

CIVIL ENERGY SELF-DEFENCE IN THE VISEGRAD GROUP

Solar panels, heat pumps, and energy poverty

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Introduction

The war in Ukraine has triggered several different psychological, social, and economic reactions in societies. In the socio-economic aspect, the armed conflict in Ukraine evokes a sense of financial and social threat in many European societies. Among the main reasons for unrest in the economic area is the concern about energy security and price of energy that started in connection with economic recovery from the COVID-19 pandemic and spiked as the consequence of the Russian invasion. To examine these challenges in the Visegrad Group (V4) countries – the Czech Republic, Hungary, Poland and Slovakia – the International Visegrad Fund supported project entitled “Civic energy self-defence in the shadow of the war in Ukraine: grassroots energy activities in V4”. This project was implemented by researchers from universities and think-tanks of all four countries and this report is one of its outputs. It presents findings from our empirical research conducted in early 2024. After this short introduction, four chapters discuss results of research conducted in individual countries. Conclusion summarizes the main findings and aggregates them for the whole Visegrad Group. Besides this report the project’s outputs include also four policy briefs with a short summary of our findings and policy recommendations. These policy briefs are in English language, but also all four national languages (Czech, Hungarian, Polish, and Slovak) can be found on project web pages.

The project “Civic energy self-defence in the shadow of the war in Ukraine: grassroots energy activities in V4” is a direct response to the challenges of the sense of threat to energy security caused by the war in Ukraine in the societies of the Visegrad Group countries. The interruption of the supplies of natural gas (gas), oil, and other raw materials from Russia not only forced governments to adjust their energy policies to the new conditions but also forced citizens to change their social behaviour and strategy. This has given rise to grassroots social activities that we call ‘energy self-defence’, which is the main subject of this project. The problem raised in the project is therefore complex: providing citizens with access to ‘clean energy’, showing social obstacles to access to energy, unequal distribution of energy, and finally combining a fair energy transition with energy security, innovation and decentralisation of energy systems at the civic level. Conflicts have shown that large-scale energy infrastructure that provides a centralised energy system can be easily disrupted by military action. In contrast, decentralised energy systems based on renewable sources allow communities to play a more proactive role not only in controlling their energy consumption, but also in maintaining their own energy security. In addition to providing greater resilience and independence, renewable energy contributes to the transition to a more sustainable energy system and can significantly reduce electricity bills.

Besides energy security issues, the project analyses the barriers and challenges experienced by the citizens of the V4 countries in the face of increasing energy and heating fees. It also aims to explain and show how the energy crisis has influenced the behaviour of economically and spatially diversified social groups. The comparative research covering four countries, residents of rural and urban areas, as well as people with different financial and cultural capital, may show universal mechanisms in V4 societies. In general, it is about understanding how the concern for energy security has influenced the activity and actions of citizens and how energy self-defence can strengthen innovative behaviour in society.

The main goal of our research is thus to detect changes in social behaviour and coping strategies in response to the unfolding, multifaceted energy crisis, which includes both rising prices and an increasing sense of threat to energy security.

The project collected empirical material and new knowledge on how to use the energy crisis caused by the war in Ukraine to accelerate energy transition in the V4 countries and, at the same time, how to protect citizens from the rising costs of energy and heating homes and the risk of spreading energy poverty in the V4 countries. The innovativeness of the project manifests itself in several elements as it combines

- Social diagnosis with practical recommendations
- Research activities with a specific social context (the war in Ukraine, energy crisis)
- The challenge of energy security with an opportunity to take action that, on the one hand, will accelerate energy transition and, on the other hand, activate citizens over the issues of transition, climate protection and reduction of energy poverty.

This project treats energy transition as a mixture of interrelated social challenges: climate protection, energy security, technological innovations and reduction of energy poverty. These four tasks are treated as a framework for civic energy self-defence. This approach thus allows the researchers to draw crucial policy conclusions in times when decision-makers are focusing on long-term solutions that will not only decrease EU's dependency on Russian fossil fuels, but will also support energy transition (RePowerEU, European Green Deal). Our research provides knowledge about grass-roots activities of citizens of the V4 countries that are reversing their energy consumption patterns to respond to issues connected to raising energy prices and energy security.

The project is of great importance for both social practices in the V4 countries and expanding knowledge about the challenges of energy policy and social policy in the V4 countries. We assume that energy transition is not only a technological and economic challenge but, above all, it is a process of social change in which citizens must participate. The energy crisis caused by the war in Ukraine has shown that it is impossible to carry out an efficient energy transition without an appropriate social policy framework and an active civil society. Moreover, compared to the rest of the EU, V4 households have limited cost absorption and investment capacity. For the V4 countries, it is important to combine all these challenges into a logical and comprehensive energy policy that includes

- Ensuring the energy security of citizens
- Developing technological innovation in the energy sphere
- Creating a strong energy civil society
- Implementing social policy limiting energy poverty.

Each of these elements is an issue that requires both assessment and suggestions for policy improvement in the V4 countries. In each of these elements, the V4 countries lag behind the core EU countries. Paradoxically, as a result of the war in Ukraine, the poor energy infrastructure and energy policy framework that were developed in the former Eastern bloc can and should be radically modernized.

We have collected our unique empirical data with the help of a series of focus groups conducted in all four Visegrad Group countries. In each country we conducted three focus groups with approximately 7 participants in each group (see Appendix for an anonymized list of participants). Altogether our 12 focus groups consisted of 77 people.

Each of these three groups included on different type of energy consumers:

- Prosumers
- Heat pumps owners
- People suffering from energy poverty

The first group included ‘prosumers’, i.e. people who consume, but also produce electric energy. Because it is the most spread technology, we focused on photovoltaic energy within this group, populating it with owners of foot-top solar panel. Other types of energy are not that spread within the region, for example, there is almost no wind energy in Slovakia. The second group consisted of owners of heat pumps who use this technology for heating (and in some cases also hot water preparation). The third group consisted of people who are suffering from energy poverty.

1. The Czech Republic

1.1 Introduction

The Czech Republic has experienced a period of economic downturns in recent years, mainly due to the COVID-19 pandemic in 2020 and subsequent developments in 2021. The post-pandemic recovery itself was not as smooth as initially expected. Strong demand growth, a slow recovery on the supply side and mismatches in supply and demand chains have led to shortages of some production inputs and a consequent gradual increase in commodity prices, particularly energy. Russia's subsequent aggression against Ukraine exacerbated these adverse effects. European and global sanctions against the Russian Federation have resulted in shortages of selected raw materials and commodities, leading to further price increases and inflation peak in September 2022 when it reached 18 % (Czech Statistical Office, 2024).

In response to the energy inflation, the Czech Republic adopted a series of policy measures, including the implementation of price caps (set at 200 EUR and 100 EUR (excluding VAT) per MWh of electricity and gas, respectively), support for energy-intensive businesses, a compensation mechanism for households' energy bills (covering the period from October to December 2022), and the temporary coverage of surcharges for renewable energy sources (RES) from the state budget (European Commission, 2023). To facilitate the growth of RES, the government has introduced several new measures, e.g., the five-fold increase (to 50 kW) in the installed capacity limit for smaller sources, including solar power plants for which owners must apply for a licence. Furthermore, RES up to 50 kW have been exempted from building permits or notifications, as well as from building location decisions and planning consent. RES up to 100 kW have been classified as simple constructions with shorter permitting periods in the construction procedure.

Another measure aiming at the energy cost reduction and the enhancement of the energy independence of the society introduces the so-called energy communities where its members can share the electricity they generate (see more in the press release of the Czech MIT, 2024a).

As a consequence of the energy crisis and the measures adopted, the Czech public has demonstrated a heightened level of engagement in the investment of photovoltaics and heat pumps over the past two years. The latest figures from the largest distribution system operators for electricity demonstrate that 116,740 new photovoltaic installations were connected to the grid since 2022, representing a significant increase from the 50,620 installations connected at the end of 2021. The installed capacity of photovoltaic panels has thus increased considerably, from 2,1 GW prior to the war to 3,5 GW at the end of 2023 (MIT, 2024a). The number of heat pumps supplied to the Czech market also demonstrates a notable increase in both 2022 and 2023. While 31,522 heat pumps were sold in 2021, the figure rose to 60,439 in 2022 and to 55,620 in 2023. In 2022, more than 20 % of newly build flats in family and apartment buildings is heated by heat pumps (MIT, 2024b). At the same time, a notable surge in energy poverty was observed between 2020 and 2023. As indicated in the Ministry of Labour and Social Affairs of the Czech Republic (MLSA) report, the number of individuals experiencing energy poverty has increased twofold since 2020. In 2023, the MLSA documented that over 1.3 million people were affected by energy poverty, which encompasses inability to afford adequate heating, mounting debt on energy bills, or spending over 20% of net monthly income on energy (Klusáček and Kalenda, 2024).

To gain a deeper understanding of the phenomena, we conducted observations from the perspective of everyday life and analysed data on trends related to the development of

renewables (prosumers and heat pumps owners) and the simultaneous expansion of energy poverty. These factors provided sufficient justification for conducting focus group interviews in the Czech Republic. We conducted three focus groups which took place online in April 2024.

- The focus group with prosumers consisted of 6 people, including 4 male and 2 female participants (Interviews CZ1 – CZ6), three from Central Bohemia, one from Pilsen, one from the Vysočina region and one from Prague-East.
- The focus group with heat pumps owners consisted of 5 people, among them 2 male and 3 female participants (Interviews CZ7 – CZ11), each of them representing a different region, one of them from Central Bohemia, one from Pilsen, one from Vysočina, one from Zlín and one from Hradec Králové region.
- The focus group with people in energy poverty consisted of 6 people, of which three were male and three female (Interview CZ12 – CZ17). They were also from different regions/towns: Havířov, Jablonec nad Nisou, the Hradec Králové region and Pilsen.

1.2 Prosumers

The findings of the focus group indicate that the primary motivation for the decision to purchase photovoltaic panels was economic, specifically the desire to reduce energy consumption. This was particularly evident in the context of the latest developments in the Czech energy market, which was experiencing a series of unprecedented challenges, including rising energy prices and the collapse of multiple energy suppliers.

In terms of energy security, some participants indicated that they currently feel more secure. Consequently, the installation of photovoltaic panels has had a relatively limited and positive impact on the perception of energy security, as indicated by half of the respondents. It is, however, noteworthy that the majority of these individuals indicated that they feel more secure when they have contracts with large suppliers. Regarding the concept of energy communities, it is not yet a well-established phenomenon. The respondents expressed a certain degree of scepticism regarding this assertion, although they acknowledged the growing number of photovoltaic panel users and their potential for collaboration in this regard. However, they do not perceive themselves as belonging to the energy community.

The installation of photovoltaic panels has a more pronounced effect on the behaviour of respondents (or their immediate family members). The respondents indicated a heightened interest in the functioning of the energy market and their consumer rights, as well as weather forecasts. Furthermore, Czech households demonstrate a lack of engagement with energy policy, as evidenced by their limited attention to political developments and changes in policy. Conversely, respondents identified regulatory and legal gaps, as well as a lack of financial support, as the primary obstacles to the investment into photovoltaic panels.

Ultimately, the prevailing sentiment is that the Czech government is placing a greater emphasis on large-scale energy resources (in contrast to decentralised systems such as photovoltaics), including nuclear power plants and utility-scale solar installations designed to feed electricity directly into the grid.

A. Motivation for installation

The main reason for the decision to invest in photovoltaic panels is the economy, in particular the rise in electricity prices and the intention to reduce energy consumption (Interviews CZ2 -CZ6). Fear of rising energy prices (mainly electricity) was a frequently cited argument. Two participants decided to invest in photovoltaic panels when their fixed-term contract with an

energy supplier came to an end and they began to investigate their options before signing a new contract (Interviews CZ1 and CZ3). For one household, the availability of government subsidies was also an important driver (Interview CZ4). None of the respondents cited environmental or climate factors as a reason for investing in photovoltaic panels.

B. Energy savings and a sense of energy security

As mentioned above, energy savings were the main driver for investment for almost all respondents (Interviews CZ2 – CZ6). Most respondents concluded that the installation of photovoltaic panels had met their expectations in terms of energy savings (Interviews CZ2 – CZ6). However, they also identified several drawbacks, mainly connected to technical and regulatory nature (Interview CZ6). One of the respondents mentioned the complexity of the installation process for balcony systems (in this context, it is worth mentioning the simplification of the registration of balcony systems in Germany, which came into force on 1 April 2024, see more in Bundesnetzagentur, 2024) (Interview CZ4).

In terms of energy security, three respondents stated that their perception of energy security had improved as a result of installing photovoltaic panels (Interviews CZ1, CZ3 and CZ4). As regards energy suppliers, all respondents tend to be conservative and have contracts with rather larger energy suppliers (e.g., ČEZ or Innogy), perceiving them as more stable and resilient (Interviews CZ1 – CZ6). It is worth noting that energy security has become an issue in the Czech Republic due to the collapse of several energy suppliers between October 2021 and March 2022 (see Energetický regulační úřad, 2021). However, one respondent prefers a more short-term contract to have the option to switch suppliers more often.

C. Relationship between solar power and changed consumer behaviour

The installation of photovoltaic panels has directly or indirectly changed the respondents' behaviour (indirect means that the installation of photovoltaic panels has not affected their individual behaviour, but the behaviour of other members of their household – Interview CZ1). Some of them are now more interested in the issues that affect the final consumer, such as the functioning of the market and billing (Interviews CZ4 and CZ5). Two of the respondents are now using the virtual battery service, which allows them to (virtually) seasonally store some of their excess electricity for use when it is needed, e.g. in autumn or winter (Interviews CZ2 and CZ5).

Four of Czech participants are following the weather forecasts more closely to get an idea of the future capacity factor/utilisation of their installations (Interviews CZ2 – CZ4 and CZ6). Two of the respondents are now more aware of the climate change issue than before, recognising the positive externalities of renewable energy (in terms of reducing CO₂ emissions) (Interviews CZ2 – CZ3). However, the most significant change in how respondents perceive their situation after installing photovoltaic panels is in terms of self-sufficiency (Interviews CZ3 – CZ5). However, the impact of perceiving themselves as more self-sufficient does not allow them to consider purchasing new appliances with high electricity consumption. Only two respondents have started to think about buying such an appliance in the future (e.g. a hot tub or an electric car) (Interviews CZ2 and CZ5). The others, on the contrary, have purchased more efficient appliances (Interviews CZ1 and CZ6).

It is also clear from the responses that people are now more active in communicating / discussing their experiences with photovoltaic panels. All of them participate in dedicated groups on the Facebook platform (Interviews CZ1 – CZ6). One of them is also active in face-to-face discussions, e.g. with their friends or neighbours (Interviews CZ3).

The issue of energy communities as an effective means of restructuring energy systems and empowering citizens locally by giving them the right to share energy and thus benefit from

energy efficiency and lower bills is not yet a well-established phenomenon. Respondents are rather sceptical about this, although they recognise the growing number of photovoltaic panel users and their potential for cooperation in this regard (Interviews CZ3 and CZ4). They do not see themselves as part of what might be called the citizen energy sector (Interviews CZ1 – CZ6). Most of them do not consider themselves to be part of it, having heard about it for the first time during the focus group discussion (Interview CZ1). They trust the decentralised system less and still see the customer-distributor relationship (as a centralised system) as safer and more resilient (Interviews CZ2 – CZ6). Participants are afraid of technical failures (especially during the winter season), which would lead to a lack of electricity without a backup (taking electricity from the grid). One of them had already experienced a breakdown of his installation and the need to buy electricity from the grid (Interview 6). Only one respondent would be interested in terminating his contract with his distributor if he had the technology to physically store enough electricity (Interview CZ4). However, three respondents would be interested in sharing their excess electricity with hospitals, nursing homes or shelters. They think this is a good idea (Interviews CZ1 – CZ3).

The final issue discussed relating to the behaviour was the option of cross-border sharing of electricity in the form of international cooperation. Two participants do not see any benefit in international cooperation (Interviews CZ3 and CZ4) and see distributors or traders rather than final consumers as the beneficiaries of international cooperation. One participant thought this was a great idea (Interview CZ3), the other would consider such an option and would not be afraid to supply surpluses if compensated in some way, such as a discount on distribution fees or in a similar way (Interview CZ4). One respondent stated that activity should only be carried out at home with “Czechs” (Interview CZ1).

D. Readiness for further investments in other devices

In general, all respondents were considering another investment, e.g. installing another photovoltaic panel on the remaining part of the roof or garage (Interviews CZ1 and CZ3), investing in battery storage (Interview CZ5) or replacing the remaining old installation with a new one (Interview CZ6). When it comes to energy storage, half of the respondents are aware of the problem (Interviews CZ1, CZ3 and CZ6). One respondent would welcome the availability of higher capacity batteries (Interview CZ.3). Two of them have seriously considered purchasing an electric vehicle to charge them during off-peak hours when electricity demand is lower. However, they would like to see more battery capacity, which they feel is low in current electric vehicles (Interviews CZ2 and CZ3).

Regarding heat pumps, all respondents were rather sceptical about the return on investment in such a system due to high capital and operational costs (Interviews CZ3 – CZ6). Similarly, small wind turbines are seen as “economic nonsense” (Interviews CZ1 – CZ6). Regarding other alternatives for storing excess electricity, one of the participants considered a sand battery as an option for storing energy in the form of heat that can later be used to heat the home (Interview CZ4).

E. Assessment of the government’s policy towards prosumers

There was no extensive debate on government policy. In general, participants highlighted regulatory and legal gaps and financing as the biggest barriers for people to purchase and use photovoltaic panels (Interviews CZ3 and CZ4). Regarding the legislative/regulatory gaps, none of the participants was able to elaborate and discuss the issue in more detail. When it comes to financing, they see the state itself as a problem rather than an enabler. According to our participants, government support for photovoltaics has decreased. Another problem is the insufficient capacity of the distribution network, which makes it difficult to connect new solar installations to the grid (Interviews CZ1 – CZ6). Another drawback is the

lack of awareness among the population and the lack of space for installation (Interview CZ3). Our participants believed that the Czech government is giving priority to other, more large-scale energy resources, such as nuclear power plants or utility-scale solar installations designed to feed electricity directly into the grid (Interviews CZ1 – CZ6).

1.3 Heat pumps users

The focus group with owners of heat pumps indicated that the primary motivation for purchasing a heat pump among participants is economic, particularly considering the unprecedented circumstances on the Czech energy market. The predominant emotions driving this decision were uncertainty and a desire for self-sufficiency. However, regarding energy savings, only a minority of respondents are now in a more favourable position, while the situation of the remainder is even less advantageous than it was prior to the installation of the heat pump.

With regard to the question of energy security, the installation of heat pumps has had a positive effect on the perception of energy security of only three respondents. In contrast to the findings among prosumers, no discernible pattern emerged with regard to behavioural change. Some respondents started to maintain a higher temperature in their homes compared to the pre-heat pump period. In contrast, the remaining respondents indicated that their habits had not undergone any alteration. A single respondent indicated that they feel more comfortable in terms of energy consumption following the installation of heat pump. With regard to the energy suppliers, the majority of respondents expressed negative sentiments, which differed from the attitudes of prosumers. Some respondents have previously experienced negative interactions with energy supplier companies.

Similarly, the participated heat pump owners did not follow the development of energy policy in the Czech Republic. Nevertheless, it is evident that a significant challenge hindering the adoption of heat pumps is the lack of financial resources, which is perceived as the most significant barrier to purchasing and utilising these devices. With regard to energy communities, this phenomenon is not yet well established. Only two respondents perceive themselves as part of an energy community, with the principle of subsidiarity being highlighted as the municipality should be responsible for the creation of such a community.

Finally, those who own heat pumps share a similar perception of the Czech government's energy policy priorities. They also perceive a bias towards large-scale energy resources, including nuclear power plants, small modular reactors, and utility-scale solar plants designed to feed electricity directly into the grid. This is seen to occur at the expense of decentralised, small-scale solutions.

A. Reasons for investing in heat pumps

As with photovoltaics, the economy was one of the strongest drivers behind the decision to purchase heat pumps. High energy prices and government predictions about their future development have affected most of the respondents to some extent. Uncertainty, fear of future supply or self-sufficiency were the main emotions behind the decision. However, for example, two participants chose heat pumps as the only feasible option for heating and possibly cooling their new family house (electric boiler does not meet the environmental requirements for new houses, inability to connect to the gas distribution network and lack of space in the house to store biomass to install a biomass boiler) (Interviews CZ7 and CZ8). Some participants stated that the decision to purchase a heat pump was also driven by a mixture of reasons such as energy savings, environmental impact, property valuation and the experience of their family members (Interviews CZ9 – CZ11). The availability of

government support was important for most respondents, for example, for one participant the decision to switch from a gas boiler to a heat pump was influenced by the availability of government support and the policy of banning gas boilers (Interview CZ7).¹

B. Energy savings and a sense of energy security

Four participants were better off in terms of energy costs after installing the heat pump than before (Interviews CZ7, CZ9 – CZ11). However, one participant was concerned with additional maintenance or repair costs in the event of malfunction. He saw the return on investment in about ten years. He was rather critical about the energy costs and the return on investment. If unexpected breakdowns occur after the five-year warranty period, they expect to be in the “red” numbers (Interview CZ8). As mentioned in the first section, two participants chose heat pumps as the only feasible solution and would prefer an electric boiler if possible (Interviews CZ8 and CZ9). The biggest disadvantage is that heat pumps cannot work when the outside temperature is low. When the temperature falls below a certain threshold, the heat pump switches to the electric boiler (Interviews CZ7 and CZ8). Two respondents also used or planned to use a fireplace to keep warm (Interviews CZ7 and CZ10).

Four respondents stated that their perception of energy security had improved as a result of installing a heat pump (Interviews CZ7 and CZ9 – CZ11). One participant stated that the purchase of a heat pump has not affected his perception of the (non-)availability of energy, he felt the same as before (Interview CZ8). Regarding the energy suppliers in the Czech Republic, most of the respondents were critical. In particular, two had negative experiences with them in the past - bad communication, a kind of game of chicken (Interview CZ10 and CZ11). One respondent believed that it was not traders but distribution system operators who were concerned about energy security (Interview CZ8). One participant argued that the main purpose of the trader was to do business, to make profits, income, and not to increase energy security (Interview CZ8).

C. Relationship between heat pumps and changed consumer behaviour

All participants agreed that heat pumps will sooner or later be the cleanest energy source (in combination with photovoltaic panels). Two of them also emphasised the ease of maintenance (Interviews CZ8 and CZ9). On the other hand, they were aware that the operating noise level is quite high, which has to be taken into account (e.g. not to disturb the neighbours) and that they require quite a lot of space (Interviews CZ7 and CZ10).

In terms of behavioural changes, one respondent heated their home to a higher temperature than before the heat pump was installed (Interview CZ11). The other two did not change their behaviour, although one felt more comfortable when it comes to the energy consumption (Interviews CZ7 and CZ8). Only one respondent observed behavioural changes as he was trying to save more energy (Interview CZ10). One respondent also appreciated the better control through the application (Interview CZ7). However, most of the participants did not pay more attention to the issue of energy policy (Interviews CZ8, CZ10 and CZ11). One respondent's interest in energy policy has increased since installation of the heat pump, e.g. he now follows government energy policy more often than before (Interview CZ7).

Similarly to the prosumer focus group respondents, the issue of energy communities as an effective means of restructuring energy systems and empowering local citizens by giving them the right to share energy and thus benefit from energy efficiency and lower bills is not

¹ The debate on banning gas boilers has started with the revision of the Energy Performance of Buildings Directive

yet a well-established phenomenon. Only two respondents perceived themselves as a part of an energy community (Interviews CZ7 and CZ11). They emphasised the principle of subsidiarity as the municipality should create such a community. In particular, one respondent, who had a typical roof that is difficult to put photovoltaic panels on, thought it would be a good idea to make an agreement with the municipality and put the panels somewhere else. It would also have an economic benefit (Interview CZ7). Ideas about whether it would be possible to create an energy community in the building or at the community level (municipality) were evenly divided, some respondents thought it is realistic (Interviews CZ9 – CZ11), others did not (Interviews CZ7 and CZ8). They did not see themselves as part of what could be called the civic energy sector. Therefore, some of them did not see themselves as part of the community energy sector either (Interview CZ8). However, some of them saw great potential in being part of the wider civic energy community. Although respondents expected the number of heat pumps owners to increase in the future, they did not believe that they would create a significant political movement, such as the so-called solar barons did in the past, pushing for a high electricity feed-in tariffs (Interviews CZ7 and CZ8).

D. Readiness for further investments in other devices

Two of the respondents considered adding photovoltaic panels to the heat pump to use the electricity generated to cover part of the heat pump's electricity needs (Interviews CZ9 and CZ10). However, not at this time, as they considered this technology not mature enough or had other priorities. One respondent did not consider PV panels, one of the respondents' attic was not suitable for installation (Interview CZ7). This respondent also mentioned their different seasonality - heating season is in winter when solar power generation is lowest (Interview CZ7). In addition, at the time of installation, government subsidies for both were not available, so they opted for heat pumps only (Interview CZ8). One respondent has already installed both PV and a heat pump. They also used their electric car for storage (Interview CZ10).

Another issue related to photovoltaic was the waiting time for installation, which takes about two years. In addition, there was a high fee for overflowing into the grid. The best solution would be to store the excess electricity in the electric vehicle or by heating the pool (Interview CZ7). One respondent also considered a small wind turbine as the area where he lives is quite windy. However, this technology was not available on the Czech market (Interview CZ8).

E. Assessment of the government's policy towards owners of heat pumps

There was also a debate about government policy on heat pumps. The most discussed issue was the availability of government support, as the main barrier to heat pump installation was the high initial cost (Interviews CZ7, CZ10 and CZ11). One participant highlighted government support for the replacement of solid fuel boilers (Interview CZ8). However, another participant complained about the rules set for obtaining subsidies (Interview CZ7). In addition, he also mentioned his objections to the government's policy during the energy crisis; he believed that the price cap set by the government should have been set on the producer side and not on the retail side (Interview CZ7).

In general, some respondents believe that the Czech government tends to favour large-scale energy sources such as nuclear power plants, later small modular reactors and utility-scale solar plants designed to feed electricity directly into the grid (Interviews CZ7 and CZ8). These sources can supply electricity to large areas. One participant complained that he saw the state abandoning support for biogas plants, biogas boilers, and putting everything on one card - nuclear power (Interview CZ7). He also highlighted heat production from incineration

of municipal waste as a priority in his region (Interview CZ7). Another respondent did not follow state priorities in energy sector (Interview CZ10). Participants also saw potential in the use of large heat pumps in commercial buildings (Interviews CZ7 and CZ8)

1.4 Energy poverty

The final focus group discussion addressed the issue of energy poverty. While some respondents demonstrated a comprehensive understanding of the billing process, the structure of electricity and heating tariffs, and related topics, this was not a universal observation. It is incontestable that energy costs represent the most significant within household budget, and that the energy bill constitutes a discrete item within the total costs. The six Czech respondents offered a variety of explanations for the high cost of energy, ranging from vague perceptions to more specific attributions involving political representatives, energy companies, and even energy appliances.

The war in Ukraine has only a limited impact on the energy sector, particularly in regard to heating bills. The narrative about the decisive negative impact of the invasion of Ukraine on energy prices was not confirmed. All respondents provided a clear response, indicating that the most cost-effective method for heating a household is through the use of firewood. Another method for reducing the financial burden of energy bills or maintaining a comfortable temperature within one's home is through the implementation of insulation measures. A reduction in temperature is perceived as an additional method of reducing consumption, and arguably the most straightforward approach.

The respondents confirmed the long-term positive attitude of the Czech Republic towards nuclear energy. Conversely, there was considerable divergence of opinion regarding photovoltaics and heat pumps. Additionally, the Czech respondents exhibited a similarly disparate set of views on support programmes for the purchase of new boilers or more environmentally friendly heating systems.

A. Challenges in paying energy bills

According to all the Czech respondents, energy costs/energy bills are the biggest item within household budget, and they had to be watched (Interviews CZ12 – CZ17). For each respondent, the energy bill represented a different share of their total household costs, which was determined by different issues. While for two respondents it was mainly an additional financial expense comparable to another mortgage payment (Interview CZ3) or an additional CZK 3,000 (600 EUR) for deposits (Interview CZ6); for three others, it mainly represented a need to carefully monitor how much the energy costs or what options/advantages alternative suppliers offer. For only one respondent, it was an extra expense, approx. 3,000 CZK for a heat pump, which needed to be monitored, but at the same time it did not represent a particularly large budget item (Interview 3.1).

For one of the respondents, energy costs/energy bills caused feelings of aversion and reluctance along the lines of “I don't want to pay it, but I have to because it is mandatory” (Interview CZ12). At the same time, however, for all the respondents the energy costs/energy bills represented a certain dedication, as despite the high costs, one needed to pay for energy because it is difficult to live without electricity (Interviews CZ12 – CZ17).

An interesting question is when the respondents started to perceive higher costs of energy. Four respondents cite the onset of the COVID-19 pandemic as one of the turning points, as it was followed by an increase in energy prices and thus higher expenses.

I don't know if it was during COVID, but before it was almost free and the more of us there are, the more it increases, the more electricity is consumed (Interview CZ12).

During COVID, for those who did not have a fixed price, it [the price] increased and when the war started, it went up senselessly (Interview CZ13).

Three respondents also mentioned the year 2022, when, among other things, the Russian military aggression against Ukraine took place.

I lived in England and came back in 2022 and found everything terribly expensive, even food (Interview CZ17).

You just have to keep an eye on it, as it is also affected by the war in Ukraine, and COVID – since then everything has become more expensive and there is always a reason (Interview CZ14).

B. The assessment of the reasons for the high prices

This part, which focuses on the reasons for the high prices, is directly and logically related to the previous part. In response to the question, “Who is behind the rise in energy prices?”, or “Who is responsible for the high electricity prices and high household expenses?”, the Czech respondents’ answers varied, ranging from vague views to views that referred to political representatives, energy companies and even energy appliances. In general, however, it can be stated that mistrust of political entities and energy companies prevailed among all the Czech respondents (Interviews CZ12 – CZ17).

Two of the respondents could not give a reason for the high prices: “I don't know” (Interview CZ15), and “it’s hard to say, I’m not convinced of anything” (Interview CZ12). Four of the respondents then expressed their belief that some political entity is responsible for the high energy prices. These political entities take different forms in their views, ranging from the abstract item “the highest and most powerful” (Interview CZ14) and “higher powers [that] always make excuses for something” (Interview CZ13) to a specific political entity,

the government [that] is not able to put a ceiling on [energy prices]; those companies do it themselves (Interview CZ13).

Even the international organization “European Union”, but also “America” was mentioned (Interview CZ16). These political entities are then very often supplemented by energy companies or their activities.

I don’t know, maybe the resale of electricity; we export it unnecessarily and buy it back at a high price, so that it becomes nationalized (Interview CZ12).

C. Mechanisms to decrease energy bills

This part focuses on mechanisms to decrease energy bills. In this context, five out of the six Czech respondents clearly answered that one of the best ways to heat a household is by using firewood as the cheapest option. It could be used either independently (Interviews CZ13 and CZ14) or as an addition to, for example, “a heat pump, but the cheapest option is definitely firewood” (Interview CZ12). Only one of the respondents stated that he had never thought about the best way to heat his home (Interview CZ16)

Another way to reduce the costs of energy bills, or maintain heat in one’s home, is to insulate one’s house. In this case, all Czech respondents answered that they had a fully or partially insulated family house or apartment (Interview CZ12 – CZ17). Insulation is thus considered by most of the respondents to be the best way to maintain/capture heat, even in a 100-year-

old family house. One interviewee described her home as follows: “1920, new windows, doors, floors, insulation of the meter wall” (Interview CZ14). Only in one case there was a problem with the insulation of the walls of the house, as it is a “monumental villa” (Interview CZ13). To the question, “How do you assess the current heating costs, and do they affect the overall financial situation of the household?”, two respondents answered yes to the latter part (Interviews CZ16 and CZ13).

Our costs will definitely increase, firewood also costs something and we want to operate the electric boiler to maintain the temperature; it is not a cheap matter (Interview CZ16).

On the other hand, two other respondents did not see a problem in this regard because they had central heating or a heat pump and reduced the temperature (Interviews CZ12 and CZ15). Temperature reduction was perceived by five respondents as the easiest way to reduce consumption. They reduced the temperature in their apartment or house during the day and especially at night to between 18 and 22 degrees Celsius. According to one of the respondents,

we reduced the temperature from 24 to 22 degrees (Interview CZ14).

Only in one case did the respondent answer that he did nothing in this regard, or that he did not lower the temperature, but kept it at a level that suited him (Interview CZ16). None of the respondents were forced to turn off the heating completely.

D. The impact of the invasion of Ukraine on heating bills

The Czech respondents spoke only to a limited extent, namely twice, about the impact of the war in Ukraine on the energy sector and especially on heating bills. In the first case, it was when the respondents answered the question about whether they were concerned about the rise in energy prices due to the war in Ukraine. The prevailing narrative about the decisive negative impact of the invasion of Ukraine on energy prices and, in particular, placing all the blame for the high heating bills on the government due to its support for Ukraine, was not confirmed. In one case, the respondent answered that the price had definitely increased due to the war, but he did not worry (Interview CZ15). Two of the respondents unequivocally rejected concerns about the rise in energy prices due to the war in Ukraine.

I think they are just blaming it on that, an inflated bubble (Interview CZ17).

The war is nonsense; we have family there; we know how it goes there; I worked at a dormitory as an administrator; I moved among those people (Interview CZ16).

In the second case, the respondents answered the question regarding the complications with energy payments before and after the outbreak of the conflict in Ukraine by saying that when the conflict started, there was an increase in the prices (Interview CZ13 and CZ14).

E. Mechanisms and policies supporting energy savings

This part focuses on mechanisms and policies supporting energy savings (decreasing energy bills). The Czech respondents had different ideas about what photovoltaics and heat pumps are. While in the case of photovoltaics all the respondents knew what the purpose of solar panels was, in the case of heat pumps, two of them answered that they did not know or were not interested. In the same way, the Czech respondents had different ideas of how these two methods can solve energy and heating costs. There was a rather sceptical attitude towards photovoltaics among the respondents. On the one hand, it was due to the financial costs of

solar panels, particularly their “high acquisition costs” (Interview CZ13). Other similar views included claims by other two participants.

In my opinion, photovoltaics are not worth it in our country (Interview CZ16).

What they produce in addition, the person in question gives it to the company, but sells it for less than what he buys it for (Interview CZ14).

One person even responded with disinterest when claiming that “I don’t care about it; solar panels are booming now, but I’m not interested in it” (Interview CZ17). On the other hand, among the Czech respondents, in the case of the heat pump, there was a rather positive approach to its purpose and acquisition (Interviews CZ13 and CZ16), as it was seen as the simplest and most reliable option (Interview CZ12).

The Czech respondents also confirmed the long-term positive attitude of our country towards nuclear energy in connection with the changes taking place in the energy sector. Three respondents clearly emphasized that they would not protest against the nuclear energy under any circumstances (Interviews CZ12, CZ13, and CZ15). On the contrary, the aforementioned sceptical attitude towards photovoltaics was confirmed.

A lot of solar panels have been added to those fields; I don’t know if it’s good; it takes up a lot of agricultural land and it doesn’t give the villages anything (Interview CZ16).

Similarly, the Czech respondents had different opinions on subsidies for socially weaker or disadvantaged groups. Three respondents admitted that subsidies for the elderly or single mothers made sense and the state should take care of these groups.

Subsidize nursing homes, for example; the state should take care of those people (Interview CZ13)

It depends on what kind of pension they [retirees] have, but perhaps breadwinner mothers have a bigger problem, and the state should take care of them (Interview CZ14).

The remaining three respondents completely disagreed with this opinion, presenting two arguments. First, our respondent explicitly ruled out any such support and argued that it should be reduced (Interview CZ12). Second, two other respondents pointed out that subsidies in the form of housing allowances already exist, so there is no need for extra support (Interviews CZ15 and CZ17).

Our respondents had varying opinions also when it comes to support programs for purchases of new boilers or more environmentally friendly heating. Three respondents admitted that they had either never dealt with similar support programs because they lived in an apartment/sublet (Interviews CZ15 and CZ17) or because they did not have the finances for a new boiler or heating system (Interview CZ14). Two other respondents, on the other hand, stated that they had information about similar programs (Interview CZ13) or even addressed the issue, but did not meet the conditions for the subsidies, such as green savings (Interview CZ16). The last respondent then confirmed his previous sceptical attitude towards subsidies/contributions, which, in his view, “are mostly nonsense; it’s a utopia” (Interview CZ12).

1.5 Conclusion

This chapter focused on the attitude of Czech respondents on different themes connected to energy policy. A total of 17 respondents from various Czech cities and regions took part in three focus groups discussing three different energy topics: (a) photovoltaic panels, (b) heat pump and (c) energy poverty. More women (9) participated in the survey, than men (8).

The primary motivation for the decision to purchase photovoltaic panels was financial; the desire to reduce energy costs. Energy security was a less important driver. For the Czech households, well-established centralised relationship (supplier-consumer) is seen as a guarantee of security of supply. This pattern is also demonstrated by the emotion behind the concept of energy communities. Respondents expressed a certain degree of scepticism, despite the growing number of photovoltaic panel owners and their potential for collaboration in this regard. On the other hand, the installation of photovoltaic panels has had a more pronounced effect on the behaviour, such as heightened interest in the functioning of the energy market, consumer rights, as well as weather forecasts.

Czech prosumers pay limited attention to political developments in energy policy. However, they were able to highlight regulatory and legal gaps, including financing, as the primary obstacles to the purchase and utilisation of photovoltaic panels. Besides, they complained about the Czech government prioritisation of large-scale energy resources (mainly nuclear power plants and utility-scale solar installations).

We observed the same primary motivation for purchasing heat pumps as photovoltaic panels – economy, in particular connected to market uncertainty, and a desire for self-sufficiency. However, the desired outcome has materialised for only a minority of respondents, while the situation of the rest of this group was even less advantageous after installing heat pumps than it was before. In contrast to the findings among prosumers, no discernible pattern emerged with regard to behavioural change. Most respondents expressed negative sentiments about energy supplier companies. Contrary to prosumers, some respondents perceive themselves as part of an energy community, emphasising the role of local governments and municipalities. They felt more energy secure after installing heat pumps than before.

Similarly to prosumers, heat pumps owners do not follow the development of energy policy. Nevertheless, the most significant barrier to purchasing and utilising heat pumps is the lack of financial resources. Finally, those who own heat pumps share a similar perception of the Czech government's priorities with prosumers - a bias towards large-scale energy resources, including nuclear power plants, small modular reactors, and utility-scale solar plants designed to feed electricity directly into the grid. This is seen to occur at the expense of decentralised, small-scale solutions.

In the case of energy poverty, all the Czech respondents saw energy costs/energy bills as the biggest item of their household budget that had to be watched. At the same time, the energy bill represented a different type of cost within their total household budget, which was determined by different options. The cause of high energy prices was perceived differently, from vague arguments to blaming political representatives, energy companies, or energy appliances. According to our respondents one of the best ways to heat a household is using firewood as the cheapest option. Another way to reduce the costs of energy bills, or maintain adequate warmth, is to insulate one's house. All our respondents had a fully or partially insulated family house or an apartment. Temperature reduction is perceived as another, and easiest, way to reduce consumption. The Czech respondents spoke only to a limited extent about the impact of the war in Ukraine on the energy sector and especially on energy bills.

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2. Hungary

2.1 Introduction

The energy crisis in the wake of the post-COVID economic rebound and the Russian war in Ukraine have profoundly impacted Hungary. To highlight some of these effects, the Hungarian account deficit rose to 8.2% in 2022, and inflation rose to 25.9% by the beginning of 2023, the highest percentage increase in the European Union (European Commission, 2023). The direness of situation can also be demonstrated by the fact that one of the main political products of the Hungarian government, the so-called utility cost reduction program, which provides low energy prices to households, had to be significantly altered due to budgetary pressures (Weiner and Szep, 2022). Therefore, both from an academic and policy perspective, it is highly relevant to analyse how the society coped with increasing prices and their corresponding negative effect in a politically and economically highly constrained environment (for further discussion on the structural and institutional conditions in Hungary for decarbonization and energy price effects, please see: Muth et al., 2024). The main goal of our research is to detect changes in social behaviour and coping strategies in response to the unfolding, multifaceted energy crisis, which includes both rising prices and an increasing sense of threat to energy security.

To answer this research question, discussions were held by three focus groups in March of 2024. One group included citizens who had been installing heat pumps since 2021, one group dealt with solar energy users, and the last group included people who were victims of energy poverty. To address these problems, the following analysis provides an overview of the main drivers, motivations, coping strategies and other crucial aspects of different segments of energy users in Hungarian society.

2.2 Prosumers

Six participants shared their views and opinions about solar power use in Hungary. To provide a brief background, all participants live in well-insulated houses in the countryside or near Budapest.

A. Motivation for installation

Overall, the motivation for installing solar panels for the focus group participants was primarily driven by economic considerations, such as the competitive prices of renewables, the long-term savings of low carbon alternatives such as using electric vehicles, and the desire to find solutions that result in greater energy independence. Surprisingly, the energy crisis and the war in Ukraine did not significantly influence their decisions, as most installations occurred before these events in 2021. In general, installing solar power successfully protected its users from the negative effects of an energy crisis, as their monthly energy bills stayed relatively low. The sharply rising energy prices caused by the crisis also turned their investment profitable in an exceptionally short period of time (1-3 years instead of 8-12 years). This observation refuted our initial hypothesis that solar panel installations were driven primarily by increasing fossil fuel prices due to the war. Instead, the war accelerated an existing trend of renewables becoming more price competitive.

It was generally agreed among participants that the current system of allowing excess energy generated in the warmer summer months to be consumed in the winter (the so called “balance-based settlement system”) had been very beneficial to consumers. It became

apparent that as soon as this system is phased out², buffer systems (e.g., batteries) will be needed, as well as alternative approaches to utilizing the installed system efficiently. It was also noted, however, that batteries are currently prohibitively expensive. Nevertheless, solar power systems were highly favoured overall, for both technical and financial performance, among users. Notably, installing these systems increased the sense of energy security and flexibility in response to profound changes in the electricity market.

An interesting note was added by two participants that their solar panel systems were oversized by design to accommodate future electric car usage and alternative heating methods. Furthermore, since the government introduced a politically heavily contested measure to pay only 5 HUF/kWh to consumers for excessive energy fed into the grid, participants preferred to use all generated energy (e.g., using electricity for heating rather than turning on existing gas boilers) instead of feeding it into grid.

B. Attitudes towards the utility service provider and state

When participants were asked about how their relationship with local utility service providers have changed after installation, they revealed a spectrum of experiences, from satisfaction and smooth operations to significant frustration and legal concerns. Three participants expressed relative satisfaction with local providers, viewing their relationship as purely transactional. However, one participant raised a critical issue: although he received a license from the service provider to install his solar capacity, the grid system could not accommodate his system, resulting in underperformance and financial losses. He feels neither the service provider nor the state has compensated him, causing significant anger and discontent. Participants agreed that national regulation and EU rules primarily affect them as solar panel users, not the utility company.

Related to the last point about legal challenges, it was mentioned by participants that advocacy for favourable regulation and protection of consumers interest was crucial to discourage state to introduce legislation, such as changing consumer prices unilaterally, which creates an unpredictable environment for consumer decisions (investing in additional capacities for electric vehicles or heating systems, etc.).

Participants views varied, reflecting both optimism and scepticism about the political lobbying power of solar panel users. It was acknowledged that web-based communities (e.g., Facebook groups) could facilitate rapid mobilization for advocacy purposes which can respond quickly to issues. A recent example of such success was the withdrawal of government measure to phase out balance-based accounting system after backlash from solar power users. However, there was scepticism about the potential for large-scale advocacy. One participant believed that there would be limits to solar panel installations imposed by the state. He argued that the state would restrict the growth of independent installations to maintain control over these resources. Another participant expressed doubt about Hungary's readiness for such a movement, citing historical and cultural divisions within the country. He felt that the current system, which is state-controlled, would not easily allow for a significant shift in power to solar panel users. In conclusion, while there are challenges and scepticism regarding the potential for solar panel users to become a major advocacy force, there are also examples and arguments suggesting that with sufficient numbers and

² The government wanted to phase it out with immediate effect for new consumers in 2023, but due to political resistance, they withdrew the measure. It was decided that consumers can stay in the annual balance-based settlement system for 10 years after installation.

organization, they could influence energy policies and advocate for more favourable conditions.

C. Relationship between solar power and changed consumer behaviour

In general, two dominant views have been shared by participants about how solar power changed their consumption. The first subgroup utilizes excessive energy to finance additional consumptions (Jevons paradox). Remarkably, two participants built pools and heat them with solar energy, which might be considered luxury consumption. Installation of air conditioning and purchase of electric vehicles were also mentioned by this group.

The other subgroup expressed views that their new system made them more conscious of their consumption habits. Some participants highlighted the need for strategic energy use to maximize efficiency. One participant mentioned that they avoid heating with air conditioning and are not planning additional high-energy investments, such as an electric car, until the regulation changes. Another participant discussed adjusting their habits to use high-energy appliances like dishwashers and washing machines during the day when solar energy is available. They emphasized the importance of using generated electricity directly and expressed support for community storage solutions.

Overall, while some participants have already made significant changes to their energy consumption habits and appliances, others are planning future purchases or adjusting their usage patterns to align with solar energy production and more environmental use of energy consumption.

How consumers have changed their behaviour can also be detected by how often they discuss issues related to solar power use with neighbours/experts/fellow users. Our analysis reveals that while some engage in discussions with friends and neighbours about solar power use, they do not do it frequently. The main reason is that they are generally satisfied with the installed systems and do not face any rampant problems which would require immediate action or help from experts. Consumers acknowledged that there are platforms on social media to discuss solar power issues and advocacy groups have been formed to represent consumers interests, but the participation in these groups were very mixed by participants. They understand that participation in these groups depend on how technical issues (especially grid performance, accounting and payment rules) are handled by the state.

When participants were specifically asked about whether they considered buying heat pumps to complement their solar panel system, they made the following observations. Notably, participants' views varied based on their specific circumstances and experiences, with a general consensus that effective insulation and careful consideration of the property's characteristics are crucial for choosing the appropriate heating solution. Good insulation is a prerequisite for installing heat pumps efficiently, and old houses may not be suitable for this system. Despite these constraints, heat pumps were viewed favourably, and those who used them were satisfied with their performance.

D. Views on energy communities, energy solidarity and cross border cooperation

The concept of energy communities garnered mixed reactions among participants. Some were enthusiastic about the idea and expressed a strong interest in joining such initiatives if they became viable in the future. They saw potential benefits for individuals and the community at large, although they acknowledged that regulatory and logistical challenges exist.

One participant saw energy communities as a way to share excess energy instead of installing expensive battery solutions, sympathizing with the idea of sharing energy with kindergartens or other public institutions. Another participant pointed out that energy cooperatives might be a distant reality for Hungary, given the lack of widespread solar panel adoption in some areas and the technical and regulatory challenges. They noted that their neighbourhood had minimal solar panel presence, indicating limited immediate potential for forming local energy communities. Some participants doubted the feasibility of energy communities in Hungary due to the local mentality and the technical limitations of the existing infrastructure. They cited the need for substantial improvements in local grid to manage electricity distribution effectively.

Loosely related to energy communities, participants were also asked and expressed varied views about what they think about *energy solidarity*, meaning sharing excessive energy to people in need. Several participants were open to the idea, with conditions. They emphasized the importance of knowing where the electricity would go and ensuring it reaches the intended recipients. One participant mentioned they would be happy to donate surplus electricity if they could direct it to a specific place, such as their child's high school, ensuring a tangible and trustworthy impact. This trust factor was crucial for them to consider expanding their production to support those in need. However, there was also a voice opposing such charitable act based on worldview that people in needs should be supported by the government from taxes and not by individuals.

The idea of cross-border energy cooperatives, particularly with neighbouring countries like Slovakia, intrigued some participants. They expressed openness to join international cooperation. However, concerns were raised about the high system usage charges in Hungary, which account for 52% of electricity costs, and the complexities of integrating cross-border systems.

Overall, while the concept of energy communities and cross-border cooperatives is appealing to some, significant technical, regulatory, and cultural challenges need to be addressed. Participants agreed that advancements in infrastructure and regulatory frameworks are essential for these initiatives to become a reality.

E. Policy environment for solar power use and citizens recommendations

Participants believed that nuclear energy is a primary focus for Hungary's energy policy, evidenced by the ongoing construction of Paks 2 nuclear power plant. They see nuclear energy as central to Hungary's long-term energy security strategy, especially since it is an emissions free energy source. Participants also believed that there is a strong commitment to (Russian) natural gas due to economic and political considerations. This is the context in which solar power development in the country is assessed by participants. Participants unanimously recognized government's efforts to promote solar energy through subsidies. However, majority of participants expressed frustration about subsidies' late payment, ad-hoc implementation of such schemes as well as lack of grid infrastructural development and exclusion of market mechanisms which would make energy market more predictable and easier to plan in terms of investments. The desire for a more open and competitive market environment was a recurring theme for solar panel users, with participants believing that this could lead to better outcomes for consumers and the energy sector as a whole.

Participants expressed their view that public awareness about the benefits of solar panel is very limited in Hungary. They believe that the main reason for it is that a significant portion of the population only thinks in the short term and struggles to see the long-term benefits of such investments. To change this approach, effective communication and education are

deemed essential. Other significant barriers for greater uptake of solar power include the high upfront cost of installation, a lack of environmental thinking, and insufficient information available to consumers. Therefore, the focus groups concluded that investment in infrastructure, providing additional financial incentives, education and promotion of grassroots community initiatives were crucial to overcoming these barriers

2.3 Heat pump users

Six participants shared their views and opinions about their heat pump usage in Hungary. To provide a brief background of participants, four of them live in the agglomeration of the capital, Budapest, and two in the countryside. Four participants live in houses ranging from 50 to 100 m², while two live in relatively large houses (180 and 220 m²). Five of them primarily use heat pumps for heating and hot water preparation.

A. Motivation for installation

Participants installed heat pumps to realize long-term cost savings, improve energy efficiency, modernize their heating systems (make their homes ‘smarter’), and leverage renewable energy sources. Among these reasons, the most frequently mentioned factors were reducing energy costs of the household, and improving the utilization of produced solar power.

B. Performance and financial implications of heat pump usage

In line with their expectations, heat pump users experienced substantial cost savings and efficient heating performance with their systems, especially when integrated with solar energy and supported by appropriate tariffs and backup systems. They mentioned two key aspects related to the technical and financial performance of their systems:

- Their heating costs have substantially been reduced since they had installed heat pumps, especially if they had well-sized solar energy system and could make use of favourable tariffs (so called H tariff³).
- They have backup systems for extreme weather conditions such as very cold temperatures.

The heating and cooling capacities of the installed heat pumps proved sufficient for most participants, particularly in well-insulated properties. It was acknowledged that good insulation is a prerequisite for efficient and comfortable use of heat pumps.

C. Sense of energy security and relationship between users and utility companies

The gathered responses highlighted a combination of increased independence, ongoing vulnerabilities, and various considerations for system reliability. Crucially, many participants felt that installing heat pumps and associated solar systems increased their energy independence and flexibility. They appreciated the ability to reduce reliance on natural gas and electricity providers, especially during the energy crisis. One participant argued that although consumers are not entirely independent, they have become more flexible and better able to react to changes. This flexibility was especially valued given Hungary’s vulnerability in terms of natural gas supply from Russia.

³ The H tariff provides a lower tariff for the electricity consumption of heat pumps and other renewable energy heating methods.

It is interesting to note that participants kept their gas boiler and other backup systems for various reasons. These back-ups offer a sense of security in case the heat pumps break or weather conditions make their usage unpredictable. Despite increased independence, participants also acknowledged that they remained vulnerable to local energy service providers due to the lack of reliable or affordable energy storage solutions. Without the ability to store solar energy, they still depend on the grid and thus are exposed to changing rules or underdeveloped grid infrastructure among others. This explains why most heat pump users have/keep multiple energy sources such as natural gas boiler or fireplace to minimize negative effects and exposure. Further concerns mentioned in relation to heat pump usage was the high maintenance costs for the system, lack of affordable energy storage—which could possibly solve multiple issues such as dependence on utility companies during a power outage and the need for more efficient use of produced energy.

It should be noted that there was a general distrust towards energy service providers, exacerbated by recent experiences and conditions including the above-mentioned changing tariffs and underdeveloped grid systems. Participants expressed a strong desire for independence from utility companies and the state.

D. The impact of heat pump on consumer behaviour

Overall, the installation of heat pumps has led to more convenient and consistent heating, allowing participants to enjoy a comfortable living environment with reduced effort and concern about heating costs. Contrary to the expectation of the researcher, this question did not spark extensive responses from participants.

E. Policy environment, barriers and opportunities for heat pump in Hungary

The main challenge to increase the number of heat pump users in Hungary is the prohibitively high cost of investment. Furthermore, most people consider air conditioners that can both heat and cool a competitive alternative since these cost significantly less. People can install multiple air conditioners in a home for a fraction of the cost of a heat pump system. In a country with households' limited disposable income and cost-absorption capacity, finance is a significant hurdle (for a comprehensive overview, see Muth et al., 2024). Nevertheless, it was also mentioned that air-conditions may not be as practical or comfortable than heat pumps, particularly for those sensitive to airflow or concerned about health impacts. Besides the heat pump unit itself, there are additional costs associated with installing a heat pump, such as buffer tanks and secondary circuit designs, which further increase the financial burden.

The prevailing perception is that many people in the country are not well-informed about heat pumps. The method is relatively new and less conventional compared to traditional heating solutions. This lack of familiarity makes people hesitant to invest in them. People may be wary of investing in a technology they do not fully understand or have not seen widely adopted. What further exacerbates this problem is a general lack of green consciousness. Participants argued that many people prioritize immediate cost-effectiveness over long-term environmental benefits. The idea of investing in a heat pump for the sake of reducing the environmental impact is not yet under widespread consideration (for similar results in a large N study, see Muth et al., 2024). Furthermore, noise was a key problem for one of the participants as neighbours complained about it, which may indicate the limitations of heat pump installation in block of flats.

When participants were asked about how these barriers can be effectively addressed, they gave the following recommendations. First and foremost, government and local authorities

could offer financial incentives, subsidies, or low-interest loans to reduce the initial cost burden and make heat pumps more accessible to the public. Moreover, education through public campaigns and successful case studies pointing towards long term benefits and highlighting the positive impact on health and the environment would positively influence how people think about this heating and cooling method.

To the question of how important the ‘greenness’ of heat pump is, only two participants responded. They highlighted the fact that since heat pump uses green energy, it makes her property more valuable in financial terms. The other participant stressed the health benefits of heat pump. These responses may indicate that green consciousness is less dominant in Hungary, where financial considerations prevail over sustainability.

What makes participant sceptical about the possibility of using surplus electricity produced by a local energy community is the lack of storage capacity. Since most participants use their heat pump for heating purposes, most energy is needed in the winter when there is limited solar energy available. Currently, there is no technological solution for storing energy for longer period of time. However, some of participants were aware of different technologies that can possibly be used in the future, such as hydrogen.

Lastly, participants asserted that even if the number of heat pump users increases significantly in Hungary, their political power to influence legislation would be limited. The main reason is that legislation originates from the EU and that success of advocacy very much depends on grid infrastructure, utility companies’ approach to more flexible operation, domestic energy policy considerations, and economic viability of various storage technologies. Nevertheless, the positive example of backtracking on balance-based accounting was praised by participants.

2.4 Energy poverty

Seven participants were interviewed in the session on energy poverty. Generally, the participants live in small flats in poor conditions, except for one participant whose flat was renovated 12 years ago. They use various heating methods and energy sources (natural gas, central heating, stove, cooling-heating air conditioner) reflecting their individual circumstances and challenges. All participants live in the 8th district of the capital, Budapest.

A. Overview

For low-income individuals/families living in poor apartments conditions in the heart of Budapest, the biggest issue is the high cost and poor performance of their heating system, as well as the unhealthy conditions in their flats, plagued by wet walls and mould. In some cases even tenants who do not save on energy simply cannot keep warm due to the deteriorating heating systems.

Mould is a prevalent issue affecting tenants’ health and it causes structural damage to buildings, especially in ground floor apartments and older buildings without proper foundations or insulation. Furthermore, poor insulation in many buildings leads to cold walls and inefficient heating. Empty neighbouring apartments exacerbate heating challenges. This situation is further worsened by ongoing constructions in the neighbourhood⁴, and the inherent design flaws in older buildings contribute to cracks and dampness, making long-term solutions difficult without significant investment. In contrast, residents on upper floors

⁴ Due to the district’s relatively rapid gentrification, there are numerous ongoing constructions.

generally experience fewer moisture issues and benefit from the collective heating of surrounding apartments.

B. Consumption habits and heating costs

Participants' responses showed a variety of heating practices and challenges in maintaining comfortable temperatures in their homes. Challenges include inefficient heating systems, lack of heating in certain places (e.g., bathroom, kitchen, hallway), and issues with mould and dampness. However, it should be mentioned that two participants, who use stove in a small apartment and one whose flat is surrounded by other flats on the third floor, can manage to heat up their homes to a comfortable level without problem.

Most participants would prefer indoor temperatures around 20-21 degrees during the day, with some preferring slightly higher temperatures (22-23 degrees) and lower temperatures at night (18-19 degrees). Heating and utility costs represent a significant portion of participants' incomes, often ranging from 19% to 25%. Some of them rely on municipal assistance to cover heating and utility costs, indicating financial hardship. Health issues and related medical expenses further strain finances, as seen in participants on sick leave or with recent medical conditions. It is crucial to mention that the steeply increased price of food in Hungary after 2021 exacerbated existing financial hardships as it significantly reduced disposable income for these households. This was a common theme discussed by the participants.

C. Savings strategy and support from municipality

Participants use various strategies to keep their energy costs manageable. Many adjust heating schedules and temperatures, heat only when necessary, and maintain lower temperatures when not at home to save energy. One participant mentioned that keeping track of energy consumption through daily meter readings helps manage their usage and identify areas for potential savings. Furthermore, adjusting boiler settings and limiting hot water production are common strategies to reduce energy consumption among participants. Turning off unused appliances and lights as well as wearing extra clothes could also lower energy bill costs. However, participants living in apartment with central heating system find it challenging to implement these measures since they cannot influence the monthly fee.⁵

Another important source of support is the municipality. One of the participants said that approximately 20% of tenants in the district receives some financial support from the municipality which is income based. Participants had mixed feelings about the support, as it helps them in dealing with high costs but the administrative burden is significant (delay in payment, high demand resulting in slow evaluation of applications, etc.). Participants were also aware of a 500,000 HUF (appr. 1250 EUR) subsidy, available from the municipality for housing modernization, including energy-efficient upgrades, but the limited budget and post financing structure of the program makes access to it challenging.

D. Views on high prices and their possible causes

When participants shared their perspectives on how rising energy prices have affected their daily lives, their responses reflected a combination of economic concerns, frustration with governmental policies, and comparisons with living conditions in other European countries.

⁵ Central heating users receive heating based on outside temperature, consumers cannot control the inflow energy.

Participants universally felt the strain of rising costs, particularly for food, medicines, and essential goods. They expressed significant frustration with government policies, especially regarding energy regulation and taxation. Participants felt that domestic economic policies, including high VAT, exacerbated their financial burden and, invariably, the most vulnerable segments of society were the hardest hit by the crisis. There was a strong sentiment that the Hungarian government did not provide adequate support for its citizens, especially during crises, as compared to other countries. Two participants specifically mentioned the Prime Minister for primarily being responsible for high prices. Others did not disclose their opinions in this matter. Participants were sceptical about the government's argument that high prices are solely caused by the war in Ukraine.

E. Suggestions to improve the situation

One of the most beneficial outcomes of gathering data and information from participants dealing with energy poverty was the numerous recommendations they shared on how to improve their situation. Preferably, if participants could freely choose the heating system for themselves, they would select energy-efficient and sustainable heating options such as geothermal, solar panels, and inverter air conditioners. Also, options like underfloor heating are favoured for the comfort and convenience they offer. In general, participants were aware of benefits of solar energy (e.g., cost efficiency, sustainable), but their knowledge on heat pump was very limited.

Participants argued that regular maintenance and upgrades of heating systems are essential for improving efficiency and comfort. Older systems should be professionally maintained to address common issues, such as clogged or inaccessible drain bolts. To enhance energy savings, households should install programmable thermostats to automate temperature adjustments based on occupancy and time of day, ensuring efficient heating without manual intervention. Enhancing home insulation is crucial for retaining heat, reducing the need for constant high-level heating, and addressing dampness and mould issues. Supplemental heating options, like energy-efficient space heaters or underfloor heating solutions, should be considered for places lacking heating. Expanding financial assistance programs can significantly aid in heating modernization and energy-efficient upgrades, reducing long-term costs and improving overall comfort.

According to participants, upgrading to energy-efficient appliances and lighting can also reduce electricity consumption. In this regard, if purchase of such appliances, or, pooling resources for bulk repairs and maintenance to collectively address common issues like insulation and mould, is done via community initiatives, it can significantly reduce individual costs. It was also stressed that providing resources and workshops on energy-saving techniques can help households implement effective strategies, ultimately enhancing energy-saving efforts and reducing costs.

Expanding and streamlining access to financial assistance programs for heating and utility costs, especially for vulnerable populations, is essential. Furthermore, implementing flexible payment plans and billing options based on actual consumption rather than flat rates can provide more predictable and fair billing. Integrated support for individuals with health issues should be provided, ensuring access to necessary medical care and financial assistance for housing and utilities, especially considering that health issues were frequently mentioned by participants.

Reducing VAT and other taxes on energy can lower the cost of goods and services, making living expenses more manageable for residents. Ensuring the quality of energy supplies, such

as gas, and adjusting consumption limits⁶ to better reflect the needs of families while implementing transparent and fair pricing mechanisms is crucial. Also, fostering open communication between the government and citizens to address concerns and develop policies that reflect the needs of the population, along with ensuring transparency in government spending and aid distribution, can build trust and ensure effective and fair allocation of resources. Due to good experiences, participants also believed that partnering with non-governmental organizations and charities can help reach the most vulnerable groups more efficiently.

3.5 Conclusion

The objective of this research is to analyse how different segments of Hungarian society coped with rising prices and the increasing threat to energy security during the recent energy crisis that shook the European continent. Insights gathered from focus group participants underscore the complex and evolving relationship between solar power and heat pump users and the broader energy landscape in Hungary. The initial motivation for adopting these systems was primarily economic, with a focus on long-term savings. However, energy dependence also became a major issue during the crisis, particularly in light of challenges related to grid capacity and perceived regulatory stability. Participants also shared highly policy-relevant insights, such as their visions for the operation of energy communities—insights that have crucial implications for energy solidarity—as well as their views on the political power of these energy users and the structural conditions of energy transition, among other critical issues.

The experiences shared by participants living in energy poverty in Budapest show various challenges faced by low-income households in maintaining affordable and effective heating in Hungary. These participants, mainly living in poorly insulated and damp apartments, struggle with high energy costs, inefficient heating systems, and health issues caused by mould and cold living conditions. The skyrocketing prices of food and other essentials in wake of energy crisis have exacerbated their situation considerably. The dominant view among participants is that government policies have not adequately addressed their needs, especially when compared to support systems in other European countries. Policymakers could learn from the experiences and recommendations shared, such as supporting community initiatives for renovation and offering flexible payment options.

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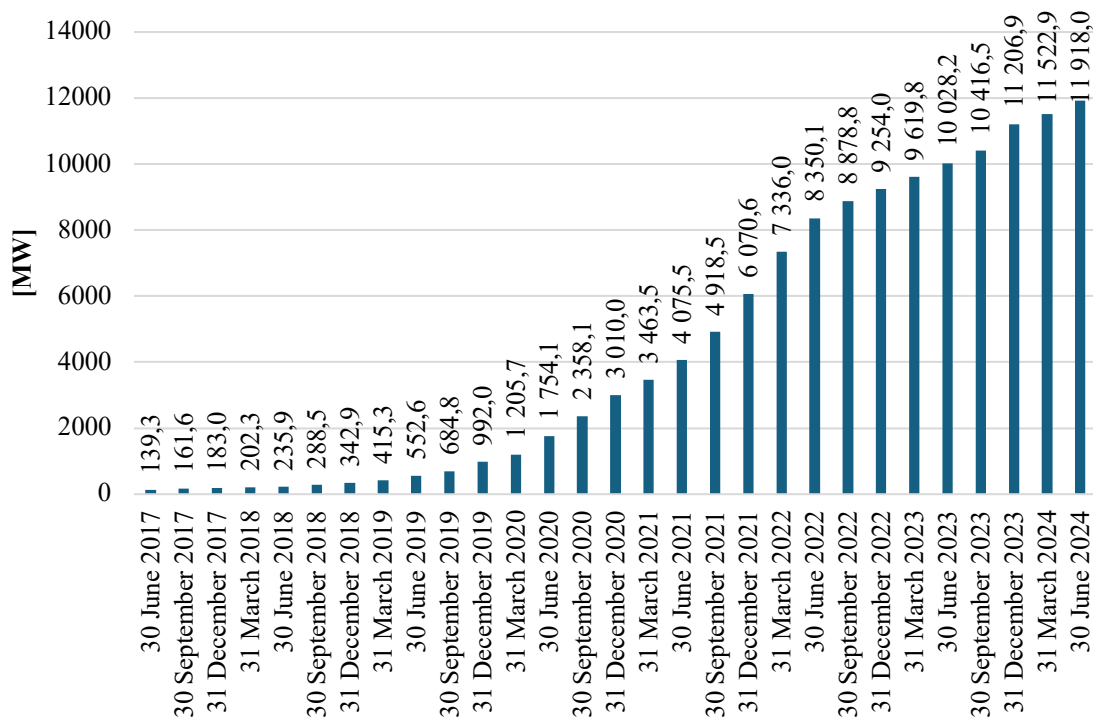
⁶ The government's popular utility cost reduction program was adjusted to subsidize natural gas and electricity consumption up to a certain level, regardless the size of property, number of residents, etc.

3. Poland

3.1 Introduction

The centralization of the energy and political systems is the main obstacle encountered by grassroots energy initiatives in Central and Eastern European (CEE) countries (Szabo and Fabok, 2020). This is manifested by state control of energy infrastructure and main energy sources, implying the attitude of energy nationalism (Žuk et al., 2024). In practice, this evokes distrust towards the unreliable external environment and stresses the necessity to rely on domestic energy sources. In response to rising energy and heating prices and uncertain future price forecasts, Polish society has become heavily involved in independent investment in photovoltaics (PV) and heat pumps in recent years. Polish PV reached an installed capacity of 17.08 GW at the end of 2023 and 17.73 GW at the end of the first quarter of 2024. Market growth in 2023 was largely based on prosumer micro-installations (43% increase in new capacity), constituting 66.3% of the total installed capacity in PV.

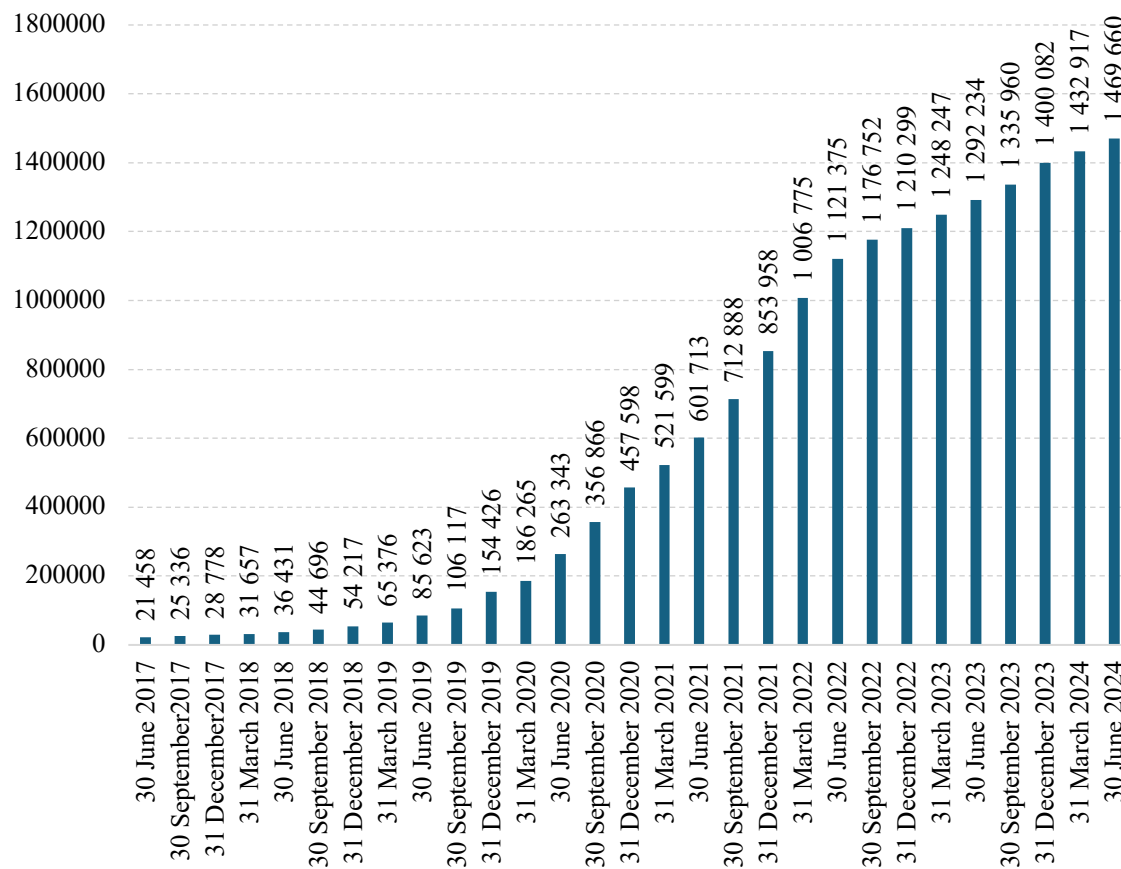
Figure 3.1: Total power of micro-installations connected by distribution system operator: quarterly cycle



Source: PTPiREE (2024)

The number of micro-installations connected by distribution system operators (DSOs) from early 2019 to late June 2024 increased by over 27 times (by 2,611%), while the installed capacity in micro-installations increased by almost 35 times. In the second quarter of 2024, DSOs connected nearly 37,000 new micro-installations to their networks with a total capacity of over 395 MW. In December 2023, the total installed capacity of micro-installations exceeded 11 GW (Figure 3.1). At the end of June 2024, the total number of all micro-installations connected to the electricity distribution grid in Poland amounted to over 1,469,000, and their capacity was over 11.9 GW (Figure 3.2).

Figure 3.2: Total number of micro-installations connected by distribution system operator: quarterly cycle



Source: PTPiREE (2024)

However, compared to 2022, the growth dynamics for the number of prosumer micro-installations was lower. Data from the first quarter of 2024 also indicate that a further slowdown or stabilization in the growth dynamics for the number of prosumer micro-installations can be expected in 2024. There may be many reasons for these trends: the introduction of unfavourable billing rates for prosumers in Poland resulting in an extended payback period; inflation and shrinking savings of society; and information that electricity lines are outdated and unable to absorb surplus energy in the event of a power outage (which causes individual photovoltaic installations to automatically switch off on sunny days).

At the same time, the growing phenomenon of energy poverty is observed. According to the 2023 report, 68% of Polish households declared that they had worried about energy prices during the 12 months preceding the survey (which is 18 percentage points more than in the previous five years); 65% of households declared that they had reduced their energy consumption in the last 12 months, and 25% of respondents admitted that they sometimes used poor quality fuels for their energy needs, such as coal dust, biomass, or waste (Lipiński and Juszcak, 2023).

Observations from the perspective of everyday life and various types of data on trends related to the development of prosumer energy, investments in heat pumps and the simultaneous expansion of energy poverty areas were sufficient reasons to take a closer look at these phenomena in Poland directly during focus group interviews.

3.2 Prosumers

A. Motivation for installation

The main reason for investing in PV is to try to become independent from energy prices and unpredictable state policy in the energy sector. It can even be said that in Polish conditions, the lack of trust in the state and its policy is among the main reasons for the emergence of energy self-defence. The will to be independent of the market situation, changing regulations and government decisions is a key factor in the creation of 'community energy.' A second factor affecting the development of micro-installations has been the possibility of obtaining various forms of funding from the European Union (EU) projects (e.g. the Regional Operational Programme), municipal subsidies and programmes such as 'Mój Prąd' [My Electricity] for the installation of PV systems. The third motivation is the planned renovation of houses and the replacement of heating systems. Some gave up on coal or eco-pea coal furnaces, others had no choice (e.g. they had no access to the gas network) and so they decided to install heat pumps. However, before they invested in a heat pump, they had had to install PV first.

B. Attitudes towards the utility service provider and state

Relations between prosumers and energy companies (especially DSOs) in Poland are generally not good. The main DSO in Poland, Tauron Dystybucja, is treated as a symbol of evil and the state's impure behaviour towards prosumers. From the perspective of prosumers, the situation worsened even more when new the billing system for prosumers came into force. The earlier solution acts as electricity storage which has an efficiency of 0.8 and does not need to be purchased. The prosumer only pays the distribution fee charged by the energy companies. This model, however, only applies to those prosumers who connected their installations by the end of April 2022. Prosumers who connected to the grid after April 2022 are covered by a completely different billing system known as net billing. From April 2022 to 1 July 2024, prosumers sold their surplus energy to the grid at the market price, set at the end of each month. However, in July 2024, they had to switch to hourly billing: energy is sold to the grid at the price applicable at a given hour.

Thus, instead of savings, prosumers expect additional fees for a given billing period. As one of them explained

I am waiting for the bill, but I am already putting money aside so that I don't go bananas when the bill comes. It is no longer as rosy as in those older contracts which were very profitable. It is no longer like that now (Interview PL2).

Another respondent added that

I have recently found out how they calculate it. The prosumer pays 75 groszy per kilowatt when he draws energy from the grid, and when he gives it back, he is paid 40 groszy (Interview PL4).

Generally, regardless of whether it concerns traditional energy consumers or prosumers, energy companies transfer the costs of energy transmission to them. The system operating in Poland does not allow, for the time being, the exchange of energy between autonomous micro-grid prosumers as part of the peer-to-peer (P2P) energy transaction (Żuk and Żuk, 2022b). Sometimes, people installed PV because they did not have access to the gas network and had to go for a heat pump. As explained by a participant

we knew that, unfortunately, we had no gas because the commune was poor and could not afford to invest in a gas connection. So we

decided to go for photovoltaics because we knew that the furnaces would also have to be replaced [eco-pea coal was burnt there]. So we decided to go for a heat pump. And we installed photovoltaics and a heat pump together. And now the bill came in September, well, it's just terrifying. There was a PLN9,000 surcharge (Interview PL1).

In addition to avoiding high energy costs resulting from general macro-social trends, investing in PV can sometimes be a way to save money resulting from private and family circumstances. As one of the respondents stated

I have moved into a new terraced house and I have gas heating. However, I decided—because the subsidy was good there – to invest in PV. My daughters leave the lights on everywhere they go, so I decided to install it, to reduce the costs a bit. And it really works for me, so I don't have a big problem with it (Interview PL6).

In this context, it can be said that investing in PV is a kind of manifestation of a 'modernizing-rational' attitude. It is not always great ideas but the need for a more rational organization of everyday social practice that stands behind this decision.

C. Relationship between solar power and changed consumer behaviour

Does installing PV change anything in the everyday behaviour of prosumers? Two phases can be distinguished: first, they are delighted by free energy and the possibility of controlling self-generation of energy; second, they feel self-satisfaction and peace of mind as they do not have to pay big electricity bills. As one of the prosumers said

my husband has an app and sometimes, at the beginning, when we installed it, he would check every day, every five minutes, how much we were producing. And now we're over it. We no longer look at our smartphones all the time. We are really happy only because we simply do not receive bills of PLN 3,000 or 4,000, and the forecasted surcharge for 2023 was, I think, PLN 200 per year. And we did not even use all the energy we produced (Interview PL4).

The topic of regaining peace, reducing worries about energy prices and increasing a sense of control over thermal comfort was often mentioned in respondents' statements. In this approach, PV not only supplies cheap energy but is also a certain self-defence tool against the threat of energy poverty. As one of the respondents stated,

the advantage is that I don't worry when it's very cold, when we didn't have photovoltaics, well, we have that old pump with a heating curve set, so when we didn't have photovoltaics, the electricity bills were very high. So we had to raise the heating curve a lot. Now I don't worry about it. It's just warm (Interview PL7).

Installing PV and the possibility of using free or cheap electricity does not mean that prosumers buy new devices that require a lot of energy. The desire to save energy rather dominates the behaviour of prosumers and does not entail the consumption of cheap energy just to 'show off'. According to a participant,

my husband and I are very pragmatic. I didn't think about it and didn't want a sauna, although my friends talked about it. I decided that I wouldn't have time to clean it, so why do I need it? I'll use it once a year, so buying a sauna would be a waste of time and money.

We didn't buy any other special gadgets in connection with cheap electricity from panels either (Interview PL3).

Interestingly, prosumers are more interested in weather and its forecasts. As one of the respondents said,

I honestly have to admit that I started paying a little more attention to the weather and I get a little annoyed when there are clouds and it's not sunny because then we produce less energy (Interview PL1).

Installing PV can sometimes be a 'pioneering' action that causes an imitative effect and encourages others to do the same. In the case of PV, an individual's activity can affect a larger group of people and be a form of civic education. A resident of a small town admitted that

when I installed it, I will tell you from my own experience, my neighbour also installed it right away. Then the second did the same, and then the third one. And that's how it went in my town (Interview PL2).

From this perspective, prosumer activity goes beyond the energy sphere understood in a narrow sense and becomes an educational, civic and social activity. This triggers activity in many areas of collective life: the pursuit of securing cheap and independent energy generates social energy on many levels.

D. Views on energy communities, energy solidarity and cross border cooperation

Creating energy communities or cooperatives is a challenge for prosumers in Poland. While our participants expressed interest in supra-individual prosumer activity, they pointed to many obstacles and problems related to such activity. As one of the respondents argued

if we had a direct recipient of our energy, but for now we cannot do this, neither technically nor legally. But if we could sell the surplus energy, we would be happy to do so (Interview PL7).

Another prosumer pointed to the legal barrier: in line with the regulations in force in Poland, an individual household can have a PV installation of up to 10 kW.

If there was a legal possibility of expanding our PV to larger ones and there were no restrictions of 10 kW, then of course we would be interested in it. Everyone would like to have cheaper energy and still be able to earn money from it (Interview PL7).

The idea of energy cooperatives or energy communities is generally accepted. However, in Poland, where social activity is low and many public problems are solved individually, the obstacles include a lack of time and of a habit of joint action. One of the prosumers bluntly claimed that

I produce more and you lack energy and I give it to you, right? And I am happy and you are happy because I sell it to you at lower prices, well, that's great. That's a balance. This kind of cooperative is good. I was just about to say that I would go for it but, unfortunately, I don't have time. If someone took care of it and organized it, I could be a shareholder (Interview PL6).

One of the prosumers pointed out that energy cooperatives would be limited mainly to rural areas for spatial reasons.

But this could only work in villages, right? But not in cities. Because whether it is Karłowice, Książę Małe, or other built-up areas of the city like Popowice, where will you install this all infrastructure? (Interview PL4)

The idea of energy cooperatives can also be a way to unite forces and take joint actions to solve existing technical problems, such as switching off inverters in households. As one of the respondents claimed,

when establishing a cooperative, if, for example, we collect 200 people and each of us gives, I don't know, PLN 500, we can install a transformer so that the current does not jump in the network and the inverters do not switch off (Interview PL4).

However, the main problem that prosumers face in creating independent energy cooperatives is the monopoly of large corporations on power grids and energy distribution. The following exchange of opinions reflects these doubts well.

But there is the issue of distribution. And the networks that they will modernize. They have to send this energy somehow, right? (Interview PL3)

And it will turn out that these are the biggest costs. Distribution. Those who have done nothing, contributed nothing, incurred no expenses, they collect the biggest fees (Interview PL4).

And that is all the pain! (Interview PL6)

Anger with distributors and large energy corporations may at some point become the main motive for action. Namely, the very idea of energy cooperatives and communities already appears in the minds of prosumers as an alternative to the status quo.

However, this is an alternative to Tauron. To these large behemoths. Really. This is an alternative. And I think that if there is this local patriotism, that is, we work for the benefit of our society, this commune or province, then sooner or later it will happen (Interview PL5).

E. Technological obstacles to the development of PV in Poland

The risk of problems related to the cooperation of micro-installations with the power grid in Poland increases in the case of individual or combined occurrence of the following conditions:

- Many micro-installations in an area supplying one transformer station converting medium voltage into low voltage (MV/LV)
- Micro-installations sited a great distance from an MV/LV power station
- High line resistance and reactance (small wire cross-sections, uninsulated network)
- Low demand for energy during the periods of highest production capacity (hours of the highest insolation)
- Expansion of an existing micro-installation without the owner informing the DSO – this phenomenon is becoming more frequent and requires the DSO to carry out checks in this regard
- The settings of the micro-installation inverter being changed from those specified in the regulations, so that the micro-installation continues to operate after exceeding the permissible voltage value in the LV network – this phenomenon is becoming more frequent (in this way, people protect themselves from inverters being switched off,

which is caused by voltage surges in the network owing to high prosumer energy production on sunny days).

The main reasons why inverters are switched off are poor quality medium voltage lines and a lack of network investments or delays in their implementation. Moreover, there are insufficient new transformers in rural areas that can regulate the voltage in the network. The main energy distributor in Poland, Tauron, has been held responsible for everything bad electricity system and for with switching off the installations. One of the prosumers explained the situation.

To put it simply, on sunny days, our beloved Tauron blocks and does not receive energy from us. If I had such a power bank so that I could charge it myself, then yes. But as long as I don't have it, I will definitely not go for it because, in June, I had a week when Tauron received practically no energy from me – in July, the same thing, in August the same thing happened again (Interview PL2).

The owners of PV admitted that they tried to intervene with distributors on their own.

I called them to ask why this was happening. And I even said that in Poland there were situations in which they blocked the operation of panels. And they can even pose a threat to safety – as in one case, near Wrocław, experts found that this blockage caused a house to burn down. This was caused by Tauron's blockage and refusal to accept energy. There was a short circuit somewhere and the house burned down (Interview PL5).

Respondents also mentioned that they had talked with Tauron employees who did not hide technical problems with the network.

When I was installing PV and the gentlemen from Tauron came to officially accept the installation, they told me briefly: Please do not brag that you have these photovoltaic panels. The more people on this street have them, the more difficult it will be for us to receive this energy from you (Interview PL1).

Without state investment in the modernization of low- and medium-voltage networks, prosumers will continue to face problems. The only solution in the current conditions is to increase the self-consumption of energy by prosumers. One such method may be heating based on heat pumps.

3.3 Heat pump users

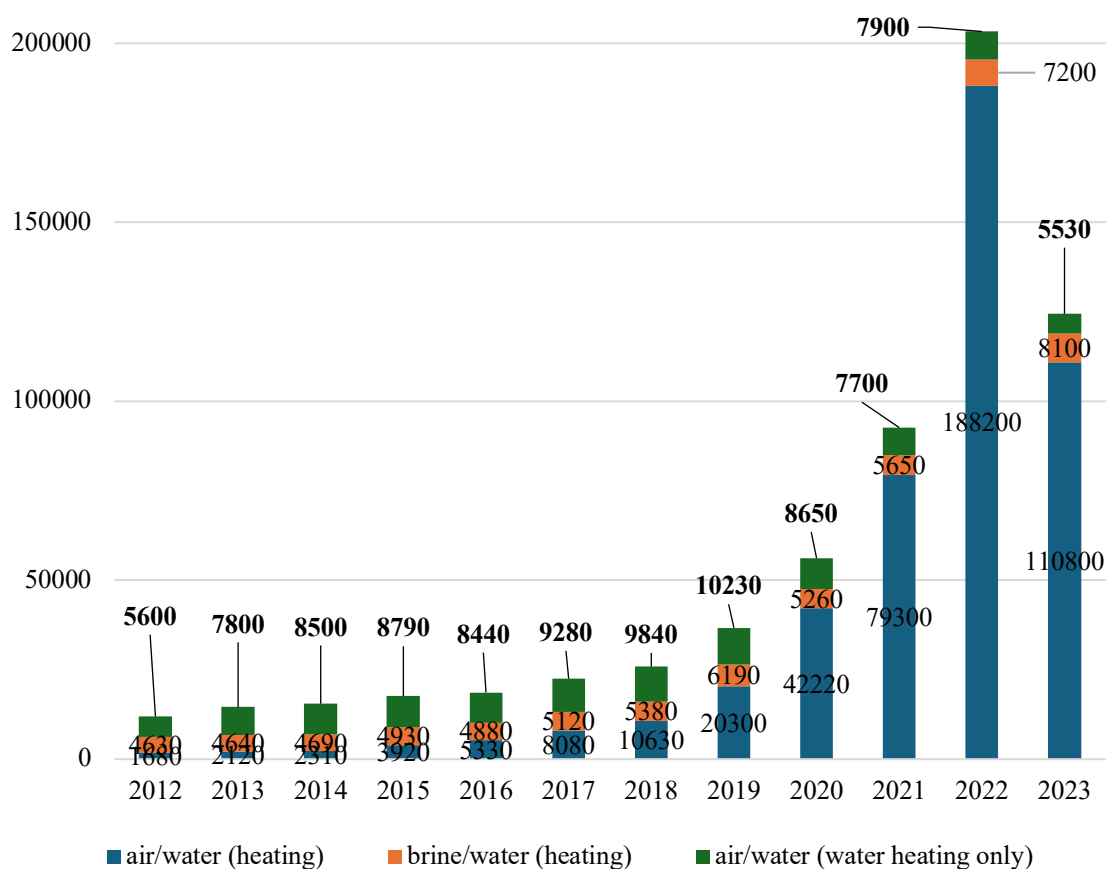
As in the case of prosumers, the energy crisis caused by the war in Ukraine (Żuk and Żuk, 2022a) and the fear of rising gas prices (as well as possible gas shortages) were very strong drivers of the development of the heat pump market in 2022.

The entire heat pump market grew by 120% in 2022, and the market of heat pumps for heating buildings by 130%. In 2022, heat pumps made up almost a third of the total number of space heating devices sold in Poland. In 2022, the number of air-to-water heat pumps sold in Poland increased by 137% compared to 2021 and amounted to 188,200 units. Sales of ground-source heat pumps for brine/water devices also increased significantly, by 28%. Air/water heat pumps intended only for heating domestic hot water recorded an increase in

sales of approximately 2%. But the following year, 2023, showed large declines in the sale and installation of heat pumps in Poland (Figure 3.3).

On the one hand, public opinion got somewhat used to the events in Ukraine and, on the other, information about the high costs of electricity bills for heat pump users appeared in the public space. These elements, plus the general uncertainty about the development of the situation and prices on the heating market, halted the upward trend in the installation of heat pumps in Poland. Changes in the electricity tariff regulation, which adversely affected prosumers, was also significant and decreased the interest in heat pumps.

Figure 3.3: Summary of heat pump sales in Poland from 2012 to 2023



Source: PORT PC (2024)

A. Motivation for installation

The outbreak of the war in Ukraine and the resulting fear about gas prices and supplies was the turning point in the dynamics of the growing number of heat pumps in Poland. As one of the respondents admitted

for me, the key reason was the war in Ukraine. As soon as the war started, gas prices began to change (Interview PL9)

Therefore, prosumers made various attempts to protect themselves ‘on their own’ against unpredictable developments. However, choosing a heat pump did not mean giving up other sources of heat. In words of one respondent,

I wanted to diversify energy sources just in case [...] Those times were quite uncertain and it was not known what would happen. But I kept my pellet stove. Last winter, I fired it up maybe twice. They ordered us – when calculating the subsidy for the pump – to remove coal stoves, but I was allowed to keep the class V pellet stove (Interview PL12).

However, it was not only the increase in gas prices but also the radical increase in coal prices that made people act. It is worth emphasizing that in Poland almost one-third of households continue to heat their homes with coal (Polska Izba Gospodarcza Sprzedawców Węgla, 2024).

Yes. 2022 and the beginning of 2023. These were uncertain times. Coal prices went up a lot. And that was probably a factor that forced us to act (Interview PL10).

In addition to global events that caused the uncertain situation, there were also completely private individual reasons for switching to heat pump heating.

In our case, the situation forced us. We were renovating the house. And at the same time, we wanted to replace the furnace. We had this intention earlier, but we waited until we made some modifications, such as underfloor heating. We insulated the house and decided on a pump because, firstly, it was ecological, and secondly, maintenance-free. Of course, if someone had a furnace before, they know what it looks like – how much you need to walk, dust and soot. That's why we wanted something that could be turned on remotely. And above all, ecology (Interview PL13).

When apartments are advertised for letting, ease of use and the safety of tenants may be additional factors in favour of investing in heat pumps. As one of the respondents admitted

for me, it was about safety. The apartment is now rented and it was simply the safest [option]. Because there was a fireplace there before, with a water jacket, and if someone has never used a fireplace, they can hurt themselves and burn down the entire apartment (Interview PL8).

B. The impact of heat pump on consumer behaviour

In addition to savings on gas or coal bills, the most important change in the daily lives of heat pump users is the greater convenience of operating heating devices. As one of the interviewees explained,

one thing is that pellets are expensive. Another thing is that when you go away, you don't know what will happen, right? Well, you don't know because something will happen suddenly, and it happened to me a few times with pellets. However, the pump doesn't fail because it works all the time. And that's the most important thing for me (Interview PL14).

The problems with the logistics of ordering fuel (coal, pellets) for traditional furnaces and keeping apartment clean are often repeated by heat pump users.

I don't have to go in, carry these bags. Order transport. All that is gone. Later, despite everything, you brought in this ash, it was dirty. (Interview PL13)

I have psychological comfort now. I can check from work and see on my phone what's going on. Convenience. I don't have dust. And this comfort is that when I go somewhere, I don't worry that it will burn out in the furnace. And there is a problem with this fuel. What they offered was also of poor quality. You had to look for it somehow (Interview PL12.)

It is also worth mentioning the feelings of heat pump users about the noise generated by heat pumps as concerns about noise are among the barriers to investing in this type of heating. According to one of the owners of a domestic air-water pump

it is really very quiet. You have to lean out the window to hear if it is working at all (Interview PL10).

C. Integration of heat pumps with PV panels

While respondents did not complain about technical issues related to the integration of heat pumps with PV, the main problem (aforementioned) they raised was the change in the models of billing the energy produced by PV panels. With these billing changes, it is very difficult to plan budgets and payback periods for investments in PV and heat pumps. One of the respondents admitted that

I have photovoltaics but on new billing principles. And it is a failure. It is simply one big scam, one big collusion. In general, they have simply made us all cheap labour. Our installation generates kilowatts for them, we sell it to them for 40 groszy and we can kindly buy it back for twice as much or three times as much. For example, PLN 1.30 (Interview PL10)

Another PV and heat pump user said that

the state and energy companies simply rob us. They buy cheap electricity from us and sell electricity expensively (Interview PL8).

Constant changes in regulations and models of billing energy produced by panels not only evoke frustration in prosumers but also discourage further investments, for example, in energy storage. Another barrier of distrust is created. The following statement illustrates this well.

I will not go for it anymore, for God's sake, for no energy storage facilities. First, it's expensive. Second, it's another swindle. It really misses the point. Because what they did with the photovoltaic billing regulations is push us away from it. All this talk about change and ecology after something like this loses its meaning (Interview PL13).

Another problem that affects the lower profitability of using heat pumps is the previously mentioned technical problems with the transmission network. What is more, it adversely affects relations and trust between the energy distributor and installation owners. The following exchange of opinions reflects this atmosphere among prosumers well.

The inverter switches off above voltage 253 (Interview PL9)

But then the Poles turn it up and change the blocking range on the inverters (Interview PL10)

But this is illegal. It will be controlled (Interview PL9)

It is already controlled. Tauron wants to control it but, on the other hand, it does not honour the agreements because the agreement states that it must supply electricity at a constant voltage (Interview PL8).

As usual, the agreement only works one way: Tauron does not honour the agreement but checks prosumers to see if they increase the voltage range on the inverters (Interview PL9).

D. Barriers to development: unpredictable regulations, assembly costs and service costs

The main barriers to further development for the PV and heat pump market are constant changes in regulations for billing energy produced by micro-installations. Heat pumps require additional high investment costs and service costs. One of the respondents pointed this out.

I paid PLN 800 [approximately 200€] – I thought I would be blown up. The manufacturer determines the price of the service. It is not like there is competition between installers. So I paid PLN 800 for a pump inspection. These are high costs. However, without it, the warranty is lost. And the pump is a complicated device (Interview PL10).

Problems with changing regulations cause even greater distrust of the state administration among prosumers and heat pump users in general. This may constitute an obstacle to the implementation of subsequent stages of the green transition (for example, switching to electric cars).

The state operates in such a way that it first encourages and then changes the rules of the game. It will be the same with electric cars. Buy them, and then it will suddenly turn out that they will impose a tax and that's it (Interview PL9).

Some respondents also noted that the government actions aimed to defend the interests of coal companies in Poland, which, because of the increase in the number of prosumers, have become even less profitable, as has the energy they produce.

The fact that the state continues to finance coal companies certainly influences decisions towards prosumers. There is such a large lobby, all these Tauron distributors (Interview PL14).

However, the government's policy towards prosumers also contributes to the political radicalization of this environment in Poland. A group called 'Prosumer protest – photovoltaic owners' strike – photovoltaic protest' was formed on the Polish Facebook. On their profile, they write the following.

If you do not agree to too low energy buy-back rates, this group is for you! Join us! The more of us there are, the more power we have! During peak hours, energy rates are negative, which means we give it away for free. In a word, we are being robbed. In the first step, the group aims to unite as many prosumers as possible. In the second step, we will create a strike map, and in the third and most important step, we will protest and disconnect our installations from the grid (Prosumer protest, 2024).

This radicalization of moods, which may soon be a factor in the creation of a radical prosumer movement in Poland, was also visible during a focus group interview.

We are still dependent on the government. Because if there is any war, and the first thing is to blow up the power plant, our heating will go to sleep. So the only option is to cut ourselves off from this entire system. I have a friend who cut himself off from Tauron altogether and installed an energy storage facility, and photovoltaics on the roof. He also installed a generator and a gas tank: he put such a cylinder in the garden and he doesn't give a damn about the state. The whole thing cost him PLN 120,000 but he cut himself off completely. He doesn't have electricity from Tauron and he doesn't give a damn about them. Somehow I don't blame him, after the government's actions with billing electricity from photovoltaics. After all, they robbed the owners of photovoltaics in velvet gloves. (Interview PL8).

3.4 Energy poverty

Energy poverty is a permanent element of the social landscape of Eastern Europe. It is widely spread in Bulgaria (29.6 %), Latvia (27.3 %) and Croatia (27.1 %) and is less frequent in Czechia (16.4 %), Hungary (16.5 %) and Slovakia (16.9 %). In Poland, this phenomenon covered 22.14% of households (Karpińska and Śmiech, 2023). Previous reports indicated pensioners, older people and single-person households as the main social categories at risk of energy poverty in Poland (Boguszewski and Herudziński, 2018). However, our research has shown that different categories of people may also be affected by energy poverty: in addition to pensioners and disability pensioners, there are also representatives of the young metropolitan precariat ('I am a guide at an educational exhibition. I won't say that my salary is enough to pay all the bills because I actually have to ask my parents for help'); employees of the public sector ('I work at the National Museum, so this is also the public sector. So there is no money, we can barely make ends meet'), as well as people who do not work for health reasons ('I have not worked for a year and a half for health reasons. Before that, I was an office worker'). Energy poverty affects many areas of public life including public health and air quality in cities.

According to data from the report on energy poverty in Poland (Lipiński and Juszczak, 2023), the households of respondents who admitted that they sometimes burned rubbish and waste in their stoves were characterized by the following features:

- 94% of them did not have access to hot water from the network
- 91% did not have access to central heating
- 85% lived in a single-family house
- 71% lived in rural areas or a city with fewer than 20,000 people
- 68% used a coal, wood or biomass stove as the main source of heating
- 64% did not have access to the gas network.

A. Consumption habits and heating costs

Respondents who struggle with the heating bills do not have many options for defending themselves against market pressure. Usually, all that remains is to save on heating and live in cool apartments. As one of the respondents explained

my only saving is that I simply set the temperature on this stove. As low as possible, one more turn and I would turn it off altogether. And

in the room where I often sit, which is the bedroom, I have it turned up a little more because I also have separate settings for each room. I have it turned up a little more there so that it would be warmer there but, for example, in the living room and the other room, or somewhere else, it is cold (Interview PL18).

Others try to turn the heating off altogether or reduce the temperature at specific times of the day. According to one participant,

I only reduce the temperature when I go to work or, for example, at night. It is also better to sleep at 18°C than at 20°C, isn't it? (Interview PL15)

Energy poverty usually goes hand in hand with low housing standards and general financial poverty.

I can use an electric blanket if necessary. And I actually have one, but it has broken down now, so I have to sit in a sweatshirt because, on top of that, I have a leaky window. So now, when it's freezing, the gas bills are really going up (Interview PL19).

The window is leaky, sealed with a blanket, I have a cat too. What good is it if I turn it off during the day, when for health reasons I freeze to the bone, as they say? I'm always cold when it's damp outside. So I'm always cold. My feet are always icy, I have to wrap myself in blankets and duvets. The cat will come and what good is it if it snuggles up to me? (Interview PL20)

B. Energy poverty as a broader social problem

People who struggle with the problem of excessively high energy and heating bills do not want any special 'assistance programmes' to be introduced. They only demand 'normal' energy prices, which in their opinion are currently very high. One of the respondents stated that

maybe there should be no such support programmes. Let there simply be cheaper heating bills. And that would be enough for us. If the price is normal, we will not need additional support (Interview PL16).

According to the respondents, energy poverty should also be considered in a broader context, namely excessively high prices and inadequate incomes. One of the prosumers discussed this problem using the example of his children, who, although professionally active, cannot afford a decent and independent life. Among the reasons this person mentioned was the high cost of energy.

I have a daughter, also 26, who still lives with us for economic reasons. She would like to go somewhere and become independent. She works, so she would like to rent an apartment and become independent. But it is difficult. Energy bills don't make it any easier. I also have a slightly older son who is currently working and renting a small flat, and it's really hard for him, although he doesn't earn that little. Everything is expensive and people's salaries are too low (Interview PL15).

Considering the data obtained, it should be stated that energy poverty requires the creation of a new public policy framework in Poland in the context of the challenges of energy transition and rising energy prices. Such public policy should consider various social groups:

retirees and older people, the young precariat, those who work but earn little, and underpaid public sector employees in Poland.

3.5 Conclusion

The research results indicate that the development of micro-installations and the heat pump market as well as the issue of coping with energy poverty are not individual problems. They are strongly conditioned by social and systemic mechanisms and state policy. This means that the challenges of energy transition cannot only be treated as a process of technological transformation. These changes require well-thought-out and developed public policy. Without state support, various social groups may reject the goals of energy transition. On the other hand, uncertainty on the heating market may strengthen civic energy self-defence actions, which, however, will take place outside the framework of the official energy policy and may contest the official state policy.

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4. Slovakia

4.1 Introduction

Slovakia has been dependent on external energy supplies for decades; however, the country's governments had not paid a lot of attention to this issue until the 2009 gas crisis which fully unveiled Slovak vulnerability. Being dependent on a single supplier (the Russian Federation) of natural gas via a single supply route (the Brotherhood pipeline), the interruption of Russian supplies to Europe at the very beginning of 2009 caused Slovakia to be without any external supplies of natural gas for almost three weeks in the middle of a very cold winter (Maltby and Mišík, 2024). Although the crisis meant a significant change in EU's approach to energy security and highlighted the need to diversify both sources and supply routes of natural gas, Slovak government relied on EU and its funds to support these efforts. Quite paradoxically, also the energy crisis connected to the COVID-19 pandemic and the Russian invasion of Ukraine stayed without a complex policy response from the Slovak government (Mišík and Oravcová, 2024). The focus since 2022 has been on energy prices for the end consumers with the government developing subsidy schemes for both natural gas and electricity that decreased the pressure of rising energy prices on households.

This chapter is looking into the position of public towards energy policy in general and energy security in particular. It examines whether Slovak public has reacted on the Russian invasion by looking into options how to increase its own energy independence by means of investing into renewable energy sources (photovoltaic solar panels) or into alternative heating sources independent from imported (Russian) natural gas (heat pumps). It also examines if energy poverty became a challenging issue for more consumers since the invasion. Although the government has been supporting utilisation of renewable energy sources in households (among other sources also photovoltaic power plants and heat pumps), this support goes back to 2015 and has not been directly connected to the energy crisis (Zelená domácnostiam, 2024). However, these programmes have experienced significant increase in interest by the public since 2022 that considered them as a suitable way how to support their energy security and decrease energy bills.

4.2 Prosumers

In 2023 21 307 new photovoltaic power plants were installed in Slovakia with the total capacity of 267MW. Out of these 92% of the number of installed solar power plants and 52% of the capacity increase came from micro-installations at residential buildings (SAPI, 2024). This meant a huge increase in comparison with 2022 when only 28 MW was installed. However, even 2022 showed an important increase compared to the previous decade. The overall stagnation of solar power plant capacity during the period between 2011 and 2021 can be attributed to eight-year long moratorium for grid connection of photovoltaic plants with the exception of micro-installations up to 10 kW (SAPI, 2023). However, even this exception did not support the development of rooftop installations before 2022 although these energy sources have been subsidised since 2015 with "Green to the households" programme. Thanks to the programme, 16 998 rooftop installations on residential buildings were subsidised in the period 2015-2023 (Zelená domácnostiam 2024), large majority in 2022 and 2023.

This section presents the findings of a focus groups discussion with owners of photovoltaic power plants. Some of our respondents had very detailed knowledge about this technology,

its technical characteristics (advantages and limitations) as well as policies and rules in place. At least 3 participants (out of 7 participants in this focus group) were very knowledgeable and showed personal interest in the photovoltaic technology and its utilisation. One participant (Interview SK5) had several types of renewable energy sources installed on their detached house – photovoltaic solar panels, heat pumps, thermal solar panels and was considering buying battery storage in the future. Few other participants showed interest in information provided by these well-informed individuals.

A. Motivation for installation

While several respondents mentioned economic reasons in combination with other reasons, especially environmental one, the latter has been the dominant reason for the majority of the group for installing photovoltaic panels. As noted by one respondent, this is

the best solution for the future (Interview SK3).

Two respondents noted that at first they were not persuaded by the photovoltaics' ability to save money, but later one respondent's mind was changed by a positive experience of his acquaintances while the other one changed their mind after getting a favourable offer for a virtual battery. All respondents invested into the solar panels prior to the start of the Russian invasion to the Ukraine so this event (and the energy crisis that coincided with it) did not influence their decision regarding photovoltaic.

However, not all respondents mentioned economic or environmental factors as reasons for investing into photovoltaic solar panels. One respondent claimed that the reason why he installed photovoltaic power plant on his home was connected to a childhood trauma when he was repeatedly asked by his mother to switch off lights when leaving room. He claimed that his own photovoltaic plant enabled him not to worry about this issue and be energy independent. This respondent did not consider environmental reasons a strong enough incentive because, he argued, any energy-saving efforts in Europe are negatively offset by the situation in other parts of the world. In his words:

I think it is naïve when people think that we can save [environment] with one solar panel [...] because when we look to Asia, [ecology] is a funny reason (Interview SK4).

B. Energy savings and a sense of energy security

The decision to develop a photovoltaic solar plant was a pragmatic one for our respondents – one respondent (Interview SK2) was building a bigger house with expected bigger electricity consumption, so he decided to cover some of his electricity consumption with his own production. He argued that even in case of higher-than-expected production – or a sudden drop of consumption (caused, for example, by adult children leaving the house) – the solar power plant makes a lot of sense with the usage of a virtual battery. The other option is that one can also sell the overproduction to the electricity distribution company. Another respondent (Interview SK3) supported this argument by saying that they use the overproduction to charge their car via virtual transfer of production (he 'donates' the overproduction to his car charging plan). According to the Slovak respondents the savings on energy bills are linked to the size of solar panels – those who have bigger photovoltaic power plant claimed that it helped them to save on energy bills (one respondent even mentioned a concrete number when claiming that his 10kW solar power plant saves him approximately 1300€ annually). The respondents with smaller power plants (for example, 3.3 kW) did not experience such big positive change in their energy bills.

While some participants claimed that the ownership of photovoltaic solar plant did not impact their sense of energy security, some of them said that it did. The latter group (for example, Interview SK1) liked the feeling of energy independence from the grid. However, according to few respondents, there is a catch – ownership of solar plant is from the security perspective directly linked to the availability of electricity from the grid. Once there is no electricity flowing from the system, there is a need for own storage system (i.e. battery) or some kind of a backup to utilise own electricity production in such a situation – this is due to technical reasons connected to production of direct current electricity from solar power panels and consumption of alternating current in the household. Therefore, an access to a virtual battery (the case of one of the interviewees) does not help during a black-out.

According to our respondents electricity companies (electricity producers, distribution system operators) are business companies that are primarily interested in profit and not other things like energy security or environmental issues and therefore they do not perceive them as actors that would be interested in helping them to cope with their energy security challenges – with help of concrete renewable energy tools or something similar. Respondents were in general very sceptical about their position as the final consumers vis-à-vis electricity companies although they own solar power plants. One respondent (Interview SK3) claimed that if electricity companies were interested in energy security or any other aspect besides their profit, they would create better conditions for property owners to install solar panels on their roofs. According to the members of the focus group, distribution companies provide some basic information on renewables options, however, this is not enough, and the property owner has to do a lot of ‘homework’ alone to fully understand the complexity of solar panel ownership (i.e. ‘prosumerism’).

When it comes to price issue, respondents were united in the position that there was nothing they can do as the end consumer and that they have to pay the price their electricity supplier asks for. There was also a mutual understanding that the price will grow in the future – and therefore

photovoltaic is of a great importance (Interview SK3).

Respondents even claimed that in a case of a sudden drop of consumption caused by price jump the solution for electricity companies would be export of overproduction abroad, so the companies do not really worry about the end consumers and their willingness to pay. One respondent claimed that because of this

it would be just to have the same price in the whole Europe (Interview SK5).

On the other hand, two respondents (Interviews SK2 and SK4) reported that during the peak of the ongoing crisis they followed markets very closely because it was more beneficial for them to sell their overproduction to the distribution company due to very high price than to use the virtual battery.

C. Relationship between solar power and changed consumer behaviour

Some of Slovak respondents reported change in their behaviour based on the availability of electricity that they produced themselves, although other group of respondents claimed that they lifestyle has not changed at all. Only few respondents started to be more aware of consumption of individual appliances they own; while one respondent noted that “new [appliances] are always more energy efficient” (Interview SK1) and therefore present a lower load on the system than the old ones.

Almost all respondents reported that they started to be more interested in weather and solar activity after they installed the solar panels. As explained by a respondent,

I am checking the weather because I enjoy it, although I cannot impact the weather (Interview SK4).

One respondent noted that they do check the weather because they are trying to minimize the amount of electricity they send to the grid (because this is not currently beneficial for them) and they decide which appliances to turn on in the morning based on the weather forecast. But they are integrating the weather forecast system into their smart home system so they will not have to do this manually anymore soon.

Another respondent (Interview SK3) claimed that they also check weather and use their smart home system (and freely available solar activity forecasting applications) to optimise their consumption based on electricity production of their solar power plant. However, they noted that

one cannot be a slave to the system, so when there is bad weather [low solar radiation] I am not going to cancel doing laundry and move it for tomorrow (Interview SK3).

Responding to this comment, another interviewee (SK1) said that they had a neighbour who was taking these things to extremes and checked their electricity production in solar panels every evening before charging their car and

taught his wife when to do laundry (Interview SK1).

Our respondent even heard the neighbours arguing about badly timed laundry cycle (i.e. when their own production was low).

D. Readiness for further investments in other devices

One respondent noted that what they invested in were more solar panels after one and a half of years after installing the first batch (Interview SK2). Another respondent also showed interest to expand their existing solar power plant because they consider it to be a good investment. Only one responded claimed that they would want to buy also a wind turbine as this can be used to cover consumption during periods of none or very limited solar production (like winter or nights).

Another respondent noted that they also have thermal solar panels in combination with heat pumps that they use for heating (and cooling) so they do not have to use their solar power plant for these purposes (Interview SK5). While another interviewee was very interested in heat pump (water to water) when he was building his house, he did not have a possibility to drill the necessary well (Interview SK4). Another respondent (Interview SK1) said that she did not have a heat pump but had a well and the discussion during the focus group peaked her interest in the topic.

None of the respondents had battery storage installed together with their photovoltaic power plant. Except of one everybody mentioned technical complexity besides high investment costs and low return expectation as the main reason for not having storage. One of the respondents (Interview SK4) had a vast knowledge about the storage issue because he was in the process of acquiring one to increase his energy independence (in his own words, “to function off-grid” in case of a black-out). He is utilising his own experience with electricity production in his photovoltaic power plant to estimate a suitable size of storage (he was thinking about 40 kWh capacity) what would mean that he

would never feel any discomfort during nights if a black-out happened (Interview SK4).

Several respondents reported having electric car that they bought because they own solar power plant and they can charge the car at home with electricity produced by themselves. One respondent argued that

photovoltaic made me to think about electric car (Interview SK1).

Another respondent (Interview SK3) claimed that they can use their own overproduction toward their electric car charging plan that allows them to charge their car anywhere in Slovakia with the use of his own (virtual) electricity. However, not all respondents owned electric car – one of them had bought an internal combustion car before they installed solar panels and did not want to buy a new car; another one claimed that electric cars have only limited range what was very inconvenient for them.

E. Assessment of the government's policy towards prosumers

Slovak respondents claimed that they were not very powerful vis-à-vis electricity companies and that if the government would not apply a price cap on electricity during the ongoing energy crisis, they would have to pay much higher price and there would be nothing they could have done with it.

When asked about the main barriers to development of photovoltaic power plants, only one respondent explicitly mentioned investments costs and a few of them mentioned unavailability of public subsidies for their location (Bratislava region was excluded in the past from support schemes; however, nowadays this barrier has been dismantled). Majority of respondents mentioned unclear support from public institutions (even contradictory messages from the agency responsible for dissemination of information on photovoltaic), inflexibility of people, and discussions on social media as main barriers of photovoltaic power plant expansion. In words of one respondent,

many people succumb to misleading information, because the biggest experts on social networks are people who never had [solar power plants] and they say it is nonsense (Interview SK6).

According to our respondents, there is a very little information provided to people by the public institution. As a consequence, the end consumers cannot take an informed (and good) decision and end up with a system that does not fully reflect their needs. According to one interviewee,

people complain that hot water preparation consumes 40% of electricity from photovoltaic (Interview SK4).

The solution to this would be – according to this respondent – to install also thermal solar panels and not only photovoltaic power plant. However, there is not enough information available that would allow the end consumers to make informed decision.

According to our respondents, the ongoing support schemes are not accompanied by information dissemination campaigns that would explain advantages and disadvantages of individual solutions to the general public. Moreover, the subsidy schemes have very specific conditions that fulfil only several suppliers of renewable technologies (for example, heat pumps) what drives the price of these technologies up.

Respondents were not very keen on creating or joining an energy community. One of them said bluntly when asked about joining forces with his neighbours that he would

never, with neighbours never [form an energy community with his neighbours] (Interview SK7).

Other participant noted that – based on their own personal experience – cooperation with neighbours had been always very difficult and he could imagine how an energy community would end up with disagreements among its members (Interview SK3). Respondents were also rather sceptical about such a community for purpose of creating a common storage facility. While most of the respondents understood the technical limits of seasonal storage and did not consider it as an option because its availability is purely hypothetical, some of them considered virtual battery to work to a certain degree also in a “seasonal mode” if you had a yearly billing cycle (and the consumption and production was summarized during/after winter).

Our respondents noted that they discussed their experience with photovoltaic power plant with other people, especially in unofficial settings (“over beer”, Interview 5SK). They were not very keen to donate their overproduction to low-income households, shelters, etc. at home or abroad. One respondent noted that if one had a virtual battery and did not consume their production within the rules of such battery one was ‘donating’ their electricity to the electricity company.

According to our respondents, prosumers (owners of photovoltaic power plants) were too diverse group of people to unite around this one issue to create a political movement. As noted by an interviewee

there are people with very diverse positions [on photovoltaic power plants] even in this [focus] group (Interview SK7).

One respondent noted that this comes back to reasons why people invest into photovoltaic – for their own benefit, this had nothing to do with a common good. However, there was a positive externality in the form of environmental benefits noted by our respondents. As explained by one respondent,

when I heated water without gas [i.e. with energy from own photovoltaic power plant] I was wondering how people could use natural gas when it is 30 degrees outside (Interview SK6).

4.3 Heat pump users

2022 was the record year for heat pump sales in Europe, however, 2023 saw reversal of the decade-long growth in heat pumps sales (EHPA 2024). Similar development happened also in Slovakia, that saw the peak of interest in this technology in 2022 when almost 16 thousand heat pumps were sold. In 2023 this number decreased to 14 thousand pumps (Euractiv 2024). However, when it comes to heat pump market share this has been increasing significantly since 2022. While in 2021 the share was less than 9%, in 2022 this increased to 17,3% and in 2023 this number increased further – albeit much slower – to 20,6% (EHPA 2024). However, at the same time the demand for natural gas furnace also increased – in 2021 a record of more than 38 thousand furnaces was sold in Slovakia. This meant that gas furnace kept 60% share in the detached houses heating market (Euractiv 2024).

This section presents the findings of a focus groups discussion with owners of heat pumps. While some of the respondents were quite knowledgeable about this technology, their advantages and limitations, in general in this group were much fewer “technological enthusiasts” than in the focus group on photovoltaic power plants (prosumers) discussed in the previous section. Members of the heat pump group did not follow closely their energy

consumption; they did not try to find ways how to utilise the technology to the maximum possible way as some members of the photovoltaic group did. In most cases, the owners of heat pumps dealt with the technology only during regular maintenance provided by professionals. One respondent (Interview SK10) even noted that they tried to change set up on their heat pump once but the whole experience ended up so badly, that a technician had to come and correct the settings. Since then they had not even tried to set up the heat pump again and always call a technician.

A. Reasons for investing in heat pumps

All respondents used heat pumps for heating and hot water preparation. One respondent used it also for cooling. Two respondents implicitly stated that they are not using heat pump for cooling because it would mean a decreased comfort (as they would have to use the heat pump for cooling with underfloor system). Savings were the most often mentioned reason why participants invested in heat pumps, alongside with energy efficiency and comfort. Two respondents faced a dilemma – whether to invest into gas infrastructure (did not have a direct access to gas line when they were building their new house) or into heat pump infrastructure. The latter was for them a more efficient solution. One participant did not opt for the heat pump himself – he was buying a new house that was heat pump ready and since heat pump was already included in the final price of the house, he did not opt for a different heat source. According to him, the developer chose heat pump because of its zero-paperwork needs (no permission process is involved); however, low maintenance needs of heat pump were highly appreciated by this respondent.

Other respondents' reasons for choosing heat pumps included comfort of operation when compared to pellets or increased efficiency compared to natural gas (Interview SK14). Heat pumps were also viewed by one respondent as end-of-the line technology. As a barrier of heat pump expansion one respondent noted the system how detached houses are build nowadays – especially in the vicinity of Bratislava where whole neighborhoods are being built by developers. People are often buying houses built by developers that are pushing the price downwards and therefore opt for underfloor electric heating that is the least investment intensive. However, the operation of this type of heating is more expensive than heat pumps or other options.

Therefore, most people will not have heat pumps because developers are not forced [to provide the most cost-effective type of heating] (Interview SK8).

B. Energy savings and a sense of energy security

One respondent reported developing own cost benefit analysis when he was looking for the most suitable heat source of his new house (Interview SK8) – with heat pumps being the best option for him. Another respondent (Interview SK9) claimed that he perceived increase of energy security thanks to heat pump. His original idea was that if there was no electricity to power his heat pump, he would use a diesel generator but later he started to think about photovoltaic as a possible back up source (did not install it yet). According to our interviewees, although heat pumps have limited energy efficiency, they are still able to heat the house in an efficient way.

Energy security has not been an issue for another respondent (Interview SK10). He argued that he looked at heat pumps from economic and environmental perspective and never

had a feeling that Russians would turn the vent and everybody with gas will be out of luck (Interview 10).

Another respondent (Interview SK11), however, claimed that black outs are a big thing for him because “without electricity I am unable even to open shades”. Energy companies’ primary interest is a business interest; however, they want to be a reliable partner because it is in their primarily business interest to have an image of a reliable partner for customers.

Majority of respondents did not report any changes in their approach to the costs connected to heating after they started to use heat pumps – they did not follow the price of electricity. One respondent reported that they were not happy with their current electricity price and therefore are looking into an alternative supplier. However, according to Interview SK9 alternative electricity suppliers can present a risk as during the peak of the current energy crisis when they bankrupted due to the inability to maintain their business model (these companies were buying at the spot markets and when the price peaked they were unable to fulfil their contractual obligations).

A respondent claimed that they are not that interested in small variation in price and that a big variation does not really emerge because

when the house is insulated and the heat pump works as it should, I do not have any problem [with costs] (Interview SK10).

One respondent noted a huge consumption of his old heat pump that he had decided to change some time ago. However, the rest of the respondents were not concerned about their consumption of electricity in general and in connection to the heat pump in particular.

C. Relationship between heat pumps and changed consumer behaviour

Respondents noted that when it comes to heat pumps, they are in most cases installed into new houses – refurbishment of old house is not effective as it is very expensive due to the need to change the whole heating system (heat pumps are not effective when using with radiators). Therefore, they could not really comment on change of a lifestyle in connection to heat pumps as they changed their lifestyle – at least to a certain degree – when they moved into a new house. According to the respondent (Interview SK11), electricity price would have to be very high to see a short to medium return on investment into heat pump in case of old building. One respondent noted that his new house project included a heat pump with higher capacity than necessary because “it was better to be on the safe side” (Interview SK10) and his wife likes it because she likes to feel warm. He himself prefers it this way as he can “always air out [his] study”.

One respondent reported changes in their lifestyle, but not because of the heat pump itself but because of changes of personal preferences of his household members. Another respondent noted that they used to keep the temperature in their house 1-2° lower before, but then they realized that they had problem with moisture (linked to insulation and lower air flow) so they increased the temperature a bit.

D. Readiness for further investments in other devices

One respondent claimed that they are considering switching from air-to-air to water-to-earth heat pump as this would enable them to use the heat pump also for cooling during the summer with minimal costs. He argued that the investment to such upgrade would return in 5-6 years thanks to savings. All members of the focus group agreed that water-to-water heat pump is the best and most cost-effective solution and that in the locality where they live (the Bratislava region) underground water is very close to surface so it is relatively easy to get access to water necessary for this type of heat pump. However, there are certain risks connected to this type of heat pump as the water level fluctuates based on weather situation

in a given year (average temperature, precipitation) and some of the respondent noticed lately decreased water levels in their wells.

One respondent claimed that they are thinking about investing into photovoltaic panels or wind turbine “because it always blows in my area” (Interview SK10). Another noted that he was interested in a “key turn” approach to photovoltaic power plant, however, the companies he talked to had expectations that he would do a lot of paperwork himself what tuned him off (because of his own time restraints). One member of the focus group (Interview SK11) reported that after bad experience with craftsmen during construction of his current house he couldn’t imagine hiring somebody to install photovoltaic power plant on his roof – he was expecting a lot of challenges and problems during the installation as well as operation of the photovoltaic power plant due to low quality of craftsmanship. Also other participants of this focus group reported bad experiences with craftsmen and service personal.

Many respondents reported high investments needs connected to photovoltaic power plant as a reason why they are not thinking about installing this technology. Several of respondents also noted that there is not enough information and understanding regarding the technology not only among public, but also professionals that are installing the technology on houses.

E. Assessment of the government’s policy towards owners of heat pumps

According to our respondents, the governmental support is rather limited and the requirement that need to be fulfilled to get subsidies are often very difficult. Respondents also noted lack of strategical long-term thinking at the level of government. A respondent (Interview SK13) reported that while socialising with other members of “dog walking” community he hears stories about other people’s difficulties with energy suppliers or public subsidies and he prefers not to deal with these issues but to stay with his own solution although it might be not the most price-effective one. Another respondent noted that gas and electricity companies are easier to deal with compared to water supply company as the former

are forced by the market to behave in a civilized way (Interview SK14).

According to one respondent (Interview SK12) energy security is not up to energy companies, but the state should guarantee it – because the state sets rules and regulates energy sector.

4.4 Energy poverty

Energy poverty is on the rise in the European Union as well as within the Visegrad Group countries. While during the 2010s the share of people reporting that they were unable to keep their homes adequately warm decreased from 11,2% in 2012 to 6,9% in 2021, the number rose to 9,3% in 2022 and 10,6% in 2023 (Eurostat, 2024). The situation in Slovakia is slightly better with 5,8% of people suffering from energy poverty in 2021 and 7,1% and 8,1% in 2022 and 2023, respectively (Ibid). Slovakia had, however, the highest share of people suffering from energy poverty among the Visegrad Group countries. The numbers are, of course, much higher for people under poverty line, in this group almost 30% of people in Slovakia suffer from energy poverty – a huge increase from 19% in 2021. In both the general population and in the group of people below poverty line we can observe since 2022 a reversal of a positive trend within the majority of the Visegrad Group countries. The situation in Slovakia has been different as the share of people below poverty line suffering from energy poverty has been during 2020s highest since early 2000s (Dokupilová, 2024).

In contrast to other two focus groups conducted in Slovakia (with the owners of heat pumps and prosumers – those that own photovoltaic power plants and thus produce and also consume electricity) this focus group included majority of women. In the other two groups only one and two women respectively (heat pumps, prosumers) were involved. Indeed, research has shown that women are overrepresented as a group suffering from issues connected to energy poverty (Nguyen and Su, 2021). Some of the respondents were well informed about how billing works, what are different electricity/heating tariffs, etc. But not all of them.

A. Challenges to pay for energy bills (electricity/heating)

Our respondent argued that currently there are only two economic classes in Slovakia – the rich and the poor, with the latter having hard time to cover not only energy bills, but also basic necessities like medication. Especially pensioners and people living alone belong to the group impacted by (energy) poverty. Participants also noted that there was a difference between various dwellings from energy costs perspective. While people living in homes were, according to our respondents, able to find alternative – and cheaper – ways how to heat their place (for example, with a firewood in a fireplace), people who live in flats do not have an alternative and have to use the system they have, often not the most convenient one (Interview SK15). Members of the focus group discussed changes in the way how final heating price is calculated in flats – there is a fixed part that is linked to the size of a flat and a variable part that is linked to the actual consumption of inhabitants. The share of these two changed recently with the former being increased, so the actual consumption plays nowadays a less important role in the final heating bill than in the past. This was considered an unjust change by our respondents who claimed that when

people who are renting and do not pay separately for utilities have window open [i.e. are wasteful with energy because they pay a bulk sum covering everything] and you are not able to do anything about that [...] you can just watch it happening and pay for it (Interview SK18).

Heating bills were identified as more difficult to cover compared to electricity by those respondents that did not heat with electricity but in other ways (natural gas, district heating). One respondent noted that their flat is “warm” so the majority of costs are not connected to heating, but to cooling during the summer months (Interview SK15). Another respondent noted that they started to save energy when meters were installed in their flat some time ago. All respondents were aware about location of their meters (only one participant did not have those), some of them reported checking the meters regularly.

B. Assessment of the reasons for high prices

According to the respondents, the government is responsible for high prices of energy because it is supposed to regulate them (Interview SK16). Respondents claimed that the state has opportunity to decide from where it is going to buy energy. It can do so

through a gas pipeline or shale gas from America that has to be shipped halfway through the globe (Interview SK20).

However, one respondent was a skeptical about the ability of the state to regulate prices and thus make energy prices more affordable to citizens. He claimed that the high prices on the global market limit this ability (Interview SK19). Several respondents argued that the weak point of the current energy sector is its privatization (market system in general) that allows energy companies to charge high sums for supplied energy. According to one respondent,

if you generate [electricity] for 60€ and sell for 150€, that's 300% margin" (Interview SK17).

The solution to this should be a "better control over the sector" (Interview SK20).

C. Mechanisms to decrease energy bills

All respondents were very cautious about spending energy and several of them reported various strategies how they decrease their energy bills and

save energy because it is expensive (Interview SK17).

Heating was identified by respondents as one area where utility costs can be saved. Some respondents used systematic approach (setting up heating in their places in the most efficient way), others presented more ad hoc solutions. A respondent claimed that they have their heating set up in a way they would not "overheat" (Interview SK15). Another one noted that they had a system that they were turning down heating as a part of their morning routine, together with raising shades. Shades are also an important part of these strategies as sun can heat up the dwelling (Interview SK15). Other respondents mentioned – what they called – cooking in the most efficient way ("so that all the heat goes to the pot" and not around it (Interview SK21)). One respondent (Interview SK20) explained that they were thinking in an energy-saving way during the construction of their current home – they invested in energy saving measures like low flow shower heads, energy saving light bulbs, etc. Participants reported also putting on extra layers of clothes to deal with lower temperatures in their homes.

Another respondent noted that they are trying to save not only on heating, but also on hot water preparation – she washes dishes that

do not need to be washed in hot water in cold water (Interview SK16).

Several respondents were lowering the temperature in their home before going to work. Brick houses were praised by a respondent (Interview SK16) for having a very good thermal properties with a minimal need to heat them during sunny days. Another respondent (Interview SK18) noted that insulation of their apartment building helped to improve thermal comfort of his flat – he does not need to use an electric heater in the bathroom after the refurbishment of their apartment building.

Most of the respondents noted that they had decreased their heating the last winter, however, they agreed that it was probably caused by the warm winter and not their conscious effort to save energy. But when asked directly whether they turned down heating to save on energy bills at some point in recent past, they answered affirmatively.

D. The impact of the invasion of Ukraine on heating bills

A respondent claimed that the invasion impacted the country negatively because

we received 14 million for gas transit to Austria and Czechia. And that was clean money (Interview SK21).

And, according to this respondent, this was not the case anymore. Some respondents noted that their problem with energy bills started in early 2022, however, did not connect this with the invasion. When explicitly asked about when these problems started a respondent (Interview SK21) mentioned two crises – the Covid-19 pandemic and the invasion.

E. Mechanisms and policies supporting energy savings

Slovak respondents showed interest especially in heat pumps as a way how to decrease energy bills. This topic has emerged spontaneously already during the second question asked by the focus group moderator. Respondents claimed that heat pumps were supported by the European Union, as a suitable source of environmentally friendly energy source. However, one respondent (Interview SK18) argued that this was not a maintenance-free solution and that one has to know how to operate it properly. He mentioned his neighbors who moved into a next-door house that already had heat pump installed, and they were struggling with the technology unable to set it up correctly and enjoy its benefits. A participant who lived in a flat argued that an alternative heat source – like a heat pump – does not make a lot of sense to him because he still has to pay for district heating even if he would replace it with heat pump because of the existing rules.

Interviewees were aware of existence of support schemes for installing renewable energy sources (like “Green to the households”, see Section 4.2), however, only in rough contours and they did not know the details or if they could benefit from these schemes in any way. Some of the focus group participants criticized the scheme for unclear and changing rules and lack of information regarding the support and its consequences for the end users (i.e. how to report savings, etc.). Our respondents discussed other renewables technologies as well, however, they mixed up similar types (thermal solar panels with photovoltaic solar panels) – although they were praising both types. Some participants understood the difference, but still did not have a deeper understanding of their advantages and limits – or about the costs connected to their installation. The group almost unanimously criticized photovoltaic panels for being investment-intensive and for unfavorable subsidies schemes.

Municipalities should, according to our interviewees, subsidized energy prices not only for pensioners, but for a wide range of low-income people. The reason is that the prices are already high and if they

would go even higher, you still have to have at least some heating on in a flat (Interview SK15).

Because of this, low-income people need public support (including from municipalities). One respondent commented also on carpet subsidies that were in place in Slovakia during the time of the research. He was criticizing these because according to him they support people

who own three flats and they are renting them and [the government] supports them. And another person has only one flat and lives alone [meaning a single-income household]. Or the schemes support those that heat pools (Interviews SK18).

One respondent was even against subsidies in any form. He criticized carpet subsidies as “achievement of socialism” when everybody had the same amount of everything and argued that to create a real tailor-made benefit was nearly impossible as there were so many factors that needed to be considered (Interview SK17).

4.5 Conclusion

Our data obtained from focus group shows interesting trends in Slovakia. Many of our respondents installed their photovoltaic power plants even before the current crisis, however, their motivation was connected to – besides environmental reasons – effort to lower their energy bills and became independent from their energy providers as much as possible.

Indeed, energy companies have not been evaluated very positively by our interviewees and the ability to produce one's own electricity was considered by our respondents as a way of being independent, at least partly, from energy companies that set the prices in often unfavourable way. Therefore, most of our respondents owning photovoltaic power plants were willing to invest into more solar panels to further improve their position on the energy market. However, what they noticed was insufficient amount of information provided by state authorities. Such information vacuum was then filled, according to our interviewees, with "online specialists" on social media without any knowledge of the issue who spread misinformation and further complicated the information situation. Although prosumers themselves have been exchanging information and best practices among themselves, our respondents stayed sceptical about the ability of their fellow prosumers from the same neighbourhoods to create energy communities that would support further development of photovoltaic power plants in their area.

Heat pumps owners claimed that they invested into heat pumps mostly because they expected better energy efficiency. Indeed, they reported that this was the case and they are not worried about the electricity price as the heat pump is performing efficiently. Our respondents did not attributed changes in their behaviour to ownership of heat pumps since their life has changed when they moved to a new home with installed heat pump. They agreed that retrofitting old building with a heat pump does not make a lot of economic sense as this is a very investment-intensive change. Heat pumps do not work well with radiators that are the dominant heating system in existing buildings so replacing old heating source with heat pump is not enough. Difficulties to navigate difficult policies together with bad experience with craftsmen prevented our interviewees from investment into other types of renewable energy sources (like a photovoltaic power plant).

Participants suffering from energy poverty argued that people living in flats (as opposed to those living in houses) do not have a lot of opportunities to save on their heating bills due to the way how energy consumption is calculated. However, they are still trying to save energy in multiple ways including lowering the temperature when they are not at home, utilising sunlight, or putting on clothes. Heating was not the only area where they tried to save on energy although it was the dominant one. Participants had some knowledge about possibilities to increase energy efficiency of their homes, however, they criticised lack of information regarding the existing support schemes.

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Conclusion

The research that is presented in this report examined societal response to the current energy crisis. The COVID-19 pandemic and the following Russian invasion of Ukraine have impacted all aspects of economy including energy sector since 2020. Rising prices of all types of energy and its questionable availability created a very specific situation within the European Union, with magnitude of the problem previously unknown on the European continent. While national governments have tried to respond to this crisis by providing support and subsidies to their citizens, also the public itself has responded to this crisis in a specific way. Sometimes the public utilised tools and mechanisms provided by the central governments, like utilising public subsidies aimed at improving energy sector, in other cases citizens developed their own ways how to cope challenges connected to the ongoing energy crisis. This project examined how citizens in four countries that form the so-called Visegrad Group – the Czech Republic, Hungary, Poland, and Slovakia – have responded to this crisis in their own capacity.

The main goal of our research was to detect changes in social behaviour and coping strategies in response to the unfolding, multifaceted energy crisis, which includes both rising prices and an increasing sense of threat to energy security. We therefore conducted a series of twelve focus groups in all four countries (three focus groups in each country) covering three main topics connected to citizen's response to the ongoing energy crisis. We therefore talked to people who invested into photovoltaic power plants and thus became prosumers (i.e. producers and consumers of electricity) and to those who installed heat pump. The third group consisted of people who are having hard time to pay for their energy bills and are therefore suffering from energy poverty. This report presents the results of our findings. Although each country has its specificities, we are reporting in this conclusion on common traits identified during our investigation as well as on country specificities that are contributing to the overall picture within the region.

The reason most often mentioned by our participants for investing into photovoltaic power plants or heat pump was connected to high energy prices, although many of them did make the investment before the onset of the current crisis. They made their decision based on expected high prices in the future and also uncertainty on the market – they considered their own energy sources to be a safeguard against such instability. However, sometimes the decision was a very pragmatic one as heat pumps were just the best possible option for many reason (for example, it was included in the price of turn-key house or there was not access to the natural gas grid, etc.).

One of the most often mentioned issue during our focus groups was an issue with the existing rules and their constant change. Prosumers, heat pump owners, but also people suffering from energy poverty agreed that existing rules are not always very convenient for them and what is even worse their constant change make it very difficult to get support for new energy source (be it a photovoltaic power plant or heat pump) or to get access to help with energy bills.

Another reoccurring issue during our focus group was limited access to information. Participants criticized lack of information provided by state agencies that in their view were responsible for information dissemination. This did not concern only people who were thinking how to improve their energy situation by investing into insulation and upgrades of their heating system and were thus interested in existing options, but also those participants who already installed a heat pump or photovoltaic power plant. The latter group was

complaining that they had to look for information by themselves and often they were given incorrect or opposing information.

Except for a few participants from the Czech Republic nobody likes energy companies. They are considered to be at least partially responsible for the current energy crisis and some prosumers even claimed that they work hand in hand with the state to make the technology suitable for them and not for the prosumers, i.e. owners. Few Polish prosumers were unhappy with their deal with energy companies, because they felt that they were promised better deals when it comes to selling their overproduction to energy companies than those they got at the end. However, owners do not really have any other option than to cooperate with energy companies – the only option is to get off grid, which is, however, rather expensive. Quite interestingly, when talking about solar panels and heat pumps bringing independence, several respondents, especially from Hungary and Poland, did not mean independence from external energy suppliers like Russia, but independence from local energy providers or even the state as the rules giver. However, for some also the independence from Russian energy sources was an important factor influencing their decision to invest into solar panels or a heat pump. In the Czech Republic the relationship towards energy companies was a bit different as Czech prosumer respondents' perception of the energy market is more conservative. They feel safer and more resilient when they have contracts with large energy suppliers. This can be linked to the situation in 2021 and 2022 in the Czech Republic when several (mostly small) energy suppliers bankrupted leaving hundreds of thousands of their customers with the provider of last resort. From the perspective of other countries may this sound a bit paradoxically, but the Czech participants claimed that they consider having a contract with large energy suppliers as to be a guarantee of their energy security.

Heat pumps users agreed that the technology provides a lot of savings and that their expectations connected to functioning of heat pumps and operational costs were met. However, a predisposition for this is a good insulation of the dwelling, otherwise the heat pump's efficiency is much lower. In Hungary, heat pumps are considered to be a diversification tool that often requires also a backup (other type of heating). Some respondents, however, noted a difference between homes and apartments when it comes to heating as the ability of apartment owners to upgrade their heating is limited by the existence of district heating or other types of central heating that dictates their heating system.

People suffering from energy poverty argued that special subsidies for this group of people is not a good approach to dealing with energy poverty. Not only because it requires complicated paperwork and the rules are changing, but also because this makes them feel excluded. The solution is, in their view, affordable prices of electricity for everybody.

Prosumers from all four countries reported that since they have photovoltaic power plants on their roofs, they are much more interested in weather as sunny days mean much higher production for them as rainy ones.

Appendix

List of focus groups and their participants

The Czech Republic

Focus group with prosumers, online, 16 April 2024

Interview CZ1
Interview CZ2
Interview CZ3
Interview CZ4
Interview CZ5
Interview CZ6

Focus group with heat pump users, online, 16 April 2024

Interview CZ7
Interview CZ8
Interview CZ9
Interview CZ10
Interview CZ11

Focus group with people suffering from energy poverty, online, 16 April 2024

Interview CZ12
Interview CZ13
Interview CZ14
Interview CZ15
Interview CZ16
Interview CZ17

Hungary

Focus group with prosumers, online, 11 March 2024

Interview HU1
Interview HU2
Interview HU3
Interview HU4
Interview HU5
Interview HU6

Focus group with people suffering from energy poverty, Budapest, 14 March 2024

Interview HU7
Interview HU8
Interview HU9
Interview HU10
Interview HU11
Interview HU12
Interview HU13

Focus group with heat pump users, online, 21 March 2024

Interview HU14
Interview HU15
Interview HU16

Interview HU17
Interview HU18
Interview HU19

Poland

Focus group with prosumers, Wrocław, 15 January 2024

Interview PL1
Interview PL2
Interview PL3
Interview PL4
Interview PL5
Interview PL6
Interview PL7

Focus group with heat pump users, Wrocław, 15 January 2024

Interview PL8
Interview PL9
Interview PL10
Interview PL11
Interview PL12
Interview PL13
Interview PL14

Focus group with people suffering from energy poverty, Wrocław, 16 January 2024

Interview PL15
Interview PL16
Interview PL17
Interview PL18
Interview PL19
Interview PL20

Slovakia

Focus group with prosumers, Bratislava, 13 February 2024

Interview SK1
Interview SK2
Interview SK3
Interview SK4
Interview SK5
Interview SK6
Interview SK7

Focus group with heat pump users, Bratislava, 15 February 2024

Interview SK8
Interview SK9
Interview SK10
Interview SK11
Interview SK12
Interview SK13
Interview SK14

Focus group with people suffering from energy poverty, Bratislava, 17 February 2024

Interview SK15

Interview SK16

Interview SK17

Interview SK18

Interview SK19

Interview SK20

Interview SK21