Journal of Risk Regulation, 9 (2018), pp. 238*

[16] *Recitals 25 of the proposal for a Directive of the European Parliament and the Council, on common rules for the internal market in electricity, COM(2016) 864 final/2, February 2017*

[17] *Recital 11 of the Energy Performance of Building Directive 2018/844/EU*

[18] *Demand response is the change in energy consumption by end-users of their usual energy use patterns in response to market signals. DR will be further discussed in chapter 4*

impact on policy objectives. Both Saskia Lavrijssen[19] and Simone Pront-van Bommel[20] show that there are many assumptions on energy consumer behaviour that might not be correct. Several studies have shown that consumers are not aware of their energy consumption, costs or reduction possibilities and as Lavrijssen points out, do not make rational choices as the European legislator expects them to do.[21] Furthermore, energy consumers might not be interested in lowering energy use and changing behaviour to the use of sustainable resources.

2.2.4. Affordability or sustainability or security of supply

There is a friction between the three described values. A high security of supply asks for a strong, resilient and reliable network, which is expensive and thus lowers the affordability. A sustainable energy supply may require a commitment of clienst for a long periode (local energy supply, expensive locally dedicated infrastructures etc.), which interferes with the idea of an open competion where customers can switch supplier frequently. And a higher dependency on renewable, but intermittent energy sources may brng about a lower reliability of the supply.

It is a political choice to find an equilibrium between these three characteristics of the energy system. This equilibrium can evolve over time, as the priorities for the three values may develop in the decades.

2.3. EU Energy consumers rights

Not only the active consumer but also the passive consumer gets a central place in the European energy legislation. This passive customer is seen as the more standard traditional household consumer, or even ´energy poor´ consumer.

Consumers are traditionally protected by more general consumer legislation like the Directive on Consumer rights (2011/83/EU) and Directive on unfair terms in consumer contracts (93/13/EE). In addition, energy consumers are protected in the *lex speciales* of the electricity directive. Directive 2009/72/EC regulates important issues as access, fair prices and tariffs, non-discriminatory and clear information, data protection and privacy, settlement procedures, free choice of supplier.[22]

2.3.1. Universal service

The most elementary right of the electricity consumer is the right to be supplied with electricity. Electricity is a basic necessity for all citizens to be able to pursue and maintain a modern life.[23] It is therefore qualified as an essential service, also called a universal service. Universal service is the right of access to certain services, and the obligation to (amongst others) suppliers or network operators to offer defined services, according to specific conditions, *including complete territorial coverage and at an affordable price.*[24] The definition should according to the Commission´s *White paper on services of*

---

[19] *S.A.C.M. Lavrijssen, The different faces of Energy consumers: towards a behavioural economics approach, Journal of Competition Law & Economics, 10(2), pp. 257–291*

[20] *Simone Pront-van Bommel, De Energieconsument Centraal?, in De consument en de andere kant van de elektriciteitsmarkt, (S. Pront van-Bommel ed., University of Amsterdam, Centrum voor Energievraagstukken 2010)*

[21] *Lavrijssen, supra note 19, pp. 270-277*

[22] *Article 3 and Annex I of Directive 2009/72/EC*

[23] *Pront-van Bommel supra note 20, pp. 40*

[24] *White paper on services of general interest COM/2004/0374 final, § 3.3*

general interest be sufficiently flexible and dynamic to adapt to the social, economical and technical environments and allows Member States to take into account country based specifics.[25] Examples of services that fall under this definition are water, healthcare, postal services and transport.

The right to universal service of electricity is laid down in article 3 of the Electricity Directive and described as *the right to be supplied with electricity of a specified quality within their territory at reasonable, easily and clearly comparable, transparent and non-discriminatory prices.*[26] Universal service also includes the right to be connected to the distribution network.[27]

Universal service obligations often address a former public utility service, or former public monopoly.[28] In the Netherlands the universal service obligations are implemented in the Electricity Act.

To provide universal service to the inhabitants, Member States are required to protect the vulnerable customer by defining the concept of vulnerable customer, which may refer to energy poverty, and avoid disconnection of vulnerable customers in critical times. More general requirements are to ensure consumers transparency regarding contractual terms and conditions, to ensure consumers easily switch procedures and to ensure that consumers are provided with information about dispute settlement mechanisms.[29]

2.3.2. Reasonable price

An important aspect of universal service obligations is that household consumers will pay a reasonable price. Defining a reasonable price is complex and can be seen from different angles.[30] A reasonable price says something about the affordability of energy. Whether energy is affordable is closely related to the financial situation of the end-user. The Electricity Directive aims to ensure a reasonable price for all household consumers. In addition, the Directive protects the more vulnerable consumer that might need extra help to get a reasonable (affordable) price. Member States are using different policies to provide their (household) consumers with an affordable price.

Example of different strategies to protect the vulnerable consumer
Marija Bartl studied the strategies of four Member States: France, UK, Slovakia, Czech Republic.[31] *Bartl found that Member States used methods to:*
1) support affordable prices for all households, either through competition or price regulations
or
2) ensure affordable energy for consumers that have difficulty in paying the energy bill.
In this category Bartl found that Member States use three different measures:
a) energy sector specific measures,
b) general social welfare measures and
c) price regulations.

[25] *White paper on services of general interest, § 3.3*

[26] *Article 3 sub 3 of Directive 2009/72/EC*

[27] *Article 3 sub 3 of Directive 2009/72/EC*

[28] *Gautier, A. and Wauthy, X. (2010), Price competition under universal service obligations. International Journal of Economic Theory, pp. 6*

[29] *Article 3 of Directive 2009/72/EC*

[30] *S. Pront-van Bommel, Een redelijke energieprijs, De mythe van marktwerking, inaugurele rede juni 2012, pp.7 and S. Pront van Bommel, A Reasonable Price for Electricity, J Consum Policy, 2016.*

[31] *M. J. Bartl, The Affordability of Energy, Consumers Policy (2010) 33: 225*

Her study shows that it is challenging for Member States to develop a method that will support competition and sufficiently protect vulnerable consumers. Some of the measures can overly protect all household consumers. An example of this is strict price regulation on electricity sold to àll household consumers, instead of protecting only the households in need of help. Other systems, like market competition, might generate a reasonable price for the average household, but not for the vulnerable household due to a lack of general welfare measures. The countries studied all used a combination of different methods.

2.3.3. From reasonable to competitive

The recent proposal for the Electricity directive includes a remarkable change in relation to the right of universal service. Instead of having the right to be supplied with *reasonable* prices, the proposal speaks of *competitive* prices. Question is what the consequences are of such a possible change. It seems at least in line with the new rules on price regulation (further discussed in paragraph 4.8.) and the conviction of the Commission that an open and competitive market will produce affordable prices. The objective of the Commission is that only in exceptional circumstances prices should be regulated. Moreover, the Commission points out several times that the lack of competition in the retail market is causing increasing energy prices. It reflects only the strict economical point of view to assume that competition will lead to prices that are affordable for all household consumers.

2.4. VULNERABLE CONSUMERS AND ENERGY POVERTY

2.4.1. Defining vulnerable consumers and energy poverty

In the previous paragraphs we discussed that the new proposals try to activate energy consumers in different areas. The proposal also provides protection for the more passive consumer, which can under certain circumstances also be a vulnerable and energy poor consumer. In this paragraph we will have a closer look at whom this vulnerable and energy poor consumer is.

The European energy legislation includes no clear definitions of energy poverty and vulnerable consumers, but demands that every Member State defines the concept of a vulnerable customer.[32] This definition can be connected to *energy poverty and (…) the disconnection of consumers in critical times.* [33] This does not imply that energy poverty or an energy poor customer and vulnerable consumers are necessarily the same.[34] According to the Directive the definition of a vulnerable customer can be connected to energy poverty, also described as ´fuel poverty´ or ´energy vulnerability´.[35] The policy report on *Energy poverty and vulnerable consumers in the energy sector across the EU,* describes energy poverty as *´a situation where individuals or households are not able to adequately heat or provide other required energy services in their homes at affordable costs.* The definition of a vulnerable consumer and energy poverty (poor) differs throughout Europe.[36]

---

[32] *Article 3 section 7 of Directive 2009/72/EC*

[33] *Article 3 section 7 of Directive 2009/72/EC*

[34] *Insight-E Policy Report: Energy poverty and vulnerable consumers in the energy sector across the EU: Analysis of policies and measures, May 2015, pp. V*

[35] *H. Thomson, S. Bouzarovski & C. Snell, Rethinking the measurement of energy poverty in Europe: A critical analysis of indicators and data, Indoor and Built Environment 2017, Vol. 26(7), pp 879–901.*

[36] *S. Pye and A. Dobbins, Energy poverty and vulnerable consumers in the energy sector across the EU: analysis of policies and measures, Insight_E, 2015, pp. 5*

This definition addresses in the first place an economic aspect of energy poverty: whether the energy (service) is affordable. Secondly, the definition also points out the consequences of a lack of available energy: *not adequately heat or provide other required energy services.* The definition is also closely related to the home and the possibility to for example sufficiently heat the home.[37] Energy poverty does not need to be a one on one translation of poverty, this means that not all households that qualify as poor are energy poor, and that not all households that qualify as energy poor are poor. An example would be a household living in dwelling with a very low energy performance. Also characteristics of the consumer like age, mental and physical well-being can play a role in defining the vulnerable consumer.

The UK was the first country to define fuel poverty (energy poverty) as *the need to spend more than 10% of their income on energy to keep the home in a satisfactory condition*.[38] Most of the research done on this topic comes from the UK. In the UK the relation between poverty and the thermal qualities of the building stock were also pointed out. Since this first definition, other countries have followed.

Identifying energy poverty is still challenging, in part because is not straightforward which indicators and methods should be used in measuring energy poverty.[39] The European poverty observatory states that 50 million EU citizens were not able to heat their homes adequately in 2016.[40]

The European legislator has over the last years developed a special focus on this vulnerable energy consumer. Especially in the Third Energy Package the protection of the vulnerable consumer became a more politically important issue.[41] In the new legislative package the protection of the vulnerable consumer is further encored by a new set of measures to protect vulnerable consumers from energy poverty, including measures to stimulate competition in the retail markets, like improving switching conditions.[42] Another example is that the right of consumers to receive clear information is extended.[43] In addition, Member States are not only obliged to define the vulnerable customer[44], the new proposals also require Member States to define energy poverty and ´a set of criteria for the purposes of measuring energy poverty´.[45] The requirement that each Member State defines both vulnerable

---

[37] *B.S. Bouzarovski, 2014, pp. 280*

[38] *B.S. Bouzarovski, Energy poverty in the European Union: landscapes of vulnerability, WIREs Energy Environ 2014, 3: 276–289 and Ofgem, Sustainable development report, November 2007, pp. 31.*

[39] *J.C. Romero, P. Linares & X. López, The policy implications of energy poverty indicators, Energy Policy, volume 115, April 2018, Pages 98-108. For recommendations and more information on indicators to identify energy poverty read Trinomics report: Selecting indicators to measure energy poverty, May 2016.*

[40] *Energy poverty observatory, www.energypoverty.eu*

[41] *Recital 53 and article 3 section 7 of directive 2009/72/EC*

[42] *The proposal includes an article to regulate switching fees. Switching fees are only allowed if the supplier can demonstrate that the consumer has received a demonstrable advantage from the contract and ends the contract before maturity, article 12 of proposal COM(2016) 864 final/2.*

[43] *The proposal includes a new separated article on billing and billing information, article 18 of proposal COM(2016) 864 final/2*

[44] *Article 3 section 7 of directive 2009/72/EC*

[45] *Article 29 and recital 41 of the proposal for a new Electricity Directive COM (2016) 860 final/2. The European Economic and Social Committee (EESC) proposed that the EU would adopt a common general definition to improve the assessment of energy poverty throughout Europe, EESC OPINION of the European Economic and Social Committee on Energy poverty in the context of liberalisation and the economic crisis (Exploratory*

consumers and energy poverty might not harmonize these concepts, but will most likely support a more common understanding of energy poverty in the EU.

Although defining vulnerable consumers and energy poverty is complex, and measuring energy poverty is even more challenging, we can use these concepts to further explore the role of the (vulnerable) consumer in the demonstration projects.

2.4.2. Energy poverty and geographical differences

In Europe energy poor consumers are not a homogenous group of people and each region is confronted with different challenges. In Southern Europe, consumers are, averagely, more suffering from badly insulated housing and energy poverty is often about not being able to sufficiently heat the home. Whereas in the Northern countries energy poverty is, generally, a problem for specific demographic groups and connected to the affordability of electricity / heat.[46] [47]

This implies that energy policies directed at addressing rising energy prices might be an important issue for certain groups of people, whereas energy policies improving the energy performance of the building stock might be a measure that is more effective with regard to fighting energy poverty in other regions.

2.4.3. Energy poverty in transition

The energy transition forces us to change our current production method, the way we trade energy and supply customers. Naturally this will have an impact on consumers, and especially vulnerable consumers, and their capacity to get the energy needed to live a modern life.

Energy poverty is strongly related to the financial possibilities of a consumer. As our energy system is changing due to the transition to renewables and the increasing digitisation of the energy system we have to rethink what future energy consumers need to provide for this basic need. Measures to prevent and help consumers out of energy poverty should be taking into account these changes.

Example of marked based pricing

The digitisation of our system makes it possible to offer household consumers real-time (market based) prizes. This new financial incentive will have an effect on vulnerable and energy poor consumers, as it might result in periods in which energy is no longer affordable.

opinion), July 2010. For more information read: Stefan Bouzarovski, The European Energy Divide, Energy Poverty, 2017, pp 75-107 .

[46] *The energy divide: Integrating energy transitions, regional inequalities and poverty trends in the European Union, Stefan Bouzarovski and Sergio Tirado Herrero, European Urban and Regional Studies 2017, Vol. 24(1), pp. 73*

[47] *For more information: The EU Energy Poverty Observatory (EPOV) from the European Commission gives detailed information on various aspects of energy poverty (www.energypoverty.eu).*

Economic studies show that a 100% sustainable electricity system may lead to short price peaks.[48] *Measures to avoid energy poverty should therefore address these periods in which energy might become too expensive for certain households.*

2.5. CONCLUSION

In this chapter we looked at what different roles the consumer is given, universal service and the protection of vulnerable consumers and how the transition challenges these topics.

Transitioning from a fossil fuel based system to a system based on renewables will have an impact on the stability of the energy supply, will have an impact on the design of our new production units, our buildings and the city as a whole. All of us will be confronted and affected by these changes.

The EU Commission is increasingly focusing on the household consumer. On the one hand they are the key to accomplishing the climate goals, by actively supporting the energy transition through their consumer behaviour. On the other hand the EU is more concerned about the position of the vulnerable household consumers. Preconception is that these consumers do not have the financial means to pay for the energy they need, might be badly informed, might find contracts too complex to understand, and/or are in-active. Little attention is paid to other factors, such as insufficient skills and financial possibilities to adapt to the new requirements in the electricity system. Nevertheless, we need to modify the energy system without increasing the problem of energy poverty.

One of the first elements in the approach of the vulnerable consumer, is lowering thresholds. When consumers are to become active, this should be made easy and attractive. Transparency and honest risk statements are key to convince the majority of end-users. Furthermore, new services focussed on vulnerable consumers could be developed, stimulated and supervised by government, as it is socially just to ensure that also vulnerable consumers can integrally participate in this new paradigm.

Testing new innovations in real-life conditions, like those in City-zen projects, tend to focus on technology with limited attention to the effects on passive and vulnerable consumers. Adoption of new technologies may require financial stimuli for active consumers and these may unintentionally lead to higher costs for passive consumers, thus increasing the problem of energy poverty. For example, dynamic network pricing may be used to avoid an overload on the network by simultaneous charging of electric vehicles. When electric drivers are offered a lower network tariff to charge at off-peak moments, the general level of the network tariffs is to increase. Consumers without an electric vehicle see only an increase of the tariff.[49]

In the next chapter we will analyse the different City-zen projects and map the role the citizen has in the different projects. We will also look into how the projects relate to universal service and contribute to equality.

[48] *See for instance "Examining the Viability of Energy-Only Markets with High Renewable Penetrations", J. Riesz, IEEE PES General meeting and Conference & Exposition, July 2014. and reference in note 49.*

[49] *Radical Prosumer Innovations in the Electricity Sector and the Impact on Prosumer Regulation S. Lavrijssen and A.C. Parra, Sustainability 2017, 9*

CHAPTER 3 – HOUSEHOLD CONSUMERS IN THE NETHERLANDS

3.1. INTRODUCTION

Given that this report is limited to the Dutch City-zen demonstration projects, we will first look at energy poverty and the protection of the vulnerable consumer in the Netherlands and existing Dutch policies addressing energy poverty and vulnerable consumers.

Consumer laws among others laid down in book 6 and 7 of the Dutch Civil Code, protect small end-users that are not businesses. Next to the general consumers laws the Dutch energy consumer enjoys various rights under the Electricity Act. The Dutch energy (electricity) legislation does not define household consumers, yet it distinguishes small consumers (kleinverbruikers) from large consumers. The distinction between large and small consumers is based on the size of the connection to the electricity network. Users with a connection smaller than a maximum of 3*80 Ampère (at 230 V, equivalent to 55 kW) are small consumers and those with a larger connection are defined as large consumers.[50]

Households and most small businesses have a connection that is equal or smaller than this size and enjoy special protection under the Electricity Act.

The protection of small end-users is one of the main objectives of the Electricity Act.[51] An example is that suppliers need a special permit to supply household consumers. This to make sure that the supplier is sufficiently professional, financially strong etc. to supply a household consumer.[52] Moreover, there is regulation protecting the household consumer in case of bankruptcy of the supplier[53], and household consumers have the right to be charged reasonable tariffs[54], which means that if the competition authority deems the prices charged by a supplier unreasonable, the competition authority can set maximum tariffs.[55] All suppliers are obliged to offer small end-users an energy supply agreement for an unlimited period against a reasonable price.[56]

[50] *Article 95a chapter 8 § 1 of the Electricity Act, defines the small consumers (kleinverbruikers) as consumers with a maximum connection size of 3*80 A.*

[51] *Kmst II 2007-08, 31374, nr. 2 and 3.*

[52] *Article 95a of the Dutch Electricity Act*

[53] *Besluit van 14 februari 2006, houdende regels inzake voorzieningen in verband met de leveringszekerheid (Besluit leveringszekerheid Elektriciteitswet 1998)*

[54] *Article 95b sub 1 of the Dutch Electricity Act*

[55] *Article 95b section 3 of the Dutch Electricity Act*

[56] *Article 95m sub 5 and article 95b sub 1 of the Dutch Electricity Act*

3.2. VULNERABLE CONSUMERS AND ENERGY POVERTY POLICIES

Despite the fact that the Netherlands is one of the richest European countries it is estimated that between 750.000 and 1 million or between 10 and 13 % of households are experiencing financial difficulties to pay the monthly energy bill.[57]

3.2.1. Disconnecting an end-user

However, in the Netherlands there is, besides the protection of energy consumers as laid down in the Electricity Act, one regulation addressing energy poverty directly: the Ministerial Regulation on disconnection of household consumers from electricity and gas (Regeling afsluitbeleid voor kleinverbruikers voor elektriciteit en gas).[58] This Ministerial Regulation governs the conditions and procedures that need to be followed by suppliers and operators before disconnecting. Thus, the regulation addresses one of the symptoms of energy poverty: the risk of deprivation of a household from energy supply.[59]

First approach in the regulation is the link with the general social policies regarding vulnerable customers. Household consumers that are assigned for a debt control programme (schuldhulp–verlening) cannot be disconnected.[60] The regulation stimulates household consumers to participate in such a programme. The regulation also aims to get insights in the financial situations of the vulnerable consumers.

Second, the regulation protects the remaining vulnerable household consumers from disconnection during the winter months and if disconnection poses health risks for the end-user or its cohabitants. The regulation includes a definition of the vulnerable consumer for this situation and defines it as ´a *small end-user for which the termination of transport or supply of electricity or gas would lead to very serious health risks for the small end-user or its cohabitants*´[61]

---

[57] *Most studies define energy poor as households living in poverty, which is estimated at around 10 % of the households. According to a study of Sia partners in March 2017, which analysed energy poverty in the Netherlands, approximately 1 million households, 13 % of the Dutch households, are living in energy poverty. The researchers looked not only into measured (energy) poverty, but also at hidden and perceived energy poverty. Hidden energy poverty points to households that deprive themselves from energy to keep the bill affordable. Other studies estimate that there are approximately 750.000 households living in Energy poverty (K. Roelfsema, Energy poverty in the Netherlands: The scale, target groups and potential solutions, 50pp, EES-2015-309-2.)*

[58] *There is a similar regulation for household consumers connected to (district) heating: Warmteregeling.*

[59] *Article 95b sub 7 and 8 of the Dutch Electricity Act, article 44 sub 7 and 8 of the Gas Act and Regeling afsluitbeleid voor kleinverbruikers voor elektriciteit en gas.*

[60] *Article 8 and 10 of the same regulation.*

[61] *The ministerial regulation governing protecting small end users from disconnecting implements the obligation on Member States to define vulnerable consumer in article 1 of the Regulation.*

So, the end-consumer enjoys better legal protection during the winter months,[62] and if the network operator and supplier cannot terminate the contract if the household consumer can prove that disconnecting will present serious health risks.[63]

3.2.2. Reducing energy consumption

Besides the above-discussed Ministerial Regulation, there are no energy sector specific national policies addressing vulnerable energy consumers and energy poverty, neither in subsidy policies stimulating energy efficiency or energy independency, nor in the design of financial schemes available to households to upgrade the energy efficiency of the home.[64]

These schemes are offered to all households and its financial situation is only relevant for verifying the applicant's creditworthiness to take up a loan. A French example of a retrofit project aimed at energy poverty will be further discussed in paragraph 6.4 of this report.[65]

3.3. VISION OF THE NATIONAL GOVERNMENT ON ENERGY POVERTY

Until now, energy poverty has not been an important political issue in the Netherlands. None of the political parties discussed energy poverty in their election programme during the last elections in 2017.[66] Further the Dutch government has expressed its opinion against the new proposals as laid down in the EC's winter package. The new package demands of all Member States to develop policies to protect the vulnerable consumer and to report on energy poverty.[67] The Netherlands believes that energy poverty falls under social policies, which to a large extend falls under national competence, and should therefore not be part of the European energy legislation packages.[68] The Dutch government further debates the competence of the EU on this topic and does not consider it useful to monitor energy poverty as a separate topic.[69]

---

[62] *Since May 2018 the regulation has been adjusted. Until then suppliers and network operators were only obliged to follow a strict procedure during the winter months, which included informing the authorities about financial issues of the consumer. Several stakeholders, like consumer organisations, municipalities asked the Minister to adjust this practice as it turns out that consumers disconnected during the summer months are often still disconnected during the winter months. The argument is that it is therefore better to use the same procedure during the summer months. Nevertheless, household consumers are still more protected during winter, since suppliers and network operators are prohibited to disconnect during the winter months if the consumer is in a financial support program. Stc. 2018 nr. 5311*

[63] *Article 6 Regeling afsluitbeleid voor kleinverbruikers van elektriciteit en gas (and article 7 of the Warmteregeling*

[64] *There are low-interest loans available to invest in the energy efficiency of the home, but these are often not accessible for this group of vulnerable consumers. See also chapter 7.2 of the City-zen report on energy policy and legal context and on financing and ownership. (supra note 3)*

[65] *Study for the ITRE Committee, How to end energy poverty? Scrutiny of current EU and Member States Instruments, IP/A/ITRE/ 2014-06, October 2015, p. 18. For an example of such policies read also paragraph 6.4 of this report.*

[66] *Sia partners supra note 57.*

[67] *Article 29 of the Proposal COM(2016) 864 final/2.*

[68] *Kmst 2016-17, 34663, nr. 6, § 3.*

[69] *Kmst 2016-17, 34663, nr. 4, § 4: The government doubts whether the competence falls under article 194 TFEU and thinks it should rather be designed under article 151 of the Treaty.*

3.3.1. Local policies

In contrast with the national government´s approach, local governments, often in cooperation with the private sector and other interest groups, support various initiatives to help vulnerable and energy poor consumers. In recent years several urban initiatives have sprouted, amongst which paying parts of the energy bill, helping to take energy saving measures, offering free advise or plans to give a collective subsidy on the energy bill for low-income households.[70]

Examples of support programmes

An example of a programme supported by the national government is a study that assesses the effectiveness of different interventions to reduce energy poverty and increase energy efficiency. A consortium, existing of a network operator, energy supplier, a social organisation and ECN (Energy Centre Netherlands, co-ordinator) studied five pilot projects to reduce energy poverty.[71] The pilot projects studied are shortly described:

- *The first pilot involves educating energy coaches that give low-income households advice on how to reduce the energy consumption.*
- *The second project is the Energy bank in Arnhem, which is a place where energy poor households can get again coaching, but also financial support to pay the energy bill, with a maximum of six months. The programmes aims at behavioural change, therefore the financial help is temporal, not structural. Low-income household are expected to be able to lower their energy bill by reducing energy consumption.*
- *The third pilot is a programme that offers low-income households a prepaid energy contract, which means that the user pays a sum upfront and is billed on a daily basis. Similar to a prepaid telephone deal, the consumer can refill its account whenever the credit is used. According to the pilot the objective is to create awareness around energy use and costs and this should result in energy efficient behaviour.*
- *The fourth pilot is a project with renters in social housing. Renters again are educated by energy coaches on how to reduce their energy consumption. In addition to advice, participants will also receive a box with energy efficient light bulbs and other material for small adjustment to save energy.*
- *The fifth and final pilot is a project of the Amsterdam municipality together with housing corporations and other institutions involved in helping households in critical financial situations. The object is to help households with financial problems in an early stage by offering a free energy coach that again helps the household to reduce their energy consumption.*

It can be concluded that all of these pilots follow the same logic, though using different methods, to help vulnerable and energy poor consumers: all pilots are focused on reducing the energy consumption through behavioural change, or: energy poverty is reduced by making vulnerable consumers use less energy.

All of the pilots assume that by changing behaviour the energy bill can be reduced significantly, up to 35 % if the households did not take any measures before starting the pilot. The question remains what

[70] *Energiebanknederland.nl, Amsterdam wil collectieve korting energierekening voor minima, Energeia, 13 feb. 2018.*

[71] *Energiearmoede.nl and Rapportage Energiearmoede Effectieve interventies om energie efficiëntie te vergroten en energiearmoede te verlagen, K. Staver et al. January 2017*

the effect will be of learning low-income households to shower 1 minute shorter every day and if this will help them to reduce energy poverty in the long run.

Disregarding whether or not the short-term effects of the advice,[72] it is remarkable that other measures, like offering financial support for insulation upgrades or, paying part of the energy bill, offering storage or production units, are not or hardly included in the study.

The question is also whether or not focusing on the reduction of energy consumption on a yearly basis will help reduce energy poverty in the future given that energy prices will most probably be less stable during the year, see paragraph 4.4 on demand response offers.

3.3.2. Vulnerable consumers and the demonstrators

The consumers involved and participating in the different City-zen projects are not just consumers using the current energy system: in the projects new elements are introduced to the system (such as technologies, organisation, financial arrangements) in order to test if these can contribute the sustainability of the future energy system. These tests challenge the rights of consumers on many levels and we will discuss a number of these challenges directly related to the Dutch demonstration projects.

Consumers involved or affected by the demonstrators are not a homogeneous group, but have various backgrounds, financial situations and roles (tenant, homeowners, landlords) within the different demonstrators. They live in new housing, traditional housing, and they are to different levels interested in the developments in their direct environment.[73]

3.4. Conclusion

Although more than 10% of the Dutch households have a problem to pay the energy bill, national policies aimed at preventing energy poverty are very meagre. General policies on financial weak households prevail and stimulating energy conservation, also via generic policy instruments, are believed also to address energy poverty. One specific instrument is geared to energy poor households: by ministrial decree energy suppliers are not allowed to disconnect households, with exception of households that refuse participation in a debt control programme. Disconnection during winter months is only allowed in clearly fraudulent cases.

Municipalities encounter directly the social effects of energy poverty and at local level, many initiatives have been developed to prevent vulnerable households to fall into energy poverty. These range from financial support, expenditure coaching, energy coaching and prepaid energy contracts.

Within the City-zen demonstration projects, no clearly defined group of consumers is found as the project range from refurbishment of social housing up to electrical vehicles (V2G) in high-income districts.

Also with regard to the policies set out by the European Commission in the Winter Energy Package, Dutch national government should develop a view on energy poverty. *Especially when introducing new, innovative technologies and procedures in the Dutch energy system, government (including the Regulator) should take into account that a large group of energy consumers are in a vulnerable*

[72] *The effect of these pilots was measured, not by comparing energy consumption data, but by letting households filling out a questionnaire. It is therefore difficult to measure the real effect.*

[73] *R. Fransman and A. van Timmeren, Psychological and social factors underlying pro-environmental behaviour of residents after building retrofits in the City-zen project, Energy Procedia 122 (2017) pp. 1051–1056*

position. Especially when introducing new, innovative technologies and procedures in the Dutch energy system, government (including the Regulator) should take into account that a large group of energy consumers are in a vulnerable position. Thus, every step in the energy transition must at least be checked on its effects on energy poverty. More active policies could use the opportunity of these changes in the energy system to lower the risks of the vulnerable consumers and structurally redress energy poverty.

CHAPTER 4 – DEMAND RESPONSE AND UNIVERSAL SERVICE

4.1. A DIGITAL ENERGY SYSTEM

Digitisation of the management of the energy system offers many new opportunities in the energy sector and can contribute in different ways to creating a clean, affordable and secure energy system. However, it can also pose a threat to the certain objectives, like non-discriminatory access to electricity against reasonable prices and privacy protection.

Today digital technology in the energy system is foremost seen as a means to increase energy efficiency, security of the network, security of supply, the uptake of larger amounts of renewable energy sources and administrative efficiency.[74]

In this chapter we will discuss three smart grid City-zen demonstration projects, forming the starting point to discuss the impact of digital technologies on our energy system and more specifically on (vulnerable) household consumers.

4.2. CITY-ZEN SMART GRID PROJECTS IN AMSTERDAM

The three projects we will focus on in this chapter are the smart grid projects by Alliander, the local DNO and the initiator of the projects. Central question in these projects is how smart technologies can improve grid stability, unlock and use flexibility of end-users and how electrical vehicles can contribute to both grid stability and flexibility of end-users. The projects are foremost aimed at households, not industry.

4.2.1. End-to-end smartification

The first project, called End-to-end Smartification (E2E) aims to learn how to develop an optimal smart grid by adding sensors to the distribution grid at key junctions and equipping households with smart meters. The DNO is interested to learn more about the kind and numbers of sensors and smart switches in the network that are needed to get a good overview of the conditions on the net. According to Alliander *´currents and voltages are continuously monitored to facilitate more accurate remote monitoring and control functions.´*

Ultimately this should lead to resolve and prevent outages, monitor and control the increase of local RES production, heat pumps and batteries, including those in electrical vehicles (the latter are further explored in two of the projects). Also, the projects should contribute to the development of a system that can communicate relevant information to all the grid users, including household consumers, about transport possibilities and trade opportunities.

Further the project hopes to contribute to manage peak flows over the distribution network as an alternative to grid reinforcement. One of the basic questions that is still unanswered is whether it is

[74] *Explanatory memorandum of the proposal for a Directive of the European Parliament and Council on common rules for the internal market in electricity, COM (2016) 864 final/2, pp. 2, and https://ec.europa.eu/digital-single-market/en/blog/digitising-energy-sector-opportunity-europe*

more cost effective to invest in grid reinforcements or invest in smartification and unlocking the flexibility of end-users (see also paragraph 4.7.).

4.2.2. Virtual power plant

To which degree household consumers can be flexible is a central question in the second smart grid project: Virtual Power Plant (VPP). In this demonstration project 50 households are equipped with home batteries. These houses are already outfitted with solar panels. The object of the project is to learn more about the impact of the battery on the local network. The project not only studies the impact of the battery on the grid, but also researches the value of flexibility. To investigate this topic Alliander (the network operator) together with other parties[75] has developed software that remotely controls the battery of the participating households. Partner in this project is NeoSmart, an aggregator, that uses software to control the battery. NeoSmart is in charge of purchasing electricity for the participating households and Eneco (energy company, the supplier) is contracted as the supplier and balance responsible party (BPR). NeoSmart will make for the 50 households a daily nomination and send the E-programme (energy programme and nomination) to Eneco. Electricity is solely bought on the day-ahead exchange APX. For this case NeoSmart (nor Eneco) is involved in intraday trading.

Several flexibility options will be tested in the project:

- The battery will be used for optimal self-supply to the individual households.
- The battery will be used accurately following the E-programme (avoiding imbalance costs).
- The battery will be used to follow market prices (charging during low price hours, discharging during high price hours based on day-ahead prices).

Households have been actively selected to participate in the project but they do not play an active role in the project. This means that NeoSmart is fully in charge of operating the battery. To get insight in which option households prefer, several sessions are held with the participating households under supervision of Wageningen University, that studies these preferences.

4.2.3. Vehicle to Grid

The last City-zen smart grid project in Amsterdam is the Vehicle-to-Grid (V2G). The aim of the project is to develop a smart charging system based on bi-directional charging for cars. Smart charging technology for V2G is not as developed as smart charging technology in households.[76] The first challenge was to find a manufacturer that could produce a bi-directional charging point. Second challenge is to develop business cases. The University of Applied Sciences in Amsterdam studied possible business cases. According to Bohnsack et. al.[77] several studies show that V2G has commercial potential, however no business cases are developed yet. The study has, based on consumer preferences, explored V2G possible business cases.

---

[75] *The other parties involved in this demonstration projects are: Energy exchange enablers (EXE), part of the Alliander group and NeoSmart, a supplier aggregator. In autumn 2017 NeoSmart took over the project from Greenspread.*
Wageningen University will do the social evaluation with the households participating.

[76] *Long read https://amsterdamsmartcity.com/p/vehicle-to-grid.*

[77] *R. Bohnsack,, R. Van den Hoed, H. Oude Reimer, Deriving vehicle-to-grid business models from consumer preferences. World Electric Vehicles. J. 2015, 7, 621-630.*

4.3. DEVELOPMENTS IN SMARTIFICATION

4.3.1. Common questions

All of the above projects are studying the same topic, namely: how can we fully benefit from a new digital layer of appliances measuring and registering all activity on the network? Each project addresses a different aspect: grid stability, consumption and production patterns of households and the impact of electrification on the system. Common focus is the use of these new instruments to create flexibility in the operation of the net and demand in electricity.

To get a better understanding of what we mean with smart grid, flexibilities and demand response, we will first look into two developments: transitioning to sustainable energy sources and the digitisation of the system.

4.3.2. Two major developments

There are two important developments in the energy system: the step towards renewable energy sources and the increasing use of digital systems. Both developments are very much intertwined: digital technologies help to integrate renewable energy sources into our energy system. On the other hand the increase of these sources also pushes the development of a digital energy system. This is also reflected in the City-zen smart grid projects which focus on smartification of the grid, households and transport (vehicles) to smoothly integrate the uptake of renewable energy sources.

4.3.3. Renewable energy sources (RES)

Renewable energy sources are by nature intermittent and to a larger extent than fossil fuels, unpredictable. Our electricity system needs to be ´in balance´ at every moment, meaning that at every moment demand is matched by supply. Therefore integrating renewable energy sources, which cannot be tuned as thermal power plants, demands new ways of operating the system. Traditional fossil fuel based sources can follow the demand curve, but the possibility to ´push a button´ to increase electricity generation will diminish in the transition to renewable sources. This means that the consumption of energy (electricity) needs to be tuned to the supply (production) of energy and this will naturally have an impact on how and when energy is consumed.

Renewable energy production plants, like solar plants and windturbines, are small-scale in character compared to conventional thermal or nuclear power plants and therefore located and connected in different locations than these conventional plants. Subsequently, many of the new production units are not connected to the high-voltage transmission network, but to the middle and low voltage distribution grid[78]. The grids of the DNO will experience an increased transport demand, which can – without interventions – lead to congestion and blackouts. Also their legal competence is expected to be insufficient in this situation. The DNO participating in City-zen is experimenting with new ways to deal with these challenges.

4.3.4. Digitisation

If we speak of the digitisation of the energy system this refers to the increasing use of smart meters and sensors and use of other intelligent appliances connected to the grid. The digitisation of the system goes hand in hand with many other technical developments that have changed the energy system of households over the last decade, such as solar panels, small-scale batteries and electric vehicles. For the future a more extended use of heat pumps is expected.

[78] *Connection by DNO's to the grid of 20 to 110 kV.*

These new developments offer opportunities for both household consumers and other market parties. The access to real-time data allows market parties to develop new products in the form of simple data communication gadgets informing consumers about energy flows, but also offers that stimulate certain behaviour. The real-time data are essential for offering flexible behaviour via newly developed market places and digital platforms.

4.4. DEMAND RESPONSE

Digitisation of the energy system makes it possible to harvest the flexibility of household consumers. Traditionally only large consumers were participating in flexibility schemes, but since the roll out of the smart meter household consumers can also participate in these schemes.

The smart meter can measure the electricity flow into or out of the dwelling (the net consumption or production) at small time intervals and enable consumers to see their consumption patterns. More importantly, the consumer can – at least technically – participate in the flexibility market by engaging in demand response agreements.

The active consumer is also embraced by the Commission's Legislative Package, which includes new articles on active consumers, energy consumers and demand response.

Example of household consumer flexibility

Household consumers can increase their flexibility in several ways. One option would be to invest in a battery. A battery allows the household consumer to store electricity and use the electricity at a later moment, for example when electricity prices are high.

It is also envisaged that these household batteries are discharged into the network during a period in which electricity production is scarce. In that case, the household consumer is selling its stored electricity to third parties in need for electricity.

The household consumer can offer flexibility by engaging in different kinds of *demand response contracts.* Demand response (DR) is described as the change in energy consumption by end-users of their usual energy use patterns in response to market signals. The proposal for a new Electricity Directive defines demand response as: *´the change of electricity load by final customers from their normal or current consumption patterns in response to market signals, including time-variable electricity prices or incentive payments, or in response to acceptance of the final customer's bid, alone or through aggregation, to sell demand reduction or increase at a price in organised markets as defined in Commission Implementing Regulation (EU) No 1348/2014´*[79]

4.4.1. Different demand response contracts

There are two different types of demand response contracts offered to household consumers:

1) incentive based offers (explicit demand response),[80] and
2) price-based offers (implicit demand response)

The explicit demand response is a consumer's action that is sold up-front to the market. An example is a battery owner that allows a network operator, via an aggregator, to use part of the capacity of

[79] *Article 2 section 16 of the Proposal for an Electricity Directive, COM(2016) 864 final/2*

[80] *Impact assessment study on downstream flexibility, price flexibility, demand response & smart metering, Final report, by Ecofys, Thema, Vito and Cowi, July 2016*

the battery to balance the grid in return for a (financial) reward.[81] As discussed above (paragraph 4.2.2.) in the City-zen virtual power plant project the aggregator uses the battery to test a number of schemes.

Next to the explicit demand response schemes, there are three subtypes of implicit demand response schemes:[82]

1. *Time of Use* pricing, characterized by prices that are defined in the contract and that depend on the time of the day energy is used (like a day/night tariff),
2. *Real-Time Pricing*, prices that follow wholesale prices,
   and finally
3. *Critical Peak Pricing*, an offer that includes a very high tariff during some days/hours a year and an averagely low tariff during the rest of the year.

All categories of demand response offers are appealing to the possibility for household consumers to reduce their final energy bill by adjusting their consumption patterns.

4.4.2. Examples of demand response offers

Base line: the passive consumer

The standard household consumer is billed by its supplier on basis of a standard consumption profile for each household customer. The energy bill is not based on the actual use for each hour and the price of that hour. In the Netherlands, suppliers and network operators have defined 9 profiles for 9 types of household consumers, giving consumption data for each hour of the year.[83] These profiles are updated yearly.

Households with a smart meter are billed in the same manner, unless they become an active consumer with a contract that requires the use of real-time prices for billing.

Wholesale prices

In some countries in Europe suppliers offer so-called *spot price* contracts. This is a typical implicit (price based) time of use offer. These contracts are charging consumers based on wholesale, mostly day-ahead, spot prices.

Today most Member States are rolling out smart meters[84] and this makes it possible to charge consumers a real-time based price on actual consumption. Examples of such offers are the contract of supplier Easy Energy in the Netherlands and of Eesti Energia in Estonia. For both offers you need to have a smart meter to be able to be billed according to the hourly (in this case day-ahead) spot price.

---

[81] *This is currently not possible in the Netherlands for the DNO see paragraph 4.7.*
The TSO does use battery capacity to balance the grid. For the first time in the Netherlands aggregated battery capacity participated in the frequency containment reserve for TenneT in October 2018. Energy supplier Engie developed an energy aggregation platform for participating battery installations. Mobile battery storage units, industrial batteries and second life batteries with a total capacity of 3 MW participated.
source: Energeia.nl dd. 17 October 2018

[82] *Dynamic pricing in electricity supply, Eurelectric, February 2017*

[83] *The profiles are drafted by NEDU, the Dutch association of energy companies. The profiles can be downloaded at https://www.nedu.nl/documenten/verbruiksprofielen/*

[84] *The roll out of smart meters falls under article 3, section 7 and the Annex I, section 2 of the Electricity Directive 2009/72/EC*

Electric heating scheme

Although more rare then implicit demand response offers, there are also emerging explicit demand response offers in the market. One provider offering explicit demand response offers is the aggregator Voltalis [France]. Voltalis installs a box that can remotely operate the electric heating device in the home. The heating is interrupted in case of price peaks at the imbalance market of the TSO. The aggregated flexibility is sold to the TSO. However, households do not receive any reward, only the saving on the energy bill due to the interruptions in the heat consumption.

V2G Smart charging

The amount of electrical vehicles in Europe is expanding and new offers to smart charge vehicles are developing. An example of a smart charge service provider is Jedlix in the Netherlands. Jedlix offers to charge the car as much as possible during low price hours. Part of the benefit is paid out to the consumer.

Digital platforms

The digitisation of the system also leads to the development of new platforms, for example in the shape of a trade platform for household consumers, so-called Peer-to-Peer energy trading platforms. An example of such a platform is developed by Energy eXchange Enablers (EXE) for the VPP project.[85]

Other example that is already on the market is the SonnenCommunity developed by the SonnenBattery manufacturer in Germany. The system combines battery storage, solar panels, self-consumption and energy sharing. As a result the household consumer doesn´t need a traditional supplier and uses the community instead.[86]

4.4.3. Conflicting schemes

As already pointed out earlier, demand response can serve different purposes, for example reduce the bill by reducing consumption during periods of high prices (economic value to the consumer), reduce peak flows to avoid grid congestion (network value for the DNO), balance demand and supply (energy value for the supplier), provide power to the balance responsible system operator (flexibility value for the TSO). These values are difficult to bring together in one scheme. In almost all cases, demand response can be executed based on electricity prices or on network load.[87]

Even though the market for demand response offers is growing, there are still many questions unanswered. One such question is in which way the different schemes can work together. Are different schemes interfering with each other or can they exist together or even support each other? Under the current, unbundled, market organisation, different stakeholders (consumer, aggregator, supplier, DNO, TSO) serve different interests and therefore their demand response schemes might be conflicting.

---

[85] *http://www.cityzen-smartcity.eu/ressources/smart-grids/virtual-power-plant/*

[86] *https://sonnengroup.com/sonnencommunity/*

[87] *A legal barrier impeding the DNO to buy in flexibility is for example reflected in the Dutch energy laws, which in the first place oblige the DNO to facilitate the market. Buying flexibility directly in the market is not explicitly forbidden, but to facilitate net traffic the DNO is up to now always expected to reinforce or expand the network. Another impeding factor is that the law does not allow the DNO to raise flexible tariffs. For reasons of accessibility, affordability, transparency, the network tariffs are strictly regulated. Experimenting with flexible network tariffs to stimulate demand side management will not be part of the smart grid projects. Read also chapter 9 of the City-zen report on Energy policy, legal and financial context, November 2017.*

Example of a conflict of interest in demand response: City-zen project E2E

An example is when an abundant supply of RES (on a windy day) leads to low prices and all households are charging their battery (stationary or mobile). Would this lead to transportation problems on the local grid? Can this charging of batteries avoid a demand peak when supply is scarce? A demand response incentive could be based on market prices or on the grids electrical load.

In the assessment of allowing for demand response to steer the grid electrical load the value of access to the market for the household consumer should be considered: What is the value for the grid operator compared to the value for the households? And who is responsible for governing this choice?

The Virtual Power Plant project is exploring the relation between the interests of different stakeholders. The project is now in the testing phase and participants are already experiencing that charging based on day-ahead EPEX Spot prices shows unexpected patterns and does not always sufficiently take into account real-time fluctuations on the grid. As a result a battery might based on a favorouble day-ahead price unload at 12:00, while there is in real time an abundance of electricity available and a need for increased consumption (loading). Moreover, the system solely takes into account day-ahead prices and not real-time fluctuations or intraday prices. The example shows that even though consumers are participating in a demand response scheme, they can still be offered the wrong incentives. In this particular case this might result in the conclusion that for optimal net capacity, demand response price based offers should be based on more close to real-time prices, instead of day-ahead prices only.

It can be expected that different schemes on the market can be conflicting and this complicates the use of demand response schemes. Also, certain schemes might have a positive effect on the energy bill of individual households, but might also trigger extra system costs. These plusses and minuses will vary from one situation to the next. Furthermore, demand response schemes to optimize network loading will strongly depend on the local grid situation and so the benefits for consumers connected to different parts of the networks might vary.[88]

Given that demand response schemes strongly depend on time, place and different stakeholders, they are more complicated to understand for household consumers.

In the VPP project (see paragraph 4.2.2), the Wageningen University studies the preferences of households participating in the project. Are households more eager to self-supply, use the battery as much as possible to supply the individual demand, or are schemes that are using the collective capacity also in favour. The results of this study are expected mid 2019.

4.5. INTERMEDIATE CONCLUSION

It is clear from the foregoing considerations that the digitisation and the use of ICT will be an opportunity to help enhance the sustainability of our energy system, by informing all system users (consumers, producers, grid operators, aggregators, suppliers) about the status of the system and how to respond to real-time situations. At the same time, stakeholders with different interests in demand response are active in developing this market and as a result this new market might become quite opaque and less transparent for household consumers. Furthermore these different interests lead to different demand response schemes and especially those based on grid capacity will be depending on local grid conditions, and so consumers in different areas might benefit in different ways from demand

[88] *M. Nijhuis, M. Babar, M. Gibescu, S. Cobben, Demand Response: Social Welfare Maximisation in an Unbundled Energy Market Case Study for the Low-Voltage Networks of a Distribution Network Operator in The Netherlands, IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS, VOL. 53, NO. 1, JANUARY/FEBRUARY 2017.*

response offers. Question is if this is desirable given that for reasons of accessibility, affordability and transparency, the network tariffs are strictly regulated. It is apparent that national policies need to reflect on the different interests connected to demand response schemes (see also paragraph 4.7.4.).

The question that we will address in the second part of this chapter is how digitisation of the energy system impacts consumers' rights, like the right to universal service of electricity?

4.6. TOWARDS A DIGITAL ENERGY SYSTEM: THE POSITION OF THE (VULNERABLE) CONSUMER

4.6.1. Proposal for an Electricity Directive

In this paragraph we will look at the proposal for revision of the Electricity Directive and see how the proposal combines on the one hand the need for more flexibility and the protection of both the vulnerable and active consumer. Chapter III of the proposal called ´consumer empowerment and protection´ reinforces and extends household consumers rights.

The currently binding Electricity Directive[89] already supports household consumers to become more active in the energy market and the proposal takes this a big step further by regulating that every customer is entitled to demand a dynamic price contract, but also by assuring that consumers can contract an aggregator without the consent of the customer´s supplier (article 13)[90]. The proposal also introduces separate articles on the active consumer (article 15), guaranteeing consumers to generate, store, consume and sell the self-generated electricity, also discussed in chapter II. Furthermore the proposal strengthens the right to a clear contract and billing information (article 10 and 18) and access to a free and independent comparison tool (article 14).

4.6.2. Role of data and data management

Using smart meters and other IT appliances lead to an enormous increase of consumption data. This data is crucial for both the generator of the data, in this case the household consumer, and the parties using this data to provide services and bill the customer based on this data. To avoid interoperability barriers the proposal regulates that on consumers request metering data of their electricity consumption and production should be made available in a common data format (article 24).

However, the proposal also determines that Member States or the designated competent authorities can specify the eligible parties, which may have access to the data of the household consumer (article 23) in accordance with the GDPR Regulation. The proposal does prescribes that '… *eligible parties shall include at least customers, suppliers, transmission and distribution system operators, aggregators, energy service companies, and other parties which provide energy or other services to customers.´*

The data model used in the Member State should enable efficient data access and exchange (article 23, section 2). Member States should appoint and certify the party(s) that are responsible for managing the data and ensure that all parties comply with the Directive and the GDPR Regulation 2016/679.

4.6.3. Aggregator and balance responsible party

The proposal further anchors demand response by ensuring that regulatory authorities encourage final customers to participate, either directly or through an aggregator, in all organised markets, and

[89] *Electricity Directive 2009/72/EC.*

[90] *Proposal for a new Electricity Directive: COM (2016) 864 final/2*

network operators must ensure non-discriminatory access of aggregators and other demand response providers when procuring ancillary services.[91] Member States are also obliged to provide transparent rules and procedures for data exchange between market participants (article 17 section 3c).

An example: consumption data

The supplier collects the data from the meter of a household consumer. If the consumer decides to enter into an agreement with an aggregator for demand response purposes, the aggregator will need to have access to the meter data of the supplier. Article 17 on demand response regulates, among other things, that the supplier is obliged to share the data with the aggregator without requiring compensation, under the condition that consumer has given permission.

However, if the activities by the aggregator interfere with the E-programme of the balance responsible party, the possible imbalance costs induced by the aggregator, must be compensated. The aggregator can be charged with a compensation payment. Compensation, according to the proposal, can only be paid for imbalances that lead to financial costs (article 17 section 4).[92]

In the Netherlands, the supplier of the household consumer is by law the balance responsible party[93]*, as a result there will be a need for some sort of financial settlement between the supplier and the aggregator and this might be suboptimal.*

4.6.4. Smart meters

Two other important articles in relation to demand response are article 19 and 20 on smart meters and regulating the functionalities of the smart meters. Under the current directive Member States are given the possibility to make an economic assessment on the *long-term costs and benefits to the market and the individual customer or which form of meter is economically reasonable.*[94] General principle is that all Member States will implement intelligent (smart) meters. The current directive is not very strict on the roll out period and the form or type of meter. However, the new proposal sets minimum functionalities, like providing consumers with accurate actual time of use information and ensuring the privacy of data communication. In addition, the articles 21 and 35 underline that all consumers, even if the Member State does not come to a positive conclusion on rolling out smart meters, have the possibility to request such a meter.[95]

---

[91] *Article 17 section 1 and 2 COM (2016) 864 final/2*

[92] *On behalf of Eurelectric, the Union of the established European energy industry, DNV GL did a short study on this proposed article 17. They conclude that the compensation only for the loss as a balance responsible party is insufficient as there can also be an actual loss on the energy sourced by the supplier and the energy it may invoice the consumer. Also, the report concludes that a transfer of balance responsibility to the aggregator might be a solution and that the supplier needs to be compensated, either by the consumer or aggregator, for unsold energy. Demand response activation by independent aggregators as proposed in the draft Electricity Directive, by DNV GL, July 2017.*

[93] *Article 1 o Dutch Electricity Act and System code electricity.*

[94] *Annex I section 2 of Directive 2009/72/EC.*

[95] *Recital 35 and article 21 section 1 of the proposal COM(2016) 864 final/2.*

One of the most important functionalities of the meter is its interoperability, so its functioning does not depend on specific software and switching barriers are avoided.[96]

Example interoperable meters

The UK is struggling with introducing interoperable meters. The smart meter that is currently rolled out in the UK degrades into a conventional (dumb) meter when the consumer switches to another supplier. As a result consumers are forced to switch meters if they switch supplier, which is a major barrier to change suppliers.[97]

Another requirement on the smart metering system is that it should provide consumers with information on actual time of use and consumption data should be available at near real-time and the data should be presented visualized to the final customer against no additional costs.

4.6.5. Comparison tools

The first and most important condition for consumers to participate in demand response is that they will benefit from the new demand response offers. It is therefore essential that consumers understand what offer to pick and find the demand response offer that is most beneficial to their situation. The proposal demands that all member states provide free and independent comparison tools.

Example

Today it is almost impossible to compare offers that include some sort of form of dynamic pricing. Most of the comparison websites,[98] *compare offers based on the total annual consumption of a consumer and do not take into account the consumption patterns throughout the days and the year.*

Regulating a standard data format, as discussed above, could also contribute to comparing offers. Comparable tools should be able to read the format and use historic consumption data to advice consumers on which offer fits their situation.

It can be concluded that the new proposal reinforces the rights that are laid down in the current Electricity Directive. Added to that, the Commission proposes many new policies supporting the empowerment and protection of household consumers in demand response schemes, by securing privacy of the data and access to consumption data and on the other hand, supporting the roll out of well functioning meters and ensuring access to demand response offers and better functioning comparative websites.

At the same time the Directive puts more emphasis on the vulnerable consumer by, as described in chapter II, obliging Member States to define vulnerable consumers and energy poverty and develop policies to avoid and overcome energy poverty.

4.6.6. A competitive and reasonable price versus demand response

The introduction of this chapter started with pointing out the tension between on the one hand supporting household consumers to participate in demand response agreements and on the other

---

[96] *Recital 36 and article 19 of the proposal COM(2016) 864 final/2.*

[97] *For more information check for example Octopus Energy: https://octopus.energy/blog/smart-meters-are coming/*

[98] *Examples are theenergyshop.com (UK), energievergelijking.nl (NL), strømpris.no (NO).*

hand access to affordable electricity. In this paragraph we will further study the tension between these two topics.

According to Recital 25 of proposal for a Electricity Directive: *All consumers* (should) *be able to benefit from directly participating in the market, in particular by adjusting their consumption according to market signals and in return benefit from lower electricity prices or other incentive payments.*[99]

According to the Commission all consumers should be able to benefit from directly participating in the market. This could be through demand response offers. These offers, as we have described above, can address the more active consumer that has an electric vehicle, production units and/or storage, and other household appliances that can increase the flexibility and in return offer a reward for the provided flexibility. Other offers, specifically implicit demand response pricing schemes are available to both consumers with storage and production equipment and smart household appliances and consumers without these appliances. Via such demand response offers the more ´passive´ consumers can be activated. This means that also consumers that can solely be flexible by reducing or shifting consumption in time can participate in these demand response offers.

Example demand response and storage

A consumer participating in a demand response agreement is financially stimulated to shift his demand to periods when prices are low and to lower consumption when prices are high. If a consumer engaged in an implicit demand response agreement (for example real-time pricing) has a battery, the consumer will most likely charge the battery during cheap hours and use the stored electricity during high price periods to avoid buying expensive kiloWatthours. This consumer is, as long as there is sufficient electricity on the battery, not limited in his electricity consumption.

The consumer without storage will have a similar financial incentive. The key difference is that the consumer without storage will be much more compromised in the access to electricity when prices are high, namely this consumer does not have access to cheap electricity during these hours like the consumer with storage.

Even though a demand response offer is less attractive for consumers without storage, because the offer might compromise access to affordable electricity, the offer might still be very well favoured by the consumer without storage due to the financial savings that can be made compared to a agreement with a fixed price. Also it is possible that consumers living in poverty are more sensitive to financial incentives, than more wealthy household consumers.

The example shows that financially stimulating consumers to adapt their electricity consumption can compromise the access to affordable and clean energy. It can be expected that especially consumers that are vulnerable and financially less strong, be attracted by such offers. On the other hand, a consumer that sees no opportunity to lower his demand during high price periods will face a higher energy bill.

The recital of the proposal for a Electricity Directive continues that ´*Member States should ensure a reasonable exposure of consumers to the wholesale price risk*´. Question is what can be qualified as reasonable? Assuming that *reasonable* is connected to *affordability*[100], the question whether or not a consumer is exposed to a *reasonable* wholesale price risk is depending on many specific factors related to the consumer. The most important factors are the financial situation, the energy demand which is

[99] *Recital 25 of proposal COM(2016) 864 final/2*

[100] *In alignment with reasonable in article 3 section 3 of the Electricity Directive 2009/72/EC and White paper on services of general interest COM/2004/0374 final, § 3.3*

connected to the energy efficiency of the home, the personal needs (age and health situation) and the access to alternative sources, either to self or collectively produce or store affordable electricity.

Finally the proposal specifies that also those consumers that do not choose to actively engage in the electricity market should not be penalized. Again, this is a challenging goal. Demand response offers should be financially more attractive at times to make sure that consumers choose these agreements. If there are cheap fixed price offers on the market, the incentive to engage in a demand response offer is undermined.

Moreover, finding a balance between on the one hand stimulating households to adapt their energy consumption to the needs of the market and at the same time guaranteeing access to affordable electricity at all times is not straightforward. There will be a need for a compromise in form of a price cap[101], or a new view on how to make, especially vulnerable, consumers more resilient for high market prices.

4.7. THE NETWORK OPERATORS AND DEMAND RESPONSE IN THE NETHERLANDS

4.7.1. The role of Network and the System Operator

The Transmission System Operator and Distribution Network Operator have different tasks and responsibilities.

The Transmission System Operator (TSO) operates the backbone of the grid and is responsible for manaining the so-called system balance. In the Netherlands market parties are responsible to balance their own demand and supply. As so-called balance responsible parties, they deliver daily to the TSO a programme of their demand and supply, which need to be in balance. In case a balance responsible party is not following its programme, this party is in imbalance. The real-time balancing of total supply and demand, the system balance, is an exclusive task of the transmission system operator (TSO).[102] The TSO has the responsibility to restore the ´system balance´, either through buying or selling energy.

In the Netherlands the Distribution Network Operator (DNO) has as task to distribute energy from the backbone to the end-users. It does not have a task in balancing supply and demand. This division of these tasks stems from the system in which large-scale production plants were connected to the transmission network where the operator of the transmission network has been responsible for keeping this balance.

The TSO and DNO have different responsibilities and can therefore deploy demand response for different goals.

In the City-zen smart grid projects, DNO Alliander is exploring different ways to deploy demand response. The new proposal also changes the role of the network operator from a facilitator to a party that is part of this flexibility market and engaged in developing new balancing products. [103]

Demand response can be an instrument to achieve different goals. The importance of demand response for the DNO depends on the responsibilities of the network operator. Network tariffs

[101] *The proposal generally opposes any form of price-setting, except if in relation to vulnerable consumers for reasons of extreme urgency, article 5 section 4 of the Proposal.*

[102] *Article 1.1.1 and 2.2.3 Dutch System code electricity*

[103] *F. Elskamp & G.W. Rodenhuis, De toekomst van transmissie- en dstributiesysteembeheerders in de nieuwe Elektriciteitsverordening - een 'New deal´?, Nr.1/2 April 2018*

Although the Electricity Act in the Netherlands specifies that the DNO can use measures of demand response, under the current Dutch rules the DNO cannot charge different household customers different tariffs. The current tariffs charged to household consumers do not take into account the network situation during inputs and off-takes of electricity. Household consumers pay a flat annual tariff based on the capacity of the connection, independent of the factual use of capacity and the transportation demand.[104]

Using demand response, or flexibility, can particularly be important in relation to postponing grid reinforcements. Especially if the reinforcement would facilitate only incidental peaks, using services from resources such as demand response might be more efficient. One measure to avoid these incidental peak flows, is the introduction of time dependent net-tariffs.[105]

Given the limited role in physically balancing the net, the local grid operator in the City-zen project is in the first place interested in the impact of these new developments (IT, storage and local production) on their local grid and how demand response could solve (future) capacity issues. These studies might also contribute to the answer whether the role of the local grid operator should evolve and include a local balancing responsibility.

Many DNO´s are studying the effect of the increase of distributed generation and are already anticipating a changing role and experimenting with demand response.

However, also more flexible tariffs must meet the prime conditions as non-discrimination (meaning that similar use should lead to similar tariffs), transparency, cost-efficiency and cost-reflectiveness.

4.7.2. Dynamic pricing

Network tariffs might weigh heavier on the budget of a vulnerable or energy poor consumer, than on another household consumer. The question is what type of dynamic pricing will be valued as fair by household consumers. Research by Neuteleers and Mulder shows that certain tariffs are validated as more fair than other tariffs. Important elements for end-users are that the tariff is connected to the costs incurred, that the tariff is non-discriminatory, does not enhance inequality, and benefits are equally distributed.[106] Another important element is that the tariff is predictable. Neuteleers and Mulder argue that dynamic pricing might affect vulnerable households more than other households. To mitigate this, one of the suggestions they give is to charge this group of vulnerable consumers with a lower tariff. According to them dynamic prices might become more fair in the experience of consumers if they are informed about the benefits of dynamic pricing.

4.7.3. Congestion management

The electricity network has been set up from the premise that it can answer all demand for transport of electricity, acting as the so-called copper plate. In the 20th century vertically organised system investments in power plants and in the network, were coordinated within the utility companies. After the unbundling of the vertically integrated energy companies in private companies (production, trade and supply) and publicly owned network operators, a new system of coordination was set up, in which

---

[104] *Independent of the amount of kWh.*
See also article 4 section 2, Regeling inzake tariefstructuren en voorwaarden elektriciteit.

[105] *Overlegtafel Energievoorziening: Nieuwe spelregels voor een duurzaam en stabiel energiesysteem, netbeheer Nederland, 2015, pp. 48.*

[106] *Stijn Neuteleers & Machiel Mulder, Hoe rechtvaardig zijn dynamische elektriciteitsnettarieven, ESB, 102 (4750), 2017, pp. 292-295*

the larger market parties were obliged to announce investments that would lead to a larger demand for electricity transport.[107]

Today an increase of small-scale producers and a rising demand for local transport of electricity forms a challenge for the distribution network operators. Legislation on networks is oriented towards the old system of centralised large-scale production supplying passive consumers. Locally matching demand and supply by distribution network operators could be necessary to avoid congestion.[108]

Example of planning differences and congestion

A clear example of a development that was not foreseen by the DNO was the fast increase of CHP-power (combined-heat-and–power) in the Westland-area installed by green growers in 2007. Many of the warehouses were equipped with aging gas-fired CHP- installations. In a few years time, these were replaced by modern CHP-endines with a much higher performance. In two decades, the average power of a new CHP-engine increased from 150 à 250 kW to 1.000 à 1.500 kW. The demand for grid capacity to export these volumes out of the Westland-area more than quadrupled. The DNO already planned a grid extension but the works were only completed a few years later.[109]

For these situations, when the increase of transport capacity is not yet completed, a system of congestion management has been developed by the DNO's and the TSO and subsequently regulated.[110] The DNO – in cooperation with the TSO – has to organise a daily auction to allocate the scarce transportation capacity at the congestion point. Market parties in the areas involved can, similar to the balancing auctions of the TSO, offer bids to lower their demand or increase their production, thus decreasing transport demand. The TSO can use the instruments it has to manage national balancing issues, but than for the congested area.

In case of a structural congestion, the DNO is obliged to increase transport capacity in order to avoid future congestion. The DNO can use demand response to manage the grid and eventually avoid further grid reinforcements. The Electricity Act, article 16 section 1c, explicitly states that the network operator can, in his task to construct, repair, or expand the net, take into consideration measures of demand response.

At this moment, congestion management is seen as a temporary measure until the grid capacity is expanded, and the above-mentioned premise of the 'copper plate' has not been addressed. At this moment, it is only implicitly addressed by network operators. Network operators experiment with instruments (flexible tariffs) to avoid transport peaks in their grid, as this could be more efficient than investing in a capacity increase. This is an interesting notion, that has also taken ground in the proposal for a new EU electricity regulation.[111]

---

[107] *Netcode, article 4.*

[108] *Think, From Distribution Networks to Smart Distribution Systems: Rethinking the Regulation of European Electricity DNOs, final report, June 2013, p.p. 42*

[109] *Letter to Parliament from the Minister of Economic Affairs on security of supply from Oct 17, 2007 (Kmst II 2007-2008, 29 023 nr 43).*

[110] *Regeling inzake tariefstructuren en voorwaarden elektriciteit, article 18a, and Netcode, article 4.2.5.*

[111] *Article 16 of the proposal for a new EU Electricity Regulation, COM(2016) 861 final/2and*

4.7.4. (In)efficient network investments

It could be argued that it is not efficient to increase the capacity of an electricity network to accommodate a transport peak that occurs only one hour a year.[112] The discussion on avoiding transport peaks is focused on developments around households: input from solar panels and the demand from electric vehicles. Network operators relate in cost-benefit analyses the value of the electricity transported at the peak moments to the costs of reinforcing the network.

In this view, the DNOs see the need to locally balance their grid through storage in the distribution grid, or incentivizing demand response locally for example by charging a tariff reflecting the underlying network costs. Supporting flexibility through flexible tariffs can, as described above, contribute to more optimal use of the network, but the approach is also limited for a number of reasons.[113]

a. Non-discriminatory tariffs

One important reason is that it is difficult to understand the impact of different types of flexible network tariffs on the costs for households. Questions are if potential flexible tariffs distribute the costs and benefits equally and, more importantly, if curtailing the use of the network, even by soft instruments as flexible tariffs, leads to an infringement of non-discriminatory access to the energy system.[114] It can be argued that there is no discrimination if the flexible tariffs are under the same circumstances equal for all users of the network[115]. This raises the question if "the same circumstances" encompasses the capacity of the local network. In other words: should two identical households, one in city A and the other in city B, pay different tariffs, only because the local network in city A is constrained compared to that in city B? To answer this question, it is important to note that the capacity of the network is determined by earlier investments and policies of the network operator and it is completely out of the view and beyond the influence of the users of the network.

b. Non-discriminatory access

The second reason concerns the physical access to the network. At some moment in time, market prices of electricity may show a peak that overshadows the increased momentary network tariff. Many active end-users will be willing to pay the higher tariff to sell their electricity from solar PV and gain these high prices. (The same situation can occur when consumers decide to increase their consumption in spite of high momentary tariffs.) However, the access to: the grid is restrained and the network operator cannot fulfil its duty, both to the individual customer (breach of a private contract) as to society (neglect of its public task).

Related to this point is the question on whether the network operator has the legal and technical means to effectively constrain the use of the network.

---

[112] *Overlegtafel Energievoorziening: 'Afwegingskader verzwaren tenzij', May 2018.*

[113] *V. Azarova et.al., Exploring the impact of network tariffs on household electricity expenditures using load profiles and socio-economic characteristics, March 2018.*

[114] *Directive 2009/72/EC, article 35 section 2: 'In any event, it must not discriminate between system users or classes of system users, particularly in favour of its related undertakings'.*
and Electriciteitswet, artikel 95a.

[115] *"Electricity Distribution Network Tariffs, CEER Guidelines of Good Practice", Ref: C16-DS-27-03, 23 January 2017*

c. Efficiency and effectiveness of demand response

The value of demand response to facilitate the increasing share of intermittent sources, will be smaller for active consumers behind a network constraint. The economic value is reduced for both the seller of flexibility (the consumer) as for the buyer of flexibility as they both cannot fully benefit from a large market. Not only economic value is lost, but also the societal values of sustainability and stability of the energy supply are impaired. Demand response may become a blunt instrument when mainly used to address local, temporally network deficiencies.

Towards a new policy framework?

Recently, the Dutch energy sector, co-operating in writing proposals for the energy transition, published a framework for decision making by DNOs under the title "Decision tool: reinforcement, unless…".[116] This tool is a sound first step towards the framework as meant in the above paragraph. The tool, however, is limited in its approach on the above mentioned reasons. The tool is limited to the economic parameters of the DNO itself, thus disregarding both economic values outside the scope of the DNO and non-economic values. The tool explicitly exempts considerations regarding sustainability of the energy flows at stake, as this is regarded as in the political domain. The tool is independent of the instruments to stimulate flexibility in the use of the grid, such as flexible tariffs.

Consumers invest in solar panels, batteries or electrical vehicles as they feel it as their contribution to a sustainable energy system. When because of network limitations these active consumers are penalised for or curtailed in their actions, this might have a negative impact on the motivation of active consumers and it may slow down the further dissemination of active customers.[117] This effect also demands a careful approach from DNOs and other stakeholders.

The above-mentioned limitations of local balancing or flexible tariffs show that there is a need for a further discussion that should reconcile the different interests at stake. The result could be a clear framework for decision making, guiding network operators in avoiding inefficient investments and in the mean time aming at an optimal solution as to avoid local sub-optima.

4.8. INNOVATIVE, OPERABLE, TRANSPARENT AND AFFORDABLE

The electricity system is increasingly 'smart', that is to say: depending on digital technologies. This development allows and stimulates not only large market participants, but also household consumers to actively participate in this market. Consumers are participating in different areas; some are active in producing and/or storing electricity, others participate in demand response agreements.

This transition to a digital energy system does not only impact the household consumer in its role becoming from a mere consumer to a producer and maybe a supplier, but also impacts its right as a consumer. It concerns his right to access to affordable energy, to get a transparent energy bill, to non-

[116] *Overlegtafel Energievoorziening: 'Afwegingskader verzwaren tenzij', mei 2018.*

[117] *It may also result in an increase of the use of fossil power. When limiting the output of solar power from a congested area, this power is compensated outside the area and when extra sustainable sources are not available, fossil generation will replace the curtailed volumes of sustainable power.*
An example of already existing congestion problems is found in Groningen, where many households were offered solar panels by the gas industry as compensation for the nuisance from their mining activities. As a result of the increase of solar panels in this area, the DNO is having net capacity problems on sunny days. Solar panel installations are switched off due to a lack of capacity.
Source: NOS, Te veel zonnepanelen in Groningen, 18.07.18

discriminatory access and prices, to transparency in the market. Considering the digitisation of the energy system, how are we going to provide consumers with such a fair and transparent system?

4.8.1. Access to flexibility

There are still a number of issues that prevent household consumers to become flexible and the first issue is the market for demand response offers is growing, but the market is still limited in Europe.[118] In the Netherlands for example, only in 2017 the first spot price offers were introduced.[119] Until then all offers were either based on a day/night tariff or a fixed tariff. The step to real-time pricing is still to be introduced.

The administrative system can also form a barrier. In Norway, for example real-time-pricing has been a normal contract form, so called spot-price contracts, only the administrative system of both the network operators and suppliers has so far not been able to charge consumers based on these prices. The second issue is that there are still many technical issues that prevent the development of demand response offers.

Thirdly, the network tariffs are not dynamic. Reason that these tariffs are still fixed seems to be connected to the complexity of financially stimulating household consumers to be flexible and at the same time ensure that the tariffs are non-discriminatory, transparent and cover real cost. In addition to that, the local grid operator in the Netherlands has no balancing responsibilities. Local, flexible network tariffs can only reflect the local situation on the grid and thus it can interfere with the supply and demand situation on a national or international scale. Without a proper framework flexible network tariffs may lead to local, suboptimal solutions – especially when the flexible network tariffs for transport are not countered by real-time prices for the product 'electricity'.

Fourth issue is that new market parties in the Netherlands, like the aggregator, are still depending on suppliers, which is by law the balance responsible party of all household consumers.

In addition to this the consumer itself may be a barrier. Firstly because so far research has shown that consumers remain very inactive and demand response includes more or less an element of activeness.[120] Secondly, even if the consumer is willing to offer flexibility to the market, many household consumers are only to a limited extent able to offer this.

4.8.2. Consumer advantages

Despite the existing hurdles, there are also many advantages in a digital energy system for consumers:

= Consumers can become more independent from their supplier. They can monitor their own energy flows, produce energy and by using digital platforms become suppliers themselves, supplying their neighbourhood, cooperation or friends (peer to peer electricity exchange)

= Moreover, digitisation has the potential to make the energy system more transparent. Intelligent systems are able to register all electricity flows more accurate than ever before.

---

[118] *Dynamic pricing in electricity supply, A EURELECTRIC position paper, 2017.*

[119] *Nieuwkomer EasyEnergy levert kleinverbruikers tegen kostprijs, Energeia, 28 februari 2017.*

[120] *Read also chapter 2 § 2.2.2 of this report or Simone Pront-van Bommel, De Energieconsument Centraal?, in De consument en de andere kant van de elektriciteitsmarkt, (S. Pront van-Bommel ed., University of Amsterdam, Centrum voor Energievraagstukken 2010) and SACM Lavrijssen, The different faces of Energy consumers: towards a behavioral economics approach, Journal of Competition Law & Economics, 10(2), 257–291.*

= And finally, the digitisation of the system can contribute to a more sustainable and secure energy system, as discussed in chapter 2 of this report.

4.8.3. Consumer disadvantages

a. Operability

As mentioned above, data is an essential element in the digital system. It is therefore crucial that this data is accessible to consumers in a clear and transparent format and that upon consent from the consumer the data can be shared and used by other parties in the market. This requires a standard data format, that is compatible with the household systems (the physical meter and a software viewer tool), as well as the administrative systems of market participants. In this way the household consumer can freely engage in an agreement with one or more market parties without being hindered by a loss of valuable (consumption) data.

b. Transparency

Also in relation to transparency data plays a key role. First of all the overall market should be transparent, meaning that consumers can find the right contract in their particular situation. Comparison tools can help to make this market more transparent, but only if these tools can process the necessary information to be able to really compare offers.

Secondly, transparency is important in the relation between the household consumer and its contracting party. Again providing clear data can improve the transparency and the comprehensibility of especially the more complicated demand response agreements.

c. Affordability

Demand response leans on financially incentivizing household consumers. Stimulating household consumers to lower momentary electricity demand by charging high prices or charging a penalty is difficult to reconcile with the right to universal service: the right to be supplied with electricity of a reasonable or competitive price.

The proposal further regulates market based supply prices and limits Member States to apply public interventions in price settings. Derogations are possible in relation to the supply of vulnerable household consumers, but only if it is *´strictly necessary for reasons of extreme urgency´*.[121]

Given that the proposal is very strict on price regulation of electricity supply, other measures to ensure universal service for vulnerable household consumers should be studied. The Proposal underlines that *Member States should take measures to protect vulnerable and energy poor consumers (…) Measures may differ according to the particular circumstances in the Member States (…) and may include social or energy measures relating to the payment of electricity bills, investment in residential energy efficiency, or consumer protection such as disconnection safeguards.*

In the Netherlands there are measures taken to protect household consumers from disconnecting.

Examples of Member States solutions

There are many other types of measures that could support vulnerable and energy poor households that do not intervene with competition in the market. To make vulnerable consumers more resilient they could be financially supported to invest in energy efficiency measures in the home or invest in RES

[121] *Article 5, section 1-4 of the proposal for a new Electricity Directive.*

procuction and storage capacity. During high price periods, these households become less depending on wholesale prices and it will also guarantee access to more types of demand response schemes.[122]

Another measure would be to pay a fixed part or a percentage of the monthly energy bill for this particular group of households. Such a measure would still stimulate households to find the cheapest deal and to be energy efficient.

4.9. CONCLUSIONS

In this chapter we discussed the impact of digitisation on our energy system. Digitisation offers many new opportunities, plays a crucial role in the integration of sustainable electricity sources and allows household consumers to get insight in their consumption patters and allows them access to an appropriate market. That the digital market is more easily accessible is also reflected in the creation of new platforms that allow new market participants to trade.

The City-zen demonstrations are showing the early stages of a different digital energy system. Alliander studies demand response as an alternative to grid reinforcement and if so under which circumstances. The next step will be to find out how they can get flexibility from the retail market, either by adjusting network tariffs or by purchasing such services in the market. The projects also underline the evolution of the role of the local grid operator into areas related to system services.

The VPP project develops a platform for the households connected in Amsterdam West, which makes us reflect on who has access to these new communities and who owns them.

Overall we can conclude that the transition to a digital energy system puts pressure on certain consumers' rights. The new EU-proposals anticipate by increasing consumer protection, but do not sufficiently address how to tally on the one hand access to universal service of electricity and on the other hand supporting financial stimuli to change behaviour of households. Member States should carefully consider which measures lead to the energy resilience and independency of vulnerable households, so that also these household consumers maintain access to the energy market, in a digitalized world. Easy access to the energy system remains important and this term will in future also encompass access to flexibility platforms and demand response offers. Especially for vulnerable consumers this may require specific governmental attention.

In chapter 3 we discussed that current policy to address energy poverty and vulnerable consumers in the Netherlands is limited. Moreover we discussed that up till know the focus has often been on energy efficiency and programmes to reduce energy use. Looking at how demand response offers can change the household consumers offers, solely looking at the reduction of energy use will not be sufficient in the future. Current developments show that the level of flexibility of the end-user determines more and more the final energy bill. It is precisely in this area we should focus to support vulnerable and energy poor consumers.

Finally, financial stimuli in network tariffs or market prices will unarguable lead to lower payments from those stimulated and to higher payments from those not reacting to the stimulus. When examining price or tariff proposals, regulators should be aware of how the costs and benefits are distributed over different groups of household consumers.

[122] *To avoid that households are exposed to unreasonable price fluctuations, suppliers could introduce a price cap, meaning that if prices rise a household consumer would never pay more than the cap. An example of a supplier is Octopus in the UK. They charge customers with real time prices and have a maximum price of 35p/kWh as a price cap.*

CHAPTER 5 – HEATING: COLLECTIVE SOLUTIONS AND INDIVIDUAL FREEDOM

Most of our buildings today are heated with a source that is not considered to be sustainable, whether this is an oil fired boiler, still used in certain areas in Grenoble, or natural gas in most parts of the Netherlands, these polluting sources need to be replaced in time with sustainably produced heat.

In this chapter we will look into the transition of heat demand in the built environment. We use demonstration projects in Amsterdam as an example to explore the existing heat market in Amsterdam.

The heat transition in the built environment affects household consumers directly in the way they heat their houses. Consumers will possibly need to increase the energy efficiency of their homes and the transition might have an impact on comfort levels. The Amsterdam City-zen projects demonstrate that the current organisation of the 'heat market' might not facilitate the transition sufficiently: the market is closed to new participants in certain areas and citizens are not always in the position to freely choose how they would like to transition to a CO_2 emission free home.

5.1. HEAT SOURCES USED IN THE BUILT ENVIRONMENT

In the Netherlands natural gas provides 93 % of our heat demand.[123] This means that our built environment is heavily relying on this source. Approximately 300.000 households are connected to a large district-heating network and these networks are for 75 % supplied with heat from fossil sources, such as gas- and coal-fired power plants. The other 25 % comes from waste incineration and biomass. Only 50.000 households are connected to smaller district heating networks and 500.000 households are heated with a shared, apartment block size (most often) gas-fired boiler.[124]

5.2. DIFFERENT STAKEHOLDERS

For a successful transition to a CO_2 neutral heat supply, households and other building owners are key: they will have to change from heat source and to do so, many will have to adjust their homes or buildings and possibly also their consumption behaviour.

As the municipality is the primary level of government responsible for the built environment, municipalities are given a coordinative role in phasing out natural gas in the existing built environment. In a recently presented plan to support the creation of fossil free built environment, all municipalities are asked to develop municipal plans on how to phase out natural gas. Each municipality will need to have a plan, including plans for each neighbourhood, ready by 2021.[125]

[123] *Kmst II 2016-17, 34 723, nr. 3*

[124] *Monitoring warmte 2015, ECN April 2017*

[125] *Programmastart IBP, 14 February 2018, agreement between national government, provinces, municipalities and water management authorities. Municipalities commit to develop transition plans for the build*

Other important stakeholders are parties that produce heat, which can be an energy company that exploits an existing large high-temperature heat network, or a supplier operating a small neighbourhood WKO system. Heat producers and suppliers come in different sizes and depending on the system and type of heat they offer, they have different needs and interests.

To get a closer look at the parties involved in the City-zen project we will continue with describing the different stakeholders in these projects that are specifically relevant to the heat transition.

5.2.1. The citizen

In the retrofit projects in Amsterdam both homeowners and social housing associations were supported with a grant to improve the energy efficiency of homes. The housing associations retrofitted both all electric houses and housing connected to district heating. Some of the homeowners have disconnected from the gas network and choose an alternative individual heating system. As these projects involve the existing built environment, the homeowners could voluntarily disconnect from the gas network, as they still have the right to their gas connection.[126] A couple of households for example choose to replace the gas-fired boiler by heat pumps and chose to compensate the additional electricity demand with PV panels.

Example: voluntary connection to district heating

One developer developing private properties that participated in the City-zen project with a refurbishment project, decided to connect to district heating. Developing an existing building (refurbishment), which was already connected to the gas network, the developer could choose to maintain his gas connection or decide to connect to a nearby district-heating network developed in the area.

The lack of the obligation to connect to the heat network provided the developer with room for negotiation with the heat supplier. Eventually, the developer was able to negotiate a much lower price than the normal regulated price to connect such a building.[127]

In new built areas designated for district haeting, all new buildings are connected, unless a developer or homeowner apply for a derogation.[128]

The example illustrates important aspects of the transition, namely how much room is there for the municipality, the building owner (including homeowners), citizens or developers to make choices, participate, have a say in the outcome and not in the least, negotiate.

environment, including alternatives for gas in each area that will be disconnected from the gas network before 2030.

[126] *The gas Act does not regulate the disconnection of existing connections. The gas network operator has the obligation to maintain the existing connection according article 10 section 1 Gas Act. These households do not fall under a so-called ´heat plan´ or ´heat concession area´ and do not have the obligation to connect to district heating. The absence of such a network will, of course, also limit their choice; they do not have the power to demand a connection to a heat network.*

[127] *Several parties involved in this particular City-zen project shared this information during the interviews.*

[128] *Chapter 7 of the City-zen report on Energy policy, legal and financial context. Supra note 3*

The three important success factors are a clear process toward a sustainable heating, understandable and transparent commercial offers, and – even more important – an affordable and low risk investment for the consumer.[129]

Moreover, citizens approach the transition in the first place from their individual perspective: their house and energy bill.[130] In contrast with the municipality, the homeowner cannot plan the energy transition in the public domain. For citizens to plan for energy measures, municipalities will need to provide them with a clear plan and tools.

Next to the individual perspective, there are some citizens also developing and exploring collective approaches. The collective perspective is found in the numerous cooperations and local initiatives aiming at installing sustainable electricity generation (windmills, solar panels), but also at developing bottom-up heat networks.[131] Citizens are active on an individual level and collectively engaging in the energy transition.[132]

5.2.2. The heat supplier

Heat suppliers come in many different forms, small and large, offering high or low-temperature[133], fossil fuel based or sustainable heat. They are in public hands, private hands or in the hands of a public-private co-operation. Given that the landscape of heat suppliers is so diverse, we focus on a low and high-temperature heat supplier, and more specifically on the biorefinery project developed by Waternet.

High-temperature heat

In the western districts of Amsterdam a high-temperature district heating system is operated by Westpoort Warmte (WPW), a 50/50 joint venture between NUON and the public waste incineration plant AEB. The network of WPW is fed with residual heat from a coal plant, a gas-fired plant (both NUON) and from the waste incineration plant (AEB). Westpoort Warmte counted around 22.000 connections in 2016. The other heat network in the eastern districts counted 16.870 connections in 2017.[134] In 2017 in total around 37.000 households were connected to the two heat networks in Amsterdam.[135]

---

[129] *Many investments are still not low risk, due to inadequacies of energy efficiency modelling as described in chapters 7.2 and 7.8 of the City-zen report on Energy policy, legal and financial context. Supra note 3.*

[130] *Current policy is also designed to support this approach. Individuals, not streets or a group of neighbours, can apply for loans and subsidies. Except for those homeowners that live in an apartment block with an owner association*

[131] *F. L. Hooimeijer, H. Puts & T. Geerdink, Successful development of decentralised district heating: Application of a theoretical framework, JSSP, 2016, Issue 5*

[132] *Tineke van der Schoor & Bert Scholten, Power to the people: Local community initiatives and the transition to sustainable energy, Renewable and Sustainable Energy Reviews, March 2015, Vol.43*

[133] *High-temperature means water temperatures above 70 ℃, middle temperature means around 40 to 70 ℃ and low-temperature below 40 ℃. Source: City-zen report of the Amsterdam Roadmap.*

[134] *More information can be found at: https://www.aebamsterdam.nl/over-aeb/nieuws/2016/amsterdam-zet-in-op-warmtenetten/, and https://www.nuon.nl/producten/stadsverwarming/CO_2-reductie/amsterdam-zuid-en-oost/*

[135] *https://www.nuon.nl/producten/stadsverwarming/co2CO_2-reductie/amsterdam-totaal/*

In this chapter we will focus on the district-heating network that is recently developed in the north of Amsterdam and that is owned by WPW. The specific agreements on district heating between the Amsterdam Municipality and the heat suppliers are not publicly available and the information below is based on limited publicly available information and information provided by the municipality. The agreements itself are, however, not disclosed by the city.

According to the municipality the Amsterdam North agreement dates from 2008. Parties in the agreement are WPW and the municipality. According the municipality this is a concession agreement, which includes the right and obligation to develop and exploit a high-temperature district heating network in the whole north of Amsterdam, meaning that they have the exclusive right to supply all new developing areas with their heat. The municipality states that the duration of the agreement is either 30 years or everlasting.[136] NUON is in this particular agreement in charge of developing the system and supplying heat and the municipality, through AEB, is in charge of generating heat. Since the agreement is not available and we have limited information about other agreement between the municipality and the heat companies, it is unsure if the agreement qualifies as a concession.

The (concession) agreement excludes all other heat developments in the area, meaning that no other (district) heating systems can be developed in this area. In addition to that, all houses (buildings) that are developed in the concession area have the obligation to connect to the district-heating network. Derogation from the obligation to connect can be given if the owner or the household proves to install an alternative heating system that is equally sustainable.[137] This right to chose an alternative equal solution is also laid down in the building act.[138] Not all of the concessions include such derogations and there have been several issues around the mandatory connection to the heat network.[139]

Both the municipality and the heat suppliers would like to expand the heat network. In 2015 the heat suppliers and the municipality of Amsterdam laid down the intention to extend the district heating network to 230.000 connections in 2040.[140] This ambition includes both the connection of new-built housing and existing housing.

---

[136] *Older concessions and similar agreements are often everlasting and the more recent ones are given for 30 years. It is not clear in which category this concession falls.*

[137] *To qualify as equally sustainable is a challenge, because the current EPC, which is used to qualify the alternative method, is very much in favour of district heating. It is therefore difficult to find another source that will on paper qualify as equal. Another issue that prevents household consumers from choosing the heat system is that in new developed areas these decisions are made by the developer. The final buyers are often not in the picture before the last building phase. The revision of the Dutch Heat Act includes a new article, article 3c, that regulates the disconnection from the network.*

[138] *For more information about equivalence read chapter 6.3 of the City-zen report on Energy Policy, legal and financial context. Supra note 3.*

[139] *An example of a housing project that resisted to connect to the district heating network, but were obliged by the municipality to connect is Nautilus, a homeowner's collective in Amsterdam.*

[140] *Agenda Duurzaamheid Amsterdam 2015, p. 14*

Low-temperature heat

In the Buiksloterham area in the north of Amsterdam an entire new neighbourhood is developed. This is a sustainable neighbourhood with high circular ambitions and therefore many new and innovative projects are developed in this area, including the biorefinery developed by Waternet.[141]

The biorefinery is a small sanitation plant. The sanitation plant has been designed to maximize the recuperation of energy and nutrients from the wastewater on a neighbourhood level, and to substitute a traditional centralized large-scale wastewater treatment plant. One of the products the sanitation plant can recuperate is heat from the grey water, which entails all waste water except for toilet water (from baths and showers, from laundry and dish washers), which is at approximately 20 degrees celcius and can be used to heat households. The black water, toilet water, is used to recuperate bio fuels, which can be used for electricity and heat. Waternet would like to supply the households connected to the new sanitation plant with this heat.

In contrast with high-temperature heat, which has a temperature of around 80 degrees, the heat from the biorefinery is low-temperature, approximately 20 degrees. This means that housing using this heat will need an additional installation to heat their tap water. Also this type of heat can only be used in very well insulated buildings. In addition to that, the recuperated heat will not be sufficient to supply all households that have a connection to the system.[142]

Waternet is a good example of a new type of heat supplier: not a traditional energy company, but a water company that explores how they can optimally use the by-products of their activities, like heat from sanitation or drinking water transport.[143]

Finding a customer for this type of heat is challenging for a number of reasons:

= The biorefinery is new and they cannot rely on experience,

= The current energy efficiency calculation methods used in the Netherlands are in favour of high-temperature heat and this makes it almost impossible for low-temperature (often very sustainable) heat sources to compete with high-temperature (often polluting) district heating systems (see also paragraph 5.5.3.),

---

[141] *Waternet is the regional public authority, responsible for flood protection, drinking water supply, sewerage, wastewater treatment, surface water quality and quantity control and the first company in the Netherlands combining all these services in one organisation.*

[141] *Waternet deals with many different types of water streams at different temperatures, which can be an interesting asset that could support sustainable developments in the city.*

[142] *The heat generated by such systems is often not sufficient to provide all houses connected with the heat the system generates. To make use of more low-temperature heat sources Waternet could make an ´open' heat network, meaning that all possible heat producers (citizens and industry) can feed in the heat into the system. A low-temperature heat system can be open, because the temperature is low and heat from different sources can only increase the heat, and not jeopardize the temperature, as is the case if you supply high-temperature heat.*

[143] *Waternet deals with many different types of water streams at different temperatures, which can be an interesting asset that could support sustainable developments in the city. In the City-zen project Waternet develops two demonstrations, the first one is a project in which they supply the blood bank Sanquin in Amsterdam with cold, extracted from a cold drinking water pipeline. This project is a b2b agreement and we will therefor leave this out of the scope of this report. Nevertheless, future developments might involve supplying cold to households.*

= And the existing concession agreements between the municipality and the high-temperature suppliers prevent the development of these networks in all concession areas.

Although the low- and high-temperature suppliers seem to offer a similar product to the market, the temperature of the heat determines how the heat can be used. The low-temperature heat can only be used in very well insulated buildings (today new-built areas), the high-temperature heat can heat all types of buildings, also housing with a low energy efficiency and therefore the heat matches very well the heat demand in older parts of the city.

5.2.3. The municipality

Municipalities are appointed a directive role in the transition to a sustainable built environment. Before 2021 all municipalities will need to present neighbourhood plans on how to phase out gas.

New to be built areas offer, of course, more opportunities for municipalities than existing housing and (most of) the new-built areas will not have a gas infrastructure.[144]

Although municipalities have several (legal) instruments to coordinate the transition, like planning instruments, tendering procedures and the possibility to financially support favourable developments, one of biggest limitations in relation to existing housing for municipalities is that they do not have much authority behind the front door. This is considered the private domain and so municipalities are in a large extend depending on citizens to take the necessary measures in their houses.[145] Individual solutions, like solar panels, insulation and heat pumps, all fall within this private domain of the owner of the building. Municipalities currently do not have any legal power to force homeowners to invest in any of these measures, nor have any instruments to oblige homeowners to disconnect from the gas network.[146] This makes replacing a gas network in an area challenging. The aim of the municipality is to offer a well-functioning, affordable alternative to the current natural gas based system. High-temperature district heating is often seen as one of the most suitable systems to replace the current system. However, present sources of high temperature waste heat (power plans, heavy industry etc.) will become a scarce resource in a future sustainable energy system.

A second argument why municipalities are especially in favour of collective, often high-temperature, solutions is that they have the legal instruments to plan them as they are in the public domain. In this way the municipality also answers their duty of care to make sure that all citizens are offered an (affordable) alternative to natural gas.[147]

---

[144] *Until recently the DNO also had the obligation to connect new buildings to the gas network, unless the municipality decided that the area would be a so-called heat area. Since the summer of 2018 new houses (or housing permits) will no longer get (or include) a gas connection, unless there are very strong arguments that are in favour of gas. New article 10 section 6 a of the Gas Act.*

[145] *For more information read chapter 7.1 of the City-zen report on Energy Policy, Legal & financial context. . Supra note 3.*

[146] *The right to stay connected to a gas network is still guaranteed in the Dutch Gas Act, read also chapter 6.2 of the City-zen report on Energy policy, legal and financial context.*

[147] *The right to be connected to the gas network will probably in time be replaced by the right to be able to heat the home. Municipalities will probably be obliged to facilitate or offer an alternative to gas heating.*

The easiest way to replace gas heating today is by offering a (large scale) high-temperature alternative.[148] The most common alternative is to use a (and expand the existing) district heating system.

Besides high-temperature heating, municipalities could plan middle- and low- temperature systems or all electric solutions. This is more challenging in the existing built environment, because it will often demand extra insulation of housing, and this again falls within the private domain of the homeowner.

Today the municipality uses subsidies to stimulate homeowners to invest in extra insulation and to cover the costs to disconnect from the gas network.[149] It can be concluded that the (legal) instruments and powers that municipalities have, support the development of collective, often high-temperature, solutions.

The popularity of district heating is also reflected in the plans of many local governments.[150] That these types of networks are a popular measure to reduce CO_2 emissions in Amsterdam is also confirmed by the existing concession agreements, which exclusively allow these heat suppliers to develop large areas, often without any time limit. In 2015 the Amsterdam municipality still supported the ambition of the high-temperature district-heating operators to increase the amount of heat connections from 62.000 connections in 2013 to 230.000 connections in 2040 and expend their network in new-built areas.[151]

The perspective of the municipality on optimal heat developments has changed over the last years. In November 2017 the Amsterdam Municipal Council adopted a motion to stop further developments of the high-temperature heat systems in new-built areas.[152] The municipality is currently looking into how they can implement this motion and what the effect will be on the existing concession agreements.

Another challenge is found in the absence of methods to collectively address the energy transition. There are no prescribed methods for participation of citizens except from those laid down in environmental and administative law. The processes at this moment laid down in administrative and environmental law appear not to be fit for the complex policy decisions in the energy transition.[153]

Given their task to make neighbourhood plans, municipalities still have many questions on how to decide what heat source to use, how to involve citizens in the development of these plans, how to deal with existing agreements between the municipality and other market participants, and not in the least

---

[148] *Many municipalities are exploring deep geothermic sources, but this is so far only a technological promise.*

[149] *Households pay a disconnection fee of € 118 or a disposal fee of € 687 in Amsterdam, if they want to disconnect or remove the connection to the gas network (liander.nl) This is a financial barrier and easily to overcome by f.i. integrating these costs in the gas tariffs. The Amsterdam municipality offers citizens a subsidy of € 8.000 per dwelling to phase out residential gas use. For more information: https://www.amsterdam.nl/wonen-leefomgeving/duurzaam-amsterdam/aardgasvrij/*

[150] *All municipalities are obliged to develop an energy strategy and for many of them district heating is one of the key solutions to replace the gas system. Examples are Leiden, Utrecht, Haarlem.*

[151] *Agenda duurzaamheid Amsterdam 2015, p. 14*

[152] *Motie (1404)- Groen, Bosman, Dijk (BA) Inzake duurzame warmtebronnen in nieuwbouw, dd. 08.11.2017, Gbl, afd. 1, nr.1338*

[153] *The legal framework does not provide any such method. It does not sufficiently deal with how to engage stakeholders and find a fruitful and inclusive decision-making process. Sanne Akerboom studied the role of public participation in Dutch wind farm cases. Her recommendations can be equally interesting for topics liking phasing out gas. S. Akerboom, Between public participation and energy transition: The case of wind farms, Amsterdam 2018.*

how to balance the tension between on the one hand collective large scale systems and on the other hand the individual freedom of citizens to choose an alternative heat source.

5.3. INTERIM CONCLUSIONS

In the Netherlands our heat demand is almost entirely based on burning fossil fuels. Municipalities are given the task to formulate plans at neighbourhood level on how to phase out natural gas in our built environment. The current market for district heating is dominated by existing heat suppliers that often enjoy an exclusive right to build and exploit a heat network in an area. These rights affect both newcomers in this market and citizens. The paragraph above shows the tensions in this market, namely: who gets the right to claim the area and supply inhabitants with heat and to what extend are homeowners, individually or collectively, offered the freedom to find a solution.

Furthermore, it is noted that municipalities seek solutions in proven approaches they are familiar with, such as high-temperature district heating. For the administration is it efficient (they can address many citizens with one measure), but in a sound climate policy more energy efficient approaches should be explored.

In the next paragraph we will further study this tension between the different actors in the distribution of what are called ´scarce public rights´.

5.4. SCARCE PUBLIC RIGHTS

Scarce public rights are public rights of which the availability is limited, like permits and subsidies.[154] The allocation of these rights by a government (EU, national, province or local municipality) frequently leads to disputes.[155] The increase of regulations and case law on the tendering and public procurement has increased specifically the focus on the distribution of these so-called *scarce rights*. Over the last decade the topic of scarce rights is discussed by various scholars.

Whether or not a right is scarce, depends on the amount of required rights versus the amount of available rights. In case the total demand exceeds the total amount of available rights, the public right is scarce.[156]

To be able to accurately qualify the size of the demand, it is important to find (all) potentially interested parties. This is not an easy task, specially if the rights are to be given for a longer period in the future.

5.4.1. What is a scarce public right?

Examples of scarce rights are the right to develop a new city district, the concession to build and operate a thermal energy storage system or operate the public transport in an area, a subsidy or a permit. A public authority is by allocating these rights, excluding all others from the possible benefits. In certain cases, there are numerous parties benefitting from a subsidy scheme, in other cases, there is only one permit or concession to be granted.

---

[154] *F.J. van Ommeren, W. den Ouden & C.J. Wolswinkel, Schaarse publieke rechten: Naar een algemeen leerstuk, Den Haag: Boom Juridische Uitgevers 2011, p. 17*

[155] *F.J. van Ommeren, Schaarse vergunningen, De verdeling van schaarse vergunningen als onderdeel van het algemene bestuursrecht, oratie VU, 2004,*

[156] *F.J. van Ommeren, W. den Ouden & C.J. Wolswinkel (2011), p. 20*

In our direct environment, and especially in an urban context like Amsterdam, we can see that our living space is also scarce. Struiksma and Diepering[157] are pointing out that especially in cities there is constant tension between the different possible spatial developments, whether the area should be used for building housing or offices or for green spaces or for traffic. The pressure on the scarcity of urban space will only increase and will be claimed by new types of developments, for example small-scale energy production: solar panels, windmills, small-scale biofuel installations. Also in the area of batteries and network related developments for integration of new sustainable energy, urban space has to compete with all the other inventions that will make cities resilient, such as: water management systems, food production, circular economy ambitions etc.

Where large production, industry and refineries are often placed outside of the city, the small-scale projects will increasingly penetrate our direct environment and this will increase the pressure on our urban space.

The transition to a sustainable city can be seen as the adoption of new systems or techniques, but these new systems will also involve new parties and stakeholders, such as Waternet. The new energy systems are often small-scale and therefore by nature more accessible, operable and (in the long run) more affordable than the traditional systems. As a result these systems become available to all sorts of groups of people, including (groups of) citizens that before might not have had any claim on the spatial environment. The fact that these groups now can and will make a justifiable claim for space, must be taken into account.

5.5. CONCESSIONS FOR DISTRICT HEATING

Over the last 15 years there has been a lot of development in the area of public procurement rules and regulation on the distribution of scarce rights. In the Netherlands there has been an extensive legal discourse on this topic.[158] In the European context these rights are called ´exclusive´ or excluding rights.[159] Rules around the distribution of these rights largely depend on Union law [160] and are laid down in different directives on public procurement, concessions, services directive and the more general rules of the Treaty on the Functioning of the European Union.[161]

---

[157] *J. Struiksma & M.A.M. Dieperink, Schaarse rechten en het ruimtelijk beleid, In F. J. van Ommeren, W. den Ouden, & C. J. Wolswinkel (Eds.), Schaarse publieke rechten (pp. 115-132). Den Haag: Boom Juridische uitgevers,*
Even though our direct environment is scarce, permits distributed based on an environmental plan do not necessarily need to be scarce rights. The State Council Advocate-General recently addressed this topic and comes to the conclusion that for example an environmental plan is not a decision that allocates scarce rights, given that the often only the owner of the parcel can apply for a permit, AG Widdershoven, Conclusie over schaarse publieke rechten bij ruimtelijke besluiten, case number: 201708525/2

[158] *Important contributers are F.J. van Ommeren, W. den Ouden, P.C. Adriaanse, C.J. Wolfswinkel, R.J.G.M. Widdershoven, A. Drahman en A.W.G.J. Buijze.*

[159] *C.J. Wolfswinkel, Concurrerende verdelingsregimes? Schaarse vergunningen onder Unierecht en nationaal recht na Vlaardingen en Appingedam, SEW 2018/110*

[160] *A.W.G.J. Buijze & R.J.G.M. Widdershoven, Rechtsbescherming bij de competitieve verdeling van schaarse publieke rechten in het licht van het Unierecht, in SPR, red. F.J. van Ommeren, W. den Ouden en C.J. Wolfswinkel, 2011, p.p. 411*

[161] *W.A. Janssen, EU Public Procurement Law & Self-organisation, A nexus of tensions & reconciliations, The Hague: Eleven International Publishing 2018, pp. 225-227*

In this case we look into a specific scarce right, namely the right to build and exploit a heat network. In Amsterdam this right is according the municipality laid down in several concession agreements between the municipality and the two heat suppliers.

Even though we do not know the specific content of these agreements, we can discuss some of its characteristics.[162]

The agreement between the municipality and the district heating operator includes the obligation 'to do´ something. One of the most important elements of a concession is that it is a contract for pecuniary interest, meaning that the concessionaire takes upon itself the execution of the work, operating the network and supplying the connected customers.[163] This obligation 'to do´ something is also an important element to distinguish a permit from a concession. If there is no such obligation to execute the agreed work and service, the right cannot be qualified as a concession, but has the character of a permit.[164]

Another important characteristic of a concession is that the concessionaire will carry the operational risks. The difference between a public contract and a concession contract is that in case of a concession the users of the system, the connected customers, will pay directly to the concessionaire for the services. Furthermore the operational risks lay with the concessionaire not with the concession provider.[165] A public contract is characterized by an agreement that the licensing authority pays directly for, not the users of the service.[166] As the municipality has invested in the network and has responsibilities towards the connected customers of the system, the municipality might face a risk, and not only the heat suppliers.

5.5.1. Exclusiveness

The object of a concession is the transfer of a service of general economic interest, which can be the right to build a motorway or exploiting a heat network. A concession always concerns an economic activity.

Concessions are often also characterized by exclusiveness: the concessionaire has the exclusive right to provide the service. This exclusiveness is often based on the claim that it might be difficult to provide the service without a concession, because it is economically not profitable or that it would be undesirable that different enterprises compete to provide this facility, for example on providing an electricity network.[167] This can also be seen in relation to the question if there is a need for a concession. According to case law an important aspect of a service of general economic interest is that the concessionaire (the party appointed to provide the services) is obliged to offer this service also under circumstances that might not be economically interesting. Examples of these types of obligation are that the concessionaire is obliged to offer the service to everyone requesting it, or that the service

[162] *The concession agreements are not disclosed by the municipality, see also 5.2.2.*

[163] *Recital 11 of Directive 2014/23/EU.*

[164] *Drahman 2015 p.p. 103 and R.J.N. Schlössels en S.E. Zijlstra, De Haan/Drupsteen/Fernhout, Bestuursrecht in de sociale rechtsstaat, Deventer: Kluwer 2010, p.*

[165] *article 5 section 1b of Directive 2014/23/EU*

[166] *article 5 section 1b of Directive 2014/23/EU, or read A. Drahmanm, Transparantie en mededinging in het Nederlandse bestuursrecht, 2015, p.p. 89 or S.M.M.C. Vinken en S.J.M. van Kuppeveld, Duurzame warmte: de rol van de decentrale overheid bepaalt het juridisch speelveld, GST 2011/7360, p.p. 539*

[167] *Dissertation of M.B. Bijhof, The concession in a European Law Perspective, p. 76*

needs to fulfil certain quality and trustworthy standards. Moreover, prices and tariffs of these services are often regulated.[168]

The Amsterdam district heat concessions are characterized by exclusiveness: the concessionaire has the exclusive right to provide the service. In addition to that, in the concession area there is an obligation for all building owners to connect to the system.[169] Again this obligation to connect is the result of the idea that otherwise such systems are not economically feasible.

Given the limited information we have about the specific agreement between the municipality and the district heating provider we cannot exactly define what type of agreement it is.[170] What we do know is that such agreements always should be in accordance with the Treaty on the Functioning of the European Union (TFEU).

The Treaty regulates that, articles 102 and 106, undertakings that have an exclusive right are subject to the rules of the treaty and that abuse of a dominant or monopolistic position should be prohibited. Examples of measures in case of network services to avoid abuse are unbundling[171] and price regulation. Other rules of the Treaty that are applicable are rules on free movement (article 49 and 56) on competition (article 101) and on state aid (article 107 and 108).[172]

The principle of transparency demands that these exclusive rights transferred from government to an undertaking in a concession are made publicly known. Public information on concessions is essential as these exclusive rights are in itself limitations of trade.[173] These limitations can be justified, but not on pure economic justifications. Governments, Member States or municipalities, have discretionary powers, but the use is limited by the proportionality, meaning the exclusive right must serve the objectives.[174]

5.5.2. Collective and individual freedom of choice

Historically the production and supply of heat is often in the hands of one party that has been given a monopoly. This is understandable from the perspective that that high-temperature heat is only produced and offered by a small number of parties. Also from an economic perspective there are good arguments to limit the development of a high-temperature network to one in an area tailored to the capacity of the heat source. See also the parallel with the electricity or gas networks, where the operators are appointed by law, within a set of strict regulations.

However, the exclusiveness also affects further developments in heat generation and heat demand. Giving one company an exclusive right in this market will impede other systems to develop. Today new alternatives to high-temperature systems, like individual heat pumps and low-temperature networks

[168] *Case C 393/93 ECLI:EU:C:1994:171*

[169] *Depending on the age of the agreement and the at that time applicable laws and on the derogations that are included in the agreement, some agreements allow homeowners more freedom to choose another heat system, than others.*

[170] *Contacts with the Municipality lead only to fragmented information on the agreements; the agreements are treated as confidential documents.*

[171] *Electricity and gas companies are unbundled. Heat is still vertically integrated, meaning that WPW is both network developer, operator and supplier.*

[172] *Janssen supra note 161, pp. 229*

[173] *Janssen supra note 161, pp. 230 and CJEU, 8 September 2009, Liga Portuguesa*

[174] *CJEU 8 September 2009, Liga Portuguesa, C42-07, ECLI:EU:C:2009:519*

can be installed and developed. This barrier is also addressed in a recently published White Paper by TNO in autumn 2018[175]. According to the paper the government should, instead of giving one party an exclusive right, stimulate the market to develop more affordable and efficient systems. By maintaining exclusive rights the market is not stimulated and the connected consumers pay the extra costs, according to TNO.

5.5.3. Current energy efficiency calculation methods favour high-temperature systems

The connected consumers are today not free to choose an alternative to the high-temperature heating.[176] Fortunately the recent Building Act regulates that consumers that are connected today should be given the possibility to not connect to such a system if they provide for an at least ´equally sustainable´ solution.[177] In practice municipalities have a discretionary power to define equal and in combination with the current energy efficiency rules, both builders and municipalities underline that it is not easy to get such a derogation.

Another development that will support freedom of choice of homeowners is that the new Heat Act includes an article that organises the disconnection of homeowners, meaning that connected customers will in the future have the right to disconnect. Downside is that this change will only apply to newly connected customers.

5.6. Conclusion and recommendations

In this chapter we described a small part of the heat market in a neighbourhood in Amsterdam.

The heat market is drastically changing. New developments in heat and building energy efficiency make it possible to also use low-temperature heat or affordable small-scale or individual solutions.

Nevertheless, developing new innovative heat projects is challenging, due to a lack of experience with these systems and the fact that the appliance of this type of heat is still in an experimental phase. In addition to this lack of experience, the current market for heat shows barriers to new entries due to existing (concession) agreements, which do not or only limitedly allow other parties in this market. Moreover, also the individual freedom of household consumers to choose another means to heat their homes is affected by pre-existing agreements.

The choice of the municipality to award such exclusive and excluding right to a private party is often based on the assumption that the service would otherwise not be provided and that the provision of one system for all is more efficient and affordable than individual or small-scale collective sollutions.

The last two decades there have been developments in competition and public procurement law, which have inflamed the discourse on so-called scarce public rights. The question on how and when these can be and should be distributed sees another answer today. Awarding everlasting exclusive and excluding rights without a transparent tendering procedure is today no longer possible and desirable in this market.

---

[175] *Lekker warm zonder aardgas, White paper, TNO/ECN September 2018, pp. 17*

[176] *For some systems there are derogations. This depend on whether the agreement falls under the current Building Act or not and on what derogations are allowed under the specific agreement. Many connected customers today do not fall under the new Building rules as discussed in chapter 6.3 and 6.4 of the City-zen report on Energy policy, legal and financial context, and are obligated to maintain and pay for the connection.*

[177] *Article 1,3 section 3 of the Building Act*

Not only in Amsterdam, but also in Grenoble the municipality uses such agreements to develop high-temperature heat networks. We have no insight in the content of these agreements, but they might face similar issues on the level of exclusiveness of these agreements.

Even more important is the freedom of households to choose how to heat their houses. Recent legal changes[178] in building regulations also support the freedom of choice of consumers. In this the Netherlands follow other countries in Europe like Sweden and France.[179]

We therefore recommend that local governments should show restraint in respect of granting exclusive rights in new-built area´s, but also for existing built areas in the future.

[178] *article 1.3 and 6.10 Building Act: Households can choose an equivalent alternative to heat.*

[179] *Lekker warm zonder aardgas, ECN/TNO, September 2018, pp.16*

CHAPTER 6 – SUBSIDY: RETROFITTING AMSTERDAM AND GRENOBLE

6.1. CITY-ZEN RETROFITTING

According to the Dutch governmental targets, the entire building stock needs to be CO_2 neutral in by 2050. As 70 % of the 2050 building stock has already been built at this moment,[180] this means that these existing houses will either need to be transformed into CO_2 neutral houses. Either through upgrading the energy performance or by demolishing and replacing these with new houses. This will have an enormous impact on homeowners and renters.

In this chapter we will study the City-zen retrofit subsidies or grants in Grenoble and Amsterdam. We will look into how the subsidies are designed and we evaluate which citizens are benefitting from the subsidies. The chapter will also shortly address the more normative aspects that climate subsidies are based on and what role the government has in distributing these benefits.

Given that the energy efficiency of the existing building stock is rather low and that the retrofit market is up to present time relatively small and characterized by front-runner projects, the impact and effect of upgrading our total built environment is still largely unknown.[181] What we do know is that energy efficiency has an impact on the financial situation of citizens and that the financial situation of households determines the availability of the means to invest in upgrading the built environment. Goals on how to stimulate and spend money on upgrading the energy performance are still being formulated by national and local governments.

6.1.1. Subsidies, general

'Subsidy' is defined as the financial support that the retrofit projects receive.This specific subsidy is distributed by the Amsterdam Economic Board (the Board) and not by the local government. The subsidy is paid with an EU-grant, paid out to the Board within the FP7 City-zen programme.[182]

In this chapter we will refer to it as a subsidy because it does what other subsidies do, namely: supporting, in this case homeowners, to undertake certain activities. Most importantly the definition shows that a subsidy consists of a number of elements, namely the entitlement to financial resources that are used for certain activities by the applicant.

---

[180] *A. Power, Does demolition or refurbishment of old and inefficient homes help to increase our environmental, social and economic viability?, Energy Policy, 36 (2008), pp. 4487-4501*

[181] *For more information on this topic read chapter 7 of the City-zen report on Energy Policy, Legal and financial context. Supra note 3.*

[182] *The subsidy is paid with the funding the Board received within the City-zen FP7 project, with a total of €2.6 million. Also see: ECLI:NL:RVS:2014:3379 and for more information on how to qualify European subsidies within the Dutch context and what can be defined an administrative body under Dutch law, read J.E. van den Brink, Uitvoering Europese subsidieregelingen Nederland (R&P nr. SB6) 2012/6.2.1, 524-533 and W. Den Ouden, Over toezicht en aansprakelijkheid bij Europese subsidies: wie moet op de blaren zitten?, Gst. 2003, 7*

6.1.2. City-zen subsidy

The City-zen projects aims to demonstrate how (technical) innovations can support a sustainable energy system in the urban environment. Part of the project is the provision of a subsidy to improve the energy performance of housing in both Amsterdam and Grenoble by retrofitting.

In Grenoble the budget was used in a programme to upgrade apartment blocks. In Amsterdam the grant was used to offer a subsidy to financially support retrofits by individual homeowners and two social housing associations.

6.2. AMSTERDAM

6.2.1. Design of the subsidy

The City-zen subsidy is used to upgrade almost 52.000 m^2 of existing housing. Associations of property owners (VvE's), investors, landlords and individual homeowners could apply for a subsidy . The conditions for the subsidy are directly related to the energy efficiency results of the buildiing, the size of the dwelling and the investment made.

The central condition to qualify for the subsidy is that the dwelling will use less energy than 70 kWh/ m^2/year after the retrofit. In addition, the dwelling should also make a ´big step´, which is defined as an energy use reduction of 230 kWh/ m^2/per year (a reduction of more than 75%). In this second condition an allowance exists for households that partly upgraded their house in the last years and invest now to reach the 70 kWh/ m^2/year criterium.

Applicants could get a subsidy of 50% of the retrofit investment with a maximum of € 50 per m^2. Total budget for this programme amounted to € 2,6 million. The design of this subsidy is largely based on the FP7 programme. [183]

Example of the Amsterdam subsidy calculation

An individual homeowner with a 150 m^2 home could get a subsidy of maximum € 7.500 (150 m^2 x € 50 = € 7.500), if the total investment is more than € 15.000 (50 % of 15.000 = 7.500).

All receivers of the subsidy committed to participate in sharing their energy data during the first year and in answering several questionnaires. These data is used in several research projects and is also used in this report to analyse the financial aspects of the retrofit projects.

A large part of the homeowners that received subsidy has finished the upgrade by the autumn of 2018. The social housing associations are experiencing some delays and are still in the constructing phase.[184] All upgrades need to be finished by February 2019 to receive subsidy.

[183] *FP7-smart cities call for proposals: work programme 2012, pp. 45*

[184] *The housing association decided to renovate while tenants were still living in the apartment complex. The renovations have led to so much hindrance and disorder that the residents have started a lawsuit against the housing association. As a result of the lawsuit only part of the residencies has been renovated and it is expected that the remaining apartments to be renovated during the City-zen project will not be renovated before the February 2019. A ruling is expected by January 2019.*
The subsidies for the investments made are not in discussion.

6.2.2. Method

This study focuses on the position of the household consumer and especially the vulnerable consumer, which is often described in relation to energy poverty in the different demonstration projects, and we therefore choose to focus on the financial aspects of retrofitting.

All households that were participating, both social housing and homeowners (owner-occupied houses), were asked to fill out one questionnaire per household. The questionnaire is developed by the Delft University of Technology (TU Delft) and is used in the social monitoring studies looking at the socio-economic impact of the subsidies in Amsterdam (West).

On our request TU Delft included questions on how the homeowners (not the renters) financed the energy efficiency upgrade. The questionnaire further includes questions regarding income, age and education of the renters and homeowners.[185]

Next to the information collected by TU Delft, we used anonymous information from the application forms. As both datasets were anonymous, we could not connect the applications forms to the questionnaires. The applications and allocation of the City-zen subsidy, however, provided us with information on how much individuals spent on renovating. It also includes information about the location and size of the renovated houses.

6.3. Results Amsterdam

6.3.1. Study flow (participants)

To date around 677 dwellings are subsidized[186]; 576 social housing apartments (rentals) and 101 owner-occupied houses. At this stage 104 households filled out a questionnaire: 73 of these are from homeowners (including associations of property owners, VvE's), 29 are households in (social) rental housing and 2 could not be identified due to a lack of information. The difference in response score between homeowners and renters can be explained because the homeowners have an obligation to fill out the questionnaire as condition in the subsidy grant. The people living in (social) rental housing on the other hand, do not have such obligation, as they are not receiving any subsidy directly (the social housing association does). The renters were asked to participate on a voluntary basis. Furthermore, the refurbishments in the social housing apartments have not yet been completed.

Given that only the homeowners decided themselves to renovate and pay for the renovation and that renovations in social housing lacks behind, we decided to limit the analyses to this group.[187]

6.3.2. Questionnaires and missing data

Only 40 of the 73 homeowners that filled out the questionnaire filled out how they financed the retrofit. Given the limited amount of homeowners participating in the project and given the moderate quality of the filling out of the full questionnaire, we can only conclude on general impressions and are limited to descriptively present our findings.

---

[185] *The questionnaire can be shared on request, please contact: R. Fransman: R.R. Fransman@tudelft.nl.*

[186] *Figures from Amsterdam Economic Board, August 2018.*

[187] *We see that renters depend to a large extend on the commitment of the housing associations to improve the energy efficiency of the building. For more information about legal and financial issues that are important between renters and landlords, please read chapter 7.6 and 7.7 of the City-zen full report on Energy policy, legal and financial context, pp. 104. Supra note 3.*

6.3.3. Assessment of homeowners

In Netherlands homeowners do not have any obligations to improve the energy efficiency of the home.[188] All the homeowners in this study are voluntarily upgrading their home. Covering the high upfront cost is often described as the biggest barrier for homeowners to retrofit the home.[189] Several studies have shown that only financially strong households have the possibility to cover the high upfront costs and these same households benefit most from national and local subsidy programmes.[190]

The City-zen subsidy is in its design very similar to other subsidies available in the Netherlands to upgrade housing. Difference with other subsidies is that the City-zen subsidy is only available to homeowners that that reduce their energy use to the very low level of 70 kWh/ m^2/annum.

Income

Homeowners were asked to indicate their monthly (family) income in euros after tax. Five classes of income were differentiated and the division of applicants over these classes is given in the table below.

Income class in €/month after tax	Numer of applicants	Percentage
less than 1.400, a minimum income	0	0
between 1.400 and 2.000	3	4 %
between 2.001 and 3.000	11	15 %
between 3.001 and 4.000	14	19 %
more than 4.000	45	62 %
Total:	73	

Looking closer into the 3 households with an income between € 1.400 and 2.000, the age of the applicants and the period they occupied the dwelling suggest that it concerns students and that probably the parents invested in the dwellings and paid for the retrofit costs.[191]

80% of households are in the highest income categories with a net income of more than € 3.000 a month. From the category 4.000 and up (62% of respondents), we do not know the variation in income between these households. Only 18% of the 73 responders have an income below € 3.000 after tax[192].

Financing scheme

Homeowners were also asked to indicate how they financed the upgrade. They could choose: savings, loan, subsidy, mortgage or other.

[188] *For more information read chapter 7.1 of the City-zen full report on Energy policy, legal and financial context, pp. 70*

[189] *Read also chapter 7.2 of the City-zen full report on Energy policy, legal and financial context, pp. 81*

[190] *CE Delft, Rechtvaardigheid en inkomenseffecten van het klimaatbeleid, March 2017 and Voor wie zijn de kosten en baten van het klimaatbeleid? CE Delft, April 2016, pp. 10*

[191] *One example can be found at: https://amsterdamsmartcity.com/posts/going-off-the-grid-in-amsterdam-what-on-earth-was-ii01bgaf*

[192] *In the Netherlands a so-called ´middle income´ is around 2.150 per month after tax for a one-person household in 2018.*

Households, averagely, financed 43 % of the costs with their own savings. Between households we see a lot of variations. 3 households did not use any savings and 3 households indicate to have financed the upgrade for a 100 % with savings.

24 households financed 50 % or less with savings, 16 households financed more than 50 % with savings. Next to using savings, a large part of the households paid for the retrofit with a (additional) mortgage that in average covered 32% of the costs. We see that many households (74%) use an (additional) mortgage for the investment and in those cases, the mortgage covers on average 62% of the investment sum. Much less used are the subsidies, which are averagely covering 13 %[193] of the costs and other (energy efficiency) loans standing for 11 %.

The amount of subsidies covering the costs differs a lot. There are households stating to have covered 50 up till 60 % of the costs by subsidies. Given the conditions on the City-zen subsidy as described above, in such cases the households should have found ways to apply for different subsidies and kept construction costs low. Most of the participants covered around 17 % with subsidies. It is remarkable that 9 out of the 40 stated that they did not use a subsidy to finance the measures This can not be accurate as they received the questionnaire only after the subsidy was allocated. This could be explained because the participants have not received the subsidy by the time they filled out the form or the questionnaire was not sufficiently clear at this point.

Costs

From the applications and allocation of the City-zen subsidy, we learn that the stated costs for energy upgrades varies a lot, even for similar improvements.

All households spend a lot of money on the upgrades that qualify for the City-zen subsidy: on average € 37.500 and no one less than € 6.000.

Households that keep the cost low and have a large house can get a high percentage of their costs covered by subsidies. Subsidies paid out to households living in large houses could get up to € 17.500 euro.[194] The lowest allocated subsidy so far is € 1.600 for a very small apartment of 32 m^2. We see that due to the high investments by the households, in almost all cases the investment exceeds the maximum of 50 % subsidy rule and therefore all applicants receive the maximum subsidy of € 50/ m^2. Since all of the participants have reached the maximum eligible costs, the amount of subsidy that is paid out to the homeowners depends more on the amount of square meters, than on the price of the measures or the type of measures taken.

All subsidy payments are only approved after a thourough check on the eligibility of the costs stated for the energy renovation. Apperently, when asked, the homeowners mention the total sum of their integral renovation in stead of only the strictly energy related investments. When an energy retrofit is combined with a more general upgrade (renovation), it shows to be difficult for homeowners to separate between on the one hand general costs and on the other hand the specific energy related costs.

14 households indicated that they used more than € 50.000 on the upgrades, of which there are four households that indicated to have used between € 104.000 to a 180.000. Even though these houses are large, around 200 m^2, it is difficult to imagine that these costs are solely spent on the energy efficiency upgrade. Given that it is hard to separate the investments of the energy refurbishment from

[193] *This includes the participants that indicate that they did not receive any subsidy. If we correct for this, the average subsidy lays at 17 %*

[194] *350 m^2 x € 50= € 17.500, under the condition that the household spends € 35.000 or more on retrofit costs.*

general renovation costs, it is also difficult to say something about the percentage that is covered by the subsidy.

Age, education, work and location

The average age of the members in the household that filled out the questionnaire is 42 years.[195] None of the participants is younger than 25 and the oldest participant is 66. Overall we see that all age groups are fairly equally represented in the applications.

Participants were also asked to fill out their highest level of education. Almost all household participants filled out to have higher education at university level. Three people filled out to have pre-university education and two households have a senior secondary degree. Furthermore a large group of these participants has a profession that has a focus on energy, sustainability, architecture and design. We assume that this group is more aware of the possibilities to upgrade the energy efficiency of the dwelling and also more capable to find subsidies.[196]

The City-zen project was initially focused on projects in Amsterdam-West. Since it was difficult to find sufficient projects that qualified for the subsidy in West only, also projects in other parts of the city were allowed to apply for the subsidy. The addresses that received the subsidies are predominantly located in typical high-class expensive neighbourhoods. Especially the applicants with large houses and getting the highest subsidy live in the most expensive areas.[197]

The moment that the average participant invests in upgrading the energy efficiency of the building is mostly within 2 years after they moved in.

Citizens

We can conclude so far that most of the applicants (more than 60%) receiving a City-zen subsidy have an income after tax of more than € 4.000 a month. There is no information available on how much income variation there is in this group.

From the data we also learn that this group of citizens paid for the retrofit by spending savings and/or by using a mortgage. A smaller percentage of the retrofit was covered by a subsidy or via a loan. Many participants did not fill out how the measures were paid and a number of them probalbly did not give accurate answers. The homeowners spent according to their applications an average of € 37.500 on the total retrofit costs and varying from € 6.000 euro up to € 180.000. Overall we see that this group of homeowners is willing to invest a lot of money in the energy upgrade.

The addresses show that most of the applicants live in the high-end neighbourhoods of Amsterdam.

Taking into account that this is a study based on a very limited population and that the data was not complete, we do see that this population corresponds with the outcomes of other research, meaning that the participants are highly educated, have a high incomes and live in high-end dwellings.

---

[195] *From the 73 participants, a number of 16 did not indicate their age.*

[196] *The subsidy was advertised online via the municipality and the amsterdamsmartcity platform. The City-zen mobile info point informed in its public meetings homeowners about retrofitting possibilities and about the subsidy. This resulted in several applications for the subsidy. Nevertheless, this type of deep renovation requires a high up-front investment by the homeowners and housing associations and thus it appeared difficult to find private households and housing associations that qualified for this subsidy.*

[197] *Typical expensive districts are the canal district, areas close to the city centre and the Vondelpark area.*

6.4. GRENOBLE

6.4.1. Design of the subsidies

Also in Grenoble the City-zen project made it possible to refurbish housing. Instead of spending the European money as a subsidy like in Amsterdam, in Grenoble the budget was used to invest in a refurbishment programme called MUR MUR. The first MUR MUR programme started in 2010 and ended in 2014 and was thus on going when the City-zen programme started. Today the second refurbishment programme is running, which started in 2016 and will end in 2020.

The programme is initiated by the Metropolis of Grenoble and the coordination of the programme is given to the agency ALEC (Agence Locale de L´Energy et du Climat), an energy and climate agency helping homeowners to improve the energy efficiency of the home by informing them about loans, subsidies and helping to make an energy plan.

The City-zen budget is used to subsidize the refurbishment of apartment blocks built between 1945 and 1975, considering the poor energy efficiency of these buildings and the large number of apartments built in this period. The buildings are co-owned by the inhabitants and that makes it extra challenging to renovate these houses. Three different packages with three different levels of improvement measures were offered to the homeowners. Each of those packages qualifies for the subsidy.

Grenoble set up a special subsidy scheme, incorporating the City-zen funds. It can be divided in two different subsidies:

= A subsidy on the building as a whole, a so-called ´block grant´, covering 10 to 40 % of the investment costs of the refurbishment, and

= Individual subsidy for low-income households that could cover up to 80 % of the total renovation costs.

In addition to the scheme, Grenoble created a shop to provide homeowners with free information on technical, administrative and financial issues. Professionals guided the co-owned apartment blocks through the process free of charge.

In the first MUR MUR campaign € 13,2 million of local funds were used to release almost another € 13 million of subsidies from French national government. Also energy companies contributed to this scheme as part of their legal obligation to reduce energy consumption. The participating homeowners were also benefitting from tax reductions and zero interest loans.

Since the MUR MUR I programme is financed by different subsidies, both local and national, and the design of the Amsterdam and Grenoble subsidies are very different it makes it very difficult to compare the homeowners.

Therefore we will highlight some important differences to show that the design of a subsidy programme determines which people receive the stimulating benefits and to show that authorities (local and national) can use different methods to distribute available money and address different policy goals.

6.4.2. Results

The Metropolitan area of Grenoble (LaMetro) decided to study the outcomes of the first MUR MUR campaign to see how they could improve the programme for the next round. Here is a summary of the results:

Costs

The programme offered owners of a house three different energy efficiency packages. The simple package had an average cost of € 10.300, the middle package € 14.500 and the largest package had an average cost of € 23.000.

Subsidy

As mentioned above the subsidy was cut up into two grants, 1) for the total building, and 2) for the individual household.

The individual subsidies were divided over households with a low income. The poorest households, for example a 4 persons family with an income before tax below € 29.000/year (€ 2.400/month), could get up to 80 % of the initial costs refunded. Households with an income up till € 37.000/year (€ 3.100/month) could get an average subsidy of € 3.000 (29% of the simple package). The results of the study by LaMetro found that this subsidy was crucial for these households to be able to participate in the retrofit programme.[198]

75% of the participants earned more than €37.000/year and they did not benefit from any individual subsidies. For those households earning just above this € 37.000 limit, it was difficult to find ways to cover the high cost. The limit was experienced as to ´strict´ and an abrupt threshold. Especially these homeowners were not always able to get an affordable loan to cover the costs.

In the second MUR MUR programme not only co-owned housing, but also single family houses can apply for the programme.

Citizens

We see that the design of the subsidy is aimed at improving a specific part of the building stock, namely: post-war larger building blocks. The residents of these blocks might have a low income and to also support these homeowners to participate in the renovation project, special packages were designed to help them finance the costs.

Still 75% of the participants earn more than € 37.000 and it shows that also households with an income just above the threshold are experiencing barriers to participate in the retrofit.

The study also shows that paying out a subsidy afterwards, after the initial investments and works are done, is a financial barrier for many households. Especially low-income households were sometimes forced to take up a loan to pre-finance the retrofit and this led to extra costs. Also this lesson is learned: the subsidies should prefinance the works.

6.5. LESSONS LEARNED

Both the Amsterdam subsidy and the retrofit programme in Grenoble aim to support homeowners to upgrade the energy efficiency of their home. The design of both programmes differs on many levels. Whereas the Amsterdam subsidy focuses on the building and its size, the number of square meters, apparently determines the amount of subsidy allocated. The programme in Grenoble, however, focuses on the homeowners by deciding which group of homeowners qualifies for a subsidy.

The result is that in Amsterdam high-income homeowners with large dwellings and a similar energy demand receive a higher subsidy and in Grenoble the highest subsidy goes to the homeowners with a low income and those who choose a more energy efficient package.

[198] *Chapter 7.3 of the City-zen full report on Energy policy, legal and financial context. Supra note 3.*

6.5.1. Allocation of subsidies in Amsterdam

A subsidy is, like a permit or concession, a scarce right. There is only a limited amount of money available to support households to upgrade the energy efficiency of their homes.

The Amsterdam subsidy, which is designed in the FP7 project, in this project is characteristic for the design of many other Dutch national and local retrofit subsidies. Often the amount of subsidy that is allocated to a household is connected to either the total investment that is made, or to the type of measures that are taken. The division of funds is often based on the first come first served principle. The financial situation of the applicant, however, is not taken into account in the allocation of the subsidy funds. The underlaying idea is that a subsidy should be neutral aimed at the (technical) measure and accessible to everyone.[199] By giving everyone the possibility to apply the procedure can be seen as fair, and this should lead to a fair distribution of the subsidy.

At the same time the results show that nearly all applicants are high-income households, with high-end housing and the possibility to cover the high up front costs.[200]

Thus, although everyone has the possibility to apply, in practice only a small part of the citizens is really in the position to apply. In addition, the design of the subsidy favours those households with big houses over those with a small house, even if they achieved the same or better energy performance.

6.5.2. Allocation of the subsidies in Grenoble

In France and Grenoble, subsidies are aimed at a certain group of people. The funds are used to address another issue, namely poverty and inequality. Subsidies are used to support a group of people that without the extra financial help could never have participated in the retrofit projects. They assume that higher income households do not need the financial help to invest in the upgrade. The programme in Grenoble shows that it is challenging to find this limit and this limit is logically connected to the personal financial situation of the participant (is the family in debt), but also to the standards of financial institutions (is the bank willing to give this household a loan).

6.6. Conclusion

Subsidies, grants and other funds are scarce[201], and as they are limitedly available there can be a responsibility to allocate these financial resources in a fair and transparent manner.[202] The design of a subsidy programme largely determines who can apply and how resources are allocated.

---

[199] *Examples are netting (financial benefit for solar panels), the Dutch national ISDE subsidies, tax reductions on electrical vehicles in the Netherlands.*

[200] *Similair results were found in a study by CE Delft: Wie profiteert van klimaatbeleid, R. Vergeer. The study shows that from all subsidies that are spend in relation to climate policies in the Netherlands, only 20% is spend on the poor households and 80% is given to the rich households. Poor households are the households with the 50 % lower incomes and rich households are households with the 50 % higher incomes.*

[201] *For more information on the what we mean with ´scarce' read paragraph 5.4. of this report*

[202] *The last couple of years in the Netherlands, due to developments in case law and EU law, there has been a legal discourse on how to fairly distribute so called ´scarce rights´, which are rights that are limitedly available, like permits and subsidies.*
For more information read: F.J. van Ommeren, W. den Ouden & C.J. Wolswinkel, Schaarse publieke rechten: Naar een algemeen leerstuk, Den Haag: Boom Juridische Uitgevers 2011

In the City-zen programme the objective is in the first place to experiment and generate information about retrofit projects. The funds are used to finance the measures that improve the energy efficiency of the building.

In addition to this objective, there can be other objectives that influence the design of the financial scheme. The subsidy can be used for instance to safeguard low-income households from energy poverty.

A welcoming by-product of distributing a subsidy is that the funder can gain information about how the subsidy is used and what results have been achieved. In Amsterdam the funder can – with a properly executed questionnaire – receive information from the participants about their social background, financial situation and the effect of the measures on the energy efficiency of the household. However, the programme in Grenoble shows that a more all-round programme, including free advice on financing and energy efficiency measures, can address a more diverse group of households. Moreover, by setting up this programme the local government gained insights in the existing (financial) barriers for households to participate in retrofit projects, not only from the participants, but also from those households that could not be reached by the programme. For instance they learned that middle-income households struggle to get an affordable loan and the municipality developed policies in the new scheme to address this barrier.

6.7. RECOMMENDATIONS

Overall we recommend that governmental and administrative bodies involved in distributing financial resources to homeowners, study if the procedures and the design that is used to distribute these resources is in practice sufficiently open to different income groups and supports those particular groups that the funder has in mind. Furthermore we recommend that when drafting a questionnaire, funders identify the information that they need to evaluate their funding practice.[203]

In relation to energy efficiency and energy poverty, subsidizing low-income households to retrofit can be an instrument to support vulnerable consumers to become more resilient to future changes in the energy supply. Today there is an overall assumption that it is important to support the so-called frontrunners, but it seems forgotten that frontrunners can also be found among people with a lower income if they receive the appropriate support. This could also increase the acceptance of (energy) renovations by all tenants in social housing complex.

This requires that the government, national or local, has a view on energy poverty and sets targets to reduce the number of energy poor. Only than new subsidy schemes can be formulated that not only aim at technical targets as the reduction of energy use in terms of kWh per square meter building surface, but will also address the social issues at stake.

Furthermore, we recommend that the evaluation of subsdiy schemes should not only focus on the successful participants and the achieved retrofitting measures. Special attention should be given to households that did not proceed with their project. These cases will reveal the barriers experienced in this market. A one-stop-shop as used in Grenoble is a way to get in contact with these households. Solely allocating money will not generate this type of information.

Finally, subsidies could focus on retrofitting houses that result in the best overall energy improvement, based on their technical (contruction year, construction type) and social properties (income of inhabitants, ownership of the dwellings).

[203] *Of course, in accordance with regulation 2016/679 and the relevant directives*

ANNEX A – LIST OF INTERVIEWEES

For both the "Report on Energy Policy, legal and financial context" and this "Report on the (vulnerable) citizen" in City-zen, the project team has conducted interviews with the following key people. Many of the interviewees are closely involved in the various demonstration projects in Amsterdam.

In these interviews subjects were touched that are of interest for both reports.

=	Sietse Agema*,	AEB (Afval Energie Bedrijf), Strategic advisor
=	Karel Asselberg,	StartGreen Capital, Investment Director
=	Paul Bierman*,	Liander (DNO): Project leader Vehicle to grid
=	Karin Boog,	Vereniging Eigen Huis (association of homeowners), Financial expert
=	Gerrit Buist,	UvA Amsterdam Centre for Energy, councel
=	Marjolein Cazemier*,	Ons dorp (social housing co-operation), Elisabeth Wolfstraat, Private building group, Renovation
=	Martijn van der Eerden*,	Alliander (DNO), Project Manager Virtual Power Plant
=	Jan-Willem Eissing*,	Alliander (DNO), Projectleader Virtual Power Plant
=	Peter van Gelder*,	MennoKooijstra architects: Renovation
=	Annelies Huygen,	University of Amsterdam, professor of Energy marketsUniversity of Amsterdam
=	Sebastiaan Jacobs,	Municipality of Amsterdam, Sustainability division: Renovation
=	Theun Koelemij,	Municipality of Amsterdam, senior advisor Sustainability division
=	Celina Kroon*,	Liander (DNO), projectleader for the Alliander City-zen smart grid projects
=	Stefan Kusters,	SOR (social housing co-operation), Advisor portfolio and assets management
=	Michel Ligtlee,	Vereniging Eigen Huis (association of homeowners), financial policymaker
=	Ruben van Loon*,	Alliander (DNO), projectleader end2end smartification
=	Merel Ooms,	TNO: sustainable VvE (owners association) research
=	Wybrand Pieksma*,	Eigen Haard (social housing co-operation), sustainability expert
=	Dorine Putman,	ASN Bank: manager institutionele relaties Vermogensopbouw
=	Bart van der Ree,	SQ consult: Expert in Energy transition and business development
=	Otto Reinstra*,	Waternet: Bio-refinery and cooling
=	Erik de Rooij,	SOR (social housing co-operation), assetmanager
=	Niek Schaap*,	Eigen Haard (social housing co-operation), Developer renovation
=	Jan Scheepers*,	Greenspread, Projectleader Virtual Power Plant
=	Peter Simoës*,	AEB: Strategic advisor

=	Annelies van der Stoep*,	Amsterdam economic board: project leader renovations
=	Job Swens,	Independent consultant renewable energy: i.e. collective PV projects
=	Erik Theissing,	Municipality of Amsterdam, senior advisor Sustainability division,
=	Maarten Eeke van der Veen,	Vereniging Eigen Huis (association of homeowners), energy expert
=	Justus Vermeulen,	(social housing co-operation) Areamanager IJburg Watergraafsmeer
=	David van der Wal,	DVDW Consultancy: Financial consultant for several banks and pensionfunds
=	Pauline Westendorp,	Ondernemerscooperatie NEWNRG, energy advisor on retrofits
=	Mark Wets*,	Waternet, Programma Manager Nieuwe Sanitatie
=	Daniel de Witte,	iLINQ: Renovation, architect and energy expert
=	Jannis van Zanten*,	Westpoort Warmte, District heating Amsterdam and comfort-cooling
=	Emiel van Zwet,	ASN Bank: Account manager sustainable project financing

* People directly involved in City-zen projects appear with an asterix.