sciendo

Alleviating energy poverty experienced by students living in private rented accommodation: The role of the housing provider

Vasileios NTOUROS
National & Kapodistrian University of Athens, Athens, Greece
vntouros@phys.uoa.gr

Marina LASKARI
National & Kapodistrian University of Athens, Athens, Greece
mlaskari@phys.uoa.gr

Magdalena IORDACHE-PLATIS
University of Bucharest, Bucharest, Romania
magdalena.platis@unibuc.ro

Margarita-Niki ASSIMAKOPOULOS
National & Kapodistrian University of Athens, Athens, Greece
masim@phys.uoa.gr

Joanna ROMANOWICZ
National Union of Students, London, UK
Joanna.Romanowicz@nus.org.uk

Vasileios LONTORFOS
National & Kapodistrian University of Athens, Athens, Greece
vlontor@gmail.com

Abstract. *Students are often described as an under-reported and under-supported group of the population falling into energy poverty. Although the main drivers of energy poverty are well documented, up to this date little attention is given to housing tenure as a cause of energy poverty. This study aims to support the understanding of the motivations and barriers faced by property owners that rent accommodation to students for making energy efficiency improvements to their rented properties. With this understanding recommendations for alleviating energy poverty experienced by students living in the private rented sector can be formulated. The research conducted is based on qualitative methods; focus group discussions and interviews. Data were collected from almost 30 student landlords in seven EU countries between October 2017 and January 2018. Findings show that grants and financial incentives are key for the questioned proprietors to move to energy efficiency improvements of their property but bureaucracy burdens are a major barrier for moving forward with them. In addition, the need for stronger information campaigns on energy efficiency issues is revealed. Eventually, a number of financial, consumer protection, energy efficiency and informational measures for alleviating energy poverty experienced by students living in private rented accommodation are proposed.*

Keywords: energy poverty, fuel poverty, energy efficiency, residential buildings, university students, housing market

Introduction

Energy or fuel poverty is an established socio-economic problem with severe health impacts occurring when a household is unable to afford adequate energy services in their home on their present income (Dhéret et al. 2017; Thomson et al. 2013). It is related to poor building quality and the occupants' socio-economic status and even today affects millions of households across Europe (Dhéret et al. 2017; Thomson et al. 2013). Different groups of people are severely affected from fuel poverty either physically or mentally in various ways. Infants, children, adults, elderly people and people with chronic conditions show different health implications (Jones, 2016) that are strongly related to deteriorated dwellings and to the lack of satisfactory thermal comfort (Angela Tod, 2016) and overall indoor environmental conditions. The effects of energy poverty on the physical and mental health of students living in the private rented sector are considerable (Trust, 2018) but only limited and rather recent research on energy poverty amongst young people is so far available.

In the contemporary context of the knowledge economy, education is an important mechanism of sharing. The World Bank Institute (2010) describes education and skills as one pillar of knowledge economy, while Bouzarovski & Petrova (2015) explain the correlation between two concepts: fuel and energy poverty. They demonstrate that although fuel and energy poverty are different issues, they are connected to same descriptors, such as access to electricity, education and health. In Table 1, the role of education in the field of energy poverty is generated from the set of knowledge economy pillars.

Table 1. Energy poverty awareness in the context of knowledge economy

Knowledge economy pillars (based on World Bank Institute / 2010)	**Explanations**	**Relevance of the current study**
Education and training	People create, share and use knowledge	Students learn how to protect themselves against energy poverty, how to decide in the process of renting houses and become more aware of energy efficiency.
Information infrastructure	Classical and digital communication facilitate the transfer of information	Transfer of information from official sources related to energy poverty such as European Commission and different national bodies is very valuable for the future students' behavior in the rental accommodation market.
Economic incentives and institutional regime	Rules exists and supports the Information and Communication Technology as well as entrepreneurship	Through e-mails, Facebook and other tools, students are regularly informed how to better act in saving energy and become real beneficiaries of knowledge in facing energy poverty.
Innovation systems	Networks contribute to the creation of new knowledge	New knowledge is created mainly for the targeted groups of students and housing providers. Students have the opportunity to connect with other students looking for accommodation and housing providers with other property owners.

Source: Authors' own research.

The aim of this research is to analyse the current trends in the provision of private rented student accommodation for students and their implications for energy poverty and ultimately make recommendations that will help reduce the exposure of students to energy

poverty. It is part of a wider research conducted for the H2020 funded SAVES2 project and builds on the Homes Fit For Study research (Trust, 2018) carried out by NUS-UK in 2017 aiming to provide in-depth insight into the student experience of energy poverty.

Literature review

Up to date there is no official definition of energy poverty in EU legislation and as underlined in European Commission's Vulnerable Consumers Working Group report (EC, 2015), a tight common definition for the Member States (MS) would be confining due to the diverse realities across the European Union. Nevertheless, in the European Commission's 2010 Staff Working Document 'An Energy Policy for Consumers' (EC, 2010) it is suggested that energy poor households could possibly be defined as those "*households that spend more than a pre-defined threshold share of their overall consumption expenditure on energy products*". Obviously, the concept of energy poverty extends to a household's inability to pay energy bills and to achieve basic levels of energy services, with a result that it suffers inadequate energy access.

In Europe, the phenomenon of energy poverty gained widespread attention after the unprecedented economic crisis that started in 2008. The European Union, acting fast, responded with a series of directives published during the first years of the crisis (Directive 2009/72/EC, Directive 2009/73/EC, Directive 2010/31/EU and Directive 2012/27/EU). This legislation, taken together, sets the framework of energy poverty and fosters Member States to shape their own specialized national plans to boost renovations and energy efficiency retrofits on buildings as a vicarious measure to tackle energy poverty. However, as energy poverty affects millions of Europeans, the European Commission sought to strengthen the legislation with a revised Energy Performance of Buildings Directive (EU, 2018) and the proposal for a revised Energy Efficiency Directive (EU, 2016) within its Clean Energy Package program, which recognizes the benefits of energy efficiency and prioritize the policies aiming to reduce energy poverty.

New business models in the energy field have been developed as an answer to the energy poverty challenge. Sioshansi (2018) describes that even new established companies can find value in new business models, by being innovative; one example he provides is a start-up in Europe (London) providing tracing the power flow to generators, distributors and consumers, including periods of congestions, as well as new level of price and cost transparency. According to Morris and Almeida (2018), the sustainable energy access is an international concern related to the energy trilemma – energy security, equity and environmental sustainability; they also see business models as a solution to sustainable energy access in a context of challenges for energy consumers, governments and energy players. Based on 250 businesses, a guide to support entrepreneurs in developing sustainable businesses in providing energy services to customers has been created by Gradl and Knobloch (2014); they explain the state role and the partners' involvement by developing a customer interface with four areas – selling, price and payment, service provided and the product use.

Energy poverty is an important concept of the contemporary reality, towards which all stakeholders should get more and more involved, as illustrated in Figure 1.

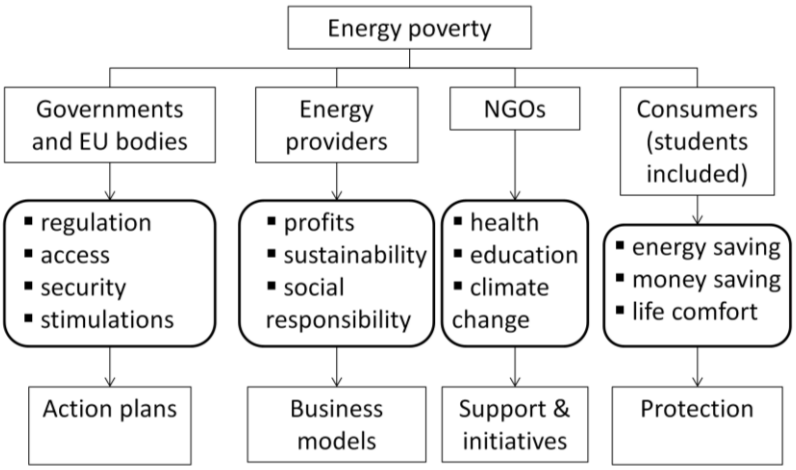

Figure 1. Stakeholders of energy poverty

Source: Authors' own research.

Measures for tackling energy poverty have been categorized by Pye and Dobbins (2016) in four areas: financial, consumer protection, energy efficiency and informational ones. When different interested parties get involved, consumers become the final beneficiaries of their actions.

Methodology

The purpose of this research is to investigate and analyze, from the landlords' perspective, the current trends in the private rented accommodation market for students and their implications for energy poverty.

Qualitative methods were followed for the collection of the necessary data from the landlords, namely focus group discussions and interviews. The target participation for the focus groups was 8-10 participants per focus group. In order to participate in the research landlords had to have at least one property rented to a university student. A €20 incentive was offered to each of the participants of the focus groups. It was difficult to get the landlords engaged in a focus group in Lithuania and the UK so in these two countries interviews via phone were conducted instead.

The National and Kapodistrian University of Athens was the leader of the research while the SAVES2 project participants were in charge of the application of the methodology in their respective country. Those were: Sofia University 'St. Kliment Ohridski' (Bulgaria), University of Cyprus (Cyprus), Technical University of Crete (Greece), Union of Students in Ireland (Ireland), Vilnius Gediminas Technical University (Lithuania), University of Bucharest (Romania), National Union of Students of the United Kingdom and De Montford University (UK).

The questions included in the focus group discussion guide involved the property that the participants rented to students. In the interviews the same list of questions as in the focus groups was asked. The same list of questions was asked in all 7 countries. The questions covered the following topics: thoughts about energy efficiency; barriers/motivations for energy refurbishment and Energy Performance (EPC) Certification; awareness/availability

of renovation grants; experience with students as tenants, and; profile of tenants they are after.

The focus groups and interviews were conducted between October 2017 and January 2018 in seven EU countries. Twenty-nine landlords participated in the research in total. Bulgaria had 4 participating landlords, Cyprus had 6 participants, Greece had 4 participants, Ireland had 2 participants, Lithuania had 6 participants, Romania had 5 participants and the United Kingdom had 2. It is worth noting that 3 out of 29 respondents rented their properties to students for the first time whereas 26 of those questioned had been renting to students for some years.

Results and discussions

The overall results are presented in two sections following the structure of the focus group discussion guide. In the first section, the drivers and criteria of landlords for selecting a student as a tenant as well as the types of offered contracts are discussed. In the second section issues related to the energy efficiency of their rented property are investigated.

Section I: Renting to students

Drivers for selecting students as tenants

Participants were asked why they chose a student as a tenant. According to the given answers, the most important drivers for selecting students as tenants are related to the financial stability provided by their parents, the impression the prospective tenants make, any signs of reliability such as punctuality with phone calls, frequent and positive communications and accommodations' suitability to students (Table 1). In particular, the "Financial status" of the tenant is the number one driver for selecting a student as a tenant by 16 out of the 29 questioned respondents, in six out of the seven countries. In fact, in Lithuania and Cyprus this driver is the most popular response. Mainly this driver refers to the financial stability that is provided by the students' parents/guardians whereas if students visit a prospective house accompanied by their parents, respondents get motivated since the presence of a guardian gives confidence in the ability to pay or to repair the property in case of damage. In addition to "Financial status", respondents take into serious consideration any signs that inspire reliability and trustworthiness and they consider a good first impression of a prospective tenant as a decisive factor. For 55% of those surveyed, punctuality with phone calls, emails or personal interviews and any other sign of dependability has an impact on whether they will rent their property to students. Interestingly, according to Bulgarian respondents, students are regarded as responsible tenants since they are careful not to damage the property, as they are financially liable for it. Moreover, fifteen participants find it important to be in frequent contact and have positive communication with student tenants; however, the latter refers to the respondents' willingness to continue renting their property to their current student tenants. Furthermore, a good first impression is of great importance for 14 out of the 29 respondents as it can reveal information about the tenant's character. Finally, an accommodation that is suitable for students is among the most important drivers for selecting a student as a tenant. Eleven participants stated that they only rent their properties to students and seven out of these eleven explicitly stated that students are the obvious choice for them as their properties are close to a university. In Ireland, a participant who was not only a landlord but also worked for a management agency for decades

commented "*The property itself decides who the tenants are. If a property is beside a university then they (landlords) seek out students, similarly if the property is older and non-refurbished then the landlord will be more likely to rent to students*" with the reasoning behind being that the general feeling amongst landlords is that students wouldn't look after a property as much as a family or professionals would do.

On the other hand, there are also many other drivers reported by those interviewed, however of less importance in general, including but not limited to the tidiness of students, their minimal demands, their age and any recommendation they can be given from former student-tenants. Ten respondents consider students' tidiness, and especially cleanliness and hygiene as an important criterion to choose a student as a tenant. Nine participants felt that students are less demanding and they are relatively easy going with minimal demands and they don't need any special facilities in the property and have fewer requirements than a family. "*As long as the wi-fi is working, students are happy*" stated one of the Cypriot participants. In Romania, where in general students are considered as worthy tenants, dealing with youth, is the most important driver for selecting students as tenants; "*Working with young people, keeps us young, so the age is important*" noted one Romanian respondent. In addition to this, in Romania, some participants also believe that creating a community of young people will attract tenants in their properties. Six of the participants regard "Good references" from previous tenants as an important factor to rent their property to a student and a recommended student will be preferred over one that has no recommendations. A minority of three of those surveyed, two from Bulgaria and one from Romania, prefer students over other groups of people because of the long term contracts and thus long term income connected to students' long period of studies. Interestingly, a small number of two respondents pointed out that they want to help students, since they were students once, and they renew the lease and not let a student go by the end of the lease term due to annual rising prices. At last, two Bulgarian respondents mentioned that the quiet the students sustain while studying is a considerable factor in selecting a student as tenant.

Table 1. Ranking of drivers for selecting students as tenants (In brackets is the number of participants)

Tenant Selection Drivers	**BG(4)**	**CY(6)**	**EL(4)**	**IE(2)**	**LT(6)**	**RO(5)**	**UK(2)**	**Total(29)**
1.Financial status of the tenant	2	5	1	1	6	1	-	**16**
2.Reliable tenants	3	5	4	-	4	-	-	**16**
3.Frequent contact with the tenant	-	5	4	-	4	2	-	**15**
4.Good Impression	-	5	3	1	5	-	-	**14**
5.Accommodation suitable for students	3	1	-	2	2	3	-	**11**
6. Cleanliness and hygiene	-	2	4	-	4	-	-	**10**
7.Students are less demanding	2	1	4	-	-	2	-	**9**
8. Dealing with youth	-	-	-	1	-	4	1	**6**
9.Good references	-	-	1	2	1	2	-	**6**

10.Creating a community of young people	-	-	-	-	-	3	1	**4**
11. Long term renting	2	-	-	-	-	1	-	**3**
12.Humanitarian reasons	-	1	-	-	-	1	-	**2**
13.The quiet they sustain while studying at home	2	-	-	-	-	-	-	**2**
14.The field of study of the tenant	-	-	-	-	-	-	-	**0**

Source: Authors' own research

Offered contracts

When participants were asked about the types of contracts they offer, non-inclusive rents were the dominant option. Twenty-five respondents pointed out that it is difficult to monitor their tenants' energy consumption and if energy bills were included in the rent, there would be little incentive for students to make good use of energy. Moreover, the liability towards utility companies in cases of grievances or debts is imposed upon tenants thus they offer non-inclusive contracts. Only two Romanian respondents offered all-inclusive rents. This is attributed to the fact that property owners in Romania try to attract students in order to create communities of young people, which in turn leads them to dependable future tenants. Additionally, a semi-inclusive rent was recorded in Romania in which the utilities are covered by the proprietor up to a specific price level and in case of an overrun then the tenant pays the remainder. A second semi-inclusive rent was reported in the United Kingdom.

Section II: Energy Efficiency of the rented property

Thoughts about energy efficiency

When asked about the importance of good energy efficiency of properties, respondents had different interpretations of what this meant and some of them had limited knowledge on the topic. However, all of the participants agreed that good energy efficiency of properties is important (Table 2). Approximately three quarters (72%) of those surveyed, 21 out of 29, consider good energy efficiency as a means of decreasing the running costs of their property and thus as a source of savings. Six Lithuanian and two Irish respondents consider energy efficiency as a very important issue when it comes to heating and insulating the property whereas some respondents from Romania and all the Bulgarian participants consider energy efficiency as a means of mitigating climate change and conserving natural resources.

Table 2. Importance of energy efficiency and reasoning behind this perception

Country	**Participants**	**Level of Importance**	**Reasoning**	**Answers**
Bulgaria	4	Very Important	Environmental protection	4
Cyprus	6	Important	Source of savings-decreasing running costs	6
Greece	4	Important	Source of savings-decreasing running costs	4
Ireland	2	Very Important	Heating and Insulation	2
Lithuania	6	Very Important	Heating and Insulation	6
		Important	Source of savings-decreasing running costs	6
Romania	5	Very Important	Environmental protection	2

			Source of savings-decreasing running costs	2
			Both	1
United Kingdom	2	Very Important	Source of savings-decreasing running costs	2

Source: Authors' own research

Energy Performance Certificates (EPC's)

Part of the discussion was about the issuance of Energy Performance Certificates (EPC) and if students have requested to receive one. The findings have revealed that all the participants in Greece, Romania and the United Kingdom have issued an EPC for their properties as this is a legal obligation in their country (Table 3). Quite positive is the fact that Romanian respondents use the EPC to better market their property; "*It is an expression of the property's quality*" stressed out one Romanian respondent. However, the opposite is seen in the other four countries. In Bulgaria, Cyprus, Ireland and Lithuania none of the respondents have issued an EPC. The reasoning behind this varies. In Bulgaria, issuing an EPC is a time and money consuming procedure that prevents landlords from getting one while in Cyprus, none of the six participants knew of their legal obligation to issue an EPC. In Ireland and Lithuania an EPC is required when selling a property and since none of the tenants had requested the property's EPC none of those questioned had issued one. Overall, just one participant from Cyprus reported that only one student tenant had requested to see the property's EPC whereas a respondent from the UK, whose property is listed with a university scheme, mentioned that the EPC is accessible online and every interested student can read it.

Table 3. Issuance of EPC for rented property

Country	**Participants**	**Have issued an EPC**	**Comments on EPC issuing**
Bulgaria	4	None	Long & financially consuming issuing procedure
Cyprus	6	None	None of them knew of their legal obligation to issue an EPC
Greece	4	All	Legal obligation
Ireland	2	None	None of the tenants had asked to see it EPC is necessary when selling the property
Lithuania	6	None	None of the tenants had asked to see it EPC is necessary when selling the property
Romania	5	All	Legal obligation and better marketing of their properties
United Kingdom	2	All	Legal obligation

Source: Authors' own research

Smart metering

When asked about the ways smart metering could help, in Greece as well as in Cyprus, none of the ten respondents had heard about smart meters. In contrast, seventeen respondents regard smart metering as an effective way for the utility company to save time from collecting consumption data and also money from energy bills since smart metering helps the tenant or owner control their consumption. "*Smart meters can help us save money*" commented one Romanian participant while a second added "*Smart meters simplify my life*". Overall, smart metering is considered as an advantageous option linked to energy efficient buildings. An

Irish respondent pointed out that "*We are in the era of smart technology and I believe they will make buildings more efficient*". In contrast, participants in the United Kingdom have not equipped their properties with smart meters due to a misconception they had that the tenant is not allowed to change energy provider if a smart meter is installed.

Actions towards domestic energy efficiency

Consequently, respondents were asked about any actions they might have taken over the last few years to increase their properties' energy efficiency. The most frequent occurring response was the replacement of light bulbs with more efficient ones. The second most popular action respondents had taken was the purchase of energy efficient appliances whereas the installation of double glazed windows and building insulation was the third most common adopted measure. One participant from Romania commented "*I changed my appliances – washing machine, refrigerator, also the bulbs, wires etc.*" while another from the same focus group stated "*I invested in thermopan windows, new meters, economical light bulbs, sensors at the entrance of the building and on the corridors, the building was insulated*". On the contrary, no measures to enhance their properties' energy efficiency had been taken by Greek respondents.

Key drivers for energy efficiency improvements

The findings revealed that grants and financial incentives are the two most important drivers for making any energy efficiency improvement to their properties (Table 4). The other driver is the abatement of the running costs. Fifteen out of twenty-nine respondents mentioned these two drivers respectively. Despite grants and financial incentives being among the most important drivers for Cypriot participants, and the most important for making energy efficiency improvements in Lithuania, respondents from these countries are not willing to renovate their property if the payback period is long. On the other hand, in Bulgaria and Greece, decreasing the running costs of the property is the most significant factor for the respondents to proceed with energy efficiency interventions. Furthermore, the results also revealed some country specific drivers. In Romania, three participants regard educational campaigns on energy efficiency as an essential driver while in Bulgaria two respondents consider attaining adequate thermal comfort inside the house as key drivers for any relevant improvements. In Greece, two participants mentioned renovating a deteriorated dwelling as a motivational driver to proceed on energy efficiency improvements whereas in Cyprus one participant pointed out environmental consciousness as a sufficient reason for any relevant improvement. Finally, in Ireland where a high EPC rating is important for a beneficial property sale, one participant regards the increase of EPC rating as his key driver for any energy efficiency intervention.

Table 4. Drivers for energy efficiency improvements

Country	Participants	Drivers for energy efficiency improvements	Answers
Bulgaria	4	Source of savings-decreasing running costs	3
		Increase thermal comfort	2
Cyprus	6	Grants and financial incentives	6
		Source of savings-decreasing running costs	6
		Environmental consciousness	1
Greece	4	Source of savings-decreasing running costs	4

		Renovate deteriorated dwellings	2
Ireland	2	Grants and financial incentives	1
		Increase the EPC	1
Lithuania	6	Grants and financial incentives	6
Romania	5	Educational Campaigns	3
		Grants and financial incentives	1
		Source of savings-decreasing running costs	1
United Kingdom	2	Grants and financial incentives	1
		Source of savings-decreasing running costs	1

Source: Authors' own research

On available incentives, grants or green loans for energy efficiency improvement in residential buildings none of the eighteen participants from Cyprus, Greece, Lithuania and the United Kingdom were aware of any. On the contrary, the remaining eleven participants from Bulgaria Romania and Ireland answered positively. Consequently, those who were aware of financial incentives or grants were asked what would be the reasons for not applying for any of these schemes. Bulgarian participants stated that their properties are in a good condition and do not require an energy efficiency loan. In Ireland, excessive bureaucracy, unclear processes and a hard to navigate national grant system prevent the participants from upgrading their properties. Finally in Romania, three participants mentioned that their small properties do not require a loan whereas the other two respondents mentioned that if a grant would be available then they could be interested to apply for it.

Conclusions

According to the findings of this research, landlords regard energy efficiency important mainly as a means of decreasing the running costs of their property and, in addition, the majority of them consider existing or prospective grants and financial incentives as the most significant motivator for making energy efficiency improvements. A significant share of participants was not aware of any financial incentives or grants in their country. For some participants who were aware, bureaucracy burdens prevented them from applying for a grant.

Findings also depict low energy awareness of some participants, which in combination with students' low energy awareness can lead to persisting energy poverty conditions in the rented property. Moreover, new emerging technologies, that are easily adopted from young people, such as smart metering, linked to energy efficiency, still need more widespread implementation.

The findings of this research point out to a number of financial, consumer protection, energy efficiency and informational measures that can help alleviate energy poverty experienced by students living in private rented accommodation To this end, dedicated action plans that promote energy efficiency interventions in student private rented accommodation motivate the upgrade of substandard houses occupied by students. In addition, campaigns informing proprietors about the benefits of renovations and financing options could accelerate energy retrofits and help the former to better market their properties. Moreover, sophisticated strategies to support the incorporation of new high efficiency products and emerging technologies, such as smart metering in buildings and the

increase of their market penetration, could trigger energy efficiency investments in student housing.

Furthermore, financial incentives for landlords whose property has a mid EPC rating, is located close to a university and has been rented exclusively to students for the last few years could be critical in tackling energy poverty amongst students. In parallel, encouraging landlords to participate in accreditation schemes in order to foster the development of a high-quality rental market would be advantageous to students making available numerous accredited upgraded houses for rent while landlords could better advertise their property.

Finally, allowing student-tenants to leave a house without a fine if the property owner does not demonstrably meet their essential demands to optimize the property's energy efficiency could also bolster the maturation of a high-quality rental market.

Energy poverty is not a simple concept. In the knowledge economy and society context, sharing knowledge and creating new one from the existing practices is more than a conceptual development. It is a new way of business models for new and open companies.

Funding acknowledgments

This work has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 754203.

References

Bouzarovski, S. & Petrova, S. (2015). A global perspective on domestic energy deprivation: overcoming the energy poverty - fuel poverty binary. *Energy Research & Social Science*, 10(2015), 31-40.

Dhéret, C., & Giuli, M. (2017). The long journey to end energy poverty in Europe - Policy brief. European Policy Centre

Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in electricity and repealing Directive 2003/54/EC

Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009 concerning common rules for the internal market in natural gas and repealing Directive 2003/55/EC

Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings

Directive 2012/27/EU of the European Parliament and of the Council of 25 October 2012 on energy efficiency, amending Directives 2009/125/EC and 2010/30/EU and repealing Directives 2004/8/EC and 2006/32/EC

Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency

Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2012/27/EU on energy efficiency (2016). Retrieved from https://ec.europa.eu/energy/sites/ener/files/documents/1_en_act_part1_v16.pdf

European Commission (2010). Staff Working Document 'An Energy Policy for Consumers'.

European Commission (2015). Vulnerable Consumer Working Group, 1–16.

Gradl, C., Knobloch, C. (2014). Energize the BoP! Energy business model generator for low-income markets. Retrieved from http://www.endeva.org/wp-content/uploads/2014/11/endeva_ETBOP_screen.pdf

Morris, K., Almeida, R. (2018). Sustainable energy accesss: case studies in unlocking business value. Retrieved from http://www.mmc.com/insights/publications/2018/feb/sustainable-energy-access-case-studies.html

Pye, S., Dobbins, A. (2016)- lead authors. Energy poverty and vulnerable consumers in the energy sector across the EU: analysis of policies and measures. Retrieved from http://www.innoenergy.com/wp-content/uploads/2016/03/INSIGHT_E_PR2_Energy-Poverty-Main-Report.pdf

Sioshansi, F. (2018). Three new energy companies finding value in three new business models. Retrieved from https://energypost.eu/three-new-energy-companies-finding-value-in-three-new-business-models/

Thomson, H., & Snell, C. (2013). Quantifying the prevalence of energy poverty across the European Union. *Energy Policy*, *52*, 563–572.

Trust, E. C. (2018). Homes fit for study. Retrieved from https://s3-eu-west-1.amazonaws.com/nusdigital/document/documents/39256/20180313_EAGA_NUS_Homes_fit_for_study_Research_report_FINAL.pdf

World Bank Institute. (2010), Measuring Knowledge in the World's Economies Retrieved from http://web.worldbank.org/archive/website01030/WEB/IMAGES/KAM_V4.PDF