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REPORT ON RESEARCH FINDINGS

REGARDING THE ATTITUDE OF THE POPULATION TO NUCLEAR ENERGY

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IS InfoSapiens

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Naturvernforbundet

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October — December 2024

The study of the population's attitudes to nuclear energy has been carried out by Info Sapiens research agency for NGO EcoAction — Center for Environmental Initiatives with the support of Heinrich Boell Foundation, Kyiv office — Ukraine and Friends of the Earth Norway (Naturvernforbundet) — Ukraine — in October — December 2024. The purpose of this study is to obtain objective and balanced data on the attitude of the Ukrainian population towards nuclear energy and its role in the future recovery of Ukraine. In particular, the study aimed to identify the public's attitude towards the government's current plans for new nuclear power units, as well as to assess the level of public awareness about nuclear energy and identify common beliefs, myths, and fears regarding this topic.

The information provided herein is a summary of the sociological study findings and their interpretation in the opinion of the authors, which does not necessarily reflect the official position of Heinrich Boell Foundation, the Government of Germany, or Friends of the Earth Norway.

CONTENT

ABBREVIATIONS

CATI	computer assisted telephone interview, a method of sociological survey
CHNPP	Chornobyl nuclear power plant
CHPP	combined heat and power plant
FGD	focus group discussion
HPP	hydroelectric power plant
IDI	in-depth interview
KHNPP	Khmelnytskyi nuclear power plant
NAS	National academy of sciences
NGO	non-governmental organization
NPP	nuclear power plant
PSYOP	psychological operations; operations intended to instill a certain feeling or idea, particularly in a foreign population; element of hybrid warfare
RES	renewable energy sources
SOE	state-owned enterprise
SPP	solar power plant
TPP	thermal power plant
ZNPP	Zaporizhzhia nuclear power plant

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INTRODUCTION

Since 2022, due to the full-scale Russia invasion, occupation of the Zaporizhzhia NPP, attacks on the energy infrastructure and threats of nuclear incidents, Ukraine's energy security became a critical challenge. One of the key issues the government should focus on is developing a post-war energy strategy that should meet the requirements of security, economic feasibility, and environmental sustainability.

According to government statements, one of the main goals of post-war energy recovery is to expand nuclear generation, in particular through the completion of power units No. 3 and No. 4 at the Khmelnytskyi NPP. To implement this project, Ukraine is planning to use reactor units previously intended for the Bulgarian Belene NPP and produced in Russia. However, this decision is giving rise to significant debate due to economic, technical, and geopolitical risks.

The occupation of the Zaporizhzhia NPP and its use by the Russian military as a tool of blackmail showed the vulnerability of nuclear generation in wartime conditions. Despite claims of NPP safety, public opinion demonstrates a clear concern about the risks of nuclear accidents and the long-term safety of nuclear energy.

Considering these challenges, EcoAction NGO and Heinrich Boell Foundation, Kyiv — Ukraine Bureau initiated a sociological study to identify people's attitudes to nuclear energy, its safety, development prospects and alternative means of formation of a resilient energy system. The study included interviews with experts, focus group discussions, and a quantitative survey (telephone interviews with 1,000 respondents) in various regions of Ukraine, which allowed us to obtain an objective picture of the public's attitude towards the government's plans for nuclear energy.

The EcoAction team analyzed the findings of this study and summarized them in the conclusions to this study. The results of the study may be useful for representatives of national authorities, experts, civil society organizations, and international partners involved in shaping Ukraine's energy policy in order to conduct targeted information campaigns and adopt necessary policy changes. These findings help us to assess the level of support or resistance of the public regarding the construction of KhNPP-3, -4, and the overall understanding of the nuclear sector, with its issues and challenges, by the population of Ukraine overall.

SUMMARY

In Ukraine, nuclear power has always been a contentious subject: it provides stable generation of electricity; yet, it raises concerns due to potential risks. The study conducted by EcoAction NGO has shown that most Ukrainians have a general idea of nuclear energy, but their knowledge often remains quite superficial.

The survey showed that **74% of respondents reported to be familiar with the principles of NPP operation**. However, only 13% feel confident enough in their knowledge to be able to explain it. The other 61% admit that they only know the basics, but are unsure of their accuracy. Interestingly, even among those who reported that they "are well aware of the principles and can explain them to others" regarding nuclear energy overall, only 43% responded correctly to the question about the number of functioning nuclear power plants (in the overall sample, the figure was 29% of respondents). Looking at the indicators of knowledge about various aspects of work of nuclear power, we can conclude that the general knowledge about it forms the knowledge about the impact of nuclear energy on the environment (78% reported to have deeper knowledge than "just the name," and 18% reported to have profound knowledge about this subject).

The results of the study show that nuclear energy is perceived as **useful but dangerous resource**. The greatest concern is the management of radioactive waste — 80% of respondents consider this to be a key problem in nuclear energy. In addition, 76% of those surveyed agree that being near a nuclear power plant is always dangerous, and wartime exacerbates these risks. Similar sentiment was expressed in regard to people's health — 68% believe that residents of satellite towns next to nuclear power plants face additional risks due to the impact of radiation. At the same time, only 46% of Ukrainians are confident that the country has effective solutions for storing and disposing of nuclear fuel. This indicates significant distrust in the state's ability to cope with long-term environmental challenges. Interestingly, young people of ages 18–24 are less likely to perceive nuclear energy as critically dangerous, compared to older respondents.

There is no consensus on the future of nuclear energy in Ukraine. On the one hand, 93% of respondents agree that nuclear power plants allow for the production of large amounts of electricity; however, 69% believe that the construction of new power units is an expensive and complicated process. Disagreements arise over perspectives. For example, 50% of respondents support the statement that nuclear fuel is an inexhaustible resource, while others doubt its long-term availability.

In general, nuclear energy is perceived by respondents as a profitable and strategically important industry, but **its development must rely on minimizing corruption risks, proper environmental protection, and adherence to high safety standard**s. The majority of respondents to the quantitative survey (68%) believe that the construction of new nuclear power plant units should be postponed until the end of the war, when the threat to the physical security of NPPs disappears. However, when it comes to reducing the use of nuclear energy by abandoning the construction of new nuclear power units and gradual closure of existing NPPs, most of the respondents in the quantitative survey (67%) did not support this scenario. As for the gradual replacement of nuclear power with renewable energy sources,

90% of Ukrainians are inclined to believe that it is at least partially possible on the condition of a comprehensive implementation of energy efficiency measures.

Experts are not so unanimous and have different views on the coexistence of nuclear and renewable energy in Ukraine. Some emphasize the equality of all energy sources, while others note that the coexistence of these types of generation is difficult and may require the choice of one dominant direction.

Despite the high level of public interest, the **information vacuum** regarding nuclear energy remains a major problem. When asked directly about the availability of information regarding the potential pathways for the development of nuclear energy in Ukraine, 38% of respondents indicated that certain aspects of this information are available if you know where and how to search for it; a third said that information was limited or completely absent. Notably, only 8% indicated that information was widely available.

However, trust for information sources varies. Ukrainians rely most on independent experts and scientists (46%), while the attitude to official government agencies is more skeptical, with only 29% of respondents believing them to be a reliable energy source when it comes to nuclear energy.

Notably, young people of ages 18–25 are much more inclined to look up information on social media, while older people tend to prefer traditional media and official statements. This indicates a need for modern approaches to communication: to raise awareness and overcome stereotypes about nuclear energy, information must be accessible, open, and understandable for different ages and social groups.

The full-scale war significantly changed attitudes towards nuclear energy. Experts note that people are increasingly skeptical of the transparency of information regarding the state of nuclear power plants, fearing that in the event of an accident or a critical incident, the state may hide the truth.

The occupation of the Zaporizhzhia NPP by Russian troops has exacerbated these fears: respondents express the opinion that nuclear plants can become a tool of blackmail and even a weapon in the hands of the aggressor.

This was one of the key ideas that came up during focus group discussions:

"...now, this nuclear energy is turning into blackmail. Look what is happening at Zaporizhzhia NPP. During the war, we can no longer speak about peaceful nuclear power. It is a time bomb."

METHODOLOGY

The study consisted of two phases, quantitative and qualitative. The phases were carried out sequentially: the qualitative phase preceded the quantitative one.

QUALITATIVE PHASE OF THE STUDY

The qualitative stage consisted of two components: in-depth interviews (IDI) with experts and focus group discussions (FGD) with the population.

In-depth interviews were conducted with experts in the field of nuclear energy, namely, representatives of various non-governmental organizations (NGOs) and companies. A total of 5 IDIs were held. Contacts were partially provided by EcoAction NGO, and other experts were invited to participate in the study based on predetermined criteria. Interviews with experts were carried out one-on-one via Zoom between October 16 and October 23, 2024.

The guide for in-depth interviews was developed by the Info Sapiens research agency in line with the research objectives and approved by EcoAction. The duration of in-depth interviews constituted up to 1 hour. Conversations were recorded with the consent of the respondents.

Number and Distribution of In-Depth Interviews. The authors and initiators of the study are grateful to the experts who took part in in-depth interviews. In total, 5 IDIs were carried out, namely:

No. of the IDI	Name of the expert	Field of activity
1	Stepan Kushnir	Chair of the Board at Khmelnytskyi Energy Cluster NGO
2	Olha Liashchuk	Specialist in adaptation of communities to climate change, project coordinator at EcoClub NGO
3	Olha Kosharna	Co-founder at Anti-Crisis Expert Nuclear Center of Ukraine NGO
4	Oleksandra Zaika	Energy expert, GIZ
5	Anastasiia Vereshchynska	Director of the European Ukrainian Energy Agency

In total, 4 women and 1 man participated in the IDIs. The results of the in-depth interviews were used to form a guide for focus group discussions, particularly in terms of testing myths and prejudices.

Focus group discussions were conducted with representatives from different regions of Ukraine (excluding temporarily non-government controlled territories). Focus groups were also held with respondents of different age groups who reside in different regions of Ukraine in localities of various types (including 3 FGDs conducted in cities located near NPPs). The FGD respondents represented various fields of activity, including: students, teachers, engineers, service workers, etc.

A total of 12 FGDs were conducted, each with 6 participants. Focus group discussions were held on Zoom from October 30 to November 13, 2024.

The guide for the FGDs was developed by the Info Sapiens research agency in line with the research objectives and approved by EcoAction. The duration of each FGD was up to 2 hours. Discussions were recorded with the consent of all participants.

Distribution of focus group discussions:

FGD No.	Region	Geography	Gender and age
1	West	Cities with under 50 thousand residents (Netishyn)*	Men / women 18-25
2	North / Center	Kyiv	Men / women 18-25
3	South / East	Cities with 100–500 thousand residents	Men / women 18-25
4	West	Cities with 50–100 thousand residents	Men / women 26-39
5	North / Center	Cities with 100–500 thousand residents	Men / women 26-39
6	South / East	Cities with over 500 thousand residents (Kharkiv / Dnipro)	Men / women 26-39
7	West	Cities with under 50 thousand residents(Varash*)	Men / women 40-59
8	North / Center	Kyiv	Men / women 40-59
9	South / East	Cities with 50–100 thousand residents	Men / women 40-59
10	West	Cities with over 500 thousand residents (Lviv)	Men / women 60+
11	North / Center	Cities with 50–100 thousand residents	Men / women 60+
12	South / East	Cities with over 500 thousand residents (Zaporizhzhia*)	Men / women 60+

* cities located in the vicinity of nuclear power plants

The results of FGDs were used to form a questionnaire for the quantitative survey, particularly for testing hypotheses.

QUANTITATIVE PHASE OF THE STUDY

The survey was conducted using the computer assisted telephone interviewing method (CATI). The survey covered a wide range of respondents from all regions of Ukraine (excluding temporarily non-government-controlled territories), including cities and rural areas, various age groups from 18 and above, and different socio-economic categories.

The number of the surveyed is 1,004 people.

The survey was conducted from November 27 to December 11, 2024.

The **questionnaire for the quantitative survey** was developed by the Info Sapiens research agency in line with the research objectives and approved by EcoAction.

The survey data were analyzed for statistically significant differences in the distribution of the responses provided by key sociodemographic characteristics. The report includes distribution tables where such differences are highlighted. Statistically significant differences at the 95% level are marked in color:

X%	Significantly less statistically than in the overall sample
Y%	Significantly more statistically than in the overall sample

RESEARCH RESULTS

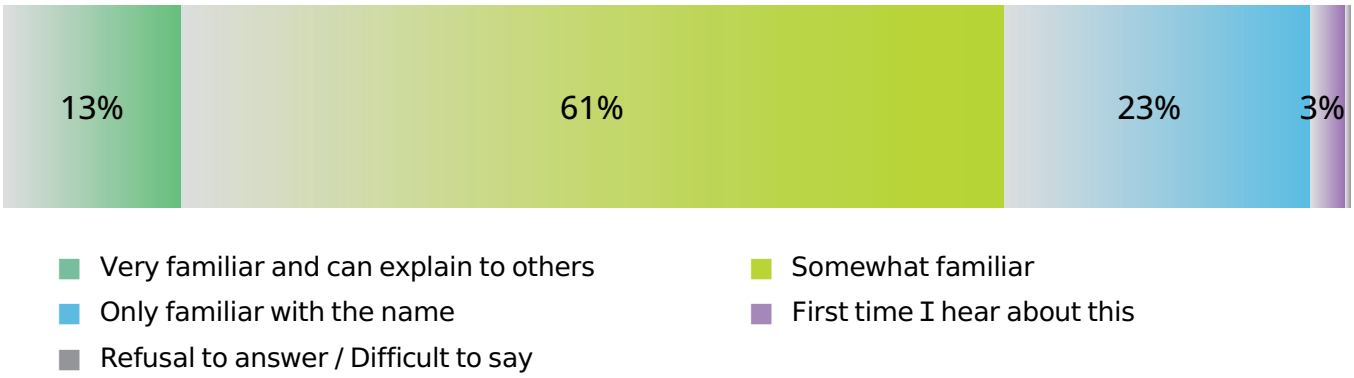
ATTITUDES TO NUCLEAR ENERGY

AWARENESS OF THE BASIC PRINCIPLES AND CERTAIN ASPECTS OF NPP FUNCTIONING

Most respondents (74%) are very familiar or at least partially familiar with the principles of nuclear energy; however, the majority (61%) say they know only parts of it but have doubts about the accuracy of their knowledge. (fig. 1). Almost one in four respondents (23%) only knows the name "nuclear energy." Importantly, 13% have a very good idea of how nuclear energy works and can explain it to others.

Still, it should be kept in mind that this entails claims made by he respondents, and even when they are confident in their knowledge, it may not necessarily be accurate.

Fig. 1. How familiar are you with nuclear energy in general?



No statistically significant differences were found among respondents of different ages, genders, and living in different regions and types of localities.

Results of FGDs about awareness of nuclear energy help to understand what people mean when they claim to have knowledge about nuclear energy. The level of knowledge varies from superficial understanding to more profound interest depending on age and location.

Young people of ages 18–25, mainly from Kyiv and southeastern regions, have only basic ideas about nuclear energy; their knowledge is limited to superficial facts or random basics that they heard by chance.

"Just the basic principles, nothing more."

(FGD, Kyiv, men and women, 18–25)

"something surface level… I know the basics."

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

Respondents aged 26–39 from South / East, cities in the North / Center, and in large cities (over 500,000 residents) often say they never tried to learn more about this issue because they do not feel it directly impacts their life. Some mentioned they learned something from family members or documentaries, but did not go into detail. At the same time, this age group includes those who would like to receive general information without delving into the subject more deeply.

"I've never been particularly interested in this issue; it's not really my field, but, well, yes, somewhere, maybe I just heard something, watched some films when the accident happened, and when they show films about this, you always watch, of course, and there's the sad, sad situation when it's Chornobyl, what happened to Chornobyl."

(FGD, North / Center, cities with 100–500 thousand residents, women and men, 26–39)

"I think so, yes, I was interested at one time, my brother works in energy, so I wondered how this energy is produced in reactors, but, to be honest, I already forgot what he told me, I just know some general things."

(FGD, North / Center, cities with 100–500 thousand residents, women and men, 26–39)

People of ages 40–59 from the Western region and Kyiv demonstrate a higher level of awareness, which is often linked to personal or professional contacts in this sphere. Some respondents expressed the opinion that nuclear energy is a complex topic that should remain within the purview of narrow specialists. At the same time, some even have an idea of the situation in other countries, such as Germany or France.

"I do have that knowledge. I even think it's above average, because I was interested in these things, and I know what, for example, is being done in other countries, and what the situations are, for example, in Germany, in France."

(FGD, West, Varash, men and women, 40–59)

"I wouldn't say I am very interested in our nuclear power plant. I mean, I have read some general information for myself, and it's enough for me. Maybe if I were an employee there or if my husband were one, I might be more interested."

(FGD, West, Varash, men and women, 40–59)

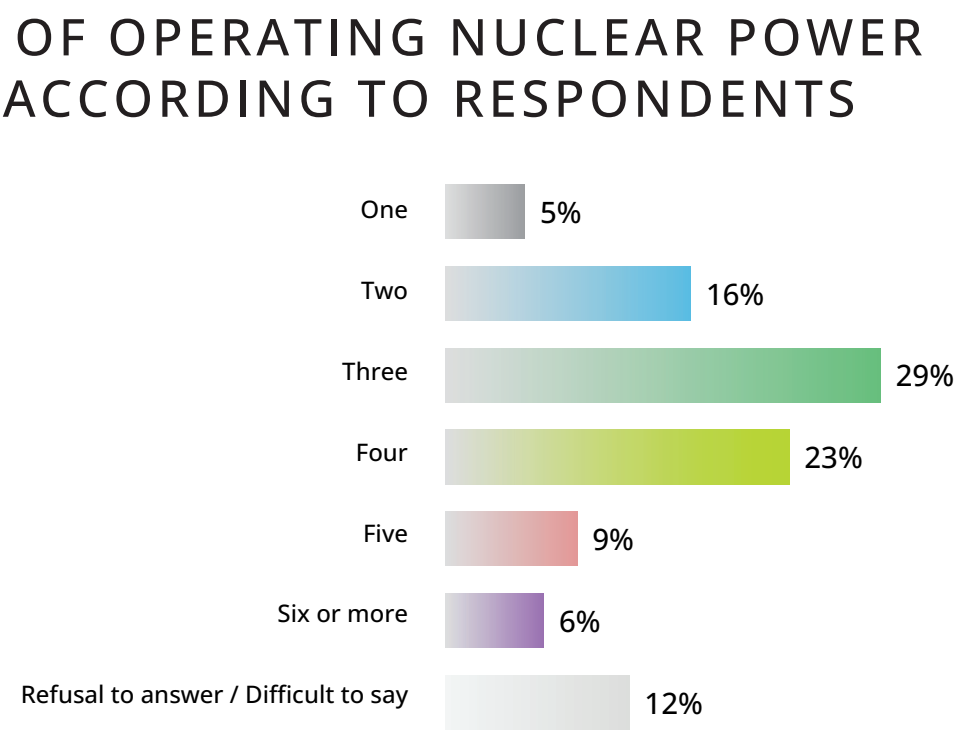
"…just not something I need. Let experts deal with this — narrow specialists, physicists. The problem is that there are fewer and fewer physicists because fewer children enroll in this specialty — that's a problem indeed. So I think it is necessary… Let the specialists handle it. I personally don't need it."

(FGD, Kyiv, men and women, 40–59)

When asked about the number of currently operating nuclear power plants, 29% answered correctly, “three.” Other answers ranged from one to six or more nuclear power plants, which is incorrect (Fig. 2).

This question can serve as a certain “test” of the aforementioned level of knowledge. Interestingly, among those who reported that they “are very familiar with the principles and can explain them to others” regarding nuclear energy overall, only 43% responded correctly to the question about the number of functioning nuclear power plants.

Fig. 2. How many nuclear power plants do you believe are currently operating in Ukraine?



The level of knowledge among respondents does not differ by age in a statistically significant way. Rural residents generally indicated the correct response less frequently than others (22% vs. 29% in the sample overall).

Regarding the knowledge about certain aspects of nuclear energy functioning, 18% (and this is the highest score among other aspects of knowledge) are “well aware” of the impact of nuclear power on the environment. This is followed by decreasing numbers, as shown in Fig. 3.

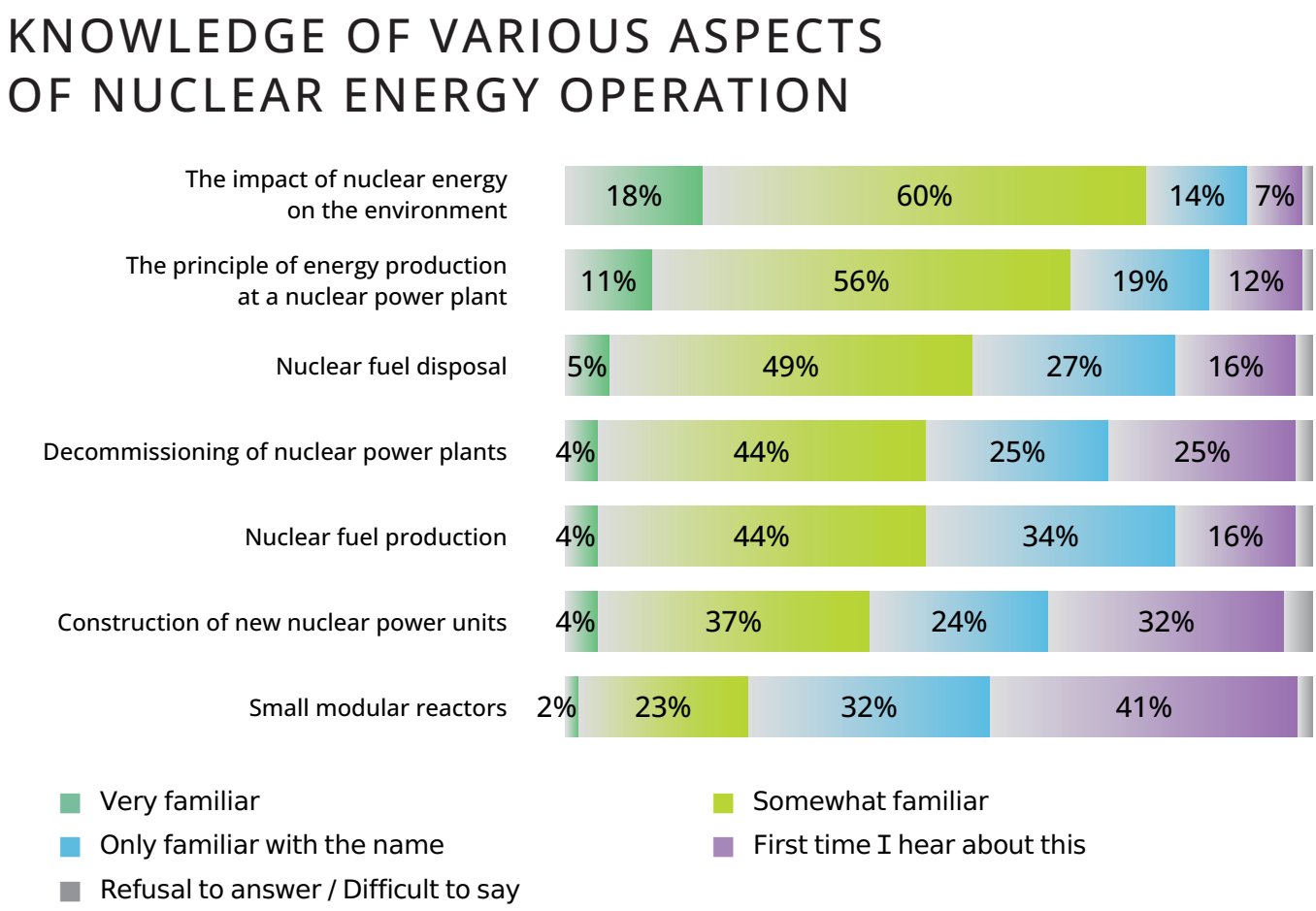
92% are “very well aware,” “somewhat aware” or “aware only of the concept” of the impact of nuclear energy on the environment, out of them most (78%) know more than “only the concept.” That is, it is knowledge about the impact on the environment that largely shapes general knowledge about nuclear energy.

Knowledge about the principles of energy production at a nuclear power plant ranks second. Overall, 86% are familiar with them or heard at least something, of them 11% are “very familiar,” and 67% know more than just the concept.

Respondents were much less familiar with other aspects, even if the knowledge in question is self-reported.

The ranking of familiarity wraps up with small modular reactors (41% heard about them for the first time, while 32% at least know the name). The issue of building new nuclear units is unfamiliar to 32%, decommissioning of nuclear power plants — 25%, production of nuclear fuel — 16%, etc. (Fig. 3).

Fig. 3. How familiar are you with the following principles of operation of nuclear energy?



The results of focus group discussions illustrate that respondents' opinions regarding the importance of knowledge about nuclear energy vary, but overall, most recognize the need for more profound knowledge in this sphere for a broader understanding of its significance. The main driver of the desire to improve awareness is safety issues. For instance, young people from southeastern regions indicate that most of the population perceives accidents at nuclear power plants to be as destructive as a nuclear strike and believes that people should be more aware of the real consequences of such events.

"Most of our population believe that an accident or an explosion at a nuclear power plant has the same destructive power as, say, a nuclear strike, a nuclear bomb. I believe that the majority of the population should be aware of this, like, even these threats about the nuclear power plant in Enerhodar. They may cause pollution, but it wouldn't be this… well, major destruction from an explosion."

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

Adult respondents from the Western region, in particular the city of Varash, emphasize the importance of understanding technological processes in nuclear energy, including robotization of operations, fuel handling, its disposal, and plant protection. They believe that this knowledge would help to understand the safety of nuclear energy. This profound awareness of the subject is likely related to the proximity of the Rivne NPP.

"...the energy industry in our society today is too large, too broad, so everyone should know it at least superficially. Technological production process. How fuel is loaded into fuel rods robotically is, well, also very interesting. And we need to know that it's not the workers, it's not the people who are doing it, it's the robots that are doing it. And, again, fuel disposal. How it is buried, where it is buried."

(FGD, West, Varash, men and women, 40–59)

"Today, given the electricity shortages in Ukraine as a whole and, again, the challenges of wartime and the destruction of this infrastructure. This at least makes sense, and people need to understand and have information on what is planned, what projects — and where — are developed in terms of construction, reconstruction, modernization of existing units or construction of new power units."

(FGD, West, Varash, men and women, 40–59)

Older respondents emphasize that it is important to inform citizens about extraction, fuel enrichment, and the system of protection of nuclear power plants, particularly that they are guarded by the security service. At the same time, there is an opinion that people need to understand the plans of modernizing and constructing new power units, especially in the during an energy crisis and wartime challenges.

"...from extraction, how it is extracted and how it is enriched, whether there is a 1st, 2nd, 3rd stage centrifuge there. What can be found there, based on what principles a nuclear power plant operates. 1st, 2nd, 3rd circuit. What kind of protections it has against overloads etc. What territorial protection is there for communities, that there are ditches with water, live wires. All the way up to the fact that the Security Service of Ukraine guards all these stations."

(FGD, West, cities with over 500 thousand residents, men and women, 60+)

The results of the quantitative survey indicate that young people of ages 18–24 and partly those aged 25–34 are best informed about most of the principles of nuclear energy. However, their knowledge is often limited to the levels of "somewhat familiar" or "only familiar with the name" (Table 1). In matters of construction of new nuclear units, respondents aged 55–65 and older (47%) tend to demonstrate better knowledge.

Table 1. How familiar are you with the following principles of operation of nuclear energy? [by age and size of locality]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
The impact of nuclear energy on the environment												
Very familiar	18%	9%	20%	22%	19%	19%	16%	16%	16%	23%	22%	19%
Somewhat familiar	60%	77%	51%	56%	61%	62%	61%	55%	62%	64%	59%	64%
Only familiar with the name	14%	8%	20%	13%	13%	12%	14%	16%	15%	9%	13%	11%
First time I hear about this	7%	6%	9%	8%	5%	6%	8%	11%	6%	4%	5%	5%
Refusal to answer / Difficult to say	1%	0%	1%	1%	2%	2%	1%	1%	2%	0%	1%	2%
The principle of energy production at a nuclear power plant												
Very familiar	11%	11%	14%	13%	12%	12%	7%	9%	11%	6%	17%	13%
Somewhat familiar	56%	51%	55%	57%	54%	57%	60%	54%	57%	68%	56%	56%
Only familiar with the name	19%	29%	16%	16%	21%	17%	20%	20%	21%	14%	15%	19%
First time I hear about this	12%	8%	14%	12%	11%	13%	13%	16%	11%	10%	11%	10%
Refusal to answer / Difficult to say	1%	0%	1%	2%	2%	2%	1%	1%	1%	3%	1%	2%
Nuclear fuel disposal												
Very familiar	5%	5%	6%	6%	5%	7%	3%	3%	6%	6%	6%	7%
Somewhat familiar	49%	42%	37%	44%	54%	57%	57%	44%	51%	58%	49%	53%
Only familiar with the name	27%	39%	38%	28%	22%	17%	25%	28%	25%	27%	31%	25%
First time I hear about this	16%	13%	18%	19%	16%	17%	13%	23%	15%	7%	13%	13%
Refusal to answer / Difficult to say	2%	0%	1%	2%	4%	2%	2%	2%	3%	2%	1%	2%
Decommissioning of nuclear power plants												
Very familiar	4%	3%	5%	4%	6%	5%	3%	3%	4%	6%	5%	6%
Somewhat familiar	44%	52%	33%	43%	38%	51%	49%	41%	45%	43%	48%	44%
Only familiar with the name	25%	21%	32%	27%	24%	18%	24%	22%	24%	29%	23%	29%
First time I hear about this	25%	23%	29%	23%	30%	23%	21%	31%	26%	19%	22%	19%
Refusal to answer / Difficult to say	2%	0%	1%	3%	2%	2%	3%	3%	2%	3%	2%	2%
Nuclear fuel production												
Very familiar	4%	1%	8%	3%	3%	7%	1%	2%	4%	3%	6%	6%
Somewhat familiar	44%	46%	29%	44%	46%	50%	48%	40%	45%	44%	42%	48%
Only familiar with the name	34%	32%	44%	34%	31%	29%	35%	36%	32%	40%	34%	33%
First time I hear about this	16%	21%	18%	17%	17%	12%	14%	20%	18%	11%	15%	11%
Refusal to answer / Difficult to say	2%	0%	1%	1%	3%	2%	2%	2%	2%	2%	2%	2%

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
Construction of new nuclear power units												
Very familiar	4%	1%	5%	3%	3%	4%	3%	3%	4%	4%	3%	3%
Somewhat familiar	37%	23%	28%	32%	35%	47%	47%	33%	33%	37%	43%	42%
Only familiar with the name	24%	33%	31%	25%	22%	21%	20%	24%	27%	29%	26%	20%
First time I hear about this	32%	41%	32%	36%	35%	25%	27%	38%	33%	25%	23%	30%
Refusal to answer / Difficult to say	3%	1%	3%	3%	4%	3%	4%	2%	3%	5%	5%	5%
Small modular reactors												
Very familiar	2%	0%	3%	2%	0%	2%	1%	1%	2%	3%	2%	2%
Somewhat familiar	23%	18%	19%	21%	25%	25%	28%	23%	20%	25%	27%	22%
Only familiar with the name	32%	40%	33%	33%	27%	35%	31%	32%	34%	26%	29%	35%
First time I hear about this	41%	42%	44%	43%	45%	36%	38%	43%	43%	44%	40%	38%
Refusal to answer / Difficult to say	2%	0%	1%	1%	3%	1%	2%	1%	1%	2%	3%	2%

RISKS AND BENEFITS OF NUCLEAR ENERGY

During the qualitative stage, a certain list of hypotheses regarding the risks and benefits of nuclear energy was formed. These hypotheses were phrased in the form of statements, with respect to which respondents of the quantitative survey were asked to express their attitude by identifying their degree of agreement / disagreement on a 4-point scale from "completely agree" to "completely disagree."

PARTICIPANTS IN THE QUANTITATIVE SURVEY RATED THE FOLLOWING LIST OF STATEMENTS:

- An exclusion zone is formed around nuclear power plants, where flora and fauna change under the influence of the NPP.
- Those who live near NPPs or service them face additional risks associated with radiation exposure.
- It was dangerous to be near an NPP even during peacetime, and it has become even more dangerous during wartime.
- The risks of nuclear energy outweigh its benefits to the environment and society.
- The safety of nuclear power plants in Ukraine meets international standards.
- Radioactive waste management is one of the most important challenges for the nuclear energy industry.
- Disposal of radioactive waste poses a threat to people and the environment.
- In Ukraine, there are solutions for storing and disposing of spent nuclear fuel.

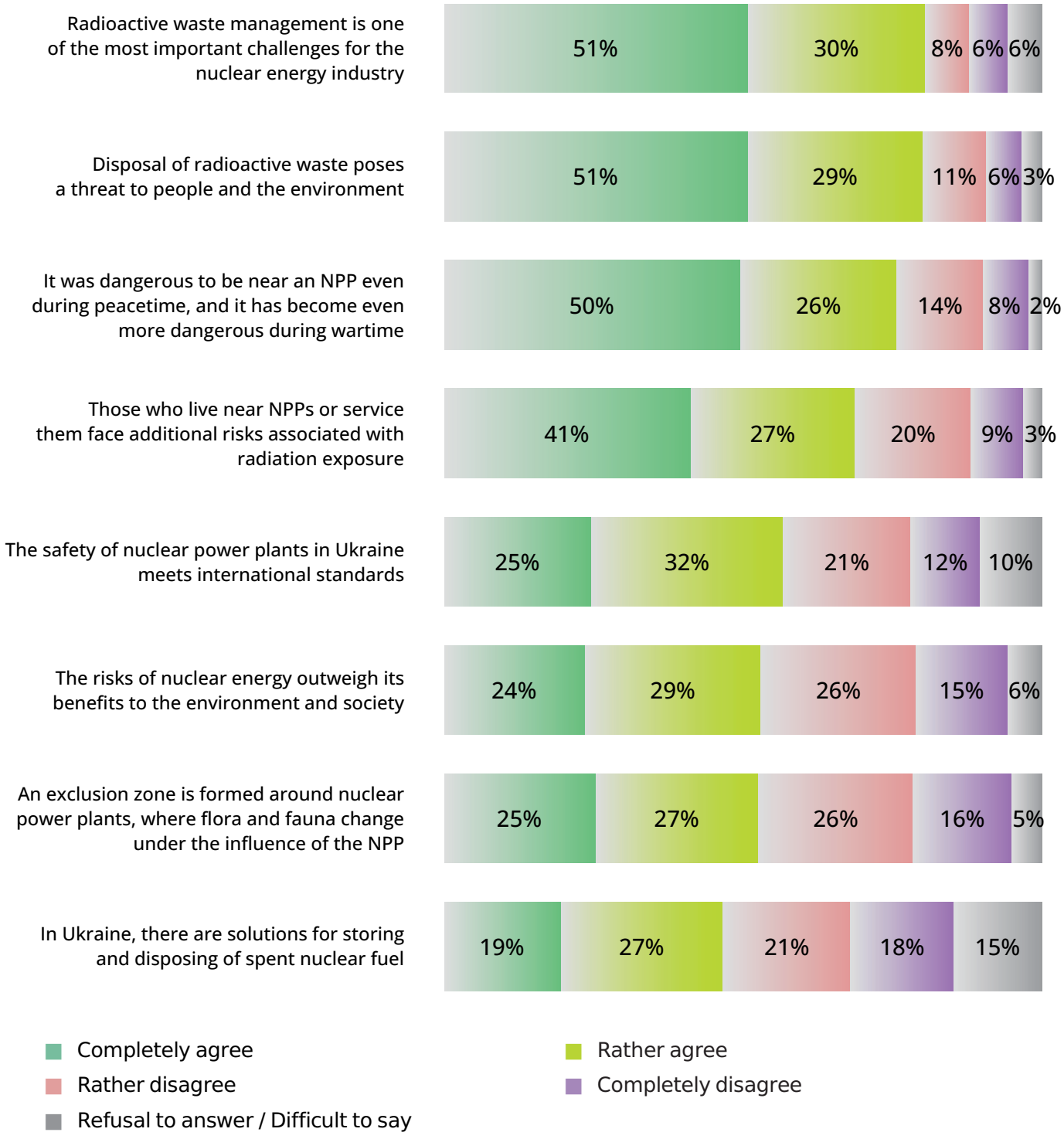
The following statements had the greatest support from respondents: "***Radioactive waste management is one of the most important challenges for the nuclear energy industry***," "***Disposal of radioactive waste poses a threat to people and the environment***," and "***It was dangerous to be near an NPP even during peacetime, and it has become even more dangerous during wartime***"— 76%–80% of the surveyed agree with them (Fig. 4).

Somewhat fewer respondents (68%) agree that "***Those who live near NPPs or service them face additional risks associated with radiation exposure***."

The lowest level of agreement (46%) was shown in relation to the statement "***In Ukraine, there are solutions for storing and disposing of spent nuclear fuel***."

Fig. 4. How much do you agree with the following statements regarding the risks and benefits of nuclear energy?

THE POPULATION'S ATTITUDES TO RISKS AND BENEFITS OF NUCLEAR ENERGY



Experts believe that the war significantly affected the perception of nuclear energy and safety. In particular, some experts point out that people tend to have lower trust in the level of information transparency: people are wary that in the event of a nuclear incident the state may hide information from people.

Other experts emphasize that the presence of Russian military personnel on the territory of the Zaporizhzhia NPP, the use of the station as a military base, and uncontrolled actions of the military on the premises only exacerbate these fears.

"The most common belief is that if an accident happens, we won't know. That is, people believe that if some nuclear emergency occurs, God forbid, or something like that, this will not be reported by official sources. To put it bluntly, the state will make every effort to eliminate such content."

(IDI with experts)

"The war affected the perception of security, regarding the Zaporizhzhia NPP, for example. Because the Russian military is there and they have turned the ZNPP into a military base, and the military moves around in any premises there."

(IDI with experts)

The quantitative survey recorded certain differences in the distribution of responses by age.

In particular, young people of ages 18–24 tend to agree less (a higher proportion of responses "more likely to agree" than "completely agree") with such statements (Table 2):

- Radioactive waste management is one of the most important challenges for the nuclear energy industry.
- Disposal of radioactive waste poses a threat to people and the environment.
- In Ukraine, there are solutions for storing and disposing of spent nuclear fuel.

Respondents aged 45–54 are more likely than the sample as a whole to disagree with the following statements:

- Radioactive waste management is one of the most important challenges for the nuclear energy industry.
- It was dangerous to be near an NPP even during peacetime, and it has become even more dangerous during wartime.
- An exclusion zone is formed around nuclear power plants, where flora and fauna change under the influence of the NPP.

Table 2. How much do you agree with the following statements regarding the risks and benefits of nuclear energy? [by age and size of locality]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
Radioactive waste management is one of the most important challenges for the nuclear energy industry												
Completely agree	51%	45%	55%	53%	56%	50%	43%	47%	50%	59%	50%	55%
Rather agree	30%	46%	36%	31%	22%	25%	26%	30%	30%	29%	30%	28%
Rather disagree	8%	5%	3%	8%	7%	9%	12%	8%	7%	3%	8%	9%
Completely disagree	6%	3%	1%	2%	10%	9%	8%	8%	7%	2%	5%	4%
Refusal to answer / Difficult to say	6%	1%	4%	5%	5%	6%	11%	7%	6%	6%	7%	4%
Disposal of radioactive waste poses a threat to people and the environment												
Completely agree	51%	32%	46%	52%	53%	57%	52%	55%	53%	52%	45%	45%
Rather agree	29%	45%	36%	30%	29%	22%	24%	29%	28%	26%	33%	29%
Rather disagree	11%	16%	9%	11%	9%	11%	9%	7%	10%	12%	13%	14%
Completely disagree	6%	4%	4%	4%	7%	6%	10%	7%	6%	9%	6%	5%
Refusal to answer / Difficult to say	3%	2%	4%	3%	3%	5%	4%	2%	4%	1%	2%	6%
It was dangerous to be near an NPP even during peacetime, and it has become even more dangerous during wartime												
Completely agree	50%	56%	41%	44%	44%	52%	63%	59%	50%	57%	46%	37%
Rather agree	26%	26%	30%	28%	24%	27%	22%	23%	27%	22%	31%	28%
Rather disagree	14%	14%	12%	19%	21%	13%	9%	11%	13%	12%	14%	22%
Completely disagree	8%	4%	15%	7%	9%	5%	4%	5%	9%	7%	8%	10%
Refusal to answer / Difficult to say	2%	0%	2%	2%	2%	4%	3%	3%	2%	2%	2%	3%
Those who live near NPPs or service them face additional risks associated with radiation exposure												
Completely agree	41%	38%	38%	37%	40%	43%	50%	47%	41%	49%	38%	33%
Rather agree	27%	31%	29%	30%	26%	24%	26%	31%	27%	24%	28%	23%
Rather disagree	20%	21%	22%	23%	20%	19%	14%	13%	19%	17%	20%	30%
Completely disagree	9%	9%	9%	7%	13%	11%	6%	7%	9%	11%	12%	9%
Refusal to answer / Difficult to say	3%	0%	3%	3%	2%	4%	4%	2%	3%	0%	2%	5%
The safety of nuclear power plants in Ukraine meets international standards												
Completely agree	25%	26%	18%	21%	23%	31%	29%	26%	27%	15%	24%	23%
Rather agree	32%	32%	35%	31%	30%	31%	33%	31%	30%	31%	37%	33%
Rather disagree	21%	25%	23%	26%	17%	18%	19%	21%	24%	26%	19%	19%
Completely disagree	12%	5%	17%	12%	16%	12%	6%	14%	10%	18%	12%	10%
Refusal to answer / Difficult to say	10%	12%	6%	9%	14%	8%	13%	9%	10%	10%	8%	14%

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
The risks of nuclear energy outweigh its benefits to the environment and society												
Completely agree	24%	25%	19%	22%	25%	26%	25%	32%	19%	27%	22%	16%
Rather agree	29%	22%	32%	29%	23%	33%	34%	34%	27%	24%	30%	27%
Rather disagree	26%	34%	25%	28%	27%	23%	23%	19%	31%	25%	29%	29%
Completely disagree	15%	14%	21%	14%	21%	13%	9%	10%	16%	23%	16%	20%
Refusal to answer / Difficult to say	6%	5%	4%	7%	5%	5%	8%	5%	7%	2%	4%	8%
An exclusion zone is formed around nuclear power plants, where flora and fauna change under the influence of the NPP												
Completely agree	25%	14%	22%	22%	25%	30%	32%	30%	27%	25%	26%	17%
Rather agree	27%	32%	24%	25%	26%	25%	32%	30%	29%	20%	27%	24%
Rather disagree	26%	37%	28%	31%	22%	26%	19%	21%	24%	28%	26%	33%
Completely disagree	16%	10%	23%	15%	23%	17%	8%	12%	15%	21%	19%	21%
Refusal to answer / Difficult to say	5%	6%	4%	6%	4%	3%	9%	7%	5%	5%	2%	5%
In Ukraine, there are solutions for storing and disposing of spent nuclear fuel												
Completely agree	19%	19%	17%	14%	19%	25%	22%	19%	20%	19%	19%	19%
Rather agree	27%	38%	34%	28%	24%	26%	21%	29%	26%	29%	29%	25%
Rather disagree	21%	20%	20%	29%	21%	15%	21%	23%	24%	16%	17%	20%
Completely disagree	18%	8%	14%	16%	20%	21%	21%	17%	14%	29%	19%	17%
Refusal to answer / Difficult to say	15%	16%	15%	14%	16%	13%	15%	12%	17%	7%	16%	19%

The results of focus group discussions indicate that respondents of different ages and from different regions of Ukraine express mixed views on nuclear energy, in particular its environmental friendliness, safety, and challenges associated with radioactive waste.

Youth from the Western regions and South / East emphasize the environmental threats associated with the disposal of radioactive waste. For example, respondents from cities with a population of 100,000–500,000 noted that the lack of effective waste disposal methods remains a serious problem. Western youth are also paying attention to the risks of radiation entering the soil, which affects the ecosystem.

"...the proper storage of this waste, and it is very harmful, and if it is stored incorrectly, we basically end up burying this waste in the ground, and it will then affect the planet."

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

"This is very harmful to the environment. And from nuclear power, it's just radioactive waste, which... We don't really have any ways to dispose of it, except to just cover it in concrete and dump it somewhere, which, well, isn't very cool."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"We have lived next to a power plant our whole life, so for us the attitude has not changed. That is, a feeling of some kind of danger, or rather, that something could go wrong and something could explode, and so on. It has always been there."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"…about radioactive waste. And in my opinion, this is one of the main threats. And, actually, when we talk about environmental friendliness, then perhaps there are some new approaches to the disposal of this waste. That is, it is important to move in this direction. Because, well, for me, if in the context of this area, this is the biggest threat… there is a barrel of radioactive waste. You hit it, or somebody hits it. It falls. It gets absorbed into the soil, and this affects the fertility of land."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

Participants from Kyiv and South / East emphasize the risks associated with the war. In particular, there is an opinion that nuclear power plants are becoming objects of blackmail and a potential threat due to their strategic importance. Young people from Kyiv emphasize that automation of nuclear plants can reduce risks, but possible hacker attacks or failures remain a threat.

"I heard about the Chornobyl story that it was a human factor, that there was an overload somewhere. So there is this factor, but for example, if in the future it is less reliant on people and more automated, this automation can glitch or be hacked."

(FGD, Kyiv, men and women, 18–25)

"…a lot of money and, of course, it is very dangerous. All these isotopes left over from the Chornobyl accident, strontium and cesium, are still there and lying in the surrounding forests."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

"There is no destruction itself, what is happening is the pollution of this territory, the pollution of the environment, the pollution of the biosphere, the soil, that is, everything that can be polluted. And that's why this blackmail exists, and it's more dangerous, I would say. Because the plant, the NPP, located in Enerhodar, it's located on the Dnieper River, and the Dnieper flows directly into the Black Sea, so the consequences will be massive.

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

"There is radiation, of course there is. And this is all now, since the Chornobyl explosion, that red forest also, I mean, it absorbed a lot of radiation. And that area that is polluted is also uninhabitable. And all of that too, there are many more such factors and people that NPPs should be closed down, that their existence on earth should be terminated because they harm the environment, the people, and we should get rid of them."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

Mentions of the Chornobyl disaster are common among all age groups, but older respondents tend to express concerns over possible accidents more frequently. They also criticize the failure to effectively dispose of nuclear waste and warn of the long-term effects of radiation.

"…in our endemic area, in Lviv oblast, there is no iodine in the environment because it was replaced with the radioactive variety. That is, we don't have it. Our thyroid gland is suffering the most."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

"…that before animals and humans were born after the Chornobyl NPP disaster with, like, five arms, say, with four legs. As for me, to be honest, I don't believe it unless I see it."

(FGD, South / East, cities with over 500 thousand residents, men and women, 26–39)

Middle-aged and older respondents note the advantages of nuclear energy compared to other types, such as CHP or hydropower. In particular, they note its economic advantages, environmental friendliness, and stability in any weather.

"No harmful emissions. Well, it's already been mentioned that it's not cheap at all. Well, I think the fact that it's environmentally friendly, with no emissions, is a very big plus."

(FGD, North / Center, cities with 100–500 thousand residents, women and men, 26–39)

"I want to say that a nuclear power plant is more environmentally safe than all those CHPP, hydroelectric power plants. Because they… Well, we know that, let it be, our power plant is powered by uranium. But how much coal, how much fuel oil we have to burn at those CHPPs, hydroelectric power plants, how much they pollute our environment which is already polluted anyway."

(FGD, West, Varash, men and women, 40–59)

"…environmental considerations, cheaper energy — that's why nuclear plants are built. On the other hand, there's danger, of course. This is a very big danger. France is phasing out nuclear energy, so is Germany. Would we assume there are stupid people making those decisions? They are phasing it out. Precisely because it's dangerous."

(FGD, Kyiv, men and women, 40–59)

"Compared to hydroelectric power and electric energy, nuclear power has advantages, major advantages. One shortcoming, I believe, is that they invented how to split an atom but did not figure out how to tame it. In cases like accidents and natural disasters and things like that. But indeed, if there is no disaster, there are fewer expenses, and the energy is cheaper."

(FGD, North / Center, cities with 50–100 thousand residents, women and men, 60+)

Older FGD participants (over 40 and over 60) emphasize that nuclear energy during wartime turns into a tool of blackmail. They find the situation at the Zaporizhzhia NPP of particular concern.

"…war is, in any case, the most important fear associated with nuclear energy. As for nuclear energy per se, it's just the radiation. But when it comes to the war, in Ukraine as well, this is all added to radiation."

(FGD, South / East, cities with over 500 thousand residents, women and men, 26–39)

"Because now this nuclear energy turns into blackmail. Look what is happening at the Zaporizhzhia NPP. During the war, we can apparently no longer speak about peaceful nuclear power. [It is] a time bomb."

(FGD, North / Center, cities with 50–100 thousand residents, women and men, 60+)

"Well, Russian troops do not necessarily try to destroy them, but they try to take over a hydroelectric power plant or a combined heat and power plant, they just allow this. They can be equally careless with nuclear stuff."

(FGD, West, Varash, men and women, 40–59)

Experts, however, note that while nuclear energy does not use fossil fuels for generation, it still has a significant environmental impact due to environmentally harmful construction stages, commissioning, extraction of uranium, and its processing. Communities located near uranium mines, such as in the Kirovohrad oblast, are particularly affected.

"…in the process of generation, they don't burn fossil fuels, coal, gas, oil, but during construction and commissioning, of course, all these works produce a major environmental harm, as well as uranium mining for the functioning of nuclear power units; these are also factors that need to be taken into account in the context of the environment. This is experienced only by localities that are close to these mines. That is, they are located in the Kirovohrad oblast, and those communities really say how the environmental situation there is far from great."

(IDI with experts)

"We do have examples in the contemporary world, we had Chornobyl, Fukushima, when such man-made disasters caused major harm to the environment. We now have, say, a 30-kilometer exclusion zone around the Chornobyl NPP, where you cannot do anything anymore, where you cannot plan any life. The situation with Fukushima required major funds later to handle the consequences. Therefore, in my opinion, these projects carry great risks for the environment."

(IDI with experts)

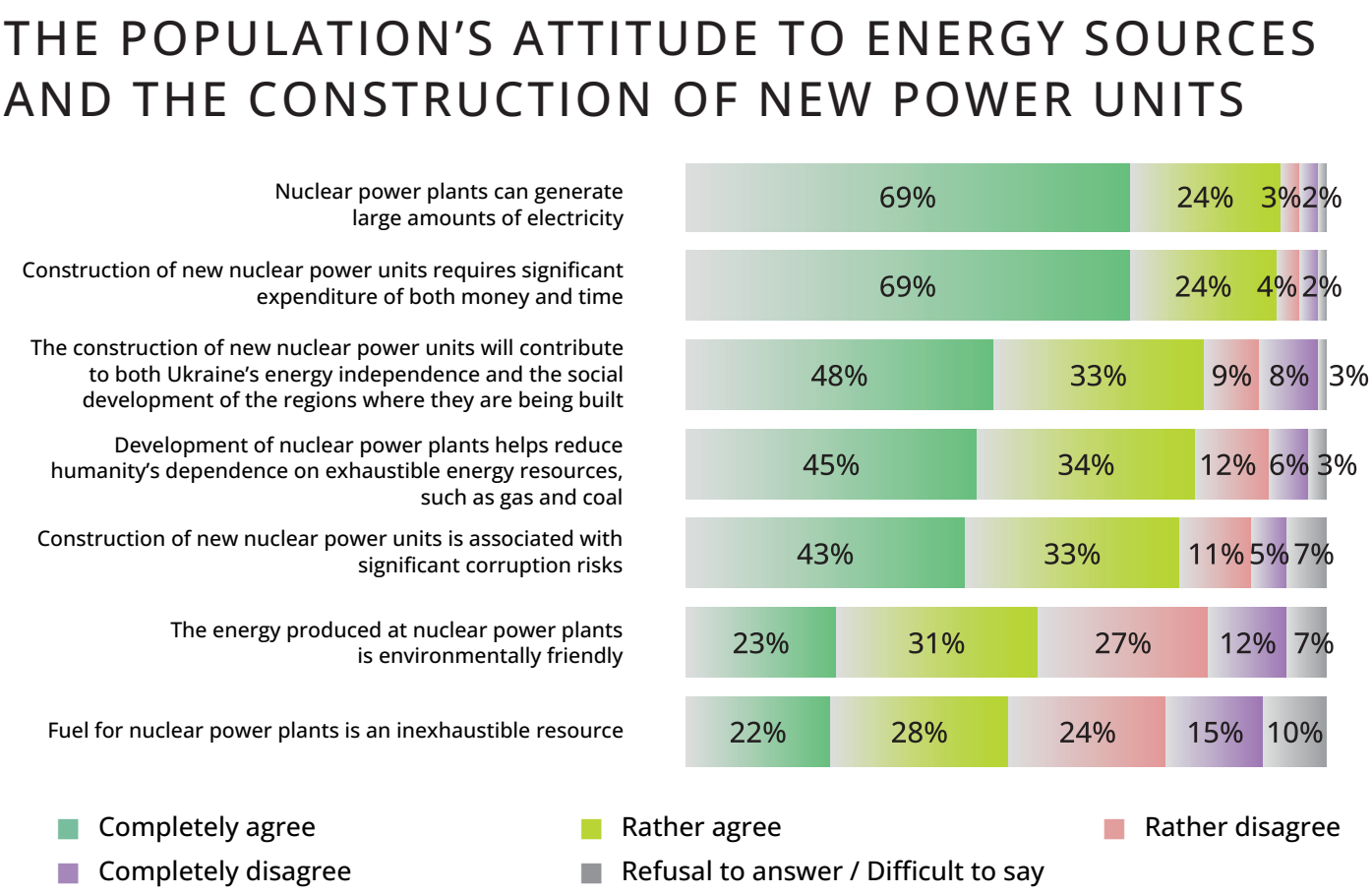
ENERGY SOURCES FOR NPPS AND CONSTRUCTION OF NEW POWER UNITS

In addition, during the qualitative phase of the research, we formed a list of statements related to the attitude to energy sources and construction of new power units. Respondents were asked to identify their degree of agreement / disagreement on a 4-point scale from "completely agree" to "completely disagree."

- Nuclear power plants can generate large amounts of electricity.
- Fuel for nuclear power plants is an inexhaustible resource.
- Development of nuclear power plants helps reduce humanity's dependence on exhaustible energy resources, such as gas and coal.
- Construction of new nuclear power units is associated with significant corruption risks.
- Construction of new nuclear power units requires significant expenditure of both money and time.
- The construction of new nuclear power units will contribute to both Ukraine's energy independence and the social development of the regions where they are being built.
- The energy produced at nuclear power plants is environmentally friendly.

The most supported statements included "***Nuclear power plants can generate large amounts of electricity***" and "***Construction of new nuclear power units requires significant expenditure of both money and time***," with 93% of respondents agreeing with them (Fig. 5). The least supported statement (50%) was "***Fuel for nuclear power plants is an inexhaustible resource***."

Fig. 5. How much do you agree with the following statements regarding the energy sources and construction of new power units?



The quantitative survey found a statistically significant difference in the distribution of responses by age. Namely, young people of ages 18–24 and 25–34 are not confident that the construction of new power units at NPPs is associated with major corruption risks, though they do "rather agree" with this statement (47% and 43% respectively for the two age groups vs. 33% in the total sample) (Table 3). Young people are also more likely to disagree that energy produced at nuclear power plants is environmentally friendly (49% and 37%, respectively, compared to 27% in the sample as a whole).

No statistically significant difference was found in the distribution of responses by the size of locality where the respondents reside.

Table 3. How much do you agree with the following statements regarding the energy sources and construction of new power units? [by age and size of locality]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
Nuclear power plants can generate large amounts of electricity												
Completely agree	69%	72%	70%	65%	74%	75%	60%	64%	70%	70%	69%	74%
Rather agree	24%	22%	24%	28%	20%	19%	27%	26%	22%	29%	25%	20%
Rather disagree	3%	5%	2%	2%	1%	2%	5%	4%	3%	0%	2%	3%
Completely disagree	2%	1%	1%	1%	3%	1%	3%	2%	1%	0%	2%	1%
Refusal to answer / Difficult to say	3%	0%	2%	3%	2%	3%	4%	4%	3%	2%	3%	2%
Construction of new nuclear power units requires significant expenditure of both money and time												
Completely agree	69%	77%	63%	71%	68%	74%	63%	67%	68%	66%	70%	72%
Rather agree	24%	21%	31%	26%	21%	14%	26%	25%	22%	25%	25%	21%
Rather disagree	4%	1%	4%	1%	6%	5%	4%	3%	6%	4%	3%	3%
Completely disagree	2%	0%	1%	1%	4%	4%	4%	4%	3%	3%	2%	1%
Refusal to answer / Difficult to say	2%	0%	2%	1%	1%	3%	3%	2%	2%	2%	0%	3%
The construction of new nuclear power units will contribute to both Ukraine's energy independence and the social development of the regions where they are being built												
Completely agree	48%	53%	46%	41%	48%	54%	47%	47%	46%	46%	50%	48%
Rather agree	33%	38%	37%	37%	29%	27%	31%	31%	35%	36%	31%	35%
Rather disagree	9%	5%	9%	11%	9%	9%	8%	10%	9%	7%	10%	7%
Completely disagree	8%	4%	6%	8%	12%	6%	10%	9%	9%	11%	8%	6%
Refusal to answer / Difficult to say	3%	0%	2%	3%	2%	3%	4%	4%	1%	0%	2%	4%
Development of nuclear power plants helps reduce humanity's dependence on exhaustible energy resources, such as gas and coal												
Completely agree	45%	42%	36%	39%	47%	57%	49%	40%	47%	43%	47%	49%
Rather agree	34%	44%	42%	34%	30%	27%	32%	36%	31%	41%	34%	32%
Rather disagree	12%	8%	14%	18%	11%	7%	8%	11%	14%	11%	11%	10%
Completely disagree	6%	5%	5%	5%	11%	6%	4%	8%	5%	0%	7%	5%
Refusal to answer / Difficult to say	3%	1%	3%	2%	1%	3%	7%	4%	3%	4%	1%	3%

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
Construction of new nuclear power units is associated with significant corruption risks												
Completely agree	43%	32%	36%	51%	43%	36%	52%	44%	42%	42%	42%	44%
Rather agree	33%	47%	43%	29%	33%	34%	24%	34%	30%	34%	35%	33%
Rather disagree	11%	13%	13%	12%	12%	11%	8%	8%	15%	15%	15%	10%
Completely disagree	5%	3%	4%	4%	6%	6%	7%	8%	4%	2%	3%	5%
Refusal to answer / Difficult to say	7%	6%	4%	3%	5%	13%	9%	6%	8%	7%	5%	8%
The energy produced at nuclear power plants is environmentally friendly												
Completely agree	23%	14%	16%	20%	21%	30%	32%	22%	24%	24%	26%	22%
Rather agree	31%	22%	29%	33%	35%	32%	32%	28%	32%	31%	32%	35%
Rather disagree	27%	49%	37%	26%	24%	19%	18%	25%	26%	33%	27%	28%
Completely disagree	12%	15%	12%	14%	14%	12%	8%	16%	12%	11%	10%	8%
Refusal to answer / Difficult to say	7%	0%	7%	6%	6%	7%	10%	9%	6%	2%	6%	7%
Fuel for nuclear power plants is an inexhaustible resource												
Completely agree	22%	29%	16%	13%	24%	27%	29%	25%	26%	19%	18%	19%
Rather agree	28%	19%	28%	32%	23%	34%	27%	31%	24%	32%	24%	29%
Rather disagree	24%	30%	26%	31%	21%	21%	20%	24%	23%	31%	28%	23%
Completely disagree	15%	18%	20%	16%	20%	9%	11%	12%	18%	13%	17%	16%
Refusal to answer / Difficult to say	10%	4%	9%	8%	12%	10%	15%	9%	9%	5%	12%	13%

Focus group participants expressed different opinions on the development of Ukraine's energy system, in particular the prospects for the use of nuclear energy. They brought up economic aspects, such as the cost of construction, operation, and maintenance of nuclear power plants, as well as the impact of these expenditures on the budget and the cost price of energy. Some raised the issue of transparency in electricity distribution, in particular export operations, and emphasized the importance of balanced use of energy resources within the country.

"...this is just in economic terms about how Ukraine's energy system should develop. There were ideas to increase the number of nuclear power plants. But there is an issue there in the years of construction and in terms of expenditures. That is, how much budget will be spent on this."

(FGD, Kyiv, men and women, 18–25)

"...the construction and decommissioning of nuclear power plants is still not included in the price of electricity, since there is such a thing as depreciation and wear and tear of any equipment. And this is all calculated during the construction process and during the operation of the nuclear power plant itself, and this does affect the overall cost, so to speak, of maintaining this power plant until it pays off in its use."

(FGD, South / East, cities with 100–500 thousand residents, men and women, 18–25)

"…how much it costs in its use — maybe not that much. But the cost price of that electricity — yes, I am curious, how much gets invested, how much is received, how much we… You know, there was this scandal that we sell something abroad and don't have enough for ourselves? Especially when there were power outages, there were situations when people would say, we sold everything and didn't keep enough for ourselves, and now we have no power."

(FGD, South / East, cities with over 500 thousand residents, men and women, 26–39)

FGD participants paid additional attention to security issues, particularly in the situation of military aggression. Respondents mentioned the risks of terrorist threats, seizure of nuclear power facilities, potential explosions or attacks that can be used for political pressure. In addition, during the discussion, the participants expressed their concern due to the occupation of the Chornobyl area and the possibility of attack on other nuclear objects, which exacerbates the overall level of anxiety. The security of nuclear facilities, in particular against external threats, remains a priority for many participants.

"Back then, we were worried when the orcs were at the Chornobyl plant — we were indeed. To be honest, these fears have grown. We are also worried about our crazy neighbors blowing up the NPP. Who knows whether they are protected or not — we have no idea. So these concerns, to be honest, have grown in this regard."

(FGD, Kyiv, men and women, 40–59)

"…danger from the terrorist threat. That is, capture by unknown individuals and, say, threats with some demands for certain preferences. That is, that they will blow something up there or do something else to influence certain policies, certain leaders or countries."

(FGD, West, cities with over 500 thousand residents, men and women, 60+)

The FGDs with the population align with the findings of the quantitative survey regarding the statement that "Nuclear power plants can generate large amounts of electricity" (to reiterate, 93% of survey participants agree or rather agree with this statement, with the majority agreeing completely). In particular, the majority of respondents aged 18–24 hold this opinion.

Young people from Kyiv (18–24) emphasize the potential economic benefits of building nuclear power plants, but note that this could worsen living conditions for local residents due to improper planning and pollution.

"…it's cheap to produce, generation is maximized. That is, as far as I know, our nuclear power plants are enough not only to power the entire country as a whole, but also to sell and import this energy abroad. That is, if it is used wisely, without allowing disasters, pollution of territories, this is, first of all, safe. Secondly, it's very effective."

(FGD, Kyiv, men and women, 18–24)

"Such enterprises have infrastructure developing around them. That is, new infrastructure emerges, such as stores, hospitals. A lot of things get done. And if it's right next to you, well, you have to look at the standards. Because often, when some object is constructed, this can seriously ruin the lives of local residents."

(FGD, Kyiv, men and women, 18–24)

"…that the developers… can turn out unscrupulous and dump waste, say, as it is often done, or bury something without telling the population, and then this information emerges after a while. And in addition to the fact that the production itself is not very safe, they also pollute the environment even more when they are building this production."

(FGD, Kyiv, men and women, 18–24)

Older respondents from the Western region (40–59) emphasize the low cot price of nuclear energy compared to other sources, such as gas or coal, and believe it to be more beneficial for the country's economy. However, the oldest respondents (60+, West) warn that the construction of such plants requires enormous financial resources and can be a burden on the state budget.

"…you can turn on electric heating at home. Very good, makes sense. It just comes down to price, you know? It is saved again. There is nuclear electricity, yes. This helps to preserve our forests. People could stop cutting down the forest so much; we already have very little left."

(FGD, West, Varash, men and women, 40–59)

"You see, fossils, they have limitations. For instance, there is about 400 years of coal left. This is world reserves. And its extraction is unprofitable. That is, all the layers that could be… Now they are there, there is shale gas and so on. Say, oil… That is, let's say, we have gas for about 80 years."

(FGD, West, cities with over 500 thousand residents, men and women, 60+)

"For a TPP, you have to constantly keep extracting coal that will burn there. And then you need to clean up all those emissions. That is, it's quite… I feel, it will be more harmful for the environment to have thermal power plants everywhere. And here, you use this fuel for quite a long time and maintain sufficiently high results for the same… I feel that the low cost of such power is due to the minimal expenditures."

(FGD, West, cities with over 500 thousand residents, men and women, 60+)

"Any construction of a nuclear power plants means billions, billions of dollars. They… they… they come from the state budget, that's one thing. They have to come from somewhere. So everyone would feel it, so to speak."

(FGD, West, cities with over 500 thousand residents, men and women, 60+)

Respondents from the South and the East (18–25) have a positive view of nuclear energy as an environmentally friendly alternative to thermal power plants that run on coal or oil and contribute to global warming. However, they note that the construction and operation of nuclear power plants may be accompanied by additional pollution due to negligence.

"…I have a rather positive attitude to this because, if we compare it to other power plants, we don't use coal, oil, which emit gas into the air."

(FGD, South / East, cities with 100–500 thousand residents, men and women, 18–25)

"If we compare our power plants that generate electricity using coal and oil, which is precisely the problem of global warming, then yes, a nuclear power plant is more environmentally friendly because it does not cause overheating."

(FGD, South / East, cities with 100–500 thousand residents, men and women, 18–25)

FGD participants aged 26–39 from the North / Center region emphasize that nuclear power plants, even under occupation, are capable of providing the country with energy, but at the same time note the high level of corruption in the energy sector, which can affect the quality of construction and operation of the plants. Older respondents (60+, West) express concerns about political and security risks, and also emphasize the need to involve foreign specialists to monitor the construction process.

"Ukraine provides — well, in peacetime — it fully provides itself with energy. Energy produced at the nuclear power plants we have. Even with the occupation of the Zaporizhzhia nuclear power plant, those territories that are controlled by Ukraine, we have enough to provide for them."

(FGD, North / Center, cities with 100–500 thousand residents, men and women, 26–39)

"…Western-style corruption, you know, there's more intelligence about it. There are some orders, tenders, you know. That is, when corruption is already embedded in the process itself — that is, whom to buy from, for example, whether Japan or the USA will get involved, you know."

(FGD, North / Center, cities with 100–500 thousand residents, men and women, 26–39)

FGD respondents aged 40–59 associate the development of nuclear energy with an increase in Ukraine's political independence. In that case, they believe, the country will not require the import of energy because it would have its own resources. However, some respondents fear that Ukraine could be used as a territory for the placement of nuclear facilities for the benefit of other countries.

"They will already be built using new technologies, accordingly, there are different safety standards there, different standards for generation."

(FGD, West, Varash, men and women, 40–59)

"…whatever it ultimately costs — the cost price of each megawatt obtained from regular plants vs. nuclear power plants, nuclear will end up a lot better. That is, it is cheaper. It will be cheaper than making all those, like, gas boilers. It will be cheaper, that's the point."

(FGD, Kyiv, men and women, 40–59)

"Nuclear energy — everybody knows this — it's cheap. But, in addition to the dangers posed by nuclear energy and nuclear power plants, there are many more issues that we are not told about. It's about nuclear fuel, it's necessary. That's one thing. And secondly, what is most important for safety is the disposal of this spent fuel. It has to be stored somewhere. There should be nuclear repositories and so on."

(FGD, Kyiv, men and women, 40–59)

"Coal mining is subsidized. It is not profitable at all. In general, if you look at the reality today, I mean, only gas extraction, it's good, profitable."

(FGD, Kyiv, men and women, 40–59)

In general, nuclear energy is perceived by respondents as a profitable and strategically important industry, but its development must rely on minimizing corruption risks, proper environmental protection, and adherence to high safety standards.

"And, accordingly, political independence. Then we will not have to bow down to anyone. We will not ask anyone for anything. We will have something of our own. Then just kind of tough it out and do things the way they should be done. But there should be specialists and research, before and after. Where they are built and how they are built. So there wouldn't be any risks in the future."

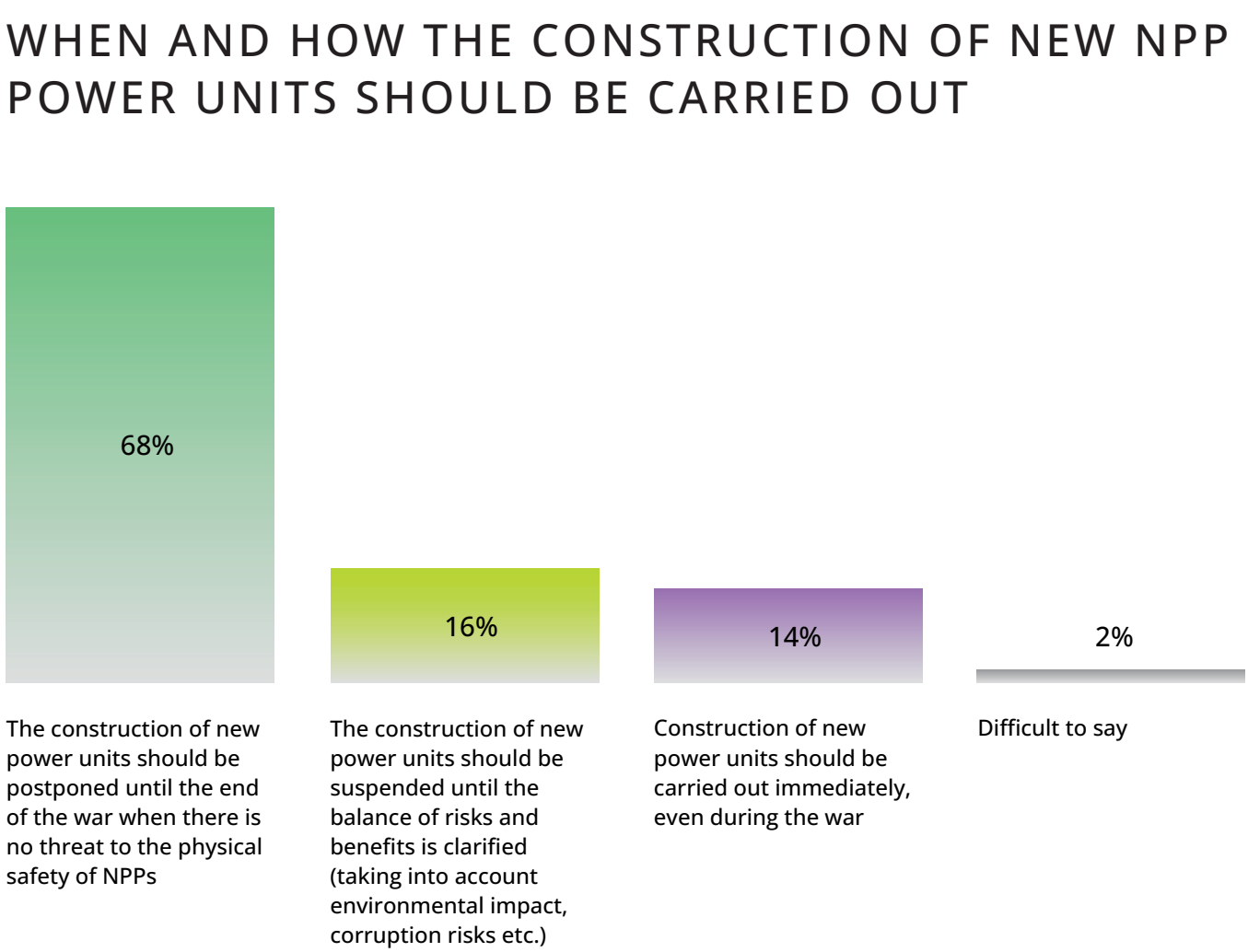
(FGD, West, cities with over 500 thousand residents, men and women, 60+)

"Clearly, we have horrible corruption at every step. And we are talking about large amounts here. So there is room for maneuver. And another issue is whether we have those specialists who are ready to do this all."

(FGD, West, Varash, men and women, 40–59)

The quantitative survey also raised the issue about the time and conditions for the construction of new power units at NPPs. The majority of respondents to the quantitative survey (68%) believe that the construction of new nuclear power plant units should be postponed until the end of the war, when the threat to the physical security of NPPs disappears. 16% of respondents support the idea of freezing construction until the balance of risks and benefits is assessed, taking into account the impact on the environment and corruption risks. 14% of respondents believe that construction should be carried out immediately, even during the war. Overall, the responses to this question indicate that the population is somewhat cautious about the construction of power units during wartime.

Fig. 6. When and how do you believe the construction of new NPP power units should be carried out?



Experts believe that the construction of new nuclear power units under current conditions is impractical due to high financial costs, the long-term nature of the projects, corruption risks, and this task not being a priority during the war. They emphasize the negative perception of such spending by society, as the funds could be directed to more effective and faster solutions, such as the development of renewable energy. Experts also mentioned the environmental and technical challenges associated with the operation of nuclear power plants. Some of the issues included dependence on water resources and the lack of flexibility in the energy system, which can cause problems in the future.

"In my opinion, most people don't support, well, at least my circle doesn't support these projects. Perhaps, my circle knows a bit more than the average Ukrainian. But, because these are expensive and long-term projects, it makes little sense for us now, at this stage of our historical time."

(IDI with experts)

"I don't know where we would get funding for such non-priority projects during the war. Getting a loan is not the best option right now, I believe, because it's expensive and non-transparent, and the corruption risks are high."

(IDI with experts)

"Overall, the population now has a negative perception of funding for anything other than supporting the Armed Forces or defending the territories or certain objects, so I feel the attitude would be rather negative than positive, as far as I know."

(IDI with experts)

"Now people feel a greater threat from the consequences that may be caused by warfare. Again, they are not always technically correct, that is, people are scared of things that have a low likelihood, but they don't think and don't know about threats that are more likely."

(IDI with experts)

"And we are going to develop a technology that requires more water, which is, to put it mildly, illogical. Especially, for example, the Khmelnytskyi NPP… where the construction of 4 new units is planned… Well, that is, 3 and 4 are about completing construction, and 5 and 6 are completely new, and that's also planned… The Khmelnytskyi NPP is cooled using a cooling pond… the water temperature in the cooling pond was not too high to handle the cooling."

(IDI with experts)

"Overall, I feel there is no major support for this, either. That is, people understand that construction of those units would take much more than just one year, but there isn't a big outcry against it either. I feel that this issue is sort of hanging in the air now."

(IDI with experts)

"First, this is pulling funding away from something that can really help us very quickly and cheaply. Say, the funds that would fund a nuclear power unit could, say, be allocated to a wind farm or solar units."

(IDI with experts)

"Now we are again zoning a certain program of the Ukrainian state, communicating that we may finish 2 units at the Khmelnytskyi NPP, and maybe the Chyhyryn NPP. These are old projects, these are large industrial generating plants that are not flexible in their generation. That is, they will create quite a few problems for our energy system in the future. So, in my opinion, this is the main challenge."

(IDI with experts)

Among respondents of the quantitative survey, the generation over the age of 65 tends to support the idea of postponing the construction of new power units until the end of the war more commonly (78% vs. 68% in the total sample) (Table 4). Young people are more likely to agree that the construction of new power units should be suspended until the balance of risks and benefits is clarified (27% compared to 16% in the sample as a whole). The 35–44 age group has the strongest opinion: here, the smallest percentage believe that the construction of new power units should be postponed (59% vs. 68% in the total sample), and the largest share agrees that the construction of new power units should be carried out immediately, even during the war (20% vs. 14% in the total sample).

Table 4. When and how do you believe the construction of new NPP power units should be carried out? [by age and size of locality]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
The construction of new power units should be postponed until the end of the war when there is no threat to the physical safety of NPPs.	68%	70%	64%	59%	66%	74%	78%	72%	70%	77%	67%	60%
The construction of new power units should be suspended until the balance of risks and benefits is clarified	16%	27%	19%	19%	17%	11%	9%	13%	12%	14%	20%	20%
Construction of new power units should be carried out immediately, even during the war	14%	3%	16%	20%	12%	13%	11%	12%	17%	8%	11%	16%
Difficult to say	2%	0%	1%	2%	6%	2%	2%	2%	2%	2%	2%	3%

Findings of FGDs dedicated to the construction of new power units overall align with the results of the quantitative survey. In particular, young people of ages 18–25 from western Ukraine, mainly from cities with populations of up to 50,000 residents, emphasize the potential benefits of exporting electricity and reducing the load on existing power units, which will increase their safety. However, they do express concerns about the war, risks of provocations, corruption, and lack of human resources.

"We will produce more energy that can be sold abroad and make more profit."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"I believe that this will facilitate the operation of the existing power units, reduce the overall load, and there will be greater safety, as the chances of any malfunctions will be much reduced."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"Well, I think the biggest downside right now is that there's a war. And because there is a war, it is quite dangerous to start construction, since Russia can set up any provocation."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"On the one hand, we have problems with energy supply due to Russian shelling, and additional capacity would not hurt. But in the context of the security situation, I think that if it is built, then, well, it should be done quietly. Because if we publicize this information, it can be harmful."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"I agree with the opinion that it is dangerous to build some unit now because it could also be related to human resources. Human resources are very scarce now, given that many have gone abroad, many are at war."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"That this sponsors the state; it actually increases corruption risks, especially because there is a war. And, as they already said, it's hard to check something. It is all less transparent than in peacetime. And as a result, the threat of corruption scandals is growing."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

Older respondents and residents of large cities tend to emphasize the need to plan such projects after the end of the war, since the security situation is currently unstable. People aged 26–39 believe that international cooperation and investment can be key to implementing such initiatives, but at the same time emphasize the risks associated with corruption and the high cost of projects. Some suggest starting construction but delaying commissioning to minimize risks.

"After the war — yes, yes. Why not, anyway. But, I don't know, on the other hand, maybe people will stop using it more or less. Because now there is a slightly different trend emerging — the use of solar panels. And for as long as I've lived in Kyiv, I think I've been seeing more and more of these panels."

(FGD, Kyiv, men and women, 18–25)

"Will there be a likelihood of a second war against Russia? If so, then we need other types of power generation which are harder to knock out. For example, say, maneuverable energy."

(FGD, Kyiv, men and women, 18–25)

"…you can build them, but not launch them because the risk is that the information will still be available to everyone, including our enemy." Maybe there is a test run of this reactor, and they go like oh! Time to bomb!"

(FGD, South / East, cities with 100-500 thousand residents, women and men, 18–25)

"…given our, let's say, national tradition of corruption, it's quite difficult to build a new plant here. Therefore, in principle, in my opinion, it's all positive, for the most part. Although this should be done after the war because, as already noted, it can be hit quite easily, I don't think anyone will take it upon themselves because it's practically like a nuclear strike."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

"…we were supposed to be given, or have already been given, or are being given massive funds to build the fifth reactor, as far as I know, at the Khmelnytskyi [NPP], then it is probably beneficial for Europe, and it is probably cheaper to build it here so that we can supply it to them. I think it's cheap."

(FGD, North / Center, cities with 100–500 thousand residents, women and men, 26–39)

Respondents over the age of 40 support the idea of constructing new power units in response to the wear and tear of existing capacity and the growing energy needs. They emphasize the need to ensure transparency in the use of funds, attract investors, and carefully calculate economic feasibility. Older citizens, particularly people over the age of 60, believe that the construction of new nuclear power plants will be part of the country's recovery after victory.

"When if not now? There are more opportunities then — after the recovery. And given the pace of our development and society, a lot of things now run on electricity. The houses are powered by electricity, there is — well, everything — electric heating, I personally even have an electric car. And it just saves our family budget a lot."

(FGD, North / Center, cities with 100–500 thousand residents, women and men, 26–39)

"If we make our electricity cheaper, then, well, I feel like building something new in the energy system will be impossible."

(FGD, West, Varash, men and women, 40–59)

"We still need to allocate funds to invest in construction, because without energy, you can't even make military equipment, for example. You need to find balance here. Or we need to look not our own funds, but maybe options to invite investors who are ready to build it at their expense, and we will also have a certain profit from this."

(FGD, West, Varash, men and women, 40–59)

"Of course. The old ones are failing, their service life is coming to an end. We need new ones. To move forward."

(FGD, West, Varash, men and women, 40–59)

"I want to say that construction is a plus. And as for the control over allocated funds. Like, you hear that 5–6 million was stolen from the allocated energy budget. I mean… I don't even know where they get this much money to steal it. That is, funds are allocated. But there should be control to make sure that there are some honest, decent people who take care of it. But we do want development and construction of nuclear plants here so that everything would be as it should be."

(FGD, West, cities with over 500 thousand residents, men and women, 60+)

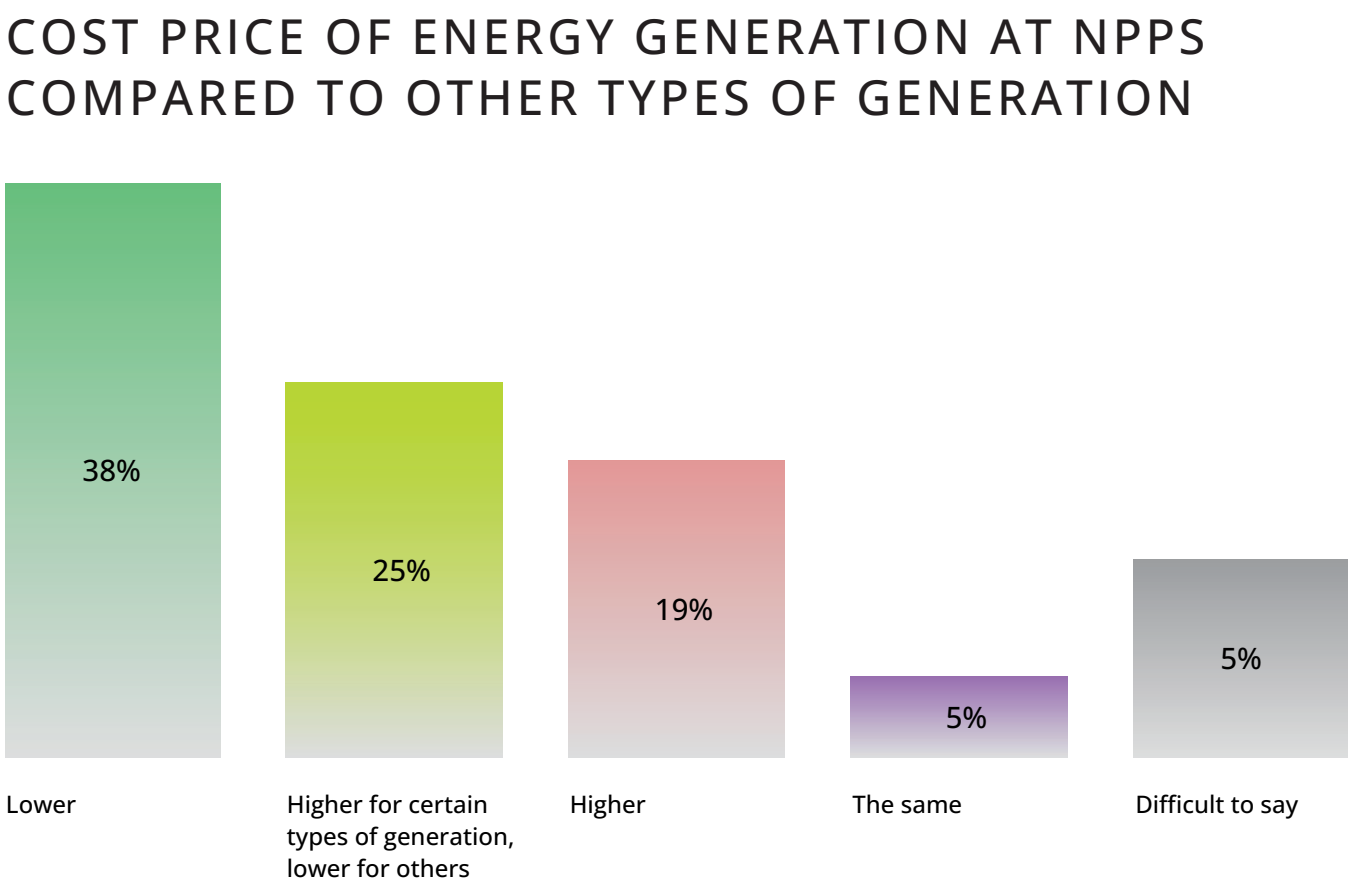
"We will absolutely rebuild, we'll rebuild everything. The most important thing for us now is to win, so that in peacetime we can get everything done."

(FGD, West, cities with over 500 thousand residents, men and women, 60+)

COST PRICE OF ELECTRICITY AT NPPS

One of the issues raised during the study was the cost price of electricity depending on the type of generation. In particular, in the quantitative survey, respondents were asked to compare the cost of electricity at nuclear power plants with the cost of electricity that we receive from other types of generation facilities (Fig. 7). Most respondents (38%) believe that the cost price of electricity from nuclear power plants is lower than from other types of generation. 25% note that the cost may be higher for some types of generation and lower for others. 19% believe that the cost price at NPPs is higher.

Fig. 7. Do you believe the cost price of power generation at NPPs, compared to other types of generation, is...?



According to experts, such opinions may be due to the fact that Energoatom uses the capacities inherited from the USSR, that is, equipment depreciation is not included in the cost price. However, they emphasize that the cost of electricity for the population is the same and does not depend on the type of generation.

"For example, Energoatom works on Soviet-era power units. That is, the return has already been made on depreciation, multiple times. So it may be cheaper but not for the population. There is a specific tariff set for the population, while Energoatom and other generation companies trade on the market. So cheap or expensive, that's a myth."

(IDI with experts)

However, some experts point to economic challenges for implementing new capacity, as alternative sources may be more expensive than existing power generation.

"A fairly well-known factor in favor of nuclear energy is, perhaps, that it is very cheap. And I come from an expert environment. So I understand why that is. I also understand that newly introduced nuclear power capacity will not generate power just as cheaply. What is more, it will be among the most expensive sources."

(IDI with experts)

The cost price at NPPs being lower compared to other types of generation is a fact most commonly brought up by respondents aged 55–65, but rarely by young people of ages 18–24 (48% and 24%, respectively) (Table 5).

Table 5. Do you believe the cost price of power generation at NPPs, compared to other types of generation, is… [by age]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65
Higher	19%	22%	23%	25%	19%	12%	16%
The same	5%	10%	7%	4%	2%	4%	6%
Lower	38%	24%	32%	34%	43%	48%	38%
Higher for certain types of generation, lower for others	25%	31%	29%	29%	23%	20%	19%
Difficult to say	13%	12%	9%	8%	13%	16%	20%

FGDs dedicated to the cost price of nuclear power have provided a more profound insight into the issue. In particular, most FGD participants also consider the cost of nuclear power to be lower compared to other types of generation. However, young people (18–24, Kyiv), who mostly agree that nuclear energy is cheap compared to other energy sources, also tend to mention environmental problems, such as emissions and waste, which can lead to more negative consequences that do not necessarily outweigh the benefits of low cost. Although the energy appears economically viable, they doubt its safety, believing that it is used much less in richer countries due to the high risks.

"It's cheap energy, but at the expense of… the environment, emissions, waste, and the like, I think there's more of a downside than a benefit from it being cheap."

(FGD, Kyiv, men and women, 18–25)

"I think it is cheaper than other types of energy. But it is less safe, and that's why it's not used in richer countries."

(FGD, Kyiv, men and women, 18–25)

Middle-aged respondents (26–39 years old, West, cities of 50–100 thousand residents) also acknowledge the cheapness of nuclear energy, but add that the construction of nuclear power plants requires significant investment and high safety standards, which can make it difficult to scale up such projects. They also point out the scale, which cannot be compared with other types of generation, such as TPP or HPP. These respondents also note that nuclear power is part of a more complex energy system in Ukraine, where various types of generation operate to ensure the balance and stability of energy supply.

"It's really cheap, it's pennies so to speak. But if we build it, and if we imagine the scale of such a project, it's not like building a TPP or an HPP, it's a completely different scale. And it has to be that way because it requires an extremely high level of safety. That is why investment in it is very different compared to regular construction of, say, wind generation."

(FGD, West, cities with 50-100 thousand residents, women and men, 26–39)

"…the price increase does not change the situation with our energy sector, because Ukraine has the opportunity to receive free grants under the Ukraine Facility, that's a program for our energy security. That is, we do not need to raise energy prices in order to be energy-independent and have the necessary generation."

(FGD, West, cities with 50-100 thousand residents, women and men, 26–39)

"…it would be quite cheap now because, if you look, say, at the TPP near Lviv, the village of Dobrotvir, and it is completely bombed now."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

Residents of South / East (cities with over 500 thousand residents, women and men, 26–39) indicate that nuclear power is relatively cheap due to the high volume of the produced energy. At the same time, they emphasize that the problem for Ukraine is that excess energy needs to go somewhere, which sometimes becomes a difficult task due to limited infrastructure for storing or selling energy.

"Simply speaking, so to say, the material itself is not that expensive compared to the output, so there is an idea that it is cheap."

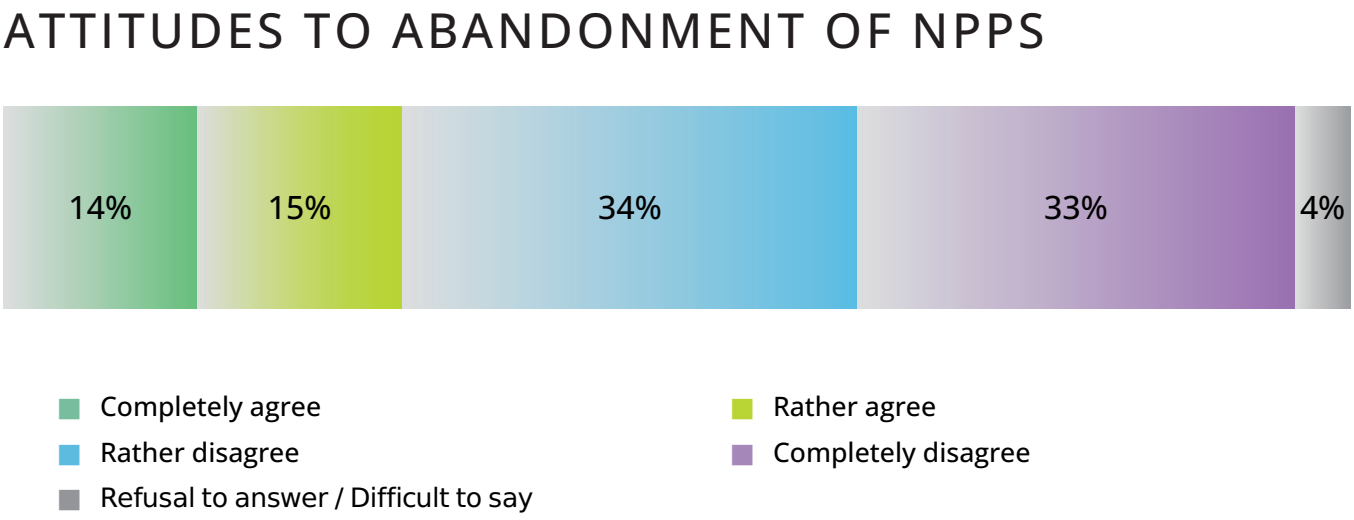
(FGD, South / East, cities with over 500 thousand residents, women and men, 26–39)

"There is an idea that it is cheap. And since the volumes are very large, and since our price is — well, what it already is… Well, we know that even with solar energy, those who do it know that they heat, say, not only their house, but also the neighbors' because there is an excess. So if we speak about a nuclear power plant, it is enormous, produces enormous volumes, and that has to go somewhere."

(FGD, South / East, cities with over 500 thousand residents, women and men, 26–39)

However, when it comes to full termination of the use of nuclear energy by abandoning the construction of new nuclear power units and gradual closure of existing NPPs, most of the respondents in the quantitative survey (67%) did NOT support this idea. Of them, half "rather disagree" with this suggestion, and the others are strongly opposed to it.

Fig. 8. To what extent do you agree or disagree that Ukraine needs to abandon the construction of new nuclear power units and gradually close nuclear power plants?



Experts believe that Ukraine should not invest in the development of new nuclear power units, as it is financially impractical and creates more problems than benefits. Instead, the focus should be on energy efficiency and the development of renewable energy sources. They also emphasize the importance of informing the public about the nuances of the energy system before making decisions.

"I believe that Ukraine should definitely not focus on the development and construction of new nuclear power units… due to the fact that Ukraine has, firstly, great potential in energy saving and, secondly, has enormous potential in the development of renewable energy sources, and the funds that are potentially invested or can, should be invested in order to build at least one nuclear power unit, it would make much more sense to spend those funds on renewable energy sources, on energy efficiency."

(IDI with experts)

"In general, I don't see any advantages or benefits for the country from the development of nuclear energy. I see a lot of problems and not a single benefit."

(IDI with experts)

"Many people who don't have a general understanding of how the energy system works, of the nuances, the pitfalls in the context of building new generation — they, of course, think that we have a deficit, of course, that means that we need to develop some kind of generation. Why not nuclear then? I don't know [they'd say]. Therefore, I feel it's important to start by raising awareness. And then it makes sense to ask the population about their attitudes towards this."

(IDI with experts)

There are no statistically significant differences in the distribution of answers to the question of whether Ukraine should gradually close nuclear power plants depending on respondents' age and the size of their locality. The exception is young people of ages 18–24, who are less likely than other age groups (6% vs. 14% in the sample as a whole) to agree with the idea of abandoning nuclear generation (Table 6).

Table 6. To what extent do you agree or disagree that Ukraine needs to abandon the construction of new nuclear power units and gradually close nuclear power plants? [by age and size of locality]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
Completely agree	14%	6%	15%	11%	16%	16%	18%	18%	13%	21%	11%	10%
Rather agree	15%	10%	17%	14%	13%	17%	18%	17%	17%	7%	14%	14%
Rather disagree	34%	44%	34%	37%	31%	31%	32%	32%	36%	31%	36%	34%
Completely disagree	33%	36%	35%	33%	37%	32%	26%	29%	30%	31%	36%	38%
Refusal to answer / Difficult to say	4%	5%	0%	5%	4%	5%	5%	3%	3%	9%	3%	4%

Discussions of the potential abandonment of nuclear generation at focus groups provide a deeper insight into people's idea of this issue. In particular, young people (18–25, Kyiv) are more likely to talk about the need for innovations that could revolutionize the industry, such as technologies for obtaining water from air. They recognize that energy development must consider a balance between different sources: nuclear, solar, and wind.

"If we start building a nuclear power plant today, it will only be operational in 5–10 years. And we will simply have more capacity. But we don't have, first of all, there is no such approach that a nuclear power plant or some other generation will replace everything. Everything will complement each other. This makes sense for us to have nuclear power, solar panels, wind turbines, CHPPs, HPPs."

(FGD, Kyiv, men and women, 18–25)

"The people should know what is happening here, what our money is being spent on. We don't live in the Soviet Union, where everything was always forced on us and we were pushed into something. First, we need to know whether we will really need it, and the downside of nuclear energy is its extremely high payback period. That is, it will not pay off for... I mean, yes, we will get cheap electricity, but how many years later?"

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

Middle-aged respondents (26–39, West, cities of 50–100 thousand residents) also mention the long break-even periods of nuclear power plants, although they recognize the importance of nuclear energy in combination with other types of generation. They indicate that the integration of technologies (nuclear, solar, and wind) should occur gradually, without illusions regarding a possible rapid transition to renewable energy sources.

"...now the development of technologies is already underway... some smaller blocks will produce the same as our large modern ones. It will be safer, it will be more technologically advanced, and it will certainly lead to the development of society and the development of science."

(FGD, West, Varash, men and women, 40–59)

Older respondents (40–59, West, Varash) believe that the development of modern technologies, such as compact safe reactors, will contribute to the progress of society.

The elderly (respondents over the age of 60 from the region North / Center, cities of 50–100 thousand residents) emphasize that solar panels and wind turbines are not a silver bullet due to the high cost of their maintenance and the lack of specialists. They do agree with the need to gradually replace nuclear power with renewable energy, indicating that this process takes time and should be done gradually.

"Solar panels cannot be considered the solution to every problem. The previous respondent said that they are very expensive. And all this needs to be maintained. And for high-quality maintenance, you need highly qualified specialists. We still either don't have such specialists in Ukraine, or we have very few."

(FGD, North / Center, cities with 50–100 thousand residents, women and men, 60+)

"Gradual replacement of nuclear energy with solar and wind energy. But it doesn't work like, bang, and it's done. We cannot stop these nuclear power plants that we have yet. There should also be a certain period there, combustion of uranium where these units are loaded. And we can slowly develop it, like in Europe."

(FGD, North / Center, cities with 50–100 thousand residents, women and men, 60+)

Respondents from the South / East region (Zaporizhzhia, cities with over 500 thousand residents, 60+) believe that nuclear generation produces much more power in comparison with solar or wind energy sources, which are thus incapable of fully replacing nuclear energy. At the same time, they point out the environmental consequences of windmills, such as noise pollution and the impact on local flora and fauna.

"Neither windmills nor [solar] panels. Nuclear energy means large capacity. This provides major energy resources. Nothing, not even the panels, will handle it."

(FGD, South / East, Zaporizhzhia, cities with over 500 thousand residents, men and women, 60+)

"The solar panels seem to be all right. But let me say something about wind turbines. Botiiv area, the Azov Sea. People would go on vacation there. If you went there now, I mean, before the war, nothing is happening in the fields. Birds don't fly there. These turbines create so much noise that even mice don't live in the fields there."

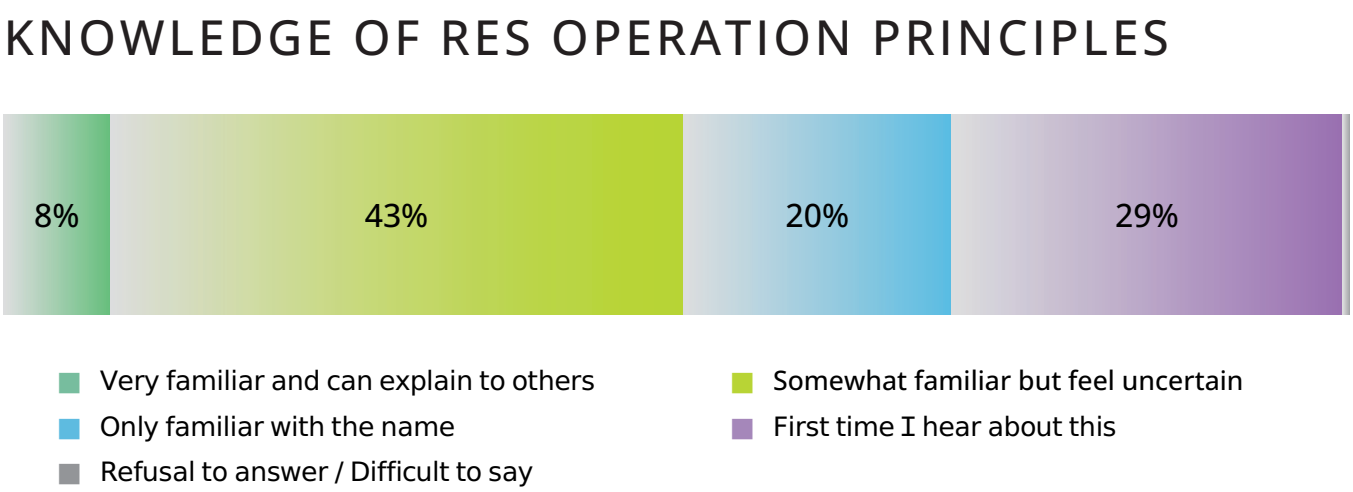
(FGD, South / East, Zaporizhzhia, cities with over 500 thousand residents, men and women, 60+)

RENEWABLE ENERGY SOURCES

Evidently, renewable energy sources as a necessary part of the energy system were mentioned at focus group discussions while talking about the potential abandonment of nuclear power.

As for the respondents to the quantitative survey, they declare moderate awareness: the majority of respondents are familiar with the concept of "renewable energy sources" (Fig. 9). More specifically, 51% indicated that they are "very familiar" with the subject and "can explain it to others" or "know something but feel uncertain," another 20% said they at least know the name of this concept. However, the share of those who declare confidence in their knowledge is only 8%. 29% heard about the principles of RES for the first time.

Fig. 9. Let us talk about renewable energy sources (RES for short). How familiar are you with the principle of functioning of RES overall?



The lowest level of knowledge was recorded among young people: 40% of this audience said they only knew the name of the concept, which is twice the percentage compared to the total sample (Table 7).

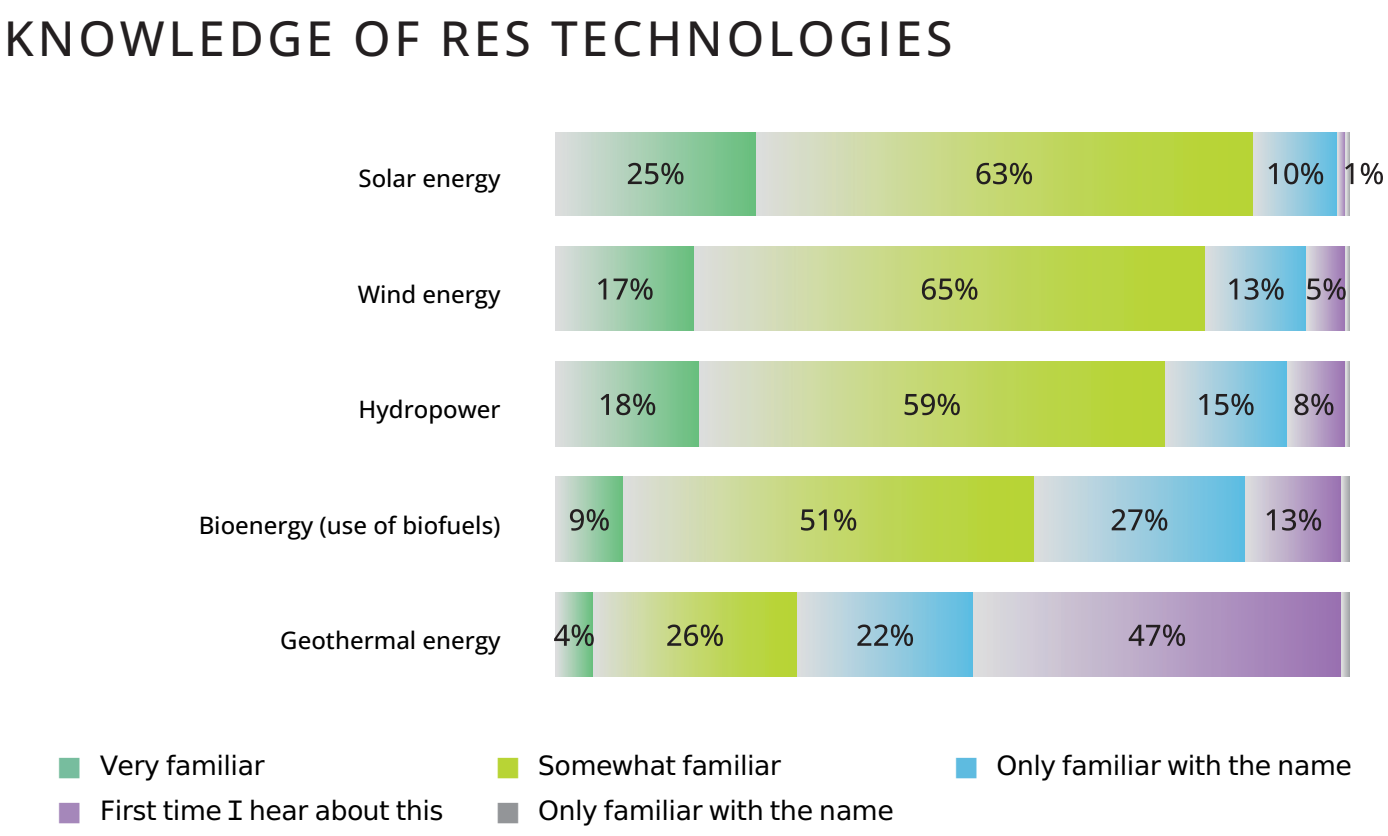
Residents of cities with a population of 101–500 thousand residents report the highest level of knowledge: 13% of them are "very familiar" with RES "and can explain it to others" (vs. 8% in the total sample).

Table 7. How familiar are you with the principle of functioning of RES overall? [by age and size of locality]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
Very familiar and can explain to others	8%	8%	9%	11%	10%	6%	3%	5%	8%	0%	13%	9%
Somewhat familiar but feel uncertain	43%	34%	43%	46%	45%	43%	40%	41%	37%	61%	40%	47%
Only familiar with the name	20%	40%	17%	14%	20%	18%	22%	21%	21%	13%	19%	20%
First time I hear about this	29%	18%	31%	29%	24%	33%	35%	33%	33%	25%	27%	24%
Refusal to answer / Difficult to say	0%	0%	0%	0%	1%	0%	0%	0%	1%	0%	1%	0%

Interestingly, specific RES technologies are much more familiar to the respondents than this notion overall. Solar energy, for instance, is the leader in terms of people's knowledge in comparison with other RES technologies. 98% of respondents have at least heard of solar energy, and 25% have very good knowledge about it. In second place is wind energy, which 95% of respondents know or have heard something about, and 17% know it very well. There is less awareness of hydropower: 92% at least heard about it, and 18% are well-informed. The use of biofuels (bioenergy) is familiar to 87%, with 9% reporting they know it very well. Geothermal energy ranks last with an overall knowledge score of 52% and the share of well-informed respondents at 4%.

Fig. 10. How familiar are you with the following renewable energy technologies?



Young people of ages 25–34 are more likely than other age groups to be very well-informed about solar energy (35% vs. 25% in the total sample); at the same time, the generation over 65 is more likely to know about this technology only by the name (16% vs. 10% in the sample as a whole) (Table 8). Young people also know a little more about other types of renewable energy. In particular, young respondents are more aware of bioenergy and geothermal energy.

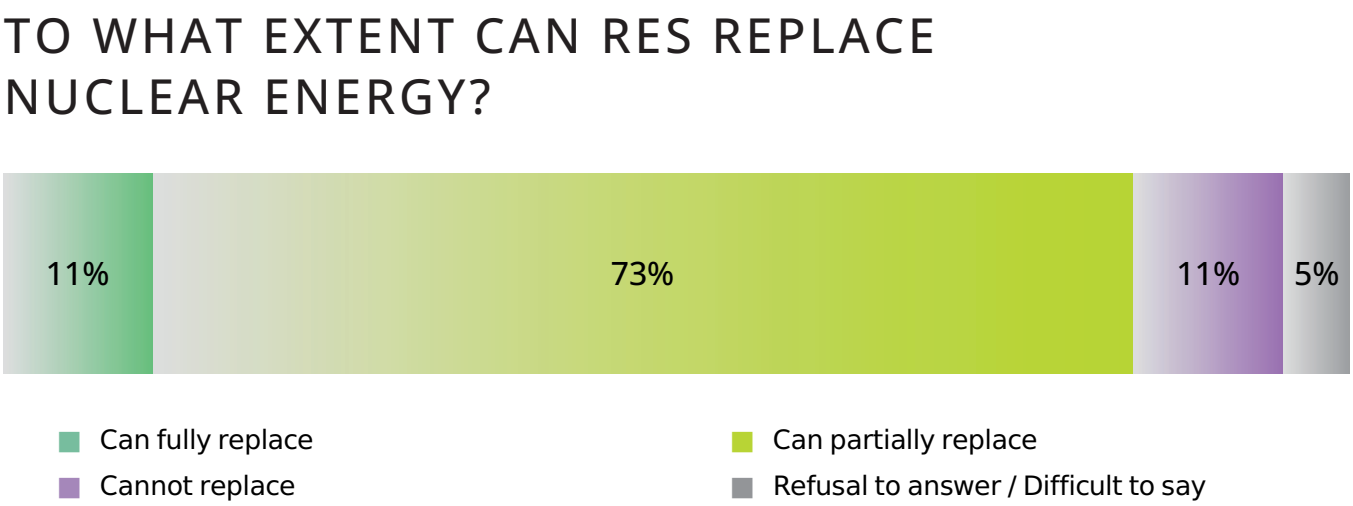
Table 8. How familiar are you with the following renewable energy technologies? [by age and size of locality]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
Solar energy												
Very familiar	25%	32%	35%	32%	24%	21%	12%	24%	27%	19%	25%	28%
Somewhat familiar	63%	63%	54%	57%	66%	67%	70%	60%	62%	74%	66%	63%
Only familiar with the name	10%	4%	9%	9%	9%	10%	16%	15%	10%	4%	8%	8%
First time I hear about this	1%	1%	3%	2%	1%	1%	1%	1%	1%	2%	2%	1%
Refusal to answer / Difficult to say	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%
Wind energy												
Very familiar	17%	18%	22%	22%	16%	17%	11%	13%	17%	14%	21%	23%
Somewhat familiar	65%	70%	62%	64%	66%	60%	67%	62%	65%	80%	64%	64%
Only familiar with the name	13%	6%	12%	9%	14%	19%	16%	17%	13%	6%	12%	11%
First time I hear about this	5%	6%	4%	5%	4%	4%	5%	8%	5%	0%	4%	2%
Refusal to answer / Difficult to say	0%	0%	0%	0%	0%	1%	1%	0%	1%	0%	0%	0%
Hydropower												
Very familiar	18%	23%	19%	18%	17%	21%	13%	15%	16%	17%	24%	19%
Somewhat familiar	59%	59%	59%	60%	61%	60%	57%	54%	61%	67%	56%	65%
Only familiar with the name	15%	16%	15%	15%	16%	12%	17%	18%	16%	10%	14%	12%
First time I hear about this	8%	3%	7%	8%	7%	5%	12%	12%	7%	7%	5%	4%
Refusal to answer / Difficult to say	0%	0%	0%	0%	0%	2%	0%	0%	1%	0%	0%	0%
Bioenergy (use of biofuels)												
Very familiar	9%	6%	13%	8%	9%	9%	7%	10%	7%	6%	11%	8%
Somewhat familiar	51%	43%	48%	52%	52%	57%	52%	49%	52%	52%	54%	52%
Only familiar with the name	27%	38%	23%	28%	27%	24%	25%	25%	25%	29%	25%	31%
First time I hear about this	13%	13%	15%	11%	11%	9%	15%	15%	15%	10%	11%	9%
Refusal to answer / Difficult to say	1%	0%	0%	1%	1%	1%	1%	0%	1%	2%	0%	0%
Geothermal energy												
Very familiar	4%	2%	6%	6%	5%	3%	2%	4%	5%	3%	4%	4%
Somewhat familiar	26%	33%	21%	27%	30%	26%	22%	21%	25%	27%	30%	31%
Only familiar with the name	22%	31%	24%	20%	22%	21%	20%	18%	24%	18%	25%	26%
First time I hear about this	47%	34%	50%	46%	42%	49%	55%	57%	46%	53%	39%	38%
Refusal to answer / Difficult to say	1%	0%	0%	0%	1%	1%	1%	0%	1%	0%	2%	0%

84% have spoken about the possibility of at least partial replacement of nuclear power with renewable energy sources (RES), with 11% being confident that full replacement is feasible. At the same time, 11% deny this possibility (Fig. 11).

We asked the respondents who said that RES cannot replace the share of power currently produced by nuclear plants the following clarifying question: "***What if, in addition to RES technologies, there were a comprehensive implementation of energy efficiency measures — would they be able to replace the share of electricity currently produced by nuclear power plants in that case?***" Most of these respondents (61% of the subsample, or 7% of the total sample) changed their opinion and agreed that RES can partly replace some of the nuclear generation. Thus, provided there is a comprehensive implementation of energy efficiency measures, over 90% of Ukrainians tend to believe that replacement of nuclear power with RES is possible at least to a certain extent.

Fig. 11. To what extent, in your opinion, can renewable energy technologies generally replace the share of electricity currently produced by nuclear power?



The oldest generation (65+) is the least confident (6%) that RES technologies can replace the share of energy currently produced by nuclear power plants (Table 9).

Table 9. To what extent, in your opinion, can renewable energy technologies generally replace the share of electricity currently produced by nuclear power? [by age]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65
Can fully replace	11%	8%	15%	15%	14%	9%	6%
Can partially replace	73%	79%	74%	70%	67%	70%	78%
Cannot replace	11%	11%	8%	13%	15%	13%	7%
Refusal to answer / Difficult to say	5%	2%	3%	2%	4%	8%	9%

As for expert opinion about this, they point out the importance of decentralizing the energy system, emphasizing the advantages of distributed generation, especially small solar and wind power plants that can reduce the vulnerability of large energy facilities. Experts believe that the development of such energy sources is realistic and promising, especially in the context of increased interest among communities in installing solar power plants. For example, in 2023, the number of applications to get support in the construction of an SPP increased tenfold compared to 2021.

Importantly, some experts believe that "ordinary citizens" do not trust the possibility of replacing nuclear power with such technologies as solar panels or wind turbines (this idea is debunked by the quantitative survey). Experts emphasize that this issue requires broader communication, since the potential for energy system transformation is already actively discussed in the expert environment, which already envisions scenarios of transition towards 70–100% of renewable energy sources by specific deadlines.

"…Personally, I see more advantages in distributed generation, in small capacities that are close to the consumer because it decentralizes the energy system, it reduces vulnerabilities in the quality of large main substations, and it is quite realistic to develop that, to speak about distributing generation…"

(IDI with experts)

"In the expert community, this is certainly considered, and there are calculations and scenarios that calculate the options for how many and which renewable energy sources are needed to move to 100%, for example, or to 70% by a certain year. If we are talking about the general population, I guess rather no… they don't believe it's possible due to the lack of information."

(IDI with experts)

"In 2021, communities that approached us to get some help with setting up an SPP were very few. And in 2023, when we announced a competition to support the construction of solar power plants at facilities, hospitals and water utilities, to put it simply… Well, we received more than 600 applications from communities. That is, the difference in people… We saw interest in RES increase more than tenfold."

(IDI with experts)

"I think the population is not even considering it. Because, say, people still have doubts whether something as big as nuclear generation can be replaced with something as small as, say, solar panels or wind turbines or, I don't know, something else."

(IDI with experts)

Experts have different views on the coexistence of nuclear and renewable energy in Ukraine. Some emphasize the equality of these energy sources, believing that the future of the energy system lies in combining modern small and medium-sized modular nuclear reactors with the development of wind and solar energy, as well as the introduction of industrial batteries to balance the system. Other experts note that the coexistence of these types of generation is difficult and may require the choice of one dominant direction.

The problems of nuclear energy they identify are primarily tied to the storage and disposal of spent nuclear fuel, which is often underestimated due to the low awareness among the population. At the same time, they also emphasize the need for active development of wind power plants, which are more stable in energy production compared to solar panels and can even work at night.

"I believe they should be equal. Not complements, but equals… Wind power plants in other countries account for 75% of the total volume of renewable sources… and we have solar ones. Wind works even at night; thus, it makes sense to develop wind generation more than solar. Therefore, I believe that the future of Ukraine's energy system is small and medium-sized modular reactors, more modern, safer, and so on, combined with the development of renewable sources and the construction of these industrial storage batteries in order to balance the energy system."

(IDI with experts)

"I personally believe that these are 2 types of generation that cannot coexist normally. When it comes to transitioning to 100% of something."

(IDI with experts)

FGD respondents believe that renewable energy sources can be an important addition to Ukraine's energy system, but are unable to replace nuclear energy completely.

"…it's more of a supplement because weather conditions have a big impact here, and just like solar panels, so do wind turbines. They are very dependent on weather conditions. And power production, so to speak, depends on it. So I see it as more of a complement to nuclear energy."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"Perhaps, in the future, over a fairly long period of time, it could completely replace nuclear energy. But at the moment, if we compare the price we invest and what we get out of it, nuclear energy is much easier to pay off than those natural methods of energy production."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

The main advantage of nuclear energy as perceived by the respondents is its stability, capacity, and predictability compared to RES, which depend on the weather: solar panels are only effective in sunlight, and wind turbines need sufficient wind. In addition, respondents point out restrictions of RES, such as a large space needed to install them, the need for resources for construction and disposal, as well as their potential negative environmental impact, such as harm to birds caused by wind turbines.

"Well, it is achievable, but in very large volumes, if we install both, say, wind turbines and solar panels. That is the old principle, like I said, that we do not replace something completely but rather combine things."

(FGD, Kyiv, men and women, 18–25)

"We sold a lot of energy from both CHPPs and hydroelectric power plants. But I believe that at this stage, it is probably better to focus our efforts on other types of power generation, such as wind and solar energy."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

"The resource generated by a nuclear power plant is much higher, by several multiples. And it's not… exponentially, really a lot higher! If we look at those same wind turbines, as far as I know, their use is very harmful to the soil."

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

"This is stupid. I'll even explain why it is. You will never be able to calculate how sunny the day will be tomorrow. Then, you have to store this electricity somewhere in order to distribute it later. This means that you need to be mining lithium."

(FGD, Kyiv, men and women, 40–59)

Despite this, respondents recognize the potential of renewables, especially for maneuvering energy consumption during peak periods. At the same time, they emphasize that a reliable energy system must be diversified, combining different energy sources. The participants have emphasized that the development of renewable energy requires time and significant investment, and therefore nuclear energy will remain a key source of electricity in Ukraine in the coming decades.

"Today there are projects of thermonuclear reactors where you have the fusion of light atoms, like in the Sun, and this generates much more energy. There's Tokmak and so on. Scientific projects. But so far they have not succeeded. We are really standing on the verge of something, but this will continue the same way maybe for not even 5 years, but 10 or more. But well, we hope it will be in our lifetime."

(South / East, cities with 50–100 thousand residents, women and men, 40–59)

"…as an additional thing, of course. But nuclear power cannot be replaced, no."

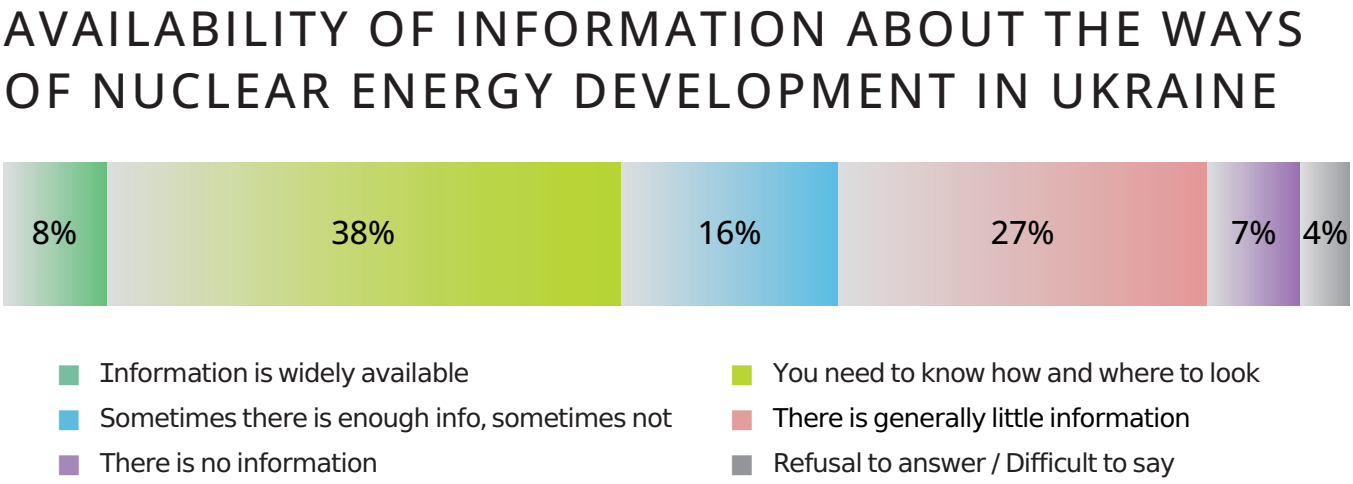
(West, cities with over 500 thousand residents, men and women, 60+)

INFORMATION AND COMMUNICATIONS

AVAILABILITY OF INFORMATION ON NUCLEAR ENERGY

The importance of informing the population about the pathways of nuclear energy development in Ukraine, its benefits and risks, is quite aptly illustrated by the data from the previous sections of this report, particularly when it comes to people's awareness of nuclear energy overall and certain aspects of its functioning, RES and specific renewable technologies. When asked directly about the availability of information regarding the potential pathways for the development of nuclear energy in Ukraine, 38% of respondents indicated that certain aspects of this information are available if you know where and how to search for it; a third said that information was limited or completely absent. Only 8% indicated that information was widely available (Fig. 12).

Fig. 12. Do you think there is enough information about the ways of developing nuclear energy in Ukraine, its benefits and risks?



Young people of ages 18–24 are more likely (52%) to say that there is enough information as long as you know how and where to find it. The older generation aged 55–65 and over 65 indicate that there is not enough information more often (36% and 42%, respectively) (Table 10).

Table 10. Do you think there is enough information about the ways of developing nuclear energy in Ukraine, its benefits and risks? [by age and size of locality]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65
There is enough information, and it is widely available	8%	13%	8%	8%	9%	6%	5%
There is enough information, but you have to know how and where to find it	38%	52%	46%	40%	34%	37%	29%
There is enough information on some aspects, but not on others	16%	22%	21%	22%	15%	10%	10%
There is generally little information	27%	7%	17%	20%	31%	36%	42%
There is no information	7%	1%	6%	8%	6%	7%	10%
Refusal to answer / Difficult to say	4%	6%	2%	3%	5%	4%	4%

According to experts, the population of Ukraine mostly has a low level of knowledge about nuclear energy. People's perceptions are largely based on stereotypes, which, in turn, come from the superficial knowledge about the advantages of nuclear energy disseminated on the official level. Experts say that the population knows quite little about the negative aspects of the industry (it should be noted that the current study, both in its quantitative phase and the FGD phase, partially refutes this statement). However, information about risks, complexities, and economic aspects is indeed not sufficiently available or discussed. People often assess risks intuitively, and a deeper understanding of energy processes is inhibited by the lack of mass education and interest in this issue.

The topic of energy gained particular attention during the power crisis caused by enemy attacks on the power infrastructure. However, experts note the risk of disinformation, which is easily accepted by society due to low awareness.

"I think it's a very low level, if we speak of awareness, when it comes to some technologies or economic issues connected with the energy market."

(IDI with experts)

"Our society is not informed… they know a little more about nuclear energy due to the disaster that happened in Ukraine in Chornobyl. But it seemed to me that this would somehow create a more negative lens for the continued development of nuclear energy in Ukraine… now, due to the shortage and the large number of problems that arise in the energy sector, it is very easy to communicate some incorrect messages, some psyops to society. And society will accept this simply because of low awareness."

(IDI with experts)

"…the nuclear industry carries a positive image of itself, and widely disseminates it to the masses through its propaganda. And this is, in principle, general information that is publicly available and easy to find. But people are not likely to delve into some issue, I don't know, say, look for hard-to-find information in English-language resources."

(IDI with experts)

"Those myths about the harm and so on, they emerged after the Chornobyl disaster and remained ever since. As for the satellite cities around NPPs, yes, that's clear. And the population around NPPs, those who live in villages, I don't think they have a negative attitude to the development of nuclear energy."

(IDI with experts)

According to experts, the population assesses the risks of nuclear energy, mostly associating them with the consequences of the Chornobyl disaster, possible accidents, or depending on the proximity to nuclear power plants. In cities where nuclear power plants are located, for example, in Netishyn, residents mostly perceive the risks as lower compared to respondents from other places due to the residents' involvement in the work at the NPP. At the same time, in neighboring localities, such as Ostroh, the population tends to be more fearful. The security factor is also relevant in the military context.

"I think that the vast majority of people imagine some kind of hypothetical Chornobyl, the impact of radiation, its spread. However, we must understand that similar impact can also occur because power outages at such facilities can also create a certain discomfort for us all, namely, the loss of power."

(IDI with experts)

"But after you literally drive a few kilometers and get to Ostroh, which is on the other side of the KhNPP reservoir, we will see a wider range of opinions because people there are more afraid of some kind of nuclear accident, for example, that they will face the consequences, and they are less involved…"

(IDI with experts)

As for thoughts expressed at FGDs regarding information about nuclear energy, young people from Kyiv believe that basic knowledge about nuclear energy can be obtained at school or through easy access to information in contemporary media. They suggest popularizing these topics via gamification or through YouTube. Ultimately, everyone chooses how deeply they want to delve into this sector.

"I feel like there's enough of everything, I just wish we would have this as a standard in our school curriculum, so to speak, teaching us the principles."

(FGD, Kyiv, men and women, 18–25)

Residents of the South / East region are also confident that information is available in open sources, but interest in looking it up depends on personal motivation. Knowledge about nuclear energy is often based on fragments from conversations with relatives or something seen online or in advertising.

"Probably not enough to be knowledgeable. But for basic knowledge, for every person, it's enough to have it taught at school and some information, maybe, in a playful form in advertising, on YouTube, and so on."

(FGD, Kyiv, men and women, 18–25)

"That is, information is available, and as for how much I want to learn it, that's my right, my conviction. As for information in general, where do you find it? Well, if you have a question, you look it up online. Now we have enough…"

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

"A person should want to know this information, what is already publicly available. Indeed, superficially, we all know some facts: something our grandmother told us, something we saw on the Internet, something we somehow know."

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

Respondents aged 26–39 admit that knowledge about nuclear energy among non-specialists is superficial. Deeper knowledge is only needed for those who work in relevant fields. FGD participants note that there is information in the public domain, and it is sufficient for everyday life. If necessary, you can find important information online, get a better understanding, and draw conclusions.

"…this is more technical information, medical, and I don't belong to these areas of education and interests, so I can only share the opinions of people who are close to me, who are also of the same opinion, as far as I see, for instance, infrastructure, that I can speak about, but there is also research about people's health, about the environment."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

"There is not enough information, but I guess there is no special need for this knowledge in everyday life, no. But if you need some information, I think such important information is on the Internet, and you can read it, analyze, draw conclusions and understand, take something for yourself."

(FGD, North / Center, cities with 100–500 thousand residents, women and men, 26–39)

Residents of Varash (40–59) emphasize the importance of local sources of information, such as newspapers and social media. They agree that a lot of information is available in the public domain, including sources in English. However, some express the opinion that more knowledge for specialists would make life safer. Kyiv residents of this age are convinced that there is enough information: it is available in the format of manuals, courses, and lectures. The problem lies rather in the interest of the people themselves. They emphasize the importance of personal willingness to delve into the subject.

"Well, in principle, that's enough, but when some… Say, the war has started, so of course it would be nice to understand what is being done and how it's being done. Then, of course, there is not enough information."

(FGD, West, Varash, men and women, 40–59)

"There are many information sources now. Starting from the fact that we have a local newspaper, and there are also social media."

(FGD, West, Varash, men and women, 40–59)

"But if you need more information, go ahead and research, the sources are there. There is a lot of information, various documents, etc. English-language ones, for example."

(FGD, West, Varash, men and women, 40–59)

"…everyone has internet not only at home, but also in their pocket. If you just want… There are probably entire manuals, courses, lectures on what to do in the event of a radiation hazard, on what nuclear energy means. But, in my opinion, there is more than enough information now, it's not that there isn't. If a person is interested, they can go look it up."

(FGD, Kyiv, men and women, 40–59)

"And that kind of information, say, about the principles of the operation itself, how many pumps, what pumps, a regular everyday person doesn't need that."

(FGD, West, cities with over 500 thousand residents, men and women, 60+)

"…at least there is quite a lot of information. If you go look up specifically, say, if you search for information how a nuclear power plant works. It is available."

(FGD, West, cities with over 500 thousand residents, men and women, 60+)

Older people believe that there is more than enough information on nuclear energy. They recognize that detailed technical knowledge about the operation of the plants is not necessary for regular citizens. Those who are interested can just "go look."

SOURCES OF INFORMATION

Respondents to the quantitative survey were offered a list of sources of information about nuclear energy and asked to select those that could and/or should provide credible information about nuclear energy, its development paths, benefits, and risks. The ranking results are shown in Fig. 13 (each respondent could choose multiple options).

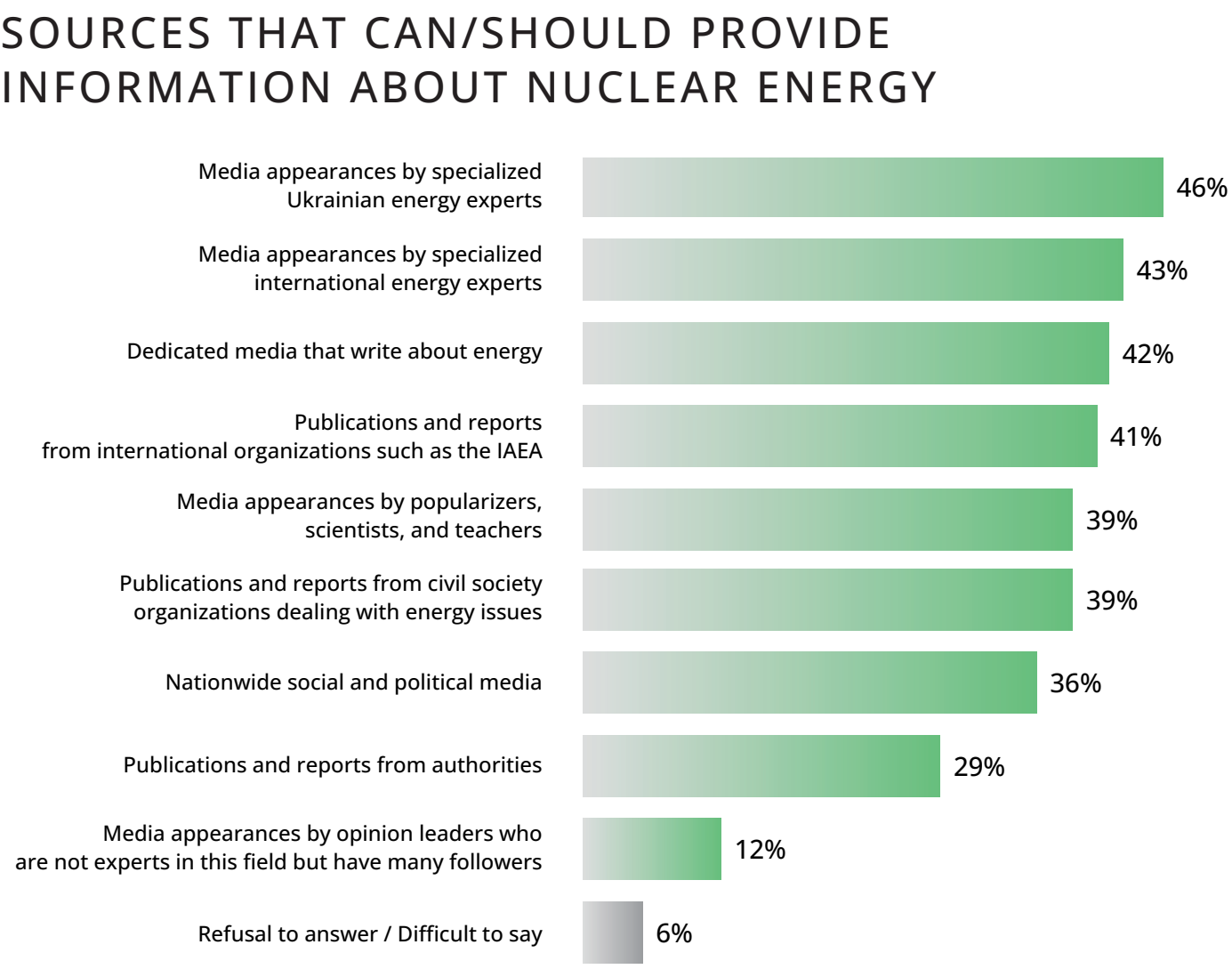
Notably, exclusively expert sources take the lead. Media appearances of Ukrainian energy experts rank first by a small margin (46% of respondents believe that it is such experts that should provide information).

In second place, with scores of 43%, 42%, and 41% respectively, are the following information sources: media appearances by international energy experts, dedicated media that write about energy, and publications and reports from international organizations, such as IAEA.

The third place, with a score of 39% each, is held by media appearances by science promoters, scientists, and teachers alongside publications and reports from civil society organizations dealing with energy issues.

Reports from government agencies (29%) and speeches by opinion leaders (12%) are of less interest.

Fig. 13. What sources of information, in your opinion, can and/or should provide trustworthy information about nuclear energy, its development paths, benefits, and risks?



In the quantitative survey, certain discrepancies were identified by respondents' age groups (Table 11). Respondents aged 35–44 are more likely to support specialized media that write about energy (50%); respondents aged 25–34 are more likely to be interested in publications and reports from civil society organizations that deal with energy issues (48%). Overall, people of ages 25–44 chose more diverse sources of information. Older people, on the contrary, chose almost all sources less often.

Young people of ages 18–24 were more likely to choose publications and reports by government agencies (45% vs. 29% in the total sample) and media appearances by opinion leaders who are not experts in this field but have many followers (19% vs. 12% in the total sample).

Table 11. What sources of information, in your opinion, can and/or should provide trustworthy information about nuclear energy, its development paths, benefits, and risks? [by age]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65
Nationwide social and political media	36%	46%	38%	42%	38%	35%	24%
Dedicated media that write about energy	42%	51%	48%	50%	49%	37%	26%
Publications and reports from civil society organizations dealing with energy issues	39%	46%	48%	45%	37%	33%	29%
Publications and reports from authorities	29%	45%	36%	31%	28%	21%	21%
Media appearances by opinion leaders who are not experts in this field but have many followers	12%	19%	13%	14%	9%	10%	8%
Media appearances by specialized Ukrainian energy experts	46%	56%	56%	57%	44%	35%	35%
Media appearances by specialized international energy experts	43%	52%	55%	49%	45%	38%	27%
Publications and reports from international organizations such as the IAEA	41%	47%	42%	44%	38%	39%	39%
Media appearances by popularizers, scientists, and teachers	39%	48%	48%	48%	37%	29%	30%
Refusal to answer / Difficult to say	6%	1%	5%	3%	4%	9%	9%

The results of focus group discussions indicate that young people most often receive information about nuclear energy through social networks, which are convenient and accessible. Many believe it is important to use truthful sources, verify information, and avoid spreading myths. Popular platforms are Instagram (in particular, NPPs' accounts), Telegram, YouTube, and even TikTok, where information is presented in the format of short videos or ads with interesting facts which may spark the audience's curiosity.

"Information can be conveyed through social media because we are very dependent on them nowadays, and therefore it can be quite accessible to us through social media. The main thing is to use sources that are truthful and to avoid paying attention, so to speak, to myths."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"The KhNPP also has an Instagram account. And there, they publish a lot of information that specifically relates to the activities that are taking place. In our city, they organize tours for high school students. Meetings with the director of the NPP, but earlier, before the start of Covid and martial law, we also invited people from other cities who wanted to learn more about nuclear energy."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

"Social media work best because at least a lot of young people use them. And if we talk about learning more about the work of NPPs in particular, I would use, for example, I don't know, some scientific publications or books with proven research."

(FGD, West, cities with under 50 thousand residents, women and men, 18–25)

Some respondents point out the importance of educational events, such as tours of NPPs, lectures, meetings with experts, and integration of the subject of nuclear energy into the school curriculum. Particular emphasis is placed on the need to highlight the positive aspects of nuclear energy, which are rarely discussed. Educational platforms, such as Vseosvita, can become useful tools for disseminating knowledge.

"This information should be shared in educational establishments. We all had this subject, Defense of Ukraine, or Defense of Motherland, and this topic is partly touched upon. But again, it is mentioned in a negative way, in relation to nuclear war. But we do not look at the good sides of nuclear power, we look at what should be done in the event of a nuclear explosion."

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

"I think this should be on some educational platforms, like, say, Vseosvita, there can be, for instance, some presentation from the representatives who can tell people, children, students about this. This should be some kind of material that, for example, is provided to educational institutions by, say, Energoatom, like, 'So and so, tell your children, your little darling children, that this exists.'"

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

"Take people to the plants, do tours. Not just, like, in a fake way, look here, look there."

(FGD, Kyiv, men and women, 40–59)

"I have seen some information, if I see it in most sources, then I will already think and believe that the information can be reliable because it is written in most sources that I trust equally. And if we take the situation in our country, we are in a situation of war. During the war, most information is presented to us from a different perspective. That is, it would be untrue to say that we are knowledgeable in most situations, they don't tell us most things, and I guess they will already after the war, maybe even a few years later."

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

Official sources, such as websites of government agencies or major media outlets, are perceived as reliable by FGD participants. At the same time, young people express a desire to receive information in the format of presentations, videos, photos, and comparisons that demonstrate the impact of nuclear energy on the environment. Somewhat older respondents (26–39) point to the importance of expert opinions — from industry professionals, representatives of research institutes, or well-known specialists, such as Lana Zerkal.

"The Ministry of Emergencies, that is, the Ministry of Internal Affairs, for example, can have websites. The websites of the Ministry of Defense of Ukraine, well, websites, government websites, which, I mean, are first-hand, from the first persons, which are state-owned, they should disseminate certain information that is necessary for people."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

"...this shouldn't be pro-government channels, like Inter, 1+1 and so on. In general, one of the really good specialists in this field is Lana Zerkal. She was once the Deputy Minister of Energy and a diplomat. She is a diplomat. I believe she is one of the few who could really tell the population about the expediency, efficiency, how it all works, and whether we really need it."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

"I believe, for instance, Lana Zerkal to be an expert. Not Minister Halushchenko, for example, but Lana Zerkal. I would be happy with her opinion. For example, perhaps some experts from research institutes, specialists. Of course, they are developing, and calculating the cost price and the return, and you can envision the technical component."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

"Suspilne [Public Broadcasting], well, they could make a film to somehow make this more relevant, because there hasn't been anything like this about energy in Ukraine for a long time, maybe a little bit about the world, about global trends. And, probably, our political figures should also explain somehow, because, for example, I recently even heard the rumor that our nuclear power plants run on Russian uranium."

(FGD, North / Center, cities with 100–500 thousand residents, women and men, 26–39)

"About the impact of some type of weapon striking the plant, or about the consequences, about the scale of the impact, as many are saying now, about distribution substations near nuclear power plants, what kind of shutdown will occur at the plant, whether it is safe, how quickly it can be restored. More aspects of that kind."

(FGD, North / Center, cities with 100–500 thousand residents, women and men, 26–39)

FGD participants suggested several ideas for raising awareness. In particular, they mentioned the creation of PSAs, documentaries, and specialized websites that would explain the operation of nuclear power plants in an accessible way. Additionally, the participants spoke about thematic events for schools and presentations that could be organized, for example, by Energoatom. In a war situation, respondents emphasized the need to provide verified and reliable information.

"Probably some kind of website that will be specifically about nuclear energy. For example, I click, and it's clearly about it... without any references to other websites."

(FGD, South / East, cities with over 500 thousand residents, men and women, 26–39)

"This definitely has to be some kind of official information. Say, the presenters who read out weather forecasts, they take this information from official sources. Accordingly, it should only be official sources that should say it, not someone somewhere just saying things."

(FGD, West, Varash, men and women, 40–59)

"Since the only operator now is Energoatom, thus, they have to provide information, in the form of videos, in the text format. I mean information, say, on websites."

(FGD, West, Varash, men and women, 40–59)

"The Ministry of Energy should also speak up. They should also work in this aspect, that is, these are strategic communications. The responsibility should still be placed on Energoatom, but the Ministry of Energy should also be involved in this. And the second part should be the way it is built now."

(FGD, West, Varash, men and women, 40–59)

Experts, for their part, emphasize the importance of access to reliable information about nuclear energy through various communication channels: official websites, television, social networks, infographics, and video content. They emphasize the need for transparency, data availability, and visibility to better understand the benefits and risks of nuclear power in society.

"These can be original articles, since Energoatom, too, they often publish original articles or blog entries about energy development in various popular sources."

(IDI with experts)

"I feel it would be good to have an infographic here because it's visual, it looks good, and you can immediately see the comparison and everything. For example, say, building an SPP, a solar power plant, costs this much, disposing of the panels which are an integral part of an SPP would cost this much, and building an NPP costs this much."

(IDI with experts)

"Official sources now, as far as I know, for example, the Khmelnytskyi NPP website is not available to users at all, it doesn't exist. Although that website previously contained a lot of important information that was important from a security perspective, for example, environmental protection. The lack of access to this information in the form of a website creates certain inconveniences."

(IDI with experts)

"Television, particularly local. There are central channels, and there are local ones. So, I believe that local TV channels should have some special broadcasts to promote nuclear energy."

(IDI with experts)

"If it's a Telegram channel or a media outlet, or any format of communication on social networks, I would like it to have a link to reliable sources, and not in the form of an audio message about this word of mouth thing... This, of course, is because the video format on YouTube is a very common form of interaction with the audience. And Ukrainian YouTube is gaining momentum. And more people are looking for some new content in Ukrainian. So, with this demand in place, I think educational information on this acute issue could be provided."

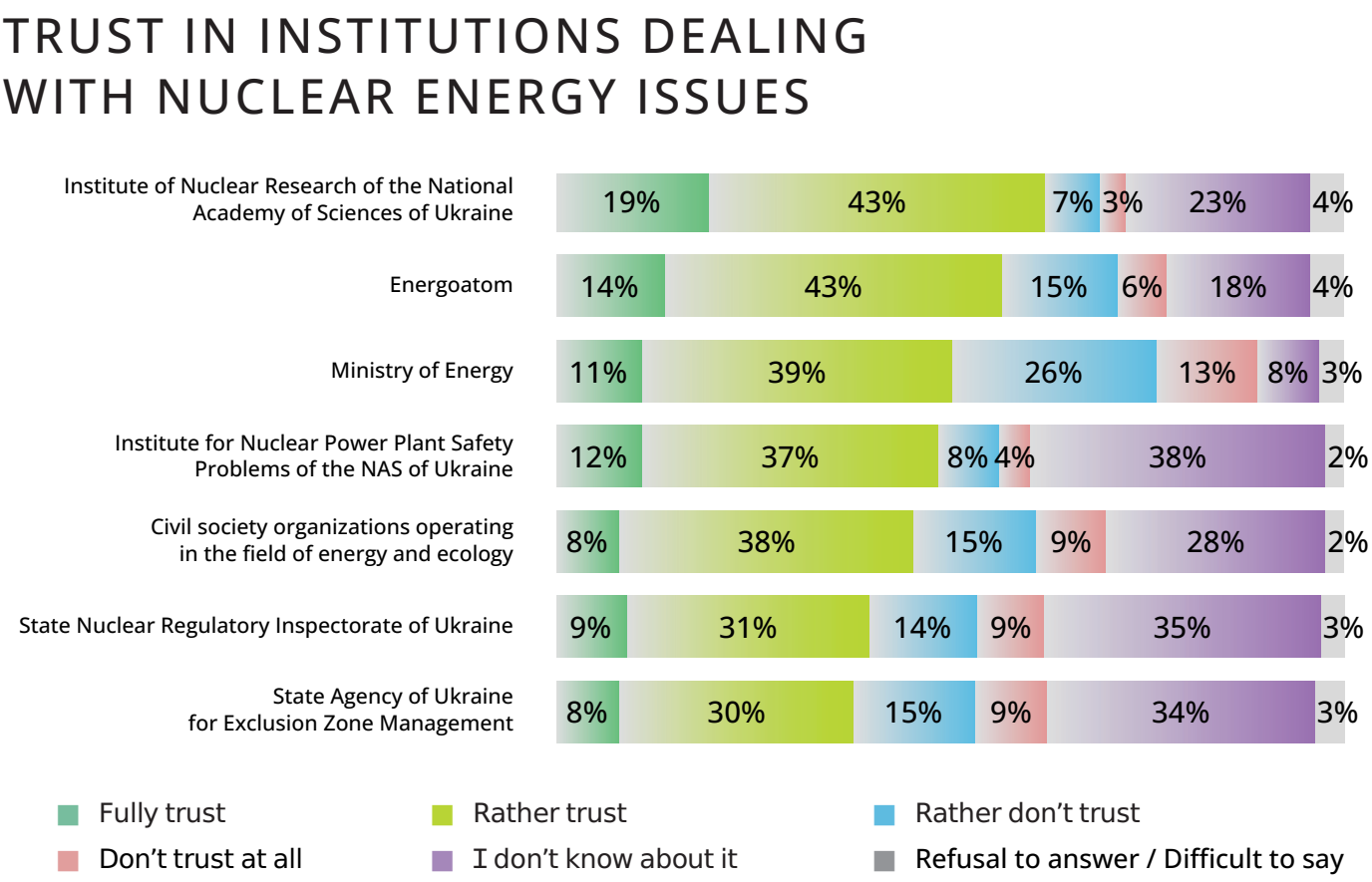
(IDI with experts)

TRUST IN INSTITUTIONS AND CORRUPTION RISKS

The Institute for Nuclear Research of the National Academy of Sciences of Ukraine (62%) and Energoatom (57%) gained leadership among respondents to the quantitative survey in the rating of trust in institutions responsible for nuclear energy. Opinions regarding the Ministry of Energy were divided: 50% fully or partially trust this institution, 39% rather distrust it or completely distrust it (Fig. 14).

Regarding such institutions as the Institute for Nuclear Power Plant Safety Problems of the NAS of Ukraine, the State Nuclear Regulatory Inspectorate of Ukraine, the State Agency of Ukraine for Exclusion Zone Management, a significant proportion of respondents refused to answer or chose "difficult to say," which may indicate a low level of familiarity with these institutions overall (34% and 35%, respectively).

Fig. 14. How much do you trust each of these institutions?



As for differences among age groups, young people of ages 18–24 and 25–34 are more likely to report trust in the listed institutions:

- The Institute for Nuclear Research of the National Academy of Sciences of Ukraine and Energoatom are more likely to be trusted by young people of ages 25–34 (53% and 52%, respectively);
- The Ministry of Energy is fully or somewhat trusted by 70% of young people of ages 18–24;
- The Institute for Nuclear Power Plant Safety Problems of the NAS of Ukraine is trusted more by young people of ages 18–24 (51%) and 25–34 (18%) (Table 12).

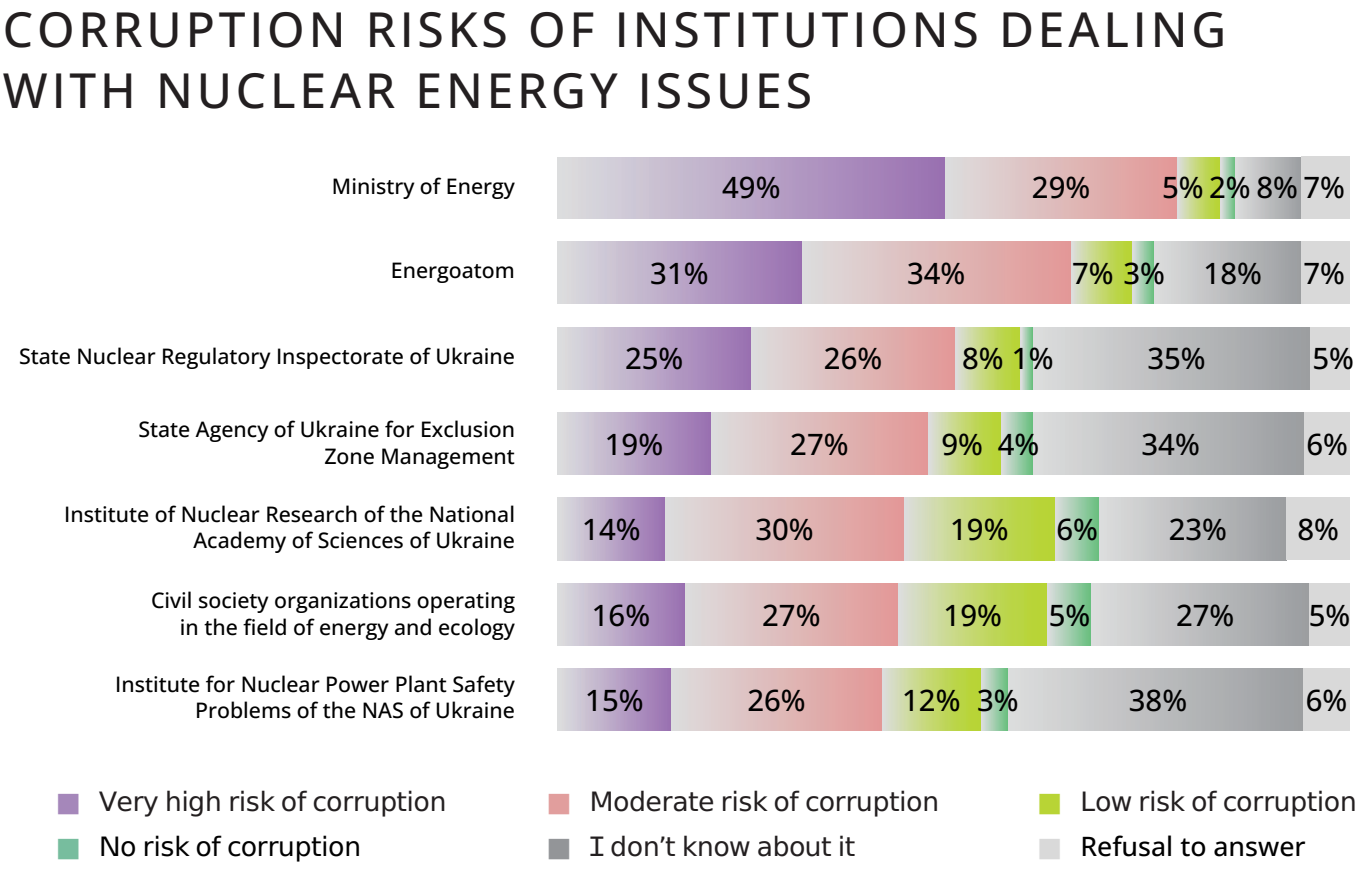
Table 12. How much do you trust each of these institutions? [by age and size of locality]

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
Institute of Nuclear Research of the National Academy of Sciences of Ukraine												
Fully trust	19%	17%	20%	18%	22%	18%	21%	17%	25%	11%	22%	17%
Rather trust	43%	49%	53%	43%	41%	37%	38%	42%	38%	49%	40%	50%
Rather don't trust	7%	1%	3%	10%	7%	9%	7%	8%	6%	6%	8%	5%
Don't trust at all	3%	6%	2%	3%	3%	2%	5%	2%	5%	5%	3%	3%
I don't know about it	23%	23%	20%	25%	24%	26%	23%	26%	22%	26%	23%	20%
Refusal to answer / Difficult to say	4%	4%	2%	1%	4%	8%	6%	4%	4%	3%	3%	5%
Energoatom												
Fully trust	14%	13%	16%	12%	12%	15%	15%	16%	14%	9%	15%	11%
Rather trust	43%	43%	52%	49%	44%	36%	33%	37%	43%	53%	43%	48%
Rather don't trust	15%	8%	9%	14%	18%	21%	15%	13%	13%	9%	19%	18%
Don't trust at all	6%	4%	6%	6%	8%	7%	7%	6%	6%	10%	8%	5%
I don't know about it	18%	31%	17%	17%	13%	14%	21%	22%	18%	14%	13%	15%
Refusal to answer / Difficult to say	4%	1%	2%	2%	4%	6%	8%	6%	4%	5%	3%	3%
Ministry of Energy												
Fully trust	11%	18%	12%	8%	9%	13%	10%	14%	10%	8%	10%	10%
Rather trust	39%	52%	47%	45%	35%	31%	33%	36%	38%	37%	41%	45%
Rather don't trust	26%	13%	26%	28%	28%	27%	27%	27%	26%	26%	24%	27%
Don't trust at all	13%	4%	9%	9%	20%	15%	15%	11%	14%	17%	17%	9%
I don't know about it	8%	11%	6%	9%	6%	8%	9%	11%	8%	8%	5%	7%
Refusal to answer / Difficult to say	3%	2%	1%	0%	2%	6%	5%	2%	3%	5%	3%	2%
Institute for Nuclear Power Plant Safety Problems of the NAS of Ukraine												
Fully trust	12%	10%	18%	10%	9%	15%	9%	13%	12%	5%	12%	12%
Rather trust	37%	51%	34%	39%	39%	35%	32%	31%	40%	47%	33%	42%
Rather don't trust	8%	6%	4%	7%	8%	10%	11%	10%	5%	13%	8%	6%
Don't trust at all	4%	4%	3%	4%	3%	3%	4%	3%	4%	4%	7%	1%
I don't know about it	38%	30%	39%	39%	40%	34%	40%	40%	38%	26%	38%	37%
Refusal to answer / Difficult to say	2%	0%	2%	1%	1%	4%	3%	2%	1%	5%	1%	2%
Civil society organizations operating in the field of energy and ecology												
Fully trust	8%	8%	10%	6%	4%	10%	10%	11%	8%	5%	7%	7%
Rather trust	38%	55%	41%	39%	31%	37%	32%	38%	33%	45%	37%	40%
Rather don't trust	15%	12%	12%	12%	18%	16%	21%	13%	17%	16%	18%	16%
Don't trust at all	9%	4%	9%	8%	14%	8%	8%	8%	9%	15%	10%	8%
I don't know about it	28%	22%	27%	32%	31%	25%	25%	29%	30%	15%	27%	27%
Refusal to answer / Difficult to say	2%	0%	1%	2%	2%	3%	4%	2%	3%	4%	1%	3%

	Total sample	18–24	25–34	35–44	45–54	55–65	Over 65	Village	City with under 50 thous. residents	City with 51–100 thous. residents	City with 101–500 thous. residents	City with over 500 thous. residents
State Nuclear Regulatory Inspectorate of Ukraine												
Fully trust	9%	13%	11%	6%	8%	12%	8%	12%	10%	3%	10%	5%
Rather trust	31%	33%	37%	38%	25%	27%	26%	24%	27%	42%	33%	39%
Rather don't trust	14%	20%	11%	12%	15%	15%	14%	11%	17%	11%	13%	16%
Don't trust at all	9%	6%	4%	9%	11%	9%	10%	9%	9%	6%	12%	5%
I don't know about it	35%	28%	36%	32%	40%	36%	36%	41%	35%	34%	31%	31%
Refusal to answer / Difficult to say	3%	0%	1%	2%	2%	3%	6%	2%	2%	4%	1%	4%
State Agency of Ukraine for Exclusion Zone Management												
Fully trust	8%	11%	8%	7%	9%	9%	7%	7%	8%	1%	10%	10%
Rather trust	30%	44%	41%	33%	18%	26%	25%	29%	31%	36%	27%	31%
Rather don't trust	15%	11%	13%	18%	17%	15%	15%	15%	19%	11%	15%	14%
Don't trust at all	9%	7%	4%	7%	12%	13%	11%	6%	10%	16%	11%	8%
I don't know about it	34%	25%	32%	33%	40%	33%	37%	39%	29%	33%	36%	33%
Refusal to answer / Difficult to say	3%	1%	1%	1%	4%	5%	5%	4%	3%	2%	1%	4%

Regarding corruption risks, the Ministry of Energy takes the unfortunate lead here according to the quantitative survey: 49% of respondents believe that there is a "very high risk of corruption" in the ministry and 29% believe that there is a "moderate risk of corruption" (Fig. 15).

Fig. 15. To what extent do you believe these institutions to be at risk of corruption?



Energoatom is in second place in the anti-ranking with an overall corruption risk score of 65%, and the State Nuclear Regulatory Inspectorate of Ukraine is in third place, with 50% of respondents believing that the risk of corruption there is either "very high" or "moderate."

According to the quantitative survey respondents, the institutions that are less prone to corruption risks are the ones engaged in research, studying the safety issues of nuclear power plants, as well as the NAS of Ukraine and civil society organizations. However, it is worth noting that even for institutions that come last in the anti-ranking, more than half of those surveyed believe that there are at least moderate corruption risks.

FGD respondents most often mentioned Energoatom when discussing corruption risks — its monopoly status raises certain suspicions about corruption risks. Respondents also mentioned corruption scandals related to this organization that were covered in the media. Interestingly, they mentioned not only recent publications, but also relatively old ones, from 2021.

"Well, in 2021 there was a scandal… well, and, in general, let's note that this organization Energoatom is a monopoly in Ukraine! That is, they are monopolists. Even though we have, like, an anti-monopoly committee in our country."

(FGD, South / East, cities with 100–500 thousand residents, women and men, 18–25)

"…like Energoatom, it's very corrupt, as I've seen on the news and from what was found."

(FGD, West, cities with 50–100 thousand residents, women and men, 26–39)

Experts also point to high corruption risks in nuclear energy, in particular due to non-transparent bidding and limited access to information during wartime, which increases public distrust, as such issues are perceived particularly acutely during wartime.

"There are corruption risks indeed because now, many auctions are held without publishing documents, even in Prozorro. Therefore, of course, when Energoatom, for example, holds such tenders, journalists, investigators, experts cannot see the technical specifications, technical parameters, what Energoatom is buying, what the costs are, and so on. So, there are [risks] of course."

(IDI with experts)

"It seems to me that during war, people react more acutely to these corruption risks than in peacetime. That is, relatively speaking, in peacetime it was still perceived badly, but, like, that's what it's like in this country. But in wartime, people actually perceive everything much more acutely now. That is, this is a more resonant question. Particularly in the issue of nuclear energy. Historically, this is a very corrupt industry."

(IDI with experts)

CONCLUSIONS

The study helped us identify and form several key statements regarding the attitude of Ukrainian society to nuclear energy, plans for construction of new NPPs, and alternative vectors of energy system development.

The attitude of the Ukrainian population to nuclear energy:

- The level of knowledge about nuclear energy remains superficial. 74% of the respondents claimed to be familiar with the principles of nuclear power plant operation, but only 13% can explain it to others.
- Most Ukrainians recognize the role of nuclear energy in providing the country with electricity — 93% agree that nuclear power plants provide large amounts of electricity.
- 81% of respondents agree that radioactive waste management is a key problem in nuclear energy.
- 76% of respondents agree that being near a nuclear power plant in peacetime was already dangerous, and during wartime, these risks have only increased.
- 67% of respondents opposed the gradual closure of nuclear power plants and terminating plans for constructing new units.
- 29% overall lean towards abandoning nuclear energy entirely.

Attitude towards the construction of new nuclear power units:

- 68% of the surveyed say that the construction of new power units should be postponed until the end of the war, due to military risks and the need for significant investment.
- 14% of respondents support the construction of new power units even in the current conditions.
- 43% of respondents fully agree, and 33% rather agree that the construction of new nuclear power units is associated with significant corruption risks.

Attitude to renewable energy sources (RES):

- 84% of respondents agree that renewables can replace at least some of the electricity currently produced by nuclear power, provided they are properly integrated into the grid.

Use of nuclear energy during the war:

- 79% of respondents believe that nuclear power plants have become military targets, especially after the occupation of the Zaporizhzhia NPP.

The study indicated that Ukrainians generally have a superficial understanding of the operation of nuclear power plants, but at the same time are concerned about the risks, in particular the management of radioactive waste and military threats.

Most respondents believe that the construction of new nuclear power units should be postponed due to security and corruption risks, and because such construction requires significant expenditure of both money and time. At the same time, most respondents support the development of renewables as a possible vector for the development of Ukraine's energy system, but not to fully replace nuclear generation.

The war significantly affected the perception of nuclear energy, increasing concerns about its vulnerability to military threats. Overall, public sentiment regarding energy policy remains mixed, demonstrating both a desire for stability and the need to adapt to new challenges.

APPENDIX

DEMOGRAPHIC PARAMETERS OF THE QUANTITATIVE SURVEY SAMPLE

Fig. 16. Demographic data: Gender and age of the respondents

GENDER

AGE

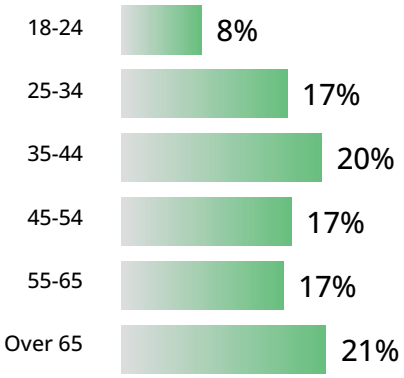
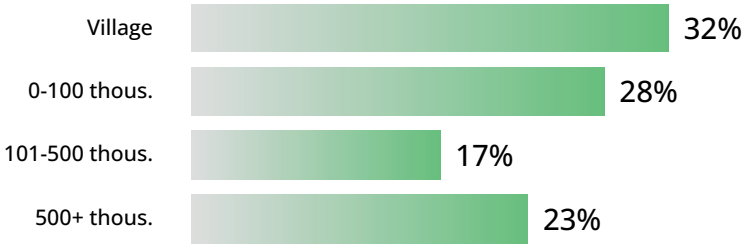


Fig. 17. Demographic data: Size of the locality, region of residence of the respondents

SIZE OF LOCALITY



REGION

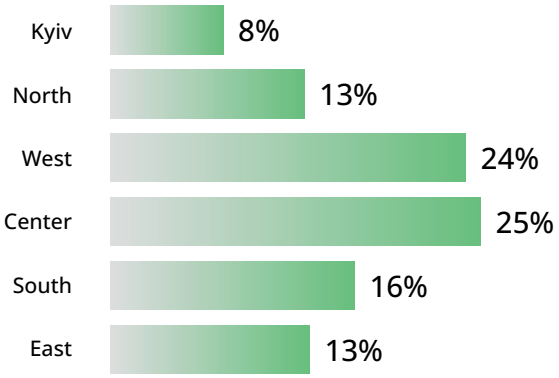


Fig. 18. Demographic data: Respondents' location

LOCATION

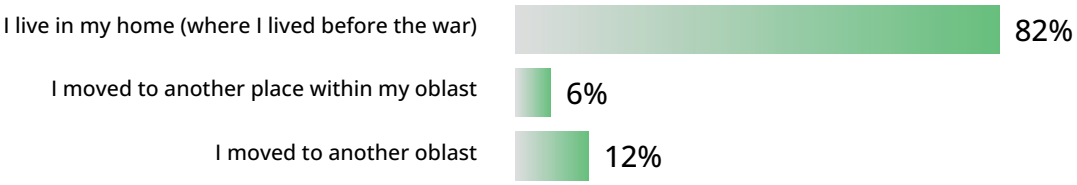
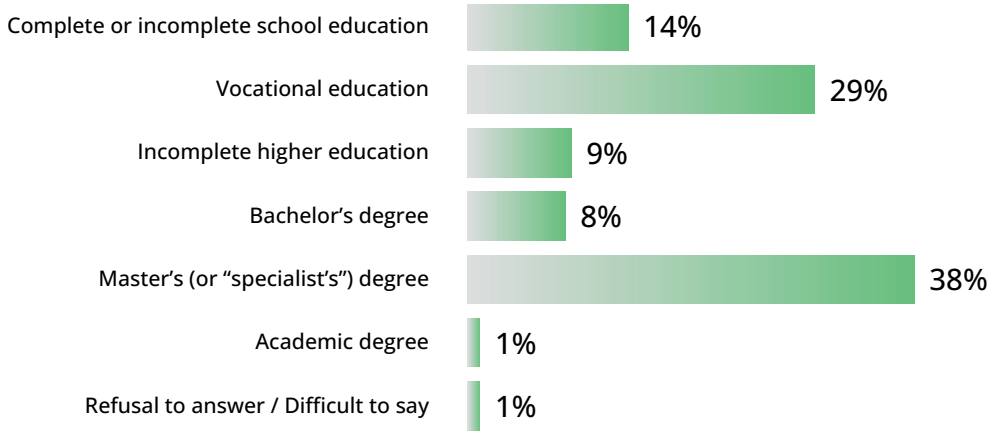


Fig. 19. Demographic data: Respondents' employment and education

EDUCATION



EMPLOYMENT

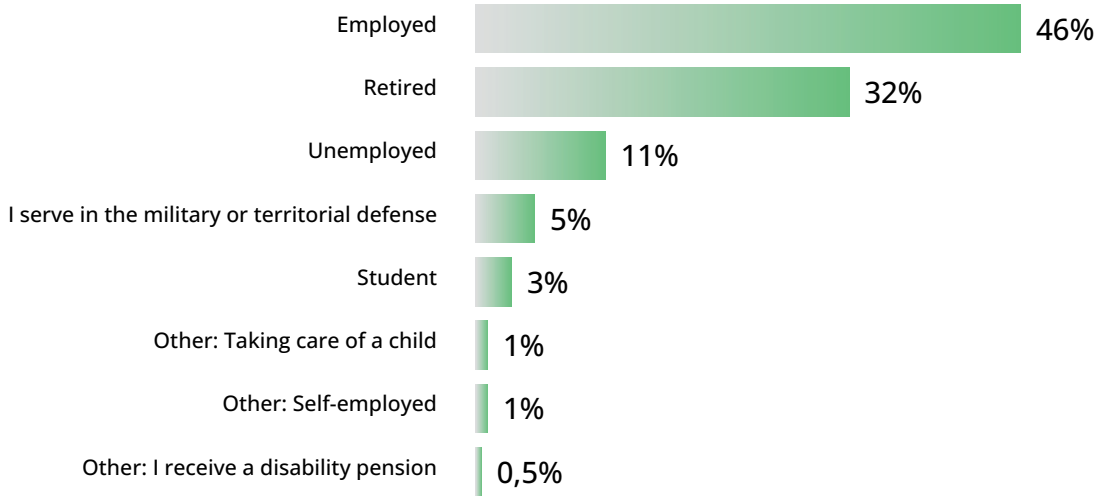


Fig. 20. Demographic data: Economic situation of the household