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Dimensions of Energy Poverty in Austria

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Abstract

Energy poverty is a multidimensional phenomenon that needs to be measured with more than a single indicator. Accordingly, this paper presents nationally and internationally discussed indicators for a comprehensive measurement of energy poverty and gives some results from current analysis.

1. Possible Approaches to Measuring Energy Poverty

In a biannual publication[1] in Austria so-called "energy-poor" households are analyzed according to two possible indicators: the connection between high-energy costs and low income on the one hand, and the aspect of non-affordability of energy on the other hand. This allows the identification of structural differences between households suffering from energy poverty and the average household. Data sources used here cover the Austrian Microcensus including a special module on energy use for the period of 2021 and 2022 and EU-SILC 2022, thus a period before the peak of energy prices in 2022. A reflection of the rising energy prices, especially in the 2nd half of 2022 was therefore hardly possible at the time of the study.

Even before the ongoing debate about high energy costs and affordability, Statistics Austria analyzed the multidimensional phenomenon and complexity of energy poverty in Austria. As stated, energy poverty is a multidimensional phenomenon that cannot be measured with one single indicator. It can mean (1) the relation between income poverty and high energy costs on the one hand, and (2) the (non) affordability and involuntary avoidance of necessary energy for the use of heating or other purposes on the other. The two approaches largely affect different households. Those households that refrain from using energy for financial reasons will generally not have above-average energy costs, in contrast to energy-poor households with high energy costs by definition. An evaluation of the data from EU-SILC 2022 shows that of the households at risk of poverty with high energy costs, only 5% (and thus only individual cases) also state that they cannot afford to keep their home adequately warm. The amount of overlap is therefore extremely small.

However, the groups affected by the two approaches to energy poverty often come from similar socio-demographic groups (e.g. low education). What both household groups also have in common is that they are more affected by low household income. For energy-poor households with high energy costs, a household income below the at-risk-of-poverty threshold is part of the definition. However, even those energy-poor households that stated in the EU-SILC that they could not afford an adequate amount of heating have a lower household income than the average for all households.

This article shows various indicators that can be used to measure energy poverty. Two data sets are available for the analysis in this chapter, which further increases the complexity of measuring energy poverty. Data from the Microcensus supplementary module "Household energy use" 2021/2022 (further referred to as "Microcensus Energy") and data from EU-SILC 2022 (EU Statistics on Income and Living Conditions, income year 2021), both on the household level, are used. The different survey focuses (energy consumption versus household living conditions and income), but also the different survey periods, sample compositions and methodologies of the surveys, lead to different results for the energy poverty indicators (see Tables 1 and 2). Microcensus Energy shows a slightly higher average income and significantly higher energy costs than EU-SILC:

The socio-demographic data of the Microcensus Energy is taken from the regular Microcensus. In the later, only parts of the household income are available. To generate the total household income, needed for the calculation of the energy poverty indicators, some income aspects are added from administrative data. Residual components were estimated using a complex machine learning and a donor procedure. Low-income households are represented less often at the Microcensus Energy, and this is not compensated for completely by the weighting.

EU-SILC asks directly about energy expenditure; energy quantities are not recorded. Only occasionally purchased energy sources, such as wood, are more difficult to record in this way. The energy costs surveyed using EU-SILC are significantly lower than those of the Microcensus Energy. While the latter shows average annual energy costs of 2,475 Euros, the annual energy costs of EU-SILC are 1,690 Euros.

The indicator set includes objective indicators (e.g. on energy costs) and subjective indicators (e.g. can

[1] See Wegscheider-Pichler, A./ Lamei, N./ Gußenbauer, J. (2024): Dimensionen der Energiearmut in Österreich 2021/22. Indikatorenüberblick und detaillierte Betrachtung. Statistik Austria/ E-Control Austria. Wien. Available at: https://www.statistik.at/fileadmin/user_upload/Energiearmut-2021_22_barr_Web.pdf (accessed on 17/10/2024).

you afford to heat properly).

There are currently no official, internationally harmonized indicators for measuring energy poverty. In Austria, the legislation for measuring energy poverty is still in discussion. Statistics Austria selected eight different indicators, which are currently being discussed at national and international level. For the calculation different thresholds were defined. Three indicators relate to energy poverty with high energy costs, four variants relate to energy poverty where heating is not (sufficiently) affordable. The indicator for outstanding payments for ancillary housing costs is also shown.

It should be pointed out that other thresholds (e.g. energy costs >12% of household income) could also be applied, which would have a corresponding impact on the proportion of energy-poor households. From a statistical point of view, the thresholds and definitions used for an analysis of energy poverty depend on criteria such as relevance, (international) comparability and reliability of the data. If the number of cases is too small, for example, because the thresholds are too narrow, no valid results can be evaluated.

Energy poverty indicators related to high energy costs and low household income

Table 1 shows three energy poverty indicators measuring the aspect of high energy costs. The indicator (1) for measuring energy poverty with high costs looks at those households that have above-average expenditure on energy for housing combined with a low household income. The at-risk-of-poverty threshold of 60% of the median is used for the definition of low household income. Similar to the at-risk-of-poverty threshold, "above-average energy costs" were defined as being 40 percentage points above the equivalent median expenditure. Energy expenditure for mobility, e.g. for fuel, is excluded here.

The energy poverty indicators (2) and (3) are defined more simply. Here, households with energy costs accounting for more than 10% of household income (2) and households with energy costs accounting for more than 15% of household income (3) are identified as energy-poor. Any risk of poverty is not considered, which is why indicator (1) and (2) or (3) may or may not overlap due to excessive energy costs. All households that are considered energy-poor according to (3) are by definition also energy-poor according to (2).

Table 1: Energy poverty indicators in Austria: high energy costs and low income

	Microcensus Energy		EU-SILC	
	Number of households	Share in %	Number of households	Share in %
(1) Households with above-average expenditure on energy for housing (> 140% of the median, equivalized) AND at risk of poverty	134,100	3.3%	146,300	3.6%
(2) Households with energy costs > 10% of household income	664,560	16.5%	351,000	8.6%
(3) Households with energy costs > 15% of household income	273,730	6.8%	154,000	3.8%

S: STATISTICS AUSTRIA, Microcensus „Household Energy Use" 2021/2022, EU-SILC 2022. – Calculated at household level.

The values for the energy poverty indicator (1) are very similar for the two data sets (Microcensus Energy 3.3% of households in Austria, EU-SILC 3.6%). The slightly lower value of Microcensus Energy is due, among other things, to the lower number of households at risk of poverty as a result of a slightly higher average income of this survey compared to EU-SILC. It should be noted that using the median to determine the threshold value means that higher energy costs only partially affect the level of energy poverty. Higher energy costs lead to a higher median and thus to a higher threshold value, above which

energy poverty begins by definition. According to the Microcensus Energy 2019/2020, 3.2% of households were energy poor. This increased marginally to 3.3% of households in 2021/2022.

Looking at the energy poverty indicators (2) and (3), the values of 16.5% and 6.8% according to the Microcensus Energy data set are significantly higher than those of EU-SILC at 8.6% and 3.8% respectively. The differences are due to the already mentioned significantly higher energy costs in Microcensus Energy compared to EU-SILC. The beginning in the rise in energy costs can be seen more clearly in the energy poverty indicators (2) and (3). According to the Microcensus Energy 2019/2020, 12.8% of households here had an energy cost share of over 10% of household income (2), 5.3% had an energy cost share of over 15% (3).

Non-affordability of an adequate amount of energy

To consider the second approach to energy poverty - the inability to afford an adequate amount of energy - a subjective question from EU-SILC "*Can your household afford to keep your house/your flat adequately warm*?" can be used for the energy poverty indicators (4) and (5) as shown in table 2. The indicator (4) thus shows those households that use less energy for heating than they would actually like or need. The indicator (5) also considers that households have a low household income, i.e. are below the at-risk-of-poverty threshold. The phenomenon of involuntary energy avoidance can also be analyzed by particularly low energy expenditure in combination with low household income. The energy poverty indicators (6) and (7) show households with low relative energy costs respectively low absolute energy costs and being at risk of poverty.

Table 2: Energy poverty indicators in Austria: non-affordability of energy

	Microcensus Energy		EU-SILC	
	Number of households	Share in %	Number of households	Share in %
(4) Households that are unable to keep their home adequately warm	-	-	129,500	3.2%
(5) Households that are unable to keep their home adequately warm AND at risk of poverty	-	-	37,000	1.0%
(6) Households with particularly low relative energy costs (energy costs account for < 4% of household income) AND at risk of poverty	<20,000	(<1%)	145,300	3.6%
(7) Households with particularly low absolute energy costs (< 50% of the median) AND at risk of poverty	66,970	1.7%	176,400	4.3%

S: STATISTICS AUSTRIA, Microcensus „Household Energy Use“ 2021/2022, EU-SILC 2022. – Calculated at household level.

Energy poverty indicator (4) shows that, according to EU-SILC 2022, 3.2% of households in Austria state that they are unable to keep their home adequately warm. If one also considers whether these households are also at risk of poverty (indicator 5), the figure is reduced to just under 1% or 37,000 households. Energy poverty indicator (5) describes a subgroup of indicator (4). In any case, the low number of cases (and thus also small sample size available for analysis) should be noted here. The energy poverty indicator (5) can therefore not be recommended for measuring energy poverty in Austria: It indicates a cumulative problem situation, which is, however, very rare and the sample-related measurement errors can be large.

The energy poverty indicator (6) may or may not overlap with the energy poverty indicator (4). Due to the mentioned significantly higher average energy costs and slightly higher income compared to EU-SILC, the Microcensus Energy data for this indicator shows that less than 1% of households are affected. In the EU-SILC, however, just under 4% of all households fall into this energy poverty group (6).

The influence of the threshold values (<4% in this case) is again pointed out here: If energy costs as a proportion of household income were raised to <6%, the Microcensus Energy data would show 1.3% energy-poor households for this indicator in combination with the risk of poverty.

According to Microcensus Energy, just under 67,000 households (1.7%) are energy-poor according to the energy poverty indicator (7). The EU-SILC calculations result in around 176,000 households (4.3%). Here too, it can be assumed that the energy poverty indicator (6) and the energy poverty indicator (7) may, but do not necessarily have to, overlap.

Arrears on utility bills

A harder and more objective criterion than the subjective assessment of the households if they can afford to keep their home warm is the question on arrears on utility bills. It is asked in EU-SILC: "*Since (recent month, last year) have you ever been unable to pay utility and maintenance costs (such as electricity, gas, district heat and repairs) on time due to financial difficulties?*"

2.5% of households reported arrears on utility bills in EU-SILC 2022. This figure shows households that had at least one case of outstanding utility bills such as electricity or heating; the data is only available from EU-SILC.

Characteristics of energy-poor households

There are numerous structural differences between energy-poor and non-energy-poor households, and this applies to both aspects of energy poverty. As mentioned, both approaches largely affect different households, but as Table 3 shows for the energy poverty indicators (1) by the Microcensus Energy and (4) by EU-SILC, these are often concentrated in similar socio-demographic groups.

Table 3: Socio-demographic characteristics for Energy poverty indicators (1) and (4) in

Austria

Used data source	
Microcensus Energy 2021/2022	EU-SILC 2022 (Income 2021)
Definition	
(1) Households with above-average expenditure on energy for housing AND at risk of poverty	(4) Households that are unable to keep their home adequately warm
Energy-poor households	
Average: 3.3%	**Average: 3.2%**
Groups, affected above average	
No more than compulsory education: 8.1%	No more than compulsory education: 8.7%
One-person households: 6.4%	One-person households: 4.7%
Age 75 and older: 4.4%	Age 35 to 54 years: 3.9%
Living in 1 or 2-family houses: 3.7%	Living in apartment buildings: 4.3%
Small apartments/flats up to 80m²: 3.5%	Small apartments/flats up to 80m²: 4.7%
Rental (non-owner-occupied): 3.6%	Rental (non-owner-occupied): 4.4%
Year of construction up to 1960: 5.0%	Year of construction up to 1960: 4.6%
Area with low population density: 3.6%	Area with high population density: 4.7%

S: STATISTICS AUSTRIA, Microcensus „Household Energy Use“ 2021/2022, EU-SILC 2022. – Calculated at household level.

Single-person households are more frequently affected by energy poverty from both approaches than multi-person households; this is also due to the definition of energy-poor households with high energy costs.

Households with no more than a compulsory school leaving certificate are also affected more than average by both aspects of energy poverty. By age, there were group differences between the aspects of energy poverty according to the highest level of concern. In the case of energy-poor households with high costs, the group of 75-year-olds and older is significantly above average; in the case of energy-poor households that are unable to heat adequately, it is currently the age group of 35 to 54-year-olds, although only slightly above average here.

Energy consumption-related characteristics such as the size of the home, the ownership of the home or the age of the building also have a significant influence on the extent of energy poverty. Energy-poor households in both approaches are more likely to live in smaller apartments, to rent and to live in older buildings.

From a regional perspective, it is interesting to see that energy-poor households with high costs tend to live in areas with a low population density, while households that are unable to keep their home warm tend to live in cities.

2. EU-SILC 2023: Affordability of Heating, Energy Efficiency

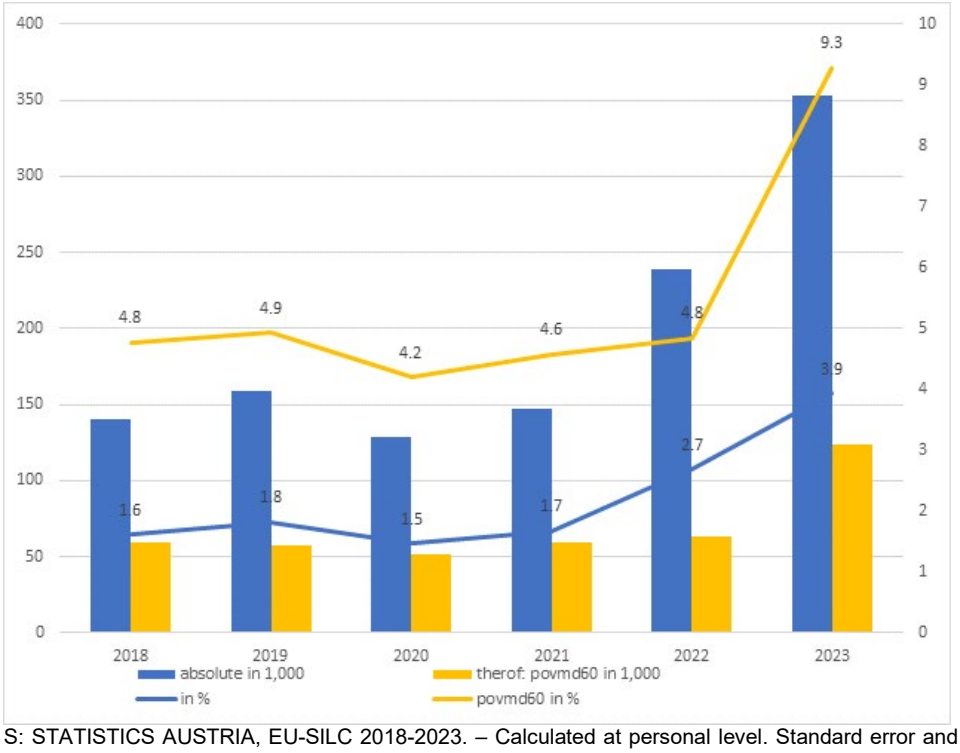
In addition to the aim to identify and calculate results for several different indicators on energy poverty as shown in the previous chapter we can add here the latest results of EU-SILC. They comprise data on the non-affordability of heating and from the ad hoc policy needs module "household energy efficiency" which was conducted in 2023.

(Non)-affordability to keep the home adequately warm

Figure 1 shows the results of the question *"Can your household afford to keep your house/your flat adequately warm*?" on the personal level. This is a standard item of the material and social deprivation indicator. Thus, it is also available in a comparative perspective for EU countries and some more[2]. It corresponds to indicators (4) and (5) from above, but with a slight variation - the level of analysis here is the personal level rather than the household level (which was used in chapter 1).[3]

While we see a relatively stable development of persons who cannot afford to heat their homes between 2018 and 2021 (around 130,000 to 160,000 persons, i.e. between 1.5 and 1.8% of the population), the number in 2022 rose to 239,000 or 2.7%. EU-SILC 2022 was surveyed in the first half of 2022 – the war on Ukraine started in February 2022 and shortly after that the prices of household energy increased, but the sharpest increases only became known after the EU-SILC field work period in summer/fall 2022. Interestingly, in this first period of increased energy prices we see already an overall effect – but for those, that were at risk of poverty, only a small and insignificant rise in non-affordability is reported. As the graph shows they started from a higher level already. For 2023, the numbers of energy poor according to this definition of non-affordability of heating increased once again (to 353.000 persons or 3.9%), and now also for those at risk of poverty the percentage increased sharply (to 9.3%).

Figure 1 Persons who cannot afford to keep their home adequately warm 2018-2023 (absolute numbers and %)



S: STATISTICS AUSTRIA, EU-SILC 2018-2023. – Calculated at personal level. Standard error and confidence interval on the example of 2023 (total numbers): SE 0.4, 95%-confidence interval between 3.2% and 4.7% or between 288,000 and 419,000 persons.

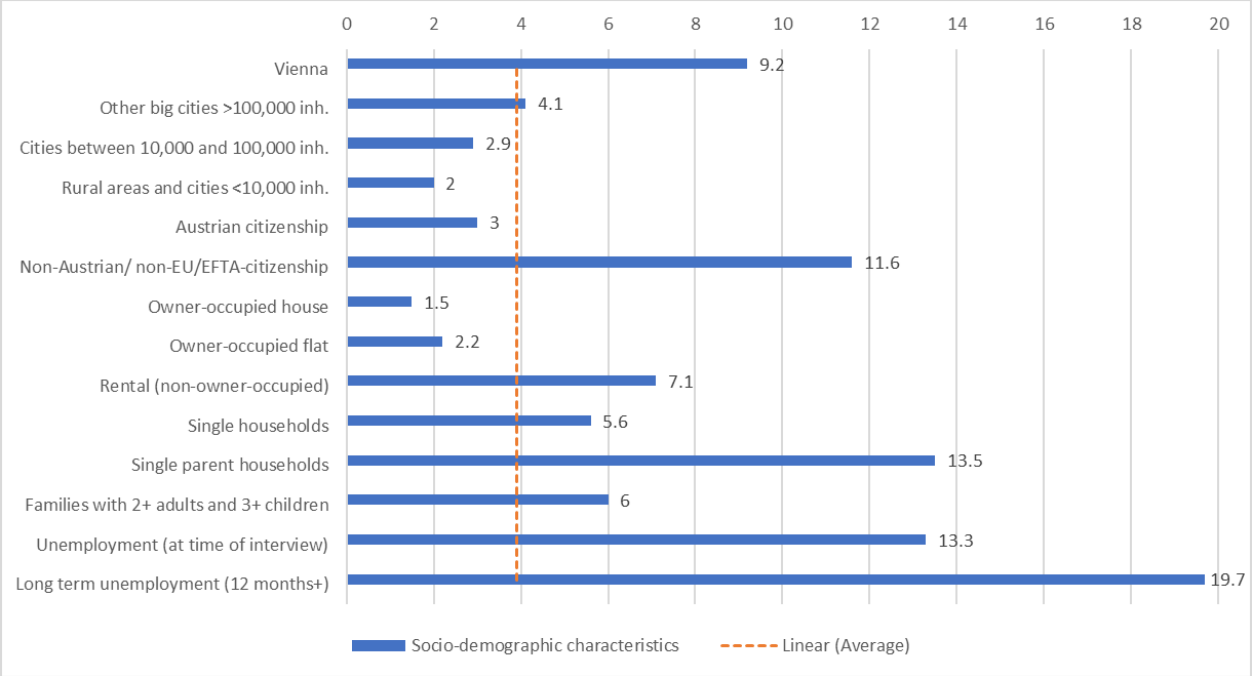
In addition to the risk of poverty (see Figure 1) and the characteristics on household level already discussed in Table 3 we can take a look on other selected socio-demographic characteristics: Figure 2 shows that several groups of persons face a higher risk of not being able to afford to heat their dwelling adequately. These characteristics, of course, can also coincide: It is persons in Vienna and big

[2] See Eurostat Database https://ec.europa.eu/eurostat/databrowser/view/ilc_mdes01/default/table?lang=de (accessed on 17/10/2024).

[3] Both perspectives have their value: in a social statistics perspective, usually the focus is on persons (or to be more precise: persons living in private households). For the specific topic of housing conditions of which questions on energy poverty can also be seen as part of the household perspective is a pragmatic choice as well.

cities rather than in rural areas, persons with a citizenship other than Austrian or EU/EFTA, single and single parent household as well as families with 3 or more children and persons affected by (long-term) unemployment that more often are unable to afford heating their homes adequately.

Figure 2: Persons who cannot afford to keep their home adequately warm by socio-demographic groups 2023 (%)



S: STATISTICS AUSTRIA, EU-SILC 2023. – Calculated at personal level.

First results on household energy efficiency

Energy costs are not only impacted by the prices of energy but also by the characteristics of the buildings, heating system and energy sources used. In the context of the European Green Deal it is of great importance to learn about the relationship between energy use, structural conditions of the dwellings and socio-demographic and economic characteristics. To this end an EU-SILC module was dedicated to household energy efficiency in 2023.

First analysis of Eurostat showed that across European countries measures to improve energy efficiency of one's dwelling have more often been taken during the past five years by persons not at risk of poverty or social exclusion. [4]

For Austria the analysis can be further broken down by the kind of measure: 12.5% of persons reported to have had *work to improve the insulation of walls, ceilings or floors* during the last five years for their main dwelling. 14.1% had an *installation of better insulated windows* done and 16.9% reported *work to improve or increase the efficiency of the heating system* during the last five years.

When looking at the incidence of such works to improve energy efficiency by household income we see a clear relationship for the question on renewal of the heating system: Whereas below 10% of persons with an income below the poverty threshold of 60% confirmed such improvements during the last five

[4] See News article https://ec.europa.eu/eurostat/en/web/products-eurostat-news/w/ddn-20240930-3 and Statistics Explained https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Living_conditions_in_Europe_-_energy_efficiency_in_households (accessed on 14/10/2024).

years it was double the percentage (20%) for persons with an income of at least 3-times the poverty threshold. The other two measures (improved insulation or better insulated windows) did not differ much between the income groups.

For further analysis additional factors concerning the construction year of the dwelling or other structural information on the building will have to be considered as well. The need to make improvements differs according to what standards are already met. The possibilities and freedom to improve one's dwelling depends on the tenure status, the permanency of the contracts and many factors more. Those variables show a clear connection with the economic resources of the households and should be considered as well.

Also, the promotion of measures to improve buildings by the state through direct or indirect transfers, changes from year to year. It will be an interesting question as to whether those policy measures have an impact on making energy efficiency renovations attractive for low income groups as well. This would have a positive impact on the environmental as well as on the social side and possible could be reflected in the numbers on energy poverty.

3. Analysis of Quarterly Data on Affordability of Household Energy

To cover also some aspects of the latest energy price shocks we can conclude with results from the survey of the social consequences of the crisis ("SILCexpress: How we are today") for 2023 and 2024.

Since the end of 2021, quarterly data on income changes and subjective perceptions of financial situation and personal well-being are being collected in order to monitor crisis impacts in a timely manner.[5] While in the beginning of this survey the emphasis lay on the analysis of effects of the Corona crisis now the impact of a high inflation phase is the main focus of this study. The group reported on here is the 18-74-year-olds living in private households.

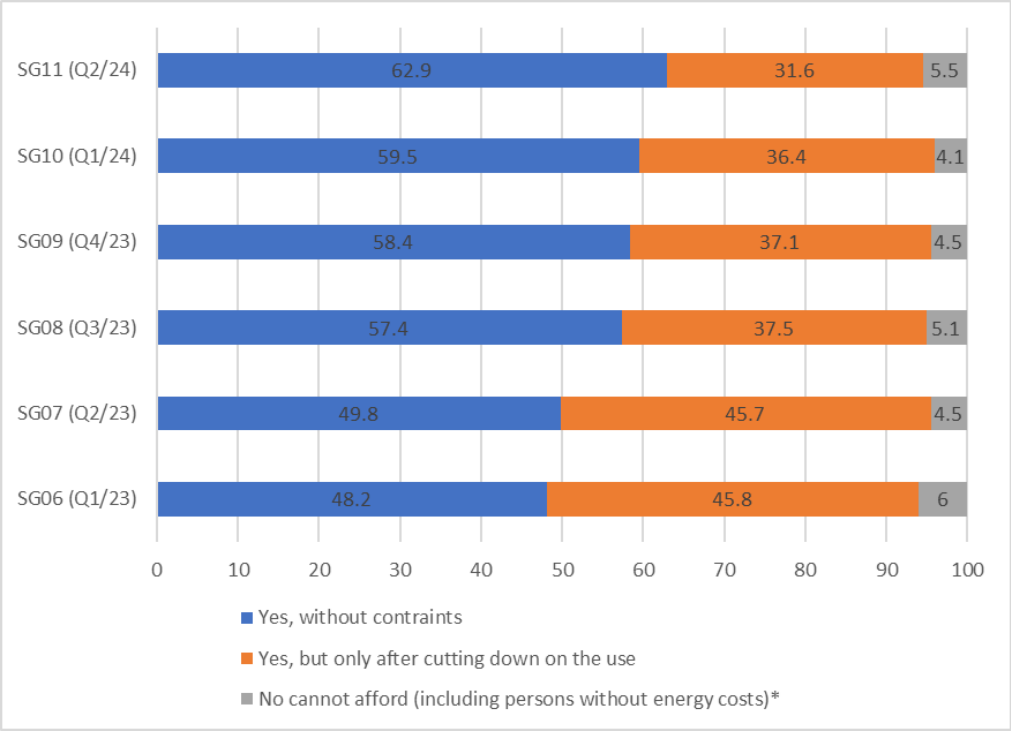
Among other questions on affordability of housing costs and other expenditures the survey asks: *"When you think of all energy your household needs for the use of heating, warm water, cooking, cooling, lights and appliances: Could your household afford the necessary energy in the past quarter?"*

This question was comparably asked from the beginning of 2023 on. According to their own statements, in the first quarter of 2023 below half of the population aged 18 to 74 (48%) could afford the household energy necessary without constraints during the quarter preceding the survey. Nearly as many (46%) could afford their energy costs but with some constraints - they claimed they had already reduced their energy use. 5% said they could not afford the necessary energy and 1% stated they had not had energy costs for the quarter surveyed.

The quarterly trend of this questions (see Figure 3) shows that – for the time being – early 2023 was the peak of the energy costs crisis. In the following quarters the percentage of those who could afford their household energy without cutting down on the use increased and was at 63% in the middle of 2024. At the same time the percentage of persons who reported being able to afford their household energy but only with reduced consumption decreased and was below one third (31%) in the second quarter of 2024. The number of those who stated they could not afford their household energy remained rather stable at around 5%.

[5] Between 2021 and 2023 Austria carried out the project with ten other EU countries and was financially supported by Eurostat and the Ministry of Social Affairs. From 2024, "How we are today" is fully funded by the Ministry of Social Affairs.

Figure 3: Affordability of household energy - first quarter of 2023 to second quarter of 2024 (%)



S: STATISTICS AUSTRIA, Survey of the social consequences of the crisis ("SILCexpress: How we are today"). – Calculated at personal level, persons aged 18 to 74 years. *Only few cases without energy costs, thus they are not shown separately.

4. Conclusions

There are several ways to define energy poverty and several sources of data to be considered. The paper at hand showed some of the current practices followed in Austria and can be seen as a stock-taking exercise. It was made transparent that decisions on indicator definitions and data sources very much affect the reporting of the level of energy poverty and the groups affected. Approaches that try to measure this complex phenomenon where more than one indicator is used seem sensible. Potentially this is at the cost of user friendliness.

Energy efficiency as well as energy poverty are topics currently tackled by legislation and policy initiatives on the European[6] and national level[7]. The term energy efficiency addresses environmental issues, the need to reduce energy consumption, the carbon footprint, environmentally friendly practices and social aspect of energy use. Energy poverty complements these issues with questions of energy costs, relation of income to energy bills, availability and affordability of energy use. From a perspective of social statistics, a high priority should be put on this topic – this includes establishing survey instruments, producing timely, reliable and valid data, working on indicator definitions and comprehensive analysis.

[6] Cf. Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU
Commission Recommendation (EU) 2020/1563 of 14 October 2020 on energy poverty
Directive (EU) 2023/1791 of the European Parliament and of the Council of 13 September 2023 on energy efficiency and amending Regulation (EU) 2023/955
Commission Recommendation (EU) 2023/2407 of 20 October 2023 on energy poverty – see https://eur-lex.europa.eu/ (accessed on 14/10/2024).

[7] An Austrian example would be the Austrian Coordination Office for Combating Energy Poverty https://kea.gv.at/en/ (accessed on 14/10/2024).