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Summary

The ECOSENS project examines nuclear energy governance, focusing on stakeholder engagement across Europe. It integrates social sciences into nuclear policy, analyzing how public participation, transparency, and political discourse shape decisions. This milestone report deals with the in depth case studies in six European countries descrtibing stakeholder engagement (or lack of it) in nuclear governance in various national context. The methodology is developed for each of the study and utilize different approaches, from interviews, social media analysis, and document reviews to assess

In Belgium, nuclear debates are highly politicized, with oppositional parties, particularly N-VA (Nieuw-Vlaamse Alliantie) and Vlaams Belang, leading social media discussions in Flanders in 2024. The Russian invasion of Ukraine heightened concerns about energy security, influencing policy shifts. Small Modular Reactors (SMRs) are framed by Dutch speaking Flemish politicians in social media discourse differently than nuclear energy in general (nuclear safety and economic growth frames were used more often in tweets referring to SMRs), and mainly promoted by center-right parties.

Slovenia's governance shows limited stakeholder influence. The National Energy and Climate Plan (NEPN) included public consultations, but most feedback was not taken into account with limited explanation. A planned referendum on a second nuclear plant (NEK2) was canceled, raising concerns about transparency and real stakeholder participation.

Slovakia faces significant challenges regarding transparency and civil society participation in its nuclear sector. Environmental NGO oversight has declined dramatically since 2010-2012, despite Slovakia's global co-leadership in nuclear power dependency. Among other, government policies have systematically restricted the Aarhus Convention and reclassified nuclear information as confidential. Both ruling and opposition parties avoid clear commitments on spent nuclear fuel final disposal. To restore effective stakeholder engagement, sustainable multi-annual core funding mechanisms must replace project-specific financing, enabling NGOs to access essential legal expertise.

The nuclear debate is also politicised in Spain, where the decision to phase out nuclear power plants was a government-driven decision agreed with the industry. The regulator and the waste management agency were mere observers of the decision, involved only because of their role in the closure and decommissioning of nuclear plants. There was no real stakeholder or public involvement, not even from the communities that host nuclear power plants. Stakeholders question the transparency of both government and industry. This is one of the main challenges for engagement in Spain.

Romania is expanding nuclear energy, including the ALFRED SMR project. Early stakeholder engagement and strong political support have helped build trust, making Romania a positive case for proactive nuclear governance.

In the United Kingdom, SMRs are a growing focus, but public engagement is limited, occurring mainly within policy and industry circles. Transparency and inclusiveness will be crucial for public acceptance of new nuclear technologies.

Several common trends emerge. Nuclear debates are highly politicized, often driven by partisan agendas. Transparency and public influence vary; some countries actively involve stakeholders, while others limit participation. The Russian invasion of Ukraine has reinforced energy security arguments, shaping policy decisions. SMRs are promoted as a future solution, though public awareness remains low. To improve engagement, the study recommends greater transparency, inclusive public participation, and structured debates. Policies should consider both nuclear and renewable pathways, moving beyond short-term

political cycles. Balanced, evidence-based discussions will enhance public trust and democratic decision-making in nuclear policy across Europe.

1 Introduction

The European ECOSENS project (2022-2025) aims to create a space for dialogue and collaboration where researchers in social sciences and humanities and nuclear energy research and policy meet, exchange views and collaborate with civil society and other relevant stakeholders related to the development and use of existing and new nuclear technologies. In the context of major societal challenges, such as the climate crisis, the call for sustainable development and the concerns regarding energy security, ECOSENS aims to open up the techno-scientific issues to the social, political, cultural and ethical context, in order to guide policies in the nuclear field. By "nuclear field" we refer in this document to the nuclear energy fuel cycle, from uranium mining to installation and operation of nuclear power plants (routine and accident conditions), up to radioactive waste management and decommissioning.

Within ECOSENS, a dedicated task within the Work Package WP1 "A collaborative assessment of (imagined) energy worlds" aims at providing an analytic and critical review of stakeholder engagement in energy governance and inter-disciplinary collaborations (Task 1.3). The task assesses the actual uptake in the nuclear field of recommendations on stakeholder engagement in energy governance and transdisciplinary collaborations in terms of justification, effectiveness and sustainability. This is expected to produce actionable insights for improved societal dialogue on energy governance and the inclusion of social considerations in technology and sustainability assessments of nuclear energy. The results from this analysis will also inform the development of recommendations for enhanced mechanisms of interaction between citizens, civil society, decision-makers and researchers.

Within the Task 1.3 three main questions are addressed: What are the current recommendations for stakeholder engagement in nuclear energy policies? What is the uptake of these recommendations? And how can stakeholders be more effectively engaged in nuclear energy policies? To respond to these questions, a multi-method approach has been used involving different activities, like analysis of existing recommendations for stakeholder engagement in the nuclear field, in order to generate a broad overview about the topics and performing the online survey with regulators, policy representatives, research institutions and other societal stakeholders in European countries to analyse the uptake in the nuclear field of recommendations on stakeholder engagement and transdisciplinary collaborations in energy governance. In addition, in-depth case studies have been performed in six participating countries addressing stakeholder engagement, as well as the salience and politicisation of the nuclear energy issue in countries with varying nuclear policies (e.g. phase-out, new-built) using media data and in-depth interviews with national stakeholders. The results of the investigations are provided in this milestone report together with methodology, findings and conclusions.

For better understanding of text also glossary of terms in given at the end of main text.

2 Case studies methodology

Case studies allow describing stakeholder engagement (or lack thereof) in nuclear energy governance, in various national contexts, namely in six participating countries: Belgium, Slovakia, Slovenia, Spain, Romania and UK. Case studies are conducted using a variety of data sources, including interviews (with national/regional/local stakeholders), media data (where available, including social media) and document analysis (e.g. energy policy documents or supporting studies), results of the online survey carried out in the previous subtask. Case studies may also address the salience and politicisation of the nuclear energy issue.

The unit of analysis consists of major decision-making events/milestones related to nuclear energy in the recent past (approx. 5 years) in ECOSENS participating countries, and the involvement of stakeholders therein. A major decision-making event / milestone is a law, policy decision or any other nationally important document setting the future course of a nuclear energy related issue. While a strong national variance exists in what would consist a recent major decision-making event, case selection focuses on achieving some homogeneity among cases, so that at least two countries are focusing on a similar case context (e.g. decisions on nuclear new built, decommissioning, or phase-out).

Conceptual framework is based on participatory energy governance, deliberative democracy, agenda setting theory, or other frameworks relevant to understand a nationally significant case.

Research questions:

- How / why is (new) nuclear coming on the agenda?
- How are policy decisions made concerning (new) nuclear technologies? What are the important factors? How are uncertainties dealt with?
- How have stakeholders experienced participation in relation to nuclear energy?
- What impact(s) of stakeholder participation can be discerned? In which policy or social contexts?
- What suggestions can be made in view of improving stakeholder engagement? Why?

The presence (or absence) of potential links between stakeholder engagement /discourses on new (nuclear) technologies, and sustainability (either as a concept per se, or particular elements such as climate action or energy security, social justice, ….) should be looked for. The applied methods are further described here in general and also provided in the description of national particular methods used for the investigation.

2.1 Semi-structured interviews

The overall aim of the semi-structured interviews is to identify stakeholder views on participation in nuclear energy governance. The methodological approach to the investigation and analysis of collected data includes the following steps:

a) Defining the interview topic list based on existing literature

The topic list stems from the relevant literature and previous analysis of legal requirements for stakeholder involvement in the nuclear field, case studies of participation practices and lessons learned for stakeholder involvement in various nuclear fields and participatory risk governance. This analysis provides a sufficient basis for designing the interview protocol and topic list (see Appendix A).

b) Determining sample and subgroups

Stakeholders are identified according to the quintuple helix and the focus of the case study: the research (SSH and non-SSH) and education system; the economic system, e.g. nuclear industry, other relevant industry (e.g. energy distribution), firms, services and banks; the natural environment, e.g. environmental NGOs; the media-based and culture-based public, e.g. local communities, Civil Society Organisations, Local Information Committees, social networks, media; the political system, e.g. regulator, government agencies, politicians.

Participants should reflect this diversity, as appropriate for the case study.

c) Ensuring interview consistency

Interviewers need to be knowledgeable about the subject. Interviewers are task members of the ECOSENS project and are therefore familiar with the topic of research and with interviews as a social science qualitative data collection method. The team of interviewers is also familiar with the ECOSENS project, such that they can address possible questions from the respondents. No additional training is needed.

d) Determining interview sequence

A standard interview sequence is adopted (introductory questions, key questions, follow-up and summarising questions).

e) Introduction to the study and informed consent

When inviting respondents and planning the interview, the interviewers introduce themselves, their organisation, the purpose of the research and the reasons that the respondents have been asked to participate in the interviews. The informed consent sheet is attached to the invitation or in a follow-up email and is obtained before the interview starts. The informed consent specifies, among others, that the interviews are recorded and that full anonymity cannot be guaranteed and identifiable information may exist. Identification is possible by the use of quotes. Identification is however limited to the organisation and not the specific interviewee. The interviews are analysed in a generative manner, i.e. insights from specific interviews are combined with all other interviews.

The informed consent also specifies data management practices and the rights of the respondent with regards to participation practices.

A draft informed consent form is provided in Appendix B. The consent form can be also agreed upon orally if explained on the recording. The invitation letter draft is given in Appendix C.

f) Providing information about the project

The introduction of the interview is general and short such as to reduce respondents' bias. At the end of each interview, it is recommended to send a letter of thanks. This letter contains a more detailed description of the project, information on data analysis and dissemination, and links to relevant websites and the contact details of the members of the research team. This letter of appreciation provides an opportunity for follow-up interviews and reduces respondents' fatigue.

g) Data management

In order to organise the data and create a system of data management a logbook will be created linked to a specific code. This code consists of the initials of the interviewer, the sequence number of the interview and the location of the interview (see Appendix A point d). Additional information relevant for identification is included in this document, as well as a possibility for note taking and first impression by the interviewer. Each interview is recorded and is subsequently transcribed. The associated recording and transcription files are logged using the same coding as the logbook. Additionally, the logbook contains the interview protocol easily accessible for interviewers in the field.

h) Analysis of the interviews.

All interviews are recorded and transcribed, with transcriptions analysed using pen and paper methodologies or specific coding software for qualitative analysis (NVivo), in order to identify emerging themes.

2.2 Social media analysis

Social media platforms like X (formerly Twitter) offer real-time insights into public and stakeholder discourse on nuclear energy. By analyzing interactions, sentiment, and content shared by different groups—such as policymakers, industry actors, NGOs, and citizens—researchers can identify key concerns, emerging narratives, and levels of engagement around issues like nuclear policy, safety, and new technologies. This helps map the landscape of stakeholder positions and informs more targeted and responsive engagement strategies. The method applied in the Belgium case uses analysis tweets on nuclear energy on the X.

2.3 Document analysis

Case studies will be complemented with the analysis of publicly available documents, such as policy statement, institutional reports from NGOSs or nuclear research entities, in order to identify what discourses can be discerned regarding (new) nuclear technologies in political statements and decisions.

2.4 Approaches used in different national cases

2.4.1 Social Media analysis of the nuclear energy debate in Belgium

This study analyses posts and comments from X (formerly Twitter) about nuclear energy, made by 79 Flemish politicians and political parties in Flanders, the Dutch-speaking part of Belgium, between January 1, 2019 and August 31, 2024. The data was collected using Coosto, which enables the scraping of tweets despite the current restrictions on access to X's API, which has become more expensive since the acquisition by Elon Musk in October 2022[1].

Relevant tweets were identified using the following query, which includes Dutch keywords related to nuclear energy in general and small modular reactors (SMRs) in particular (Appendix D):

> kerncentrale* OR kernreactor* OR kernenergie* OR atoomenergie OR nucleair* OR SMR OR "small modular reactor*" OR "kleine modulaire reactor*" OR "kleine reactor*" OR "modulaire reactor*" OR "kleine modulaire kernreactor*" OR "kleine kernreactor*" OR "modulaire kernreactor*" OR "kleine modulaire nucleaire reactor*" OR "kleine nucleaire reactor*" OR "modulaire nucleaire reactor*" OR "kleine modulaire reactor*" OR "kleine en middelgrote kernreactor*"

We collected data only from accounts of full-time, professional politicians with more than 3,000 followers and the party's page. The list of politicians is included in Appendix E. In total, we collected 5,419 tweets.

For our analysis, we annotated energy frames that were present in order to identify specific narratives surrounding nuclear energy. The selection of frames is based on existing literature (Shim et al., 2015) and consists of the following five frames:

[1] While many have left X due to dissatisfaction with the direction the platform is taking (Boyd, 2024; *Elon Musk's X Sees Decline in Users in the EU*, 14:58:34 +02:00), the presence of the Flemish politicians we examine remains relatively stable; although there is some decline in the number of total tweets for certain parties when looking at the aggregated data, the number of tweets on nuclear energy is stable overall.

- **Energy Security**: Emphasizes energy independence and supply stability.
- **Clean Energy**: Highlights nuclear energy as a low-carbon or environmentally friendly option.
- **Economic Growth**: Focuses on economic benefits, such as job creation or cost-efficiency.
- **Nuclear Safety**: Concerns related to safety measures, risks, and regulations around nuclear power.
- **Energy Affordability**: Addresses the cost of energy for consumers.

To ensure robust and efficient annotation, multiple methods were tested and compared. We examined two large language models (Meta's Llama-3.1-8B-Instruct and OPENAI's GPT-4o-mini), a dictionary-based method, and an ensemble approach. Our ensemble approach combines the previous three approaches through a voting method: when two out of three models agree on the annotation of a frame, that annotation is used for that particular tweet.

While LLMs perform well without finetuning, it is necessary to engineer the prompt and finetune the hyperparameters temperature and top_p on the dataset to get the best results. The finetuning was done on a validation set of 100 randomly selected tweets that were manually annotated by a human annotator. Through this process, the finetuning of the prompt also improved the manual annotation process by clearing up certain unclear cases. In this sense, a human annotator is working together with an LLM to improve the annotation process, which is similar to two human annotators working together to discuss and improve the annotation. The final prompt can be found in the appendix F. The final temperature was 0.7 for both models, top_p was 0.7 for Meta's Llama model, for OPENAI"s GPT model the default value 1 was used.

Besides finetuning the LLMs, the validation set was also used to finetune the voting mechanism in the ensemble approach and to refine the dictionary-based method. Once the methods were finalized, the test set was employed to assess the models' performance on unseen data, providing an unbiased evaluation of how well the annotation methods generalize to new tweets. This approach helps minimize overfitting on seen data and ensures that the methods are reliable for real-world applications.

We used five metrics to evaluate the validation and test set results. The first two, Cohen's kappa and Krippendorff's alpha are statistical measures commonly used in qualitative research to assess agreement between coders. Kappa focuses on agreement adjusted for chance, while alpha is robust to missing data and considers annotations' ordinal or nominal nature. The next three, precision, recall, and F1-score, are commonly used when benchmarking machine learning models against a golden standard – usually data annotated by a human coder. Precision measures the proportion of frames the model identified correctly, while recall assesses the proportion of correct frames that the model successfully identifies. The F1-score combines these two measures into a single value, balancing precision and recall. Figure 1 shows the results of these metrics. In general, kappa should be above 0.6 and kalpha above 0.8 for the annotation to be acceptable. For F1, a number higher than 0.8 is considered good, a score between 0.5 and 0.8 is considered average.

The ensemble method outperforms individual models, achieving the highest F1 scores and precision across frames. The dictionary-based method performs exceptionally well for nuclear safety and energy affordability frames, although F1 decreased somewhat in the test set compared to the validation set. Individual models (Meta-Llama and GPT-4) show variability, with lower precision for 'energy security' than other frames. Because we saw a very low precision for energy security frames in our test and validation set, while recall was high, we manually corrected all the sentences where the model had annotated energy security. Given that the precision for clean energy is very high while recall is low, clean energy frames may be underestimated in our final results.

VALIDATION

Meta-Llama-3.1-8B-Instruct

frame	kappa	kalpha	precision	recall	f1
energy security	0,2361	0,1534	0,3115	0,8261	0,4524
clean energy	0,7228	0,7197	1,0000	0,6579	0,7937
economic growth	0,5280	0,5253	0,3750	1,0000	0,5455
nuclear safety	0,7817	0,7824	0,7273	0,8889	0,8000
energy affordability	0,7078	0,7090	0,7826	0,7500	0,7660
	0,5953	**0,5779**	**0,6393**	**0,8246**	**0,6715**

TEST

frame	kappa	kalpha	precision	recall	f1
energy security	0,2385	0,1444	0,2879	0,8636	0,4318
clean energy	0,3676	0,3439	0,8000	0,3333	0,4706
economic growth	0,3158	0,3038	0,2000	1,0000	0,3333
nuclear safety	0,5209	0,5216	0,5000	0,6667	0,5714
energy affordability	0,5942	0,5955	0,6111	0,6875	0,6471
	0,4074	**0,3818**	**0,4798**	**0,7102**	**0,4908**

OPENAI gpt-4o-mini

frame	kappa	kalpha	precision	recall	f1
energy security	0,4871	0,4772	0,4872	0,8261	0,6129
clean energy	0,6849	0,6829	0,9259	0,6579	0,7692
economic growth	0,5852	0,5841	0,4286	1,0000	0,6000
nuclear safety	0,7870	0,7873	1,0000	0,6667	0,8000
energy affordability	0,7693	0,7693	0,9444	0,7083	0,8095
	0,6627	**0,6601**	**0,7572**	**0,7718**	**0,7183**

frame	kappa	kalpha	precision	recall	f1
energy security	0,4538	0,4301	0,4255	0,9091	0,5797
clean energy	0,5993	0,5919	0,9500	0,5278	0,6786
economic growth	0,4308	0,4267	0,2857	1,0000	0,4444
nuclear safety	0,9008	0,9011	1,0000	0,8333	0,9091
energy affordability	0,7604	0,7608	0,9167	0,6875	0,7857
	0,6290	**0,6221**	**0,7156**	**0,7915**	**0,6795**

DICTIONARY

frame	kappa	kalpha	precision	recall	f1
energy security	0,7687	0,7693	0,8947	0,7391	0,8095
clean energy	0,8136	0,8139	0,8182	0,9474	0,8780
economic growth	0,4836	0,4846	0,4000	0,6667	0,5000
nuclear safety	0,8908	0,8912	0,8182	1,0000	0,9000
energy affordability	0,8672	0,8677	0,9130	0,8750	0,8936
	0,7648	**0,7654**	**0,7688**	**0,8456**	**0,7962**

frame	kappa	kalpha	precision	recall	f1
energy security	0,6090	0,6094	0,7647	0,5909	0,6667
clean energy	0,7077	0,7081	0,7381	0,8611	0,7949
economic growth	0,5618	0,5613	0,4000	1,0000	0,5714
nuclear safety	0,8164	0,8171	0,8333	0,8333	0,8333
energy affordability	0,6987	0,6997	0,7857	0,6875	0,7333
	0,6787	**0,6791**	**0,7044**	**0,7946**	**0,7199**

ENSEMBLE

frame	kappa	kalpha	precision	recall	f1
energy security	0,5827	0,5804	0,5758	0,8261	0,6786
clean energy	0,8138	0,8132	1,0000	0,7632	0,8657
economic growth	0,6580	0,6594	0,6667	0,6667	0,6667
nuclear safety	0,9366	0,9369	1,0000	0,8889	0,9412
energy affordability	0,8080	0,8086	0,9048	0,7917	0,8444
	0,7598	**0,7597**	**0,8294**	**0,7873**	**0,7993**

frame	kappa	kalpha	precision	recall	f1
energy security	0,5044	0,4892	0,4651	0,9091	0,6154
clean energy	0,5728	0,5635	0,9474	0,5000	0,6545
economic growth	1,0000	1,0000	1,0000	1,0000	1,0000
nuclear safety	0,8449	0,8452	1,0000	0,7500	0,8571
energy affordability	0,7604	0,7608	0,9167	0,6875	0,7857
	0,7365	**0,7317**	**0,8658**	**0,7693**	**0,7826**

Figure 1: A set of heatmaps displaying precision, recall, F1-scores, and kappa values for the different annotation methods used to identify energy frames.

2.4.2 Nuclear debate in establishment of NEPN in Slovenia

The comprehensive national energy and climate plan (NEPN) is an action-strategic document that, in accordance with EU Regulation 2018/1999 on the management of the energy union and climate measures, every EU member state is obliged to adopt. The NEPN for the period up to 2030 (with a view to 2040) sets goals, policies and measures on five dimensions of the energy union, including the production of energy in the country.

The last NEPN was adopted in 2020 (this was the valid NEPN when the investigation started in late 2023) by the Government of the Republic of Slovenia based also on stakeholders' interactions. Based on it the energy license was issued for new nuclear power plan. From 2023 to the end of 2024, activities were carried out in connection with the NEPN update (to be submitted to EC) in which stakeholder engagement is performed. The case study presents the NEPN and related development in order to address research questions: How / why is (new) nuclear coming on the agenda? How are policy decisions

made concerning (new) nuclear technologies? What are the important factors? How are uncertainties dealt with? How have stakeholders experienced participation in relation to nuclear energy? What impact(s) of stakeholder participation can be discerned? In which policy or social contexts?What suggestions can be made in view of improving stakeholder engagement? Why?

Method used include document analyses (on energetika portal https://www.energetika-portal.si/dokumenti/strateski-razvojni-dokumenti/nacionalni-energetski-in-podnebni-nacrt-2024/ of responsible ministry for energy) and interviews with some key stakeholders (governmental and non-governmental institutions). The energetika portal include all relevant document and also information on public consultations with comments and remarks, participants in the process and also results from the consultation. As part of methodology we also participate at the public events to understand the extent of stakeholder engagement.

2.4.3 Stakeholder engagement in Slovakia's commercial nuclear energy program

This national case study examines stakeholder engagement in the Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) procedures for Slovakia's commercial nuclear energy program that were selected as relevant for the ECOSENS project:

a) SEA procedure for the main Energy policy document,
b) EIA procedure for the new NPP project in Jaslovské Bohunice,
c) EIA procedure for the completion of the Mochovce NPP, and
d) the most recent SEA procedure relevant to the siting of a spent nuclear fuel (SNF) geological repository;

It also discusses the significantly decreased interest of Slovak environmental NGOs in Slovakia's commercial nuclear energy program.

The primary research for this case study relied exclusively upon an online survey instrument, with an unofficial English rendering provided in Appendix J. The survey's length and structure—comprising a single obligatory question and one discretionary response field—emerged from careful deliberation regarding the target respondents who were grassroots environmental activists. It has been assumed that the respondents might have been dedicating extensive hours beyond conventional working periods to their causes, often struggling to maintain work-life equilibrium whilst managing numerous competing priorities. To maximise participation amongst these overwhelmed stakeholders, the survey's exceptional concision was deliberately highlighted in both the electronic mail subject heading and the accompanying message body, acknowledging the precious nature of the activists' limited available time.

The survey was distributed on 23 January 2023 to these two groups of respondents:

a) The 12 contact email addresses of member environmental organisations within the 'Climate Coalition' platform (www.klimatickakoalicia.sk);
b) The internal email list of the 'Slovak [Environment] Protectors' Assembly' (SOS) (www.ochranari.sk).

Note: Both the above-mentioned umbrella structures (which are not legal entities) and the main general umbrella structure of Slovak environmental NGOs, 'EKOFÓRUM' (a legal entity), are introduced in section with Slovak results. This section also explains why EKOFÓRUM was not included among survey respondents, based on two factors: (i) EKOFÓRUM's status during the ECOSENS project and (ii) the results of a 2012 IPPA project questionnaire administered to EKOFÓRUM members (Appendix K).

The respondents of the aforementioned survey had until 12 February 2023 to complete it. The response rates were as follows:

a) Climate Coalition members: 4 responses (33% response rate);
b) Protectors' Assembly members: 11 responses (response rate estimated based on resaercher's information to be below 10%. Note: the exact response rate for the Protectors' Assembly could not be calculated, as the precise number of members on the email list used for distribution is unknown).

The key desk research for this case study identified stakeholders who participated in the aforementioned EIA and SEA processes and were relevant to the ECOSENS project, analyzing their concerns, comments, and proposals. Informal consultations with Slovak environmental NGOs were conducted to verify information gathered from official documents and websites. Through a review of documents cited in the section with Slovak results, stakeholders relevant to the ECOSENS project were identified. Except for Slovakia-related ARGONA, IPPA and PLATENSO project deliverables, that can be obtained upon request by contacting the author Peter Mihok, all the other documents cited are publicly available (in the Slovak language).

This national case study contains the outcomes not only of ECOSENS's own research, but it also briefly summarizes the relevant Slovakia-related results of activities carried out within three relevant EURATOM financed projects:

- 'Arenas for risk governance', further referred by its acronym ARGONA, implemented from November 2006 to October 2009[2] (Drottz Sjöberg et al., 2009);
- 'Implementing Public Participation Approaches in Radioactive Waste Disposal', acronymed IPPA, implemented in 2011-2013[3] (Mihók & Mršková (2012), Mršková & Mihók (2013));
- 'Building a platform for enhanced societal research related to nuclear energy in Central and Eastern Europe', acronymed PLATENSO, implemented from September 2013 to August 2016[4]; as well as this case study's author's freelance research (Mihók, 2020a, 2020b, 2018, 2011).

The IPPA project questionnaire-based survey of statutory representatives of 'Ekofórum', whose inclusion into this national case study was deemed relevant, was conducted in two phases. The first phase took place during the 'Ekofórum' platform members' meeting on 8 May 2013, where a paper questionnaire was completed by all 13 participants. Of these, 12 were statutory representatives of Ekofórum member NGOs, while the remaining participant was the director of Greenpeace's Bratislava office (note: Greenpeace, as an international organisation, is not a member of the Slovak-national structure 'Ekofórum'). The second phase, conducted shortly after the aforementioned event, involved distributing the same questionnaire electronically via the Ekofórum's internal email list, i.e. to reach also representatives of those member NGOs that had not been represented at the aforementioned event. This phase resulted in two additional filled questionnaires being submitted via email. As, at that time, Ekofórum reported having 21 member NGOs on its website, the 14 completed questionnaires should represent a response rate of approximately 67%. The survey results, copied in full in Appendix L, revealed several important insights for ECOSENS, which are briefly summarised before and/or discussed in the seccion with Slovak results.

[2] Note: ARGONA project was implemented within the EURATOM's 6th framework programme under Grant agreement no. 36413. For more information, see https://cordis.europa.eu/project/id/36413 (last accessed 27 November 2024).
[3] Note: IPPA project was implemented within the EURATOM 'Nuclear fission and radiation protection' 7th framework programme under Grant agreement no. 269849. For more information, see https://cordis.europa.eu/project/id/269849/reporting (last accessed 27 November 2024).
[4] Note: PLATENSO project was implemented within the EURATOM 'Nuclear fission and radiation protection' 7th framework programme under Grant agreement no. 605140. For more information, see https://cordis.europa.eu/project/id/605140/en (last accessed 26 November 2024).

2.4.4 Stakeholder engagement in Spanish nuclear phase-out and decommissioning

The National Integrated Energy and Climate Plan 2021-2030 (PIENEC in Spanish) maintains that the companies that own the nuclear park and the National Radioactive Waste Company (Enresa) have unanimously agreed on an orderly and staggered closure schedule for the seven nuclear reactors that remain active, with the approval of the government. According to this document, after the consensus is reached between the stakeholders involved, four reactors will be closed in stages during the period of validity of PNIEC and the remaining three will do so before the end of 2035.

The case study on Spain focuses on stakeholder engagement in key political decision-making processes related to the phase-out and decommissioning of nuclear reactors. The methodological design includes a documentary review, semi-structured interviews with some relevant stakeholders (industries, governmental agencies, nuclear energy platform, NGO, civil organisations), an analysis of parliamentary questions, and an overview of media coverage. The analysis of results aims to address the following research questions:

1) What has been the participation of different stakeholders in the decision-making process regarding the gradual closure and decommissioning of nuclear power in Spain?
2) What has been the impact of stakeholder engagement?
3) What relevant forms of participation can be observed in other nuclear power contexts in Spain?
4) How should stakeholders be involved in the low-carbon energy transition?
5) What recommendations can be made for ensuring effective participatory decision-making processes?

For the interviews, we created a list of stakeholders classified by different areas of interest, and we invited them to participate through an invitation email. A total of 14 semi-structured interviews were conducted, which included representatives from various sectors: research organisations and universities (N=2), industry (N=5), NGOs and associations (N=5), public authorities (N=1), and media (N=1). Appendix K shows the list of parliamentary questions consulted in Spain. The parliamentary questions were analysed using the existing data set https://www.csn.es/es/preguntas-parlamentarias

For the media and document analysis, a systematic search was conducted to gather information from various sources including media news, reports, policy statements, academic articles, and parliamentary inquiries related to the phase-out and decommissioning of nuclear power plants. This research enabled the synthesis and organization of information for subsequent analysis, helping to identify stakeholders' opinions and perspectives on the phase-out and decommissioning process and how they have evolved from 2019 to the present. For data collection, we used two databases.: news articles were extracted from MyNews, and documents were retrieved from Google Scholar. The search covered the period from 2019 to 2024, using the following keywords to filter the search:

- nuclear AND cierre centrales (nuclear phase-out) AND desmantelamiento (decommissioning) AND España (Spain) AND decision (decision) AND público (public).
- nuclear AND cierre centrales (nuclear phase-out) AND desmantelamiento (decommissioning) AND España (Spain) AND decisión (decision) AND grupos (groups).

We have established clear criteria to filter and gather the most relevant information on the subject. The inclusion criteria are straightforward: articles must be directly related to the subject of study (the process of phase-out and decommissioning of nuclear power plants in Spain) and fully online available. Exclusion criteria included articles published in duplicate or not relevant to Spain. The selection process yielded 80 articles, 66 of which underwent full review (Appendix L). Additionally, we identified 28 documentary sources, with 22 deemed relevant for inclusion in our analysis.

2.4.5 Decisions on nuclear new built in Romania

The Romanian case study addresses the decision-making process associated with the hosting and construction of the ALFRED reactor, the demonstrator of an advanced SMR nuclear technology, at Mioveni.

Romania is developing a nuclear program, currently based on 2 CANDU Units that provide 18-20% of electricity production. The national energy strategy foresees an increase in the nuclear share up to 40% of the total energy production in the medium and long term, through an extension of the operating life of Unit 1, the expansion of the installed nuclear capacity with two new CANDU 600 units at Cernavodă, a NuScale SMR park of 6 units at Doicești-Dâmbovița (2030) and, in the longer term, the construction of the LFR (Lead Fast Reactor) technology demonstrator, ALFRED, at Mioveni - Argeș. All these objectives were reconfirmed in the Integrated National Energy and Climate Plan (PNEC), updated in 2024, following an extensive review process that involved a total of 32 institutions and organizations, including civil society and the European Commission.

Romania's involvement in the development of advanced nuclear technology began in the early 2000s, with the participation of the Institute for Nuclear Research (RATEN ICN) in the research projects dedicated to Lead Fast Reactor, one of the 6 Gen IV technologies. Political support for building the LFR demonstrator in Romania was committed in 2011 through a Government Memorandum, and reconfirmed in 2013, when the RATEN ICN platform in Miveni - Arges was nominated as the reference site.

The political decision on ALFRED siting was based on both technical and social criteria. From a technical point of view, the RATEN ICN site provides the basic infrastructure required by a reactor (roads, electricity, other utilities, etc.), technical and scientific competences in the nuclear field and experience in the operation of nuclear facilities (ICN has been operating for more than 50 years a research reactor), as well as a well-established safety culture.

From a social point of view, the construction of a new nuclear reactor on this site benefits from the good acceptability of the population of Mioveni town and the support of the local authorities. This is the result of RATEN's implementation of national legal framework provisions on public involvement, as well as of the lessons learned and recommendations of European projects dedicated to public involvement (COWAN 2, CIP, IPPA, PLATENSO, EAGLE) in which RATEN ICN was actively involved. Initiating communication and dialogue with the Local Council and the Mayor of Mioveni during the planning phase of the ALFRED project, when different options were still possible, creating a Dialogue Group with a broad representation (elected representatives, representatives of local industry and citizens, nuclear specialists) and keeping its members involved throughout the project implementation, as well as the safe operation of RATEN ICN nuclear facilities since their commissioning until now, contributed to building and maintaining trust and obtaining solid local support.

2.4.6 Stakeholder engagement with the UK Nuclear Roadmap and SMR development

In recent years, the UK government has demonstrated an ever-growing interest in the development of Small Modular Reactors (SMRs) to feed the future UK national electricity grid. Our focus for the UK case study was placed on identifying and analysing the perspectives of the range of stakeholders involved in a) formal policy making on nuclear energy futures and b) informing technological choices in relation to SMR technologies.

We chose as a starting point the UK Government document 'Civil Nuclear: A Roadmap to 2050' published in January 2024 (DESNZ, 2024). This formed the basis of a multi-methods approach which included semi-structured interviews and documentary analysis. A range of documents were analysed, including the output of the December 2023 Environmental Audit Committee (a process commissioned by the House of Commons) who focussed specifically on the role of SMRs in the future UK energy mix. Oral evidence was provided by a range of invited speakers (EAC, 2023), which consisted of answering specific questions from the committee Chair and panel. The EAC work helped to identify types of stakeholders that were invited by the committee, and which were not. It also allowed us to map the nature of topics that were raised by the committee, hinting at a prevalence of certain subjects of concern or interest over others.

For interviews, key actors in the UK nuclear landscape were identified through institutional organigrams and via preexisting networks. Individual interviewees were selected for their role, expertise, or career background, with emphasis placed on those who worked in areas relating to nuclear engineering, policy, planning, regulation, or stakeholder engagement. In the analysis presented, we include some quotes from interviews which have been anonymised in accordance with ethics approval. Respondents were offered the choice to remain fully anonymous or have a label attributed. Labels provide the organisational status of the spokesperson although attributions were not always straightforward as many respondents moved between roles in industry, government, non-government bodies and academia. Names have been kept where these are a matter of the public record. Direct quotes have been edited to reduce length but keep meaning.

Analysis of media was not conducted due to time constraints and the nature of the commentary within media which is not a direct contribution to the policy making process or technological choice process.

3 Case studies results

3.1 The nuclear political discourse on X in Flanders (Belgium)

This section discusses how Flemish parties talk about nuclear energy on X (formerly Twitter). First, we discuss the Belgian nuclear landscape and how it evolved throughout time, as these events may influence discussions on X. Second, we sketch a brief overview of the parties involved. Next, we look at the salience of nuclear energy on X, followed by an overview of the activity of the different parties. After this general discussion, we go into more detail about the energy policy frames politicians use; we examine how frames are used overall, by party, and over time. Finally, we zoom in on SMRs; who talks about them and how do they talk about them, i.e., which frames are used?

3.1.1 The Belgian nuclear landscape over time

Nuclear energy plays an important role in the Belgian energy mix. In 2022, 46% of the electricity generation came from nuclear energy sources (World Nuclear Association, n.d.). This capacity was generated through 7 reactors, 4 in Flanders and 3 in Wallonia, of which three currently closed and another two are scheduled to shut down by the end of 2025.

As outside events influence the discourse on social media, some background on the Belgian context in the last 20 years is needed to properly analyze and understand our collected tweets. We give an overview of the most pertinent events in the following paragraphs, based on articles in De Tijd (*Reconstructie van een mislukte kernuitstap | Een Zuhalleke, een liberale spookrijder en Poetin keren het tij*, 2023;

Reconstructie van een mislukte kernuitstap | En toen legde Engie de miljardenfactuur op tafel, 2023; *Reconstructie van een mislukte kernuitstap | Hoe Tinne Van der Straeten dacht dat de buit binnen was*, 2023).

In March 2003, Belgium passed a law mandating the phase-out of its existing nuclear reactors by 2015, and, at the same time, banning the construction of new ones for electricity prodution. This decision was a consequence of the first government participation of the Green party Agalev (now Groen), whose long-term goal to transition away from nuclear energy came to fruition.

However, the phase-out remained a contentious issue, subject to ongoing political and economic debates, putting its execution on the back burner with the next governments. The federal election in May 2019 led to the formation of the Vivaldi coalition government in September 2020, which, after years of being in the opposition, included the Green party Groen. One of their main goals was to, finally, execute the nuclear phase-out. As a consequence, the government confirmed its intention to implement a (partial) nuclear phase-out under a so-called Plan A, which involved relying on gas as a primary energy source to replace nuclear power. If this plan failed and the Belgian energy supply became threatened due to the phase-out, there was a plan B that included the extension of two existing nuclear reactors.

As part of plan A, Engie, the primary operator of Belgium's nuclear reactors, received subsidies in September 2020 to build new gas plants. These plants were seen as a bridge solution to ensure energy security during the transition, although this raised concerns about increased greenhouse gas emissions and dependency on imported fossil fuels.

In October 2021, debates around energy security and costs intensified, with critics questioning the feasibility of phasing out nuclear energy amidst rising energy prices. The situation took a dramatic turn in March 2022 when Russia invaded Ukraine, triggering an energy crisis. In Belgium, the crisis prompted a reassessment of the nuclear phase-out timeline. By February 2022, the government decided to delay the phase-out by adopting Plan B, which involved extending the operation of two nuclear reactors. This move aimed to strengthen energy independence and ensure stability in the face of geopolitical uncertainties.

A finalized deal between the government and Engie was reached in December 2023, solidifying the extension of another two reactors till 2035 and marking a significant shift in Belgium's nuclear energy policy. This decision came amid preparations for the federal elections in June 2024.

As N-VA, a proponent of nuclear energy, has won the elections, the inclusion of nuclear energy in the Belgian energy mix is back on the table – and there are plans, at the time of writing, to increase nuclear capacity .

3.1.2 The main actors: Flemish political parties

We discuss the politicians of seven Flemish parties in our study: the radical left PTB-PVDA, the green party Groen, the social-democratic party Vooruit, the Christian-democratic party CD&V, the liberal party Open VLD, the Flemish nationalist party N-VA, and the radical right wing party Vlaams Belang. Table 1 shows for each party the number of politicians for which we collected data. The distribution is quite skewed, as there are, for example, 23 politicians for N-VA whereas only 8 for Vlaams Belang. However, as shown in the next paragraphs, this does not necessarily mean our dataset contains fewer tweets of Vlaams Belang politicians. On the contrary, Vlaams Belang is one of the most prominent parties. To account for the skewness, we always calculate relative proportions. In what follows, we refer

to the party names for the sake of ease, but it is the aggregate of the tweets of politicians of those parties that actually form the basis of our analysis.

Table 1: Number of politicians, by party, for which tweets were collected

Party	# politicians	Party family
PTB-PVDA	6	Communist
Groen	12	Green
Vooruit	7	Social-democrats
CD&V	10	Christian-Democrats
Open VLD	13	Liberal
N-VA	23	Nationalist liberal-conservative
Vlaams Belang	8	Radical right-wing

3.1.3 Salience of nuclear energy on X

Figure 2 compares the salience of nuclear energy with the salience of another important theme, migration, which serves as a benchmark. While migration is usually more salient on X, nuclear energy comes close at times and is even more prominent than migration at certain (albeit very few) times. However, whereas migration remains relatively prominent, and thus salient, at all times, there are extended periods where nuclear energy is hardly discussed on X. Moreover, although the salience of nuclear energy seems somewhat related to key events, such as around the Russian invasion of Ukraine, there are quite some peaks that do not seem linked to one of these events, or vice versa, certain events do not cause a(n immediate) peak on X.

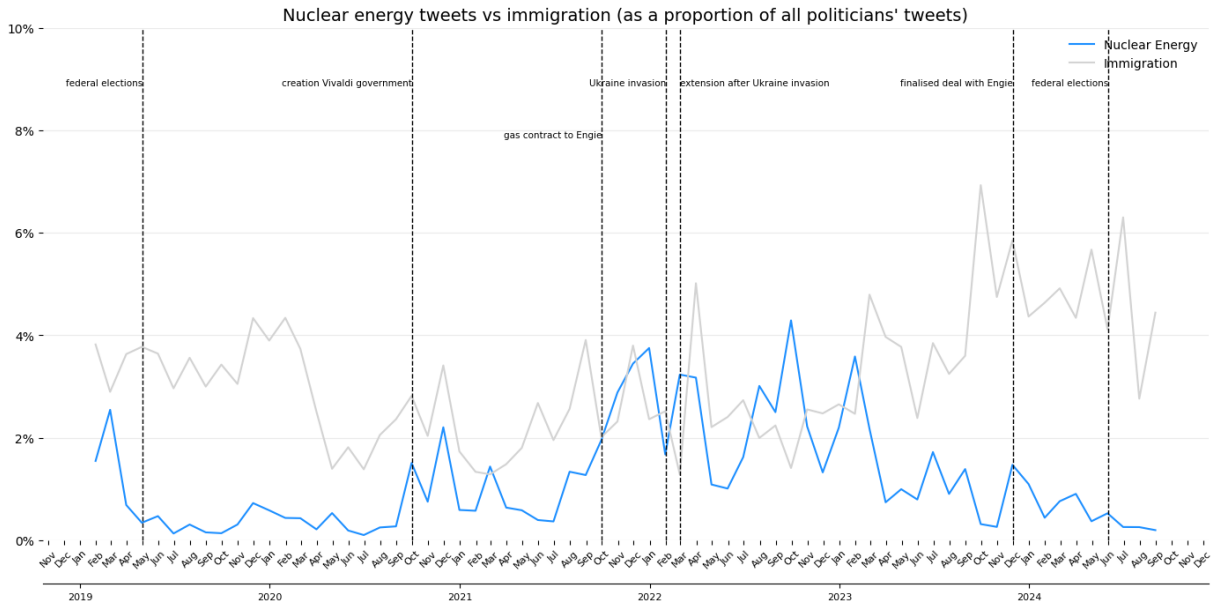


Figure 2: Nuclear energy salience on X over time

3.1.4 Proportion of tweets by party

We calculated the share of tweets of each party on nuclear energy (in general) in two ways. First, we calculated the proportion of nuclear energy tweets for a party relative to all nuclear energy tweets (that we collected). The results are shown in Figure 3. The right-wing party N-VA and the extreme righ-wing party Vlaams Belang (which were oppostional parties at the federal level in 2024), account for the largest share of nuclear energy-related tweets, over 50% and 20%, respectively. Groen and Open VLD contribute around 10%, while PVDA, CD&V, and Vooruit have the lowest engagement. However, the proportions in this calculation are influenced by how active a party is on X; parties such as N-VA and Vlaams Belang are more active than Groen, and, therefore, have a higher share of tweets within the nuclear energy debate on X. However, these differences cannot fully account for these numbers: Vlaams Belang and N-VA are somewhat equally active on Twitter (see Appendix D), but N-VA contributes significantly more to the nuclear energy debate, as also shown in Figure 4, which is discussed next.

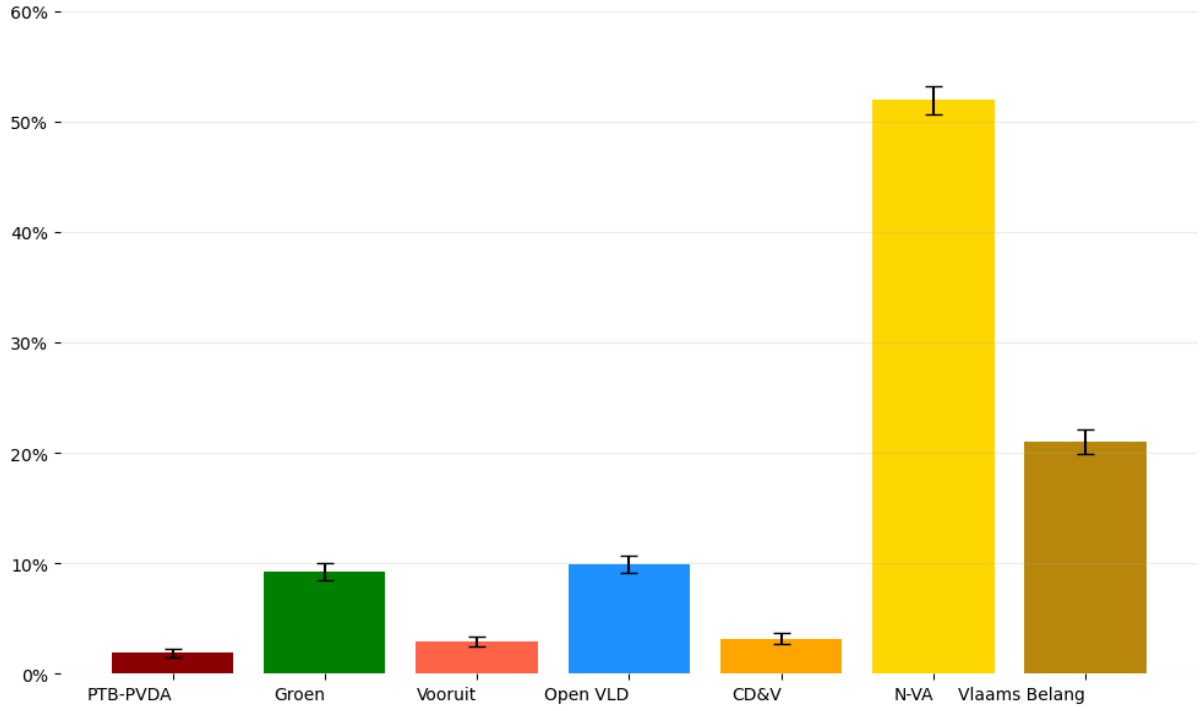


Figure 3: The percentage of nuclear energy tweets by a party relative to the total number of collected nuclear energy tweets. The vertical lines show 95% confidence intervals

Second, to account for a party's activity on Twitter, we calculated the share of nuclear energy tweets within that party's total number of tweets. In this calculation, the proportions are thus influenced by how much attention a party gives to an issue, on X. In this case, one would expect the green partie Groen and policy-defending parties to have higher shares. Figure 4 shows the result of the calculations.[5] Interestingly, N-VA stands out, with a proportion more than double that of the next party, Groen. Groen, however, does not differ significantly from Vooruit, the social democrats. They do tweet significantly more about nuclear energy than the other parties, but the differences are less than 0.5% (except with

[5] It is important to note that the y-axis of this figure has been set to 2.5% to make the differences between parties visible, although this may give the impression that proportions are very high.

PTB-PVDA). N-VA, being in opposition most of the time, thus dominates the debate – perhaps due to tweeting on the nuclear energy policies presenting an easy way to criticize the government.

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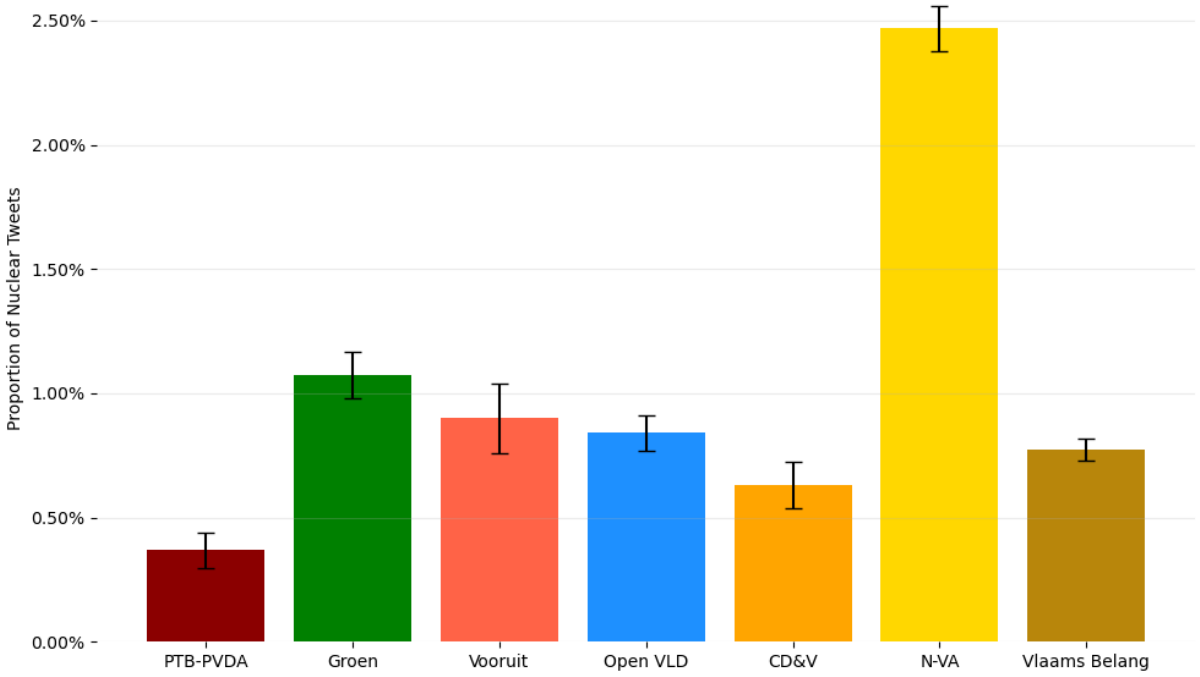


Figure 4: The proportion of a party's nuclear tweets relative to the total number of their tweets. The vertical lines show 95% confidence intervals. The y-axis is set very low to make the significant differences visible

Next, in Figure 5, we show the proportion of tweets on nuclear energy relative to the party's total number of tweets *by year*. It shows that the position of N-VA remains consistent. On the other hand, Groen is significantly more active in 2021, compared to other parties and its own activity in previous years, likely because it took an important place in discussions around the practicalities of the phase-out. In 2022, we see a peak for all parties as the nuclear energy discussion became more salient due to the Ukraine invasion, which led to the cancellation of the phase-out and the extension of two nuclear power plants.

To conclude, we can say that oppositional parties, N-VA in particular, contributed more to the debate than other parties.

Groen is also vocal but less than one would expect based on its position as an issue-owning party.

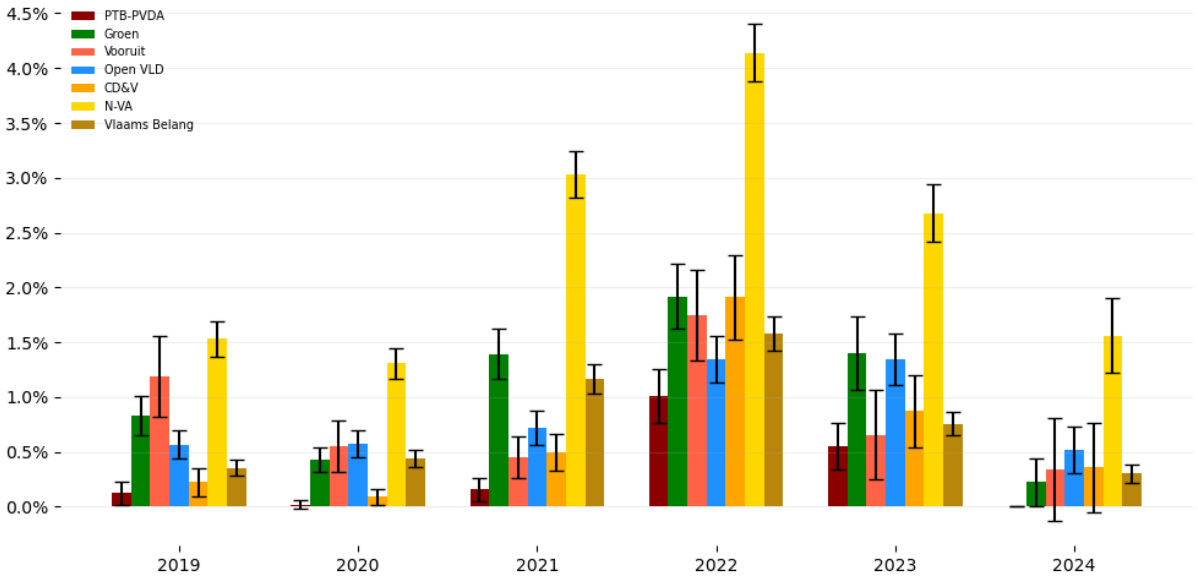


Figure 5: the proportion of tweets on nuclear energy relative to the party's total number of tweets by year. The vertical lines show 95% confidence intervals

3.1.5 Prevalence of energy policy frames

Now that we know which parties discuss nuclear energy and the salience of the topic on X, we go into more depth and examine the frames that parties use to discuss nuclear energy.

First, we look at the overall use of each frame, shown in Figure 6. It shows that no frame was annotated in about 42% of the tweets. For the tweets with a frame, it is important to note that a tweet may contain more than one frame. Perhaps unsurprisingly, clean energy and energy security frames are the first and second most important, with a proportion of about 19% and 16%, respectively. Energy affordability comes in third, at around 14%. Nuclear safety and especially economic growth are relatively uncommon frames.

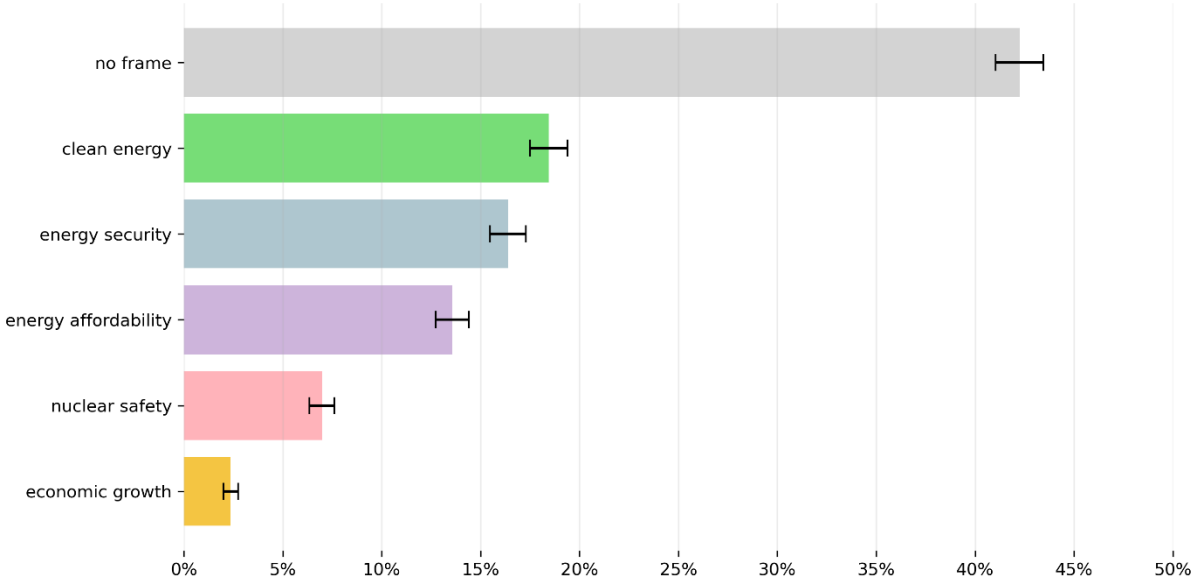


Figure 6: The proportion of each frame relative to the total number of nuclear energy tweets. Horizontal lines show 95% confidence intervals

3.1.6 Energy policy frames over time

Next, we look at the evolution of the use of these frames over time, shown in Figure 7. For this figure, we focused on the frames and thus calculated proportions for each frame relative to the number of frames, excluding tweets without a frame. The figure shows that the hierarchy in Figure 6 obscures important shifts over time. In 2019, clean energy and energy affordability were the two main energy frames, with energy security only third, a whopping 10% lower than energy affordability. However, already in 2020, energy security has become more prevalent and does not significantly differ from energy affordability anymore. This trend continues in 2021, with energy security becoming more and more prevalent, mainly at the xpensive of energy affordability. In 2022, most likely due to the war in Ukraine, energy security becomes the main frame on X, although it does not significantly differ from clean energy.[6] The results remain relatively stable in 2023. In 2024, energy affordability goes up again and clean energy and energy security frames become equally important, at the expense of nuclear safety, that, for the first time in all these years, goes down significantly, whereas economic growth comes back to the same level as in 2019 and 2020, after being a minor frame in 2021 and 2022.

[6] Given the accurarcy metrics of our models in the method section, it is likely that clean energy frames are more common than as shown in our result section.

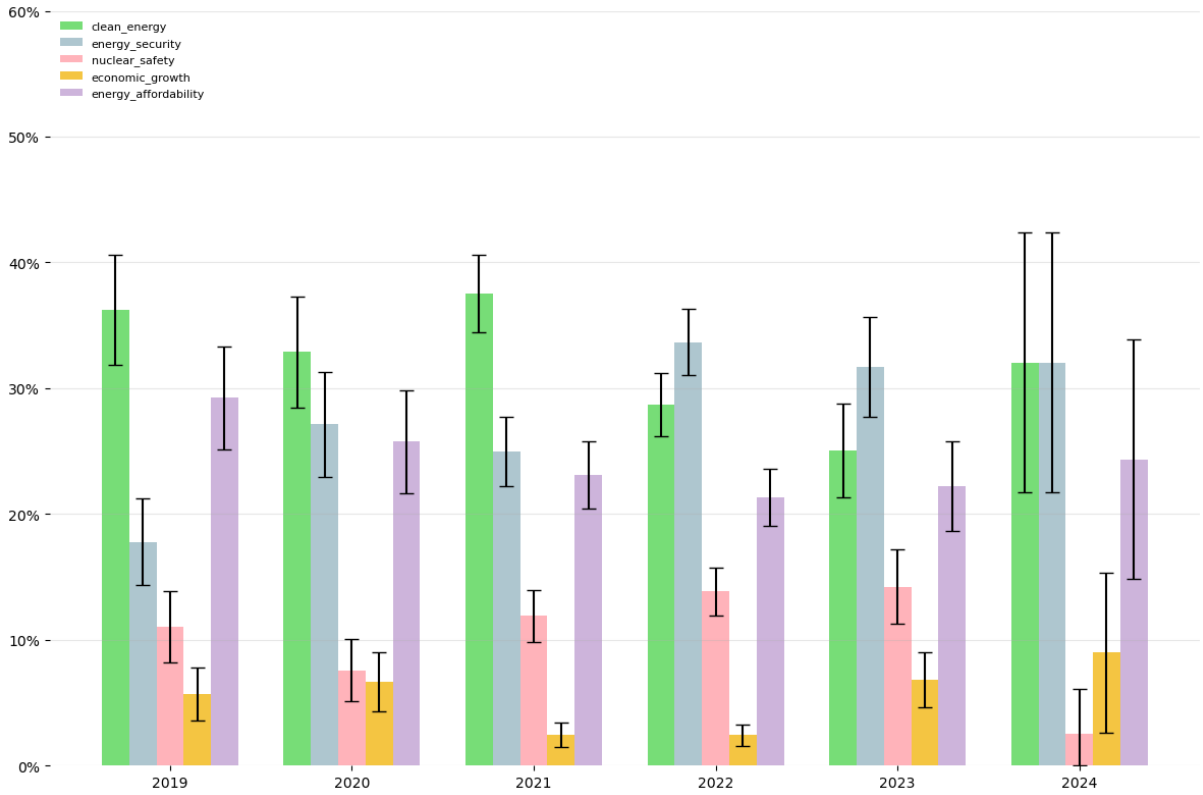


Figure 7: Proportion by frame over time, relative to all energy policy frames in the dataset. The vertical lines show 95% confidence intervals

Figure 8 zooms in on the evolution of the proportion of clean energy and energy security frames, adding the months prer year and with significant political and geopolitical events annotated. The clean energy frame experienced an early peak around the federal elections in 2019 but remains relatively stable with occasional fluctuations until 2022. In contrast, the energy security frame sees a sharp increase following key events such as the Ukraine invasion in early 2022, where it surpasses clean energy in prominence. This upward trend continues during the extension of energy contracts and negotiations with Engie. Both frames decline after 2023, with clean energy and energy security converging at lower levels by mid-2024. The chart highlights how geopolitical events and policy decisions influence the salience of energy-related frames, particularly the heightened focus on energy security during crises. It also shows a very clear upward trend for energy security, whereas clean energy remains relatively stable.

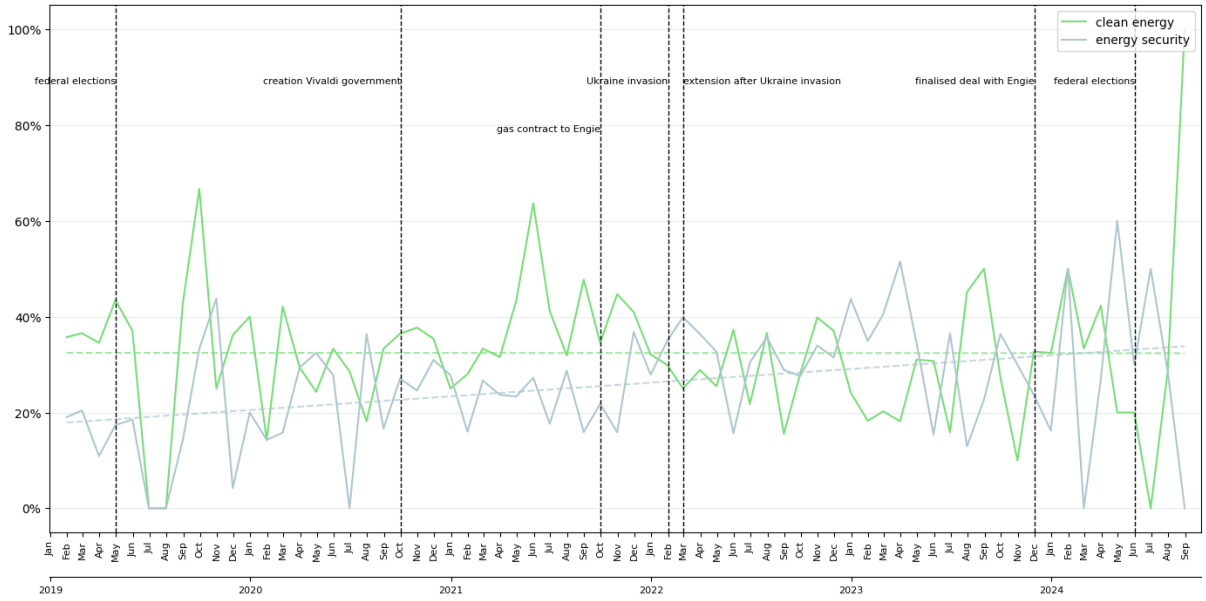


Figure 8: Evolution over time – proportion of clean energy and energy security frames relative to all nuclear energy tweets

3.1.7 Energy policy frames by party

Next, we look at the frames used by each party, displayed in Figure 9. We calculated the share of each energy policy frame in the tweets of a partytrelative to the total frames used by that party. The percentages in the figure thus sum to 100% for each party across the different subplots.

Several things stand out. First, while N-VA and Vlaams Belang dominate the discourse on X, they use significantly fewer frames than the issue-owning party Groen: in about 35% of their tweets, Groen does not use a frame, whereas for N-VA this is about 42% of their tweets and for Vlaams Belang even 50%.

Second, almost all parties have adopted the clean energy frame (PTB-PVDA being the exception). As such, while clean energy, and related to this, climate change, is considered to be an issue owned by Groen, they cannot co-opt this frame (anymore). They do, however, refer to nuclear safety significantly more than other parties – except the Christian-democrats CD&V, who use the frame as often as Groen. Similarly, the energy security frame is also common amongst all parties, except again PTB-PVDA. This time, however, there are significant differences between Groen on the one hand and Open VLD, N-VA, and CD&V on the other; Groen uses it less than the more center/right-wing parties.

Third, the left parties focus on energy affordability, with the radical left PTB-PVDA using this frame in 45% of their tweets and the social democrats Vooruit in 20% of the cases. One reason may be that these parties usually target less affluent parts of the public.

Finally, economic growth is used very little across parties, with the exception of perhaps open VLD and CD&V, although the differences with other parties are barely significant. Still, it is interesting to note that this frame is most used by center parties.

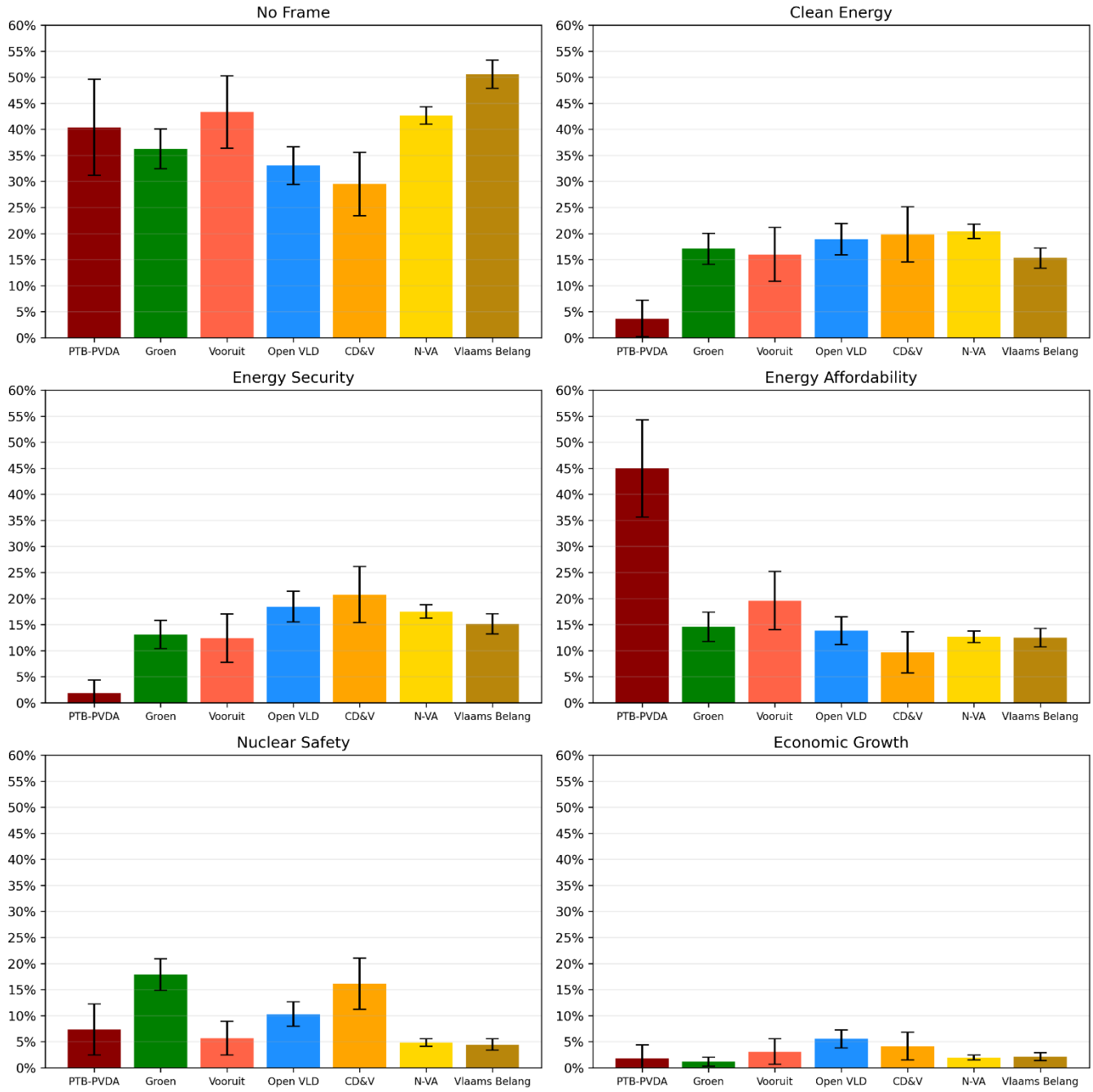


Figure 9: The proportion of each energy policy frame, by party, relative to the nuclear energy tweets by that party

3.1.8 Energy policy frames over time by party

Although the number of tweets is too low to look at the evolution of frames for each party in detail, we want to examine if the shift to energy security frames is present with all parties. We therefore split our dataset in a "before-" and "after the Russian invasion", with 2022-02-24 being the cutoff (and included in the "after") and calculate the proportions for each frame and party in these two periods. The comparison is shown in Figure 10. We focus specifically on clean energy, energy security, and energy affordability as these are the most common frames and the ones with the most visible changes. The figure shows little variation between parties. Clean energy is the only one where the results are a mixed

bag: Vooruit, surprisingly, uses significantly *more* clean energy frames than before, whereas N-VA and Vlaams Belang use significantly less. For the energy security frame, on the other hand, there is consensus; all parties use it more than before the invasion, although the differences are not always significant. Similarly, for most parties, energy affordability becomes a less common frame, except for Groen and PTB-PVDA, although these differences with before are not significant.

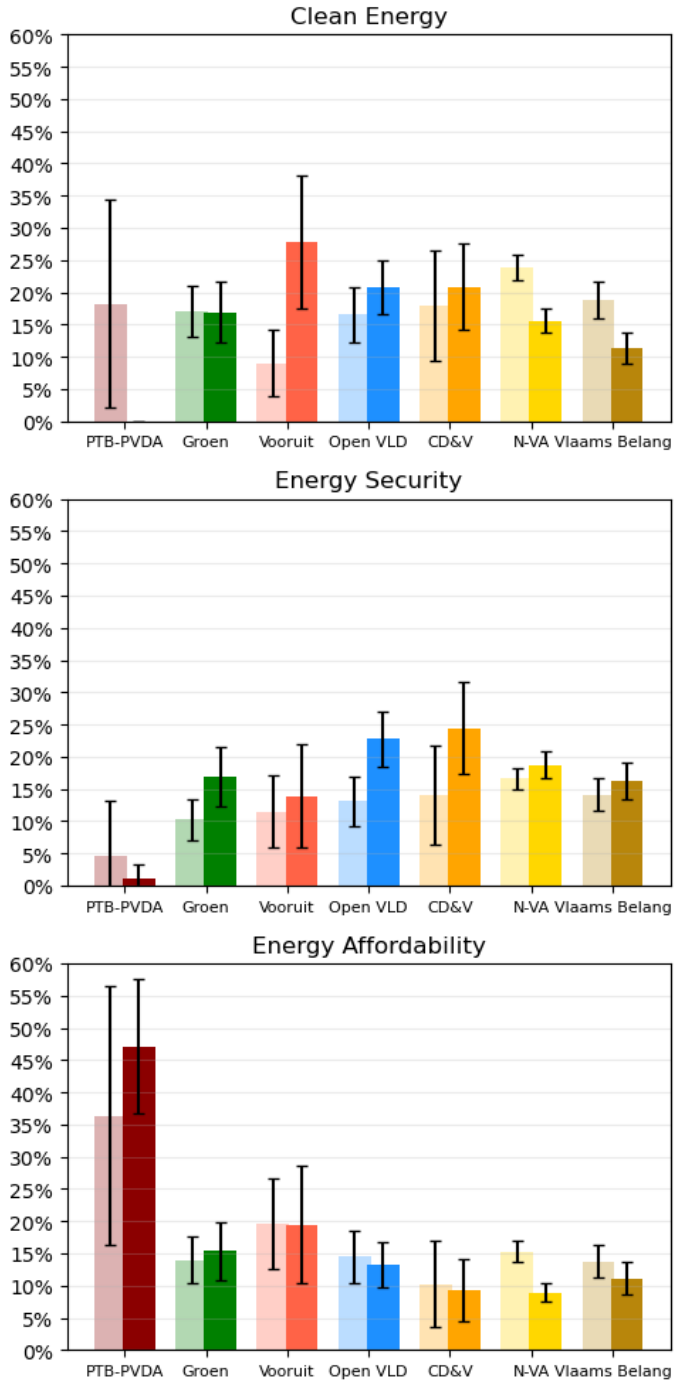


Figure 10: The proportion of each energy policy frame, by party, relative to the nuclear energy tweets by that party before the Russian invasion of Ukraine (left bar) and after the invasion (right bar)

3.1.9 Small modular reactors on X

Finally, we zoom in on the discourse on small modular reactors (SMRs). When comparing the SMR tweets with nuclear energy tweets, the latter also include SMRs, as these are part of the general nuclear energy discourse. We first discuss the prevalence of SMR tweets over time, then examine which parties discuss SMRs, and finally look at the frames used with SMRs.

Figure 11 shows that the absolute number of tweets referring to SMRs remains relatively steady, with slight fluctuations but no significant peaks, until a modest increase around late 2022 (when the government took the decision to fund an SMR research programme) and early 2023. The trendline for SMRs indicates a gradual but minimal upward trajectory over the years, reflecting slow but steady growth in attention. Figure 12 makes this even more obvious by showing the proportion of SMRs tweets relative to the number of nuclear energy related tweets; it shows a clear positive trend line. It indicates that more and more of the nuclear energy conversation includes or refers to SMRs.

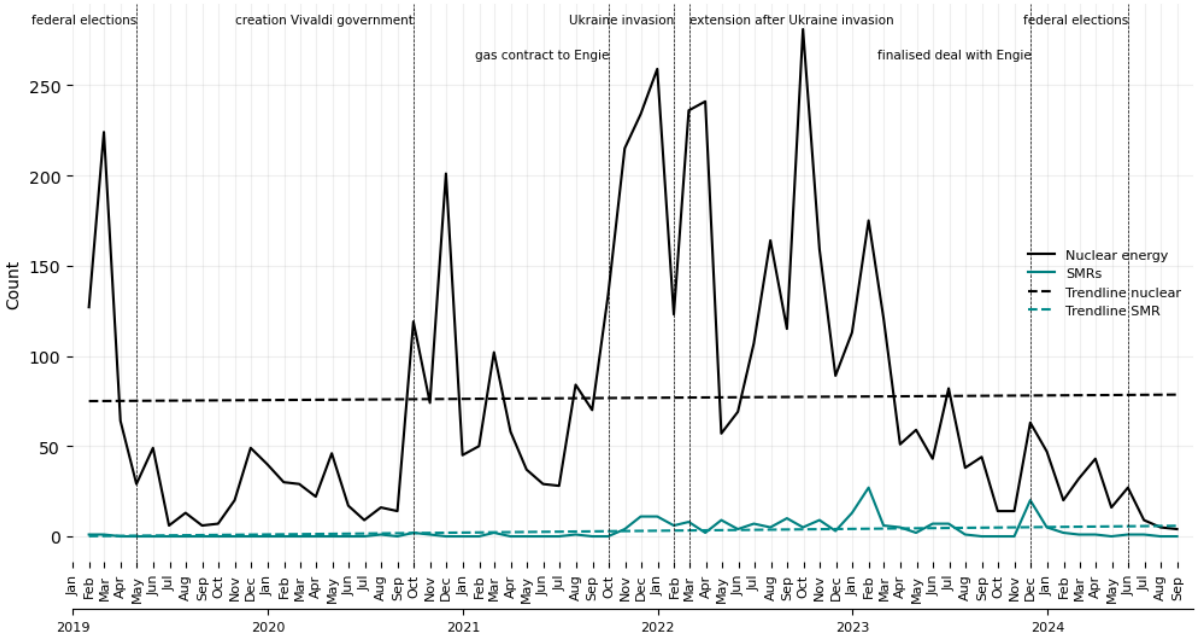


Figure 11: Number of tweets containing a reference to SMRs compared to the total number of nuclear energy related tweets

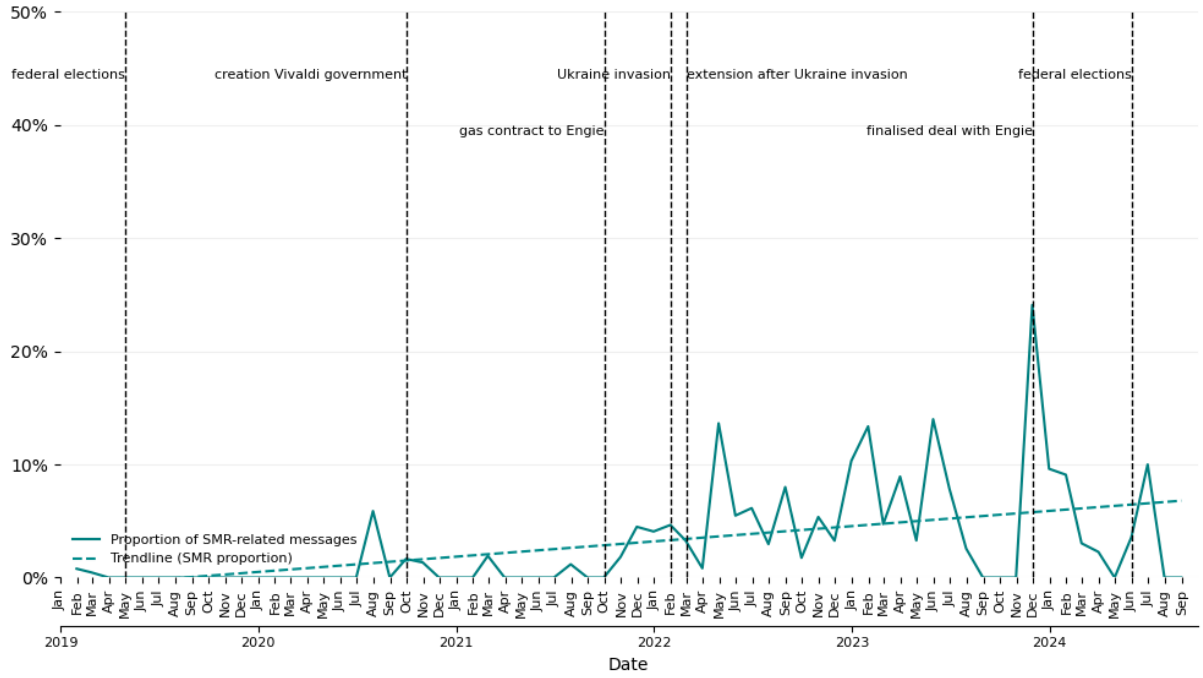


Figure 12: The proportion of tweets referring to SMRs, relative to the total number of nuclear energy tweets

To examine which parties primarily discuss SMRs, we again present two plots with two different calculations. First, Figure 13 shows the proportion of the tweets by a party relative to the number of tweets referring to SMRs by all parties. Again, this is influenced by a party's activity on X. As in the general nuclear energy debate, N-VA is the most prominent party. However, whereas the proportion of Groen and Open-VLD were about the same in the general debate, Groen almost never refers to SMR's, while Open VLD is the second party and scores higher than Vlaams Belang (although the difference is not significant), which was second in the nuclear energy debate. This is a first indication that the parties participating in the SMR debate are different parties than those participating in the general nuclear energy debate.

To again correct for a party's activity on X, we also calculated the proportions of SMR tweets relative to its number of tweets on nuclear energy in general. This paints quite a different picture; CD&V is the most prominent party, with Open VLD second and Vooruit third. Important to note is that the difference between these three parties are not significant, whereas the difference between CD&V and Open VLD with all the other parties (except Vooruit) are significant. This reinforces the idea that different parties, in this case, centre parties, focus on SMRs rather than nuclear energy in general, a debate that was dominated by ideologically opposing parties; the greens and the (radical) right.

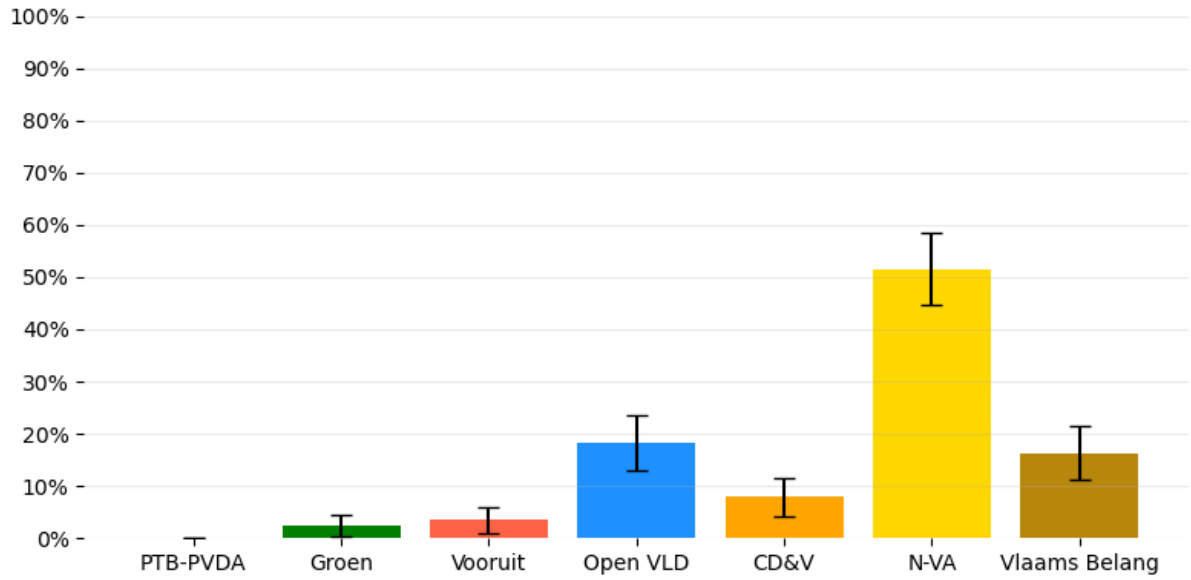


Figure 13: The proprotion of a party's tweets about SMRs relative to the total number of collected tweets referring to SMRs. Vertical lines show 95% confidence intervals

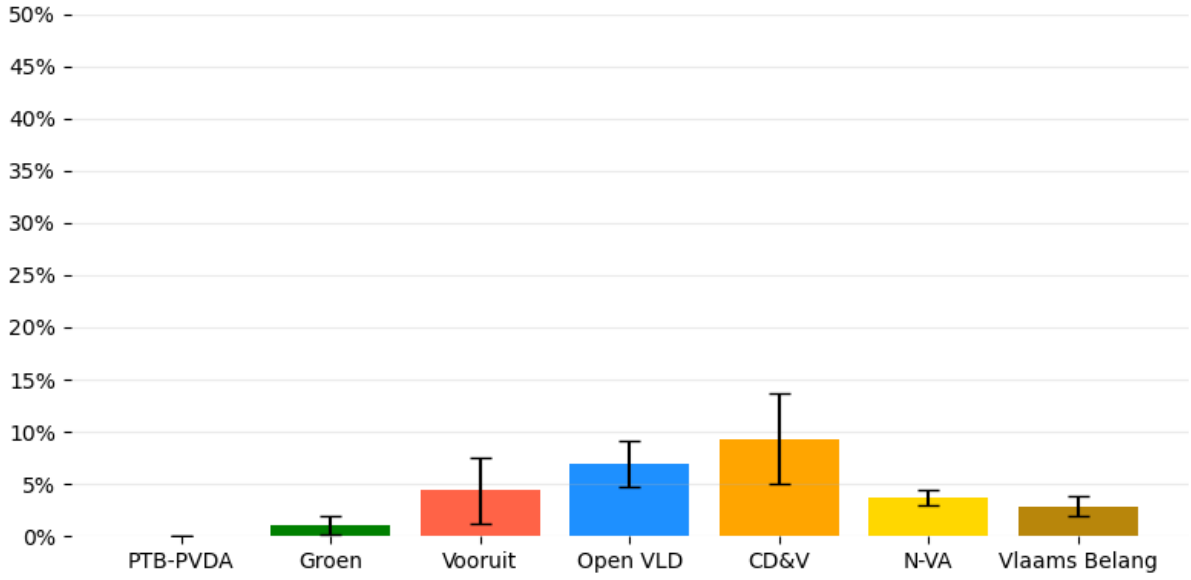


Figure 14: The proprotion of a party's tweets about SMRs relative to the party's number of tweets referring to nuclear energy. Vertical lines show 95% confidence intervals

Finally, we examine the energy policy frames that are used in conjunction with SMRs[7] and compare these with the frames used with nuclear energy in general in Figure 15 . It is important to note that we

[7] Unfortunately, due to the low number of tweets referring to SMRs, an analysis of the frames by year does not give any interesting/significant results.

focus on comparing the policy frames themselves, and therefore excluded tweets without a frame to calculate the proportions.

These results again show that the SMR debate on X is different from the nuclear energy debate in general. Overall, nuclear safety and economic growth are more prevalent when discussing SMRs, while these two frames were relatively uncommon in the general nuclear energy debate. On the other hand, energy security, affordability, and clean energy are used significantly less. These results may be somewhat influenced by the fact that different parties have become more prominent, as CD&V and Open VLD, for example, both used more nuclear safety frames than other parties when examining the general nuclear energy debate. However, as these proportions are calculated based on the total number of SMR tweets, and N-VA dominates this number, this cannot be the only reason. Indeed, we see that also with N-VA and Groen, economic growth and nuclear safety frames are more common in the SMR debate than when looking at nuclear energy tweets in general. A figure illustrating this is included in Appendix I, but will not be discussed here as the absolute numbers are too low to warrant an extensive analysis.

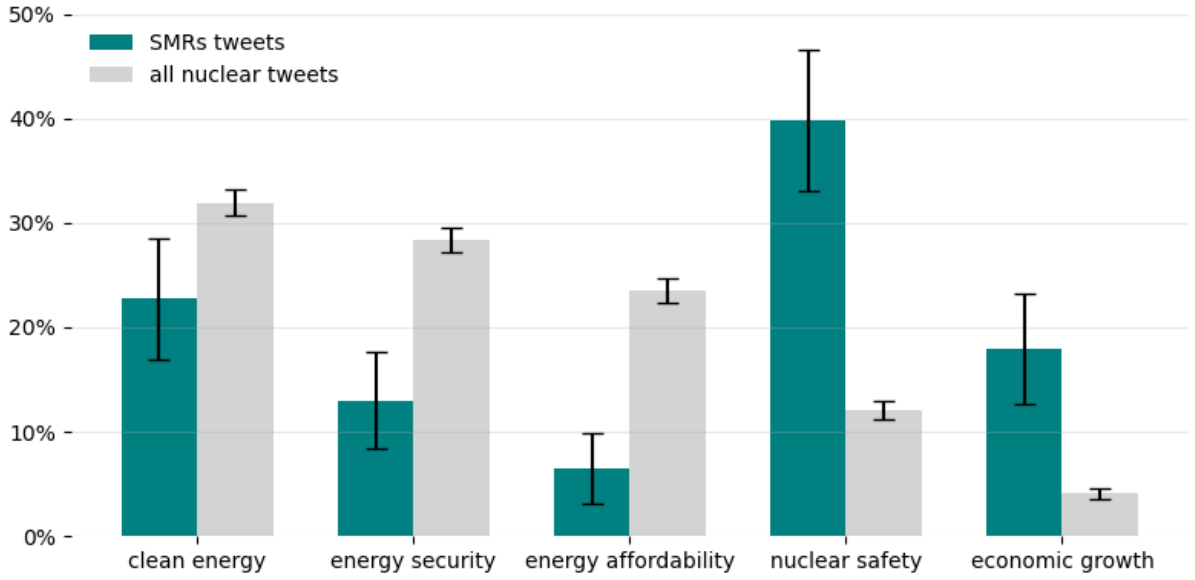


Figure 15: The proportion of each frame relative within all frames in SMR tweets, compared to the proportions within general nuclear energy tweets

3.1.10 Conclusion

As expected based on other research (Latré et al., 2019; Wolfgang C. Müller & Paul W. Thurner, 2017), the debate on X is also highly politicized, with different parties focusing on different frames, although for the clean energy frame there is an almost widespread adoption. Next, we see that the Russian invasion of Ukraine has significantly shaped the debate by influencing the frames political parties use. Specifically, the energy security frame became increasingly used by almost all parties, usually at the expense of energy affordability and to a lesser extent, clean energy. Finally, we see that small modular reactors create opportunities for a change in the nuclear discourse, as other parties and different energy policy frames come to the forefront on X. First, Center-right parties such as CD&V and Open VLD were, relatively speaking, more vocal in the SMR debate than in the general nuclear energy debate.

Second, nuclear safety and economic growth were more often used in tweets referring to SMRs than in tweets referring to nuclear energy in general (including SMRs)[8].

3.1.11 Refernces

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[8] It is important to note that if the SMR tweets would not be included in the "general nuclear tweet" dataset, both results would be even stronger.

3.2 Nuclear debate in establishment of NEPN in Slovenia

3.2.1 Nuclear development in Slovenia

"Peaceful Use of Atoms" in Slovenia

Since 1966, with the introduction of the TRIGA research reactor, Slovenia took its first step toward becoming a "nuclear country." This status has sparked divergent responses that continue to influence the planning of Slovenia's energy future. Both established and emerging perspectives within the public sphere contribute to shaping societal reflexivity on nuclear issues. As Giddens notes, *"The reflexivity of modern social life consists in the fact that social practices are constantly examined and reformed in the light of incoming information about those very practices."* The ongoing debates surrounding nuclear energy exemplify this reflexivity in which both individual and institutional actors are engaged in these discussions (Giddens, 1990).

Mapping the timeline of societal perceptions of nuclear energy (People and Nuclear Energy: From Enthusiasm to Stigma (Polič, 2013)) reveals a significant shift in public attitudes: from initial enthusiasm during the early years of nuclear use to growing fear following the first nuclear accidents in the 1970s (Three Mile Island, 1979), to nuclear renaissance in the time between the nuclear accidents (Chernobyl (1986) and Fukushima (2011)).

Slovenia (then part of Socialistic Federative Republic of Yugoslavia - SFRJ) constructed first NPP in 1981 when te Krško Nuclear Power Plant (Krško NPP, also NEK) began trial operations. From its inception, the NPP (built in Yugoslavia, shared between Slovenia and Croatia in 50:50) became the "star" of Slovenia's energy system, a proud symbol of the nation's expertise in managing complex and hazardous technology. From a national perspective, in addition to safe operations, the plant also held significant sovereign importance, as it increased Slovenia's autonomy in electricity supply.

Simplistically, public fears about safety were rationalised with arguments that our NPP is built with superior U.S. technology, not the considerably less reliable Russian technology. Furthermore, Slovenian nuclear experts were deemed highly competent, a claim supported by the fact that the NEK has now operated for over 40 years without significant technical problems. This narrative withstood pressures such as forced shutdowns of the plant, and public confidence remained largely unshaken - even during the Yugoslav War, when the NEK was exposed to potential aerial attacks. The public perception of the plant's safety was not significantly affected by these events.

Safe Operation of NEK and "Normal" Nuclear Accidents

The first major nuclear accident at Three Mile Island (1979) had a relatively limited effect on Slovenian public opinion. Most of the general public in Slovenia remained largely unaware, while experts recognised it as highly alarming (Toš, 2021). Non-US media provided limited coverage, likely for geopolitical reasons, a topic that merits further investigation. Notably, two years after the Three Mile Island incident, NEK began operations without triggering objections or any other complaints. The integration of the first Slovene/Yugoslav NPP into regular operation proceeded almost seamlessly, with consensus among stakeholders and the highest political authorities of the time.

In contrast, public reactions to later accidents were far more intense. The Chernobyl disaster swiftly became the greatest nuclear accidents ever, partly due to its geostrategic implications. Western countries openly capitalised on ideological tensions, while Soviet authorities reluctantly confirmed what Geiger counters in the West had already detected. Gorbachev's government orchestrated a severe response to the crisis which resulted in 28 responders' deaths as a result of acute radiation syndrome, further several tens fatalities due to thyroid cancer and some 350,000 people evacuation (*Chernobyl Accident 1986 - World Nuclear Association*, 2024). Slovenia was not heavily affected by the radioactive cloud (Stritar, Istenič and Gortnar 1996) which travelled north due to geographical distance and meteorological conditions at that time.

Despite the challenges highlighted by the Chernobyl accident, Slovenia's trust in the safe operation of NEK remained relatively intact (*Center Za Raziskovanje Javnega Mnenja*, n.d.). A frequently repeated argument among advocates was overtly ideological: *"A Chernobyl-like disaster is impossible in our nuclear plant because it is built with superior Western, specifically American, technology and standards!"* (*Rick Perry*, 2019). Notably, the Three Mile Island accident- rooted in U.S. technology - was seldom mentioned in this context.

NEK maintained its status of a very safe NPP with good operation records. However, public opinion surveys conducted before and after the Chernobyl accident revealed a significant shift. In 1982, four years before the accident 48% of respondents supported the idea of constructing NEK2, while only 12% opposed it. By 1987, one year after the Chernobyl accident, opposition had risen dramatically to 82% in a nationally representative survey. This marked shift is largely attributed to the psychological and social aftermath of Chernobyl. It can be concluded that the Chernobyl accident was a true turning point, dividing perceptions of nuclear energy into "before" and "after" (Toš et al., 2021).

A quarter-century later, the Fukushima disaster profoundly shook both Slovenian and global public opinion. The tsunami that struck Fukushima also swept away many stereotypes about Japan's mastery of advanced technology. Many people in the EU and Slovenia were surprised and disappointed to witness an accident of such scale in Japan - a country known for its technological sophistication and experiences in handling earthquakes and tsunamis (*Fukushima Nuclear Disaster Response Impact on Graduate Students*, n.d.).

The general response to the Fukushima disaster was a significant global decline in public support for nuclear energy (Kim et al., 2013) in several countries. Another crucial consequence of the Fukushima disaster, shared with the other two accidents at Three Mile Island and Chernobyl, was the erosion of public trust in nuclear managers and experts. The public increasingly questioned the safety of complex technological systems, with a significant portion expressing obvious distrust (Inglehart, 1995).

This decline in trust is a defining feature of the so-called "risk society" (Beck, 1992). Addressing these issues is essential, as in "high modernity" societies, legitimising even expertly prepared projects becomes increasingly difficult.

Repository for Slovenian Low and Interim-Level Radioactive Waste

When discussing the arguments *pro et contra* nuclear technology, the issue of radioactive waste holds particular importance in Slovenia (Železnik, 2009). The main challenge has been the siting of a repository for low and intermediate-level radioactive waste (LILW) within the local environment. There has been little discussion regarding the final disposal of high-level radioactive waste (HLW), which in case of Slovenia would include also spent fuel, although in the national RW and spent fuel programme (Official Gazette RS, no. 14/23, 2023) it is foreseen that HLW disposal will be established after 2065 with the tendency of shifting its operation start to the end of the century (after 2100).

The process of finding a suitable location for LILW repository in Slovenia spanned several decades from 1990 to 2009, when the site was selected (Železnik, 2009). After a series of unfortunate incidents with local communities initially considered as hosts for the repository, the state Agency for Radioactive Waste Management (ARAO) decided to restart the process, emphasising complete transparency and openness in location selection. Expert analyses of the public opinion revealed numerous inconsistencies, prejudices, narrow-mindedness, and a lack of willingness to engage in dialogue, all compounded by fear of radiation (Kos, 1992). However, sceptics argue that this democratic approach significantly prolonged the search (Kos et al., 2011).

Based on the lessons learned in the past failed site selection process for a LILW repository in Slovenia, a much broader site selection approach was adopted together with the other responsible authorities. Local partnerships (LPs) were established in year xxx in the local communities. They served as an organisational frame for all activities during site characterisation and confirmation of potential sites. The name and the idea for LPs were transposed from the Belgian approach (Železnik, 2009). The general scheme foresaw the establishment of local partnerships through a steering committee nominated by the

municipality council. Several tools were tested such as organising different committees, participants presentations, round tables, or workshops (*Final Report Summary - IPPA (Implementing Public Participation Approaches in Radioactive Waste Disposal) | FP7*, n.d.; Železnik, 2009). The LPs were also required to organise broader discussions and form working groups, inform the public, hold round tables in communities, and involve independent expert opinions for some issues. The established LPs in Slovenia had provided a good environment for access to information, public participation and engagement in international projects (such as CIP or CARL). Very important was that the decision-making power stayed with the local municipality. The weak point of LPs was the deliberate ceasing of all activities immediately after the site was selected which might have impacts on future nuclear decision-making in the area. For comparison, in the Belgian case, the LP continue also after the LILW site selection.

After a lengthy process taking place from 2005 to 2009 a location for LILW repository was eventually identified and approved in the municipality Krško, Vrbina, next to the NEK location. Since the Krško basin is one of the more seismic active areas in Slovenia (ARAO, 2019) questions on hydro, and seismic safety appeared in public (Šavc, 2020). The current study on potential floods and measures for ensuring flood safety at NEK2 (*Aktualna študija poplavne varnosti in ukrepi za zagotavljanje poplavne varnosti JEK2*, n.d.) assured that the issues are not safety significant.

Although the selection of the Vrbina site was influenced by time constraints and so-called "participation fatigue" (Železnik, 2009), the construction works for the silo type of LILW repository finally started in 2024 and the repository will be in operation according to the plans in 2027 (*Ključni Podatki o Odlagališču – ARAO Agencija Za Ravnanje z Radioaktivnimi Odpadki*, n.d.; Official Gazetta RS, no. 14/23, 2023). LILW repository, although only for the Slovenian part of RW from NEK (exluding the RW from Croatian part of NEK), will have an important role also in the future nuclear option. It will provide a disposal option also in case Slovenia will construct another NPP, however additional licensing would need to be performed.

Starting of the second NPP in Slovenia

In recent years, several factors have reignited global interest in nuclear energy. A post-accidental "nuclear renaissance" has emerged, with 57 reactors currently under construction worldwide (IAEA, n.d.). The escalating global climate crisis has further catalysed attempts to "green" nuclear energy, positioning it as a viable solution for reducing carbon emissions. Simultaneously, renewed geopolitical tensions in regions such as Ukraine and the Middle East highlight the persistent complexities and risks associated with nuclear energy in the modern era.

In this challenging context, the campaign for constructing a second NPP in Slovenia, NEK2, officially began in 2023. The prime minister announced the urgent need for NEK2 during a visit to NEK1 (*Premier Golob Projektu JEK2 Izrazil Načelno Podporo, »a Pot Do Tja Je Še Zelo, Zelo Dolga«*, 2023). On 23 May 2024, the Slovenian government adopted the *Resolution on the Long-term Peaceful Use of Nuclear Energy in Slovenia: "Nuclear Energy for Slovenia's Future"* (Official Gazetta RS, no. 43/24, 2024). By passing this resolution, the Slovenian Parliament firmly committed to a nuclear (peaceful) future for Slovenia before the public had any meaningful opportunity to engage in the discussion on technical and even more interesting financial dimensions of the biggest Slovenian project ever. The decision that Slovenia's future will be nuclear is unprecedented, as it entirely bypassed public deliberation and prematurely promised an outcome that might only have been democratically accepted following an extensive public debate and a referendum. This hasty precedent fundamentally contradicts the very objectives outlined in the resolution.

The resolution highlights several advantages of nuclear energy, particularly its stable electricity production and low greenhouse gas emissions. But the resolution primary reference point for nuclear energy production in Slovenia is the over 40 years of accident-free operation of the Krško Nuclear Power Plant.

However, a critical reading of the resolution suggests that it was drafted quickly, without the promised thorough consideration. Some sections are written in a rather untransparent manner, undermining the

legitimacy of NEK's operation. For example, Clause 7 states: *"The prioritisation of the long-term peaceful use of nuclear energy is part of energy policy and the formulation of guidelines for the long-term, safe, sustainable, and responsible utilisation of the energy mix, including nuclear energy and renewable sources."* Clause 8 commits to a transparent, clear, and inclusive process for developing legislation and policies on the peaceful use of nuclear energy. It calls for a democratic, balanced, inclusive, open, and transparent dialogue with all stakeholders regarding the use of nuclear energy, including consultations and public debates.

In its concluding section, the resolution reiterates the goals of democratically pursuing a nuclear future, supporting the sustainable, safe, peaceful, and responsible exploitation of nuclear energy. This presupposes the inclusion of all relevant stakeholders in the decision-making process.

In parallel, discussions began in the Slovenian Parliament regarding a potential referendum on NEK2, scheduled for November 2024. The National Assembly of the Republic of Slovenia passed also in the Decree on the Call for a Consultative Referendum on Ensuring a Stable Supply of Low-Carbon Electricity on October 10, 2024 (*Odlok o Razpisu Posvetovalnega Referenduma o Zagotavljanju Stabilne Oskrbe z Nizkoogljično Električno Energijo (OdPRSONEE)*, 2024). The referendum vote was scheduled for Sunday, November 24, 2024. However, on October 24, short time after the referendum was announced, the National Assembly passed the Decree on the Cessation of Validity of the Decree on the Call for a Consultative Referendum on Ensuring a Stable Supply of Low-Carbon Electricity (*Odlok o Prenehanju Veljavnosti Odloka o Razpisu Posvetovalnega Referenduma o Zagotavljanju Stabilne Oskrbe z Nizkoogljično Električno Energijo (OdPVOdPRSONEE)*, 2024). As a result, the State Electoral Commission annulled the acts related to the referendum and determined that the referendum procedures ended on October 25, 2024. This rare unity and efficiency of decision-makers raises several questions, primarily concerning the promised democratic nature, participatory process, and transparency in decision-making regarding the energy future of Slovenia. The formal explanation for the unity and speed was a procedural issue in the order of decision-making. The legislative and legal service of the National Assembly (ZPS) was not consulted when it warned that it was not possible to unequivocally support the "nuclear option" in the ReDMRJE resolution (Official Gazetta RS, no. 43/24, 2024) and then ask voters in a referendum whether they support the nuclear option for the energy development of Slovenia. This once again raises suspicions and doubts about the authenticity of the declared principles regarding legitimate and democratically open, participatory, i.e., maximally democratic decision-making on strategically important issues such as Slovenia's energy future, which are frequently mentioned in the *Resolution on the Long-term Peaceful Use of Nuclear Energy in Slovenia: "Nuclear Energy for Slovenia's Future"* (Official Gazetta RS, no. 43/24, 2024). On the contrary, the confusion surrounding the non-implementation of the referendum strengthens the impression that the original function of the consultative referendum was to prevent or defend against unwanted interventions of numerous nongovernmental societies, which repeatedly declared their interest to participate in discussion on the nuclear energy future in Slovenia.

What We Have Learned

Slovenia's experience with nuclear energy development highlights the importance of reflexivity, transparency, and public engagement in shaping energy policy. The country's history with nuclear technology (from the successful operation of NEK to the controversial debates over NEK2 and radioactive waste management) offers valuable lessons for other nations navigating similar challenges. Some most important lessons are:

1. **Reflexivity in Nuclear Energy Decision-Making:** Slovenia's experience with nuclear energy highlights the complexity of reflexivity in energy policy. The public's ontological security—how individuals and communities perceive their safety and future—plays a crucial role in shaping attitudes toward nuclear energy. Addressing open questions about safety, waste management, and long-term impacts in reflexive and transparent way is essential to build trust and legitimacy in nuclear projects.

2. **Social Attitudes Towards Nuclear Energy:** Slovenian public opinion on nuclear energy has oscillated between enthusiasm and fear, heavily influenced by global events such as the Chernobyl and Fukushima disasters. These fluctuations have significantly impacted debates about Slovenia's nuclear future, particularly regarding the construction of NEK2. Policymakers must account for these shifting attitudes and engage in continuous dialogue to address public concerns.
3. **The Military Legacy of Nuclear Power:** The military use of atomic power, particularly the bombings of Hiroshima and Nagasaki, has left a lasting imprint on public perception. In Slovenia, this historical context continues to shape the social construction of nuclear issues. The recent renaissance of militaristic debates, such as nuclear threats in Ukraine, further complicates the public's acceptance of nuclear energy for peaceful purposes.
4. **The Mystery of Radioactivity**: Radioactivity remains a poorly understood phenomenon for the general public, often evoking fear and suspicion. Despite this, common-sense arguments in public debates - such as concerns about waste disposal or safety - must be taken seriously. Slovenia's experience with for example the Atomic Spa (mildly radioactive thermal water used as a spa centre) demonstrates that even beneficial uses of radioactivity can become controversial, highlighting the need for clear communication and education.
5. **Public Sensitivity to Radioactive Waste:** The prolonged and controversial process of siting a LILW repository in Slovenia reveals the deep sensitivity of public attitudes toward radiation. Despite expert assurances, local communities often resist such facilities, reflecting a broader distrust in institutional decision-making. This experience highlights the need for inclusive and transparent processes in siting nuclear facilities.
6. **Perceptions of Risk of Nuclear Energy:** While nuclear energy is a key component of Slovenia's electricity production, public perception of its risks remains a significant barrier. The occurrence of "normal accidents" like Chernobyl and Fukushima has reinforced the view that nuclear energy is not entirely risk-free. Slovenia's experience with NEK, which has operated safely for decades, serves as a reference point, but public trust remains fragile.
7. **New NPP depends on democratic transparency:** NEK is a cornerstone of Slovenia's energy system and a symbol of national pride in managing complex technology. However, the legitimacy of expanding nuclear capacity with NEK2 depends on democratic and transparent decision-making processes. Slovenia's experience shows that top-down approaches, such as the rushed resolution on NEK2, risk undermining public trust and legitimacy.
8. **New and Old Challenges in Nuclear Energy**: Slovenia's nuclear debate is influenced by both historical and emerging factors. The revival of Cold War-era fears, coupled with the role of nuclear energy in mitigating climate change, adds new layers of complexity. Policymakers must navigate these dual challenges, balancing the need for low-carbon energy with public concerns about safety and security.
9. **Exclusion of Civil Society in Decision-Making:** Despite declared commitments to open and participatory processes, non-governmental organizations and civil society groups in Slovenia have often been marginalized in nuclear energy decision-making. The withdrawal of the consultative referendum on NEK2 exemplifies this exclusion, raising questions about the authenticity of democratic engagement in shaping Slovenia's energy future.

With assessment of past steps in Slovenian nuclear energy development from sociological perspective we can now look at specific case of how public participation and transparency have been implemented in the adoption of very important document addressing national energy and climate plan.

3.2.2 The Comprehensive National Energy and Climate Plan - process and opinions

Main objectives of NEPN

The Updated Comprehensive National Energy and Climate Plan (NEPN) (*Posodobljeni Celoviti Nacionalni Energetski in Podnebni Načrt Republike Slovenije*, 2024) is an action-strategic document that, in accordance with EU Regulation 2018/1999 on the management of the energy union and climate measures, every EU member state is obliged to adopt. The NEPN for the period up to 2030 (with a view to 2040) sets goals, policies and measures on five dimensions of the energy union, including the production of energy in the country. The NEPN sets out objectives, policies and actions to achieve European energy-climate goals on the five dimensions of the Energy Union: (1) decarbonisation, (2) energy efficiency, (3) energy security, (4) the internal market; and (5) research, innovation and competitiveness.

Slovenia's NEPN 2024 outlines a strategy to reduce greenhouse gas emissions by at least 55% by 2030 (from 1990 levels) and achieve net-zero emissions by 2050, aligning with EU climate goals. This will be achieved through emission reductions across sectors, greater use of renewable energy, and improved energy efficiency. A central focus is the expansion of renewables. By 2030, 33% of total energy and 55% of electricity should come from renewable sources like solar, wind, and hydropower. Renewable energy will also account for 45% of heating and cooling and 26% of transport energy through electrification and sustainable fuels. Slovenia plans to phase out coal by closing the Šoštanj Thermal Power Plant by 2033. To ensure energy security, the country will diversify sources, strengthen cross-border cooperation, and invest in storage technologies. Energy efficiency will be boosted by reducing consumption to 69 TWh and ensuring that 55% of building energy use comes from renewables. Smart energy management and efficient technologies will be promoted across all sectors.

Nuclear energy remains part of the transition. The Krško plant's life has been extended to 2043, and a decision on building a second plant (NEK2) is expected by 2028. Small modular reactors (SMRs) are also being considered for the longer term. Sustainable transport will be advanced by increasing electric vehicle adoption, expanding charging infrastructure, and promoting public transport and alternative fuels. By 2030, at least 30% of new car sales should be electric. The plan also supports innovation and green investment, with funding for R&D in clean technologies and smart grid development to modernize the energy system.

As a path towards reaching the goals, NEPN 2024 presents two primary scenarios for Slovenia's long-term energy strategy, each with different policy implications:

1. **Dual Energy with Nuclear (DU-JE) Scenario**: In this scenario, Slovenia continues using nuclear energy as a key component of its electricity supply. The government would approve the construction of a new nuclear power plant (NEK2) by 2040, ensuring a stable baseload power source. This scenario assumes moderate growth of renewables, combined with nuclear energy as a long-term solution for decarbonization.
2. **100% Renewable Energy (DU-OVE) Scenario**: In this pathway, Slovenia fully transitions to renewable energy, relying on a massive expansion of solar, wind, and hydropower. This would require substantial investments in energy storage, international electricity imports, and advanced grid management technologies. The phase-out of nuclear energy after 2043 would make Slovenia completely reliant on renewables and energy imports.

According to NEPN, the choice for the scenario, i.e. the final decision on the nuclear expansion, has to be made by the Slovenian government by 2028.

Stakeholders engagement in NEPN

The government involved different stakeholders (including citizens) in the development of the NEPN throughout the whole process, according to the prepared plan (*Portal Energetika - Podnebni in Energetski Dialog Na Več Ravneh*, n.d.). Stakeholders' comments and feedback were publicly published on the online platform of the Ministry of the Environment, Climate, and Energy (MOPE) assuring transparency (*Portal Energetika - Javna Razgrnitev Končnega Predloga Posodobitve NEPN Ter Formalno Posvetovanje z Javnostjo*, n.d.). The online platform (*Portal Energetika - Nacionalni*

Energetski in Podnebni Načrt, n.d.) serves as the central website where all information on the NEPN activities are published and collected.

The preparation of NEPN was a multi-year process that involved broad stakeholder consultations, public engagement, expert assessments, and regulatory alignments with EU energy and climate policies. Slovenia followed a transparent and participatory approach, ensuring that local authorities, civil society organisations, the business community, investors and other relevant stakeholders, as well as the general public, could actively participate and discuss the different, including long-term, scenarios envisioned for energy and climate policy and assess progress.

The process, which began in 2022, included several phases: preliminary consultations, sectoral discussions, public hearings, impact assessments, and revisions based on collected feedback. The aim was not only to facilitate broad engagement with the general public and experts, but also to develop and lead targeted dialogues with individual stakeholders in accordance with Article 11 of Regulation (EU) 2018/1999. The final plan, adopted in December 2024, was submitted to the European Commission, replacing the initial NEPN adopted in 2020.

The timeline of the NEPN update started with early involvement of stakeholders and data collection to identify key challenges, opportunities, and policy directions. This phase included (1) online consultation, (2) public presentation, and (3) thematic stakeholder consultation:

(1) Online Consultation (August – October 2022):

MOPE launched a public consultation process in the form of an online survey, where stakeholders could submit suggestions on Slovenia's energy and climate priorities. 135 interested members of the public took part in the preliminary online public consultation, from which only 46 contributions were valid and further elaborated. The main messages of the online consultation were several:

- The need to make a decision regarding the new nuclear power plant or to outline a clear path toward reaching a decision.
- The issue of nuclear energy use also reflected differences in the ambition levels for renewable energy utilization.
- The existence of conflicting opinions on the further development of hydropower.
- The need to strengthen the distribution (electricity) network and enhance the resilience of the energy and gas networks in general.
- A clear call for greater self-sufficiency in electricity production (85% - 100%).

As shown in Figure 16, 45 out of 46 respondents answered the question about their sector of origin. The majority of respondents came from the general public (11), 8 from energy companies and 8 from academic and research institutions. Additionally, 6 respondents came from the business sector, 6 from the non-governmental sector, 4 from other sectors, and one representative each from the state administration and municipalities.

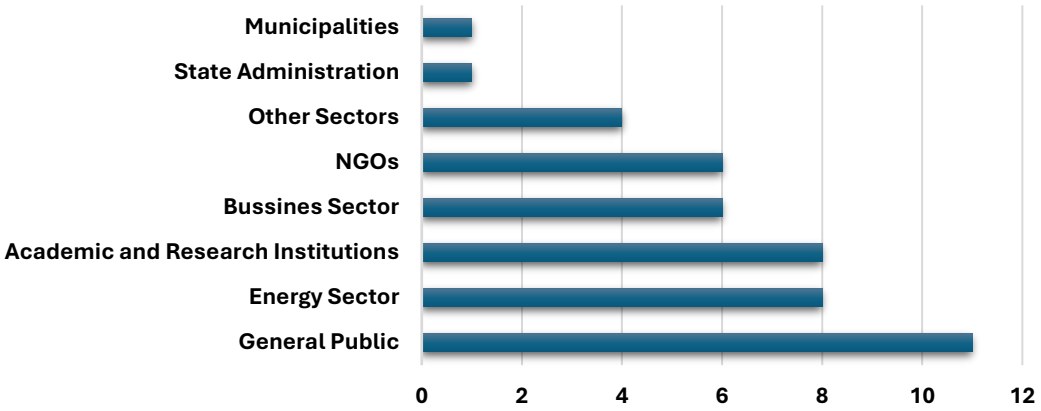


Figure 16: Categorisation of participants in online survey, August – October 2022.

(2) Public Presentation (September 2022):

A public event introduced the scope and goals of NEPN. Around 95 participants attended the public hearing, where key topics were presented, including the NEPN update process, the NEPN Implementation Report, and the results of the public opinion survey "Public Attitudes Towards Renewable Energy". The session also covered the main challenges and directions for the NEPN update. This was followed by an open discussion and an invitation for all participants to actively engage in the consultation process.

(3) Thematic Stakeholder Consultations (October – November 2022):

To establish a broad professional dialogue and involve a wider expert and public audience in the NEPN update process, a series of targeted thematic consultations were conducted. The aim was to build broader expert consensus and gather high-quality data and viewpoints on the foundations and directions for updating the NEPN, as well as to obtain reliable input data for developing and refining NEPN scenarios.

The consultations in the first phase addressed key factors influencing Slovenia's future development, as well as the main sectors, areas, and technologies facing the greatest challenges and uncertainties in the country's future development and green transition. The selection and content of the consultations were designed and adjusted based on the results and guidelines from the preliminary public consultation process.

The second phase of public consultation was dedicated to gathering feedback on the proposed directions and objectives in the first draft of the NEPN update. The consultation, which took place from April to May 2023 (30 days), included (a) public presentation, (b) online consultation, and (c) targeted thematic consultations:

(a) A Public Presentation (April 2023):

The first part focused on presenting the foundations for preparing the first draft of the NEPN update, followed by an open discussion. The purpose of the presentation was to create a public space for debate and encourage public consultation.

(b) Online consultation (April – May 2023):

The online consultation aimed to engage both the general public and experts in reviewing the proposed directions and objectives of the first draft of the NEPN update. It was conducted via an online survey from April to May 2023, with participants able to submit, modify, or complete their responses at any time during this period. The survey was not anonymous, and all contributions were publicly available.

During the consultation period, the survey page was accessed 929 times, with 279 clicks on the survey itself. A total of 137 respondents began the survey, and 73 completed it. Both completed (73) and partially filled (64) responses were reviewed, excluding empty or anonymous submissions.

In addition to survey responses, the ministry received separate comments on the NEPN update, some overlapping with survey feedback and others providing additional insights. All submitted inputs were reviewed and incorporated into the second draft of the NEPN update where possible. Many comments also addressed measures planned for further development in summer and autumn 2023, ensuring their consideration in future planning.

A total of 78 survey participants answered the question about their sector of origin. The majority came from the general public (25), 15 from energy companies, 13 from the business sector, 12 from the non-governmental sector, 7 from academic or research institutions, 3 from the state administration, 2 categorized as "other," and 1 representative from a municipality, as shown in Figure 17.

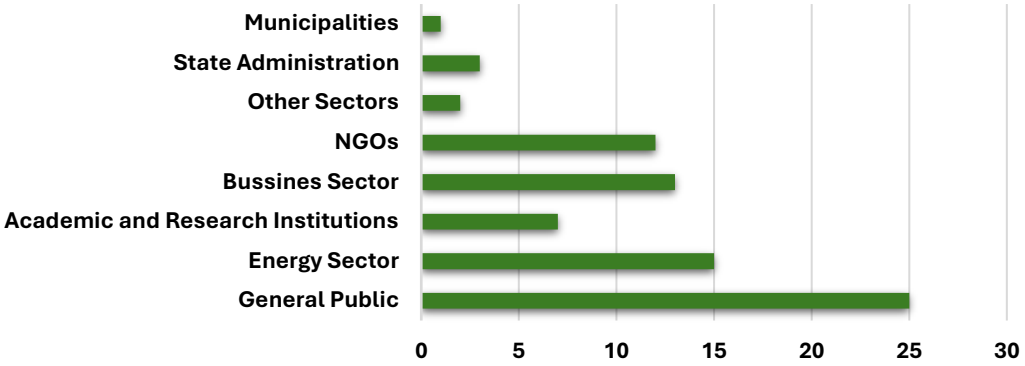


Figure 17: Categorisation of participants in online survey, April – May 2023.

Out of all the survey questions, only one directly addressed nuclear energy. It focused on support for the prompt and comprehensive assessment of the long-term use of nuclear energy, including economic and technical analyses. The goal of this evaluation was to enable a well-informed decision on the construction of a new nuclear power plant by 2027 at the latest. Figure 18 shows that almost 66% of respondents (42) strongly support this approach, while 9 support it, 5 do not support it, and 3 are completely opposed. Additionally, 5 respondents selected "I don't know", of whom 4 are from the non-governmental sector.

Except for the nongovernmental organisations (NGOs) sector, respondents from all other groups (excluding categories with only one or two representatives, which cannot be considered a "group") strongly support this direction. This suggests that respondents favour a prompt and comprehensive assessment leading to a decision on the long-term use of nuclear energy as soon as possible.

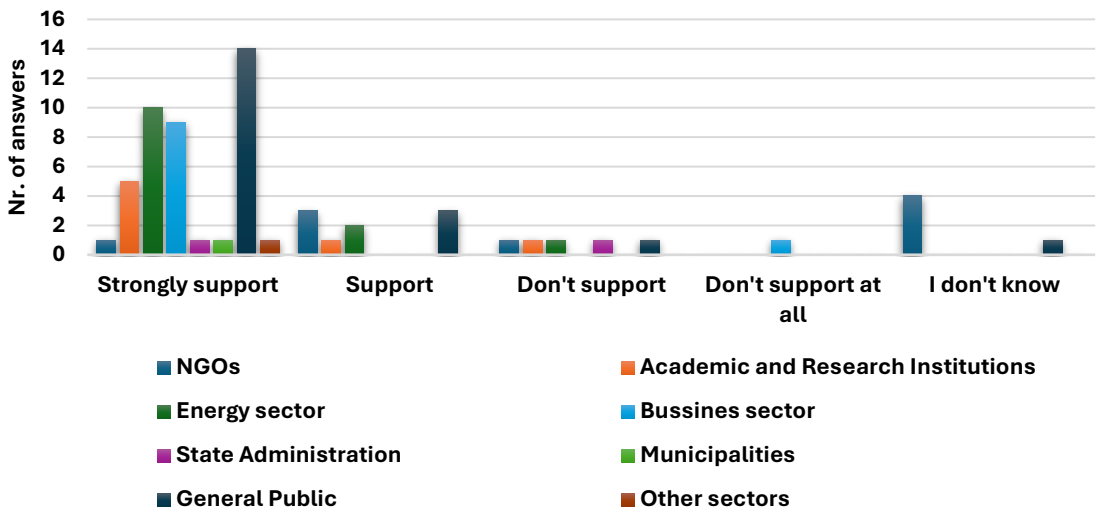


Figure 18: Support for the prompt and comprehensive assessment of the long-term use of nuclear energy.

(c) Targeted thematic consultations (April 2023):

The targeted thematic consultations were aimed at consulting with the professional public regarding the proposed guidelines and objectives in the first draft of the NEPN update.

In the last wave of the public engagement plan, lasting from May to June 2024, the final public consultation took place regarding the draft update of NEPN and the Environmental Report for NEPN. As part of the public disclosure process, two public presentations were held in June 2024: the first was in person (Faculty of Electrical Engineering, University of Ljubljana), and the second was online. During the public consultation, the ministry received over 400 comments from 22 contributors, which are all publicly accessible. Figure 19 illustrates the distribution of comments, where 11% specifically address nuclear energy, while the remaining 89% focus on other topics related to energy policy, sustainability, and climate goals.

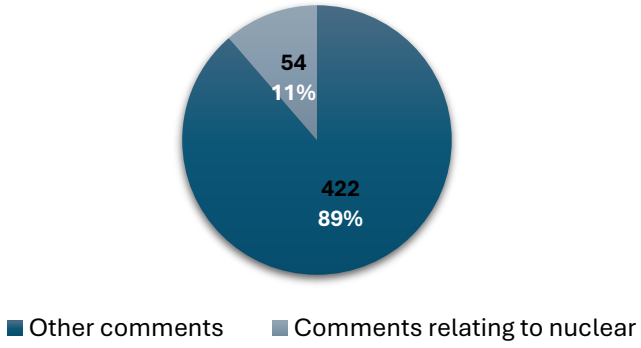


Figure 19: Comments on NEPN.

This distribution suggests that nuclear energy was not the primary focus of public discourse, but it still generated a notable share of feedback.

The categorisation of contributors of nuclear-related comments is shown in Figure 20, and the number of comments per category in Figure 21. The split into five groups, based on the Quintuple Helix Model (Carayannis et al., 2012), was done to better understand the diversity of perspectives and analyse how different societal sectors engage in the discussion on nuclear energy.

Category 1 ***(the research and education system, e.g. universities, higher education systems, research centres and schools)****:* SAZU, Department of Reactor Physics - Jožef Stefan Institute, Young Generation Network of the Society of Nuclear Experts, Society of Nuclear Experts of Slovenia

Category 2 ***(the economic system, e.g. nuclear industry, other relevant industry (e.g. energy distribution), firms, services and banks)****:* GEN energija d.o.o., Krško Nuclear Power Plant, d.o.o., Chamber of Commerce and Industry of Slovenia

Category 3 ***(the natural environment, e.g. environmental NGOs)****:* Mreža Plan B

Category 4 ***(the media-based and culture-based public, e.g. local communities, Civil Society Organisations, Local Information Committees, social networks, media)****:* Danijel Levičar* and Polona Faletič**, Jure Vetršek***

Category 5 ***(the political system, e.g. regulator, government agencies, politicians)****:* Climate Council

* State Secretary for National Nuclear Programme in the Office of the Prime Minister of the Republic of Slovenia

** Legal Adviser - Office of the Prime Minister of the Republic of Slovenia

*** Institute for Innovation and Development of University of Ljubljana

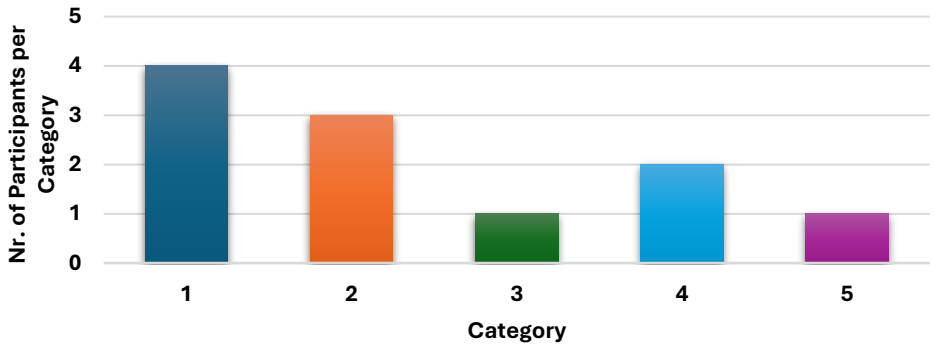


Figure 20: Categorisation of nuclear-related commentators.

The research and education sector (Category 1) had the highest participation, suggesting that academic institutions and nuclear experts played a leading role in the discussion. The economic sector (Category 2), which includes nuclear industry representatives, also contributed significantly. Conversely, environmental NGOs and political institutions (Category 3) had the lowest engagement. The media, civil society, and local community representatives (Category 4) were moderately involved. However, some individuals in this category who provided comments are employed in political and research organizations, indicating potential overlaps in stakeholder roles.

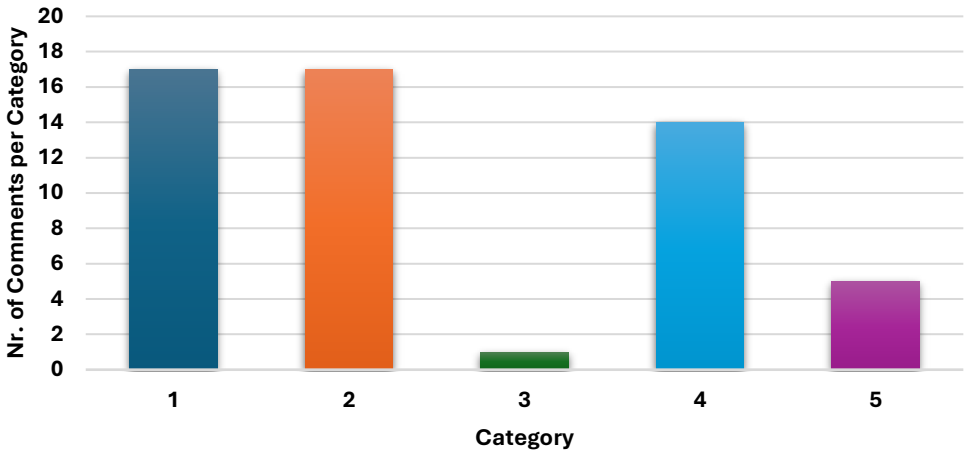


Figure 21 : Number of comments on nuclear energy per category.

By comparing Figure 20 and Figure 21, it is evident that certain categories contributed a significantly higher number of comments per participant:

- Category 4 (media, civil society, local communities) had relatively few participants but contributed a large number of comments, suggesting that this group was highly engaged and provided multiple inputs per person.
- Category 1 (research and education) and Category 2 (economic sector, including nuclear industry) had the most participants, but their number of comments was more proportional, indicating broad but less repetitive engagement.
- Category 3 (environmental NGOs) had both the lowest number of participants and the fewest comments, suggesting minimal engagement from environmental organizations in the nuclear energy discussion.
- Category 5 (political institutions) had low participation and a moderate number of comments, showing some involvement but not a dominant voice in the debate.

Comments related to nuclear energy, grouped into 23 categories based on their common themes and content, are presented in Figure 22.

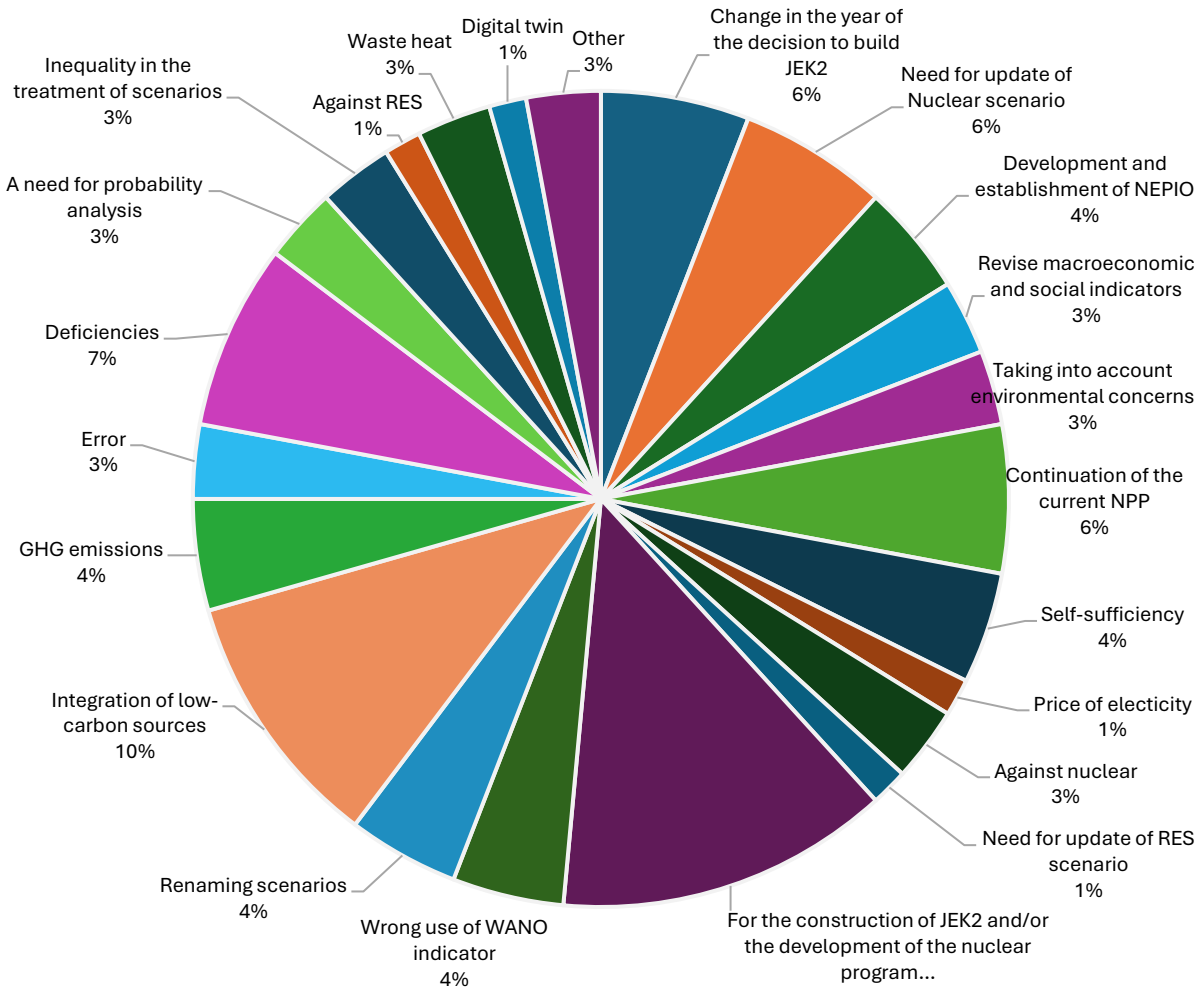


Figure 22: Categorisation of comments.

The largest share of comments (13%) focused on the construction of NEK2 and the development of Slovenia's nuclear program, indicates that nuclear expansion remains a significant topic of discussion. This is followed by the integration of low-carbon energy sources (10%), highlighting the broader concern about balancing the energy mix and ensuring a stable transition.

Several comments addressed scenario adjustments, including requests to change the decision year for NEK2 (6%), update the nuclear scenario (6%), and renaming scenarios (4%), suggesting that stakeholders wanted more clarity and refinement in the strategic planning framework. Additionally, a continuation of the current nuclear power plant (6%) was also a key topic, reinforcing the relevance of nuclear power in Slovenia's energy policy.

Environmental and economic concerns were also present, with comments emphasizing environmental factors (3%), GHG emissions (4%), and the price of electricity (1%). Some participants raised technical issues, such as deficiencies (7%), errors (3%), and the wrong use of the WANO indicator (4%), indicating concerns about methodological accuracy.

A small but notable portion of comments opposed nuclear energy (3%) or renewable energy sources (1%), indicating that while most discussions revolved around policy refinement, some stakeholders held strong positions against specific energy sources.

How nuclear-related comments were considered in the NEPN consultation process is shown in Figure 23. It can be seen that only 4 out of 54 (7%) were partially considered, while 28 (52%) were not taken

into account. This suggests that most feedback did not influence policy decisions. Additionally, 22 comments were categorized as general remarks, because they did not include concrete proposals.

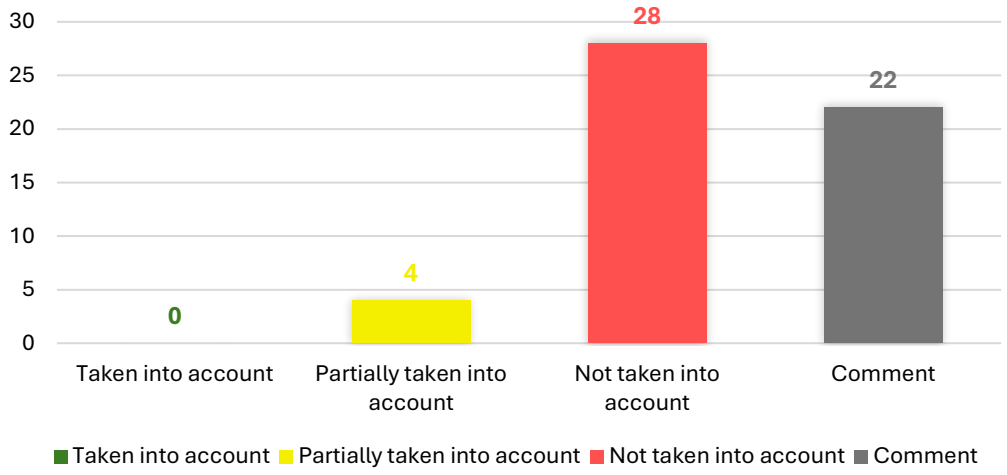


Figure 23: Consideration of nuclear-related comments in the NEPN consultation.

Despite the fact that the majority of feedback did not influence the final policy decisions, the evaluation process ensured transparency by providing justifications for each response, which allowed stakeholders to understand the reasoning behind the decisions, even if their suggestions were not adopted.

Furthermore, to gain additional insights and perspectives, engagement took place with (1) the business community, (2) local authorities, (3) youth, and (4) National Assembly and the National Council:

(1) MOPE and the NEPN Consortium actively engaged with the business community, particularly through the Chamber of Commerce and Industry of Slovenia (GZS). As the largest and most influential economic network in Slovenia, GZS played a key role in discussions regarding the NEPN update. Several structured consultations (4 in total, between May 2023 and May 2024) were held throughout the process to ensure that business sector perspectives were incorporated into Slovenia's energy transition strategy. By the end of these consultations, stakeholders agreed that dialogue between MOPE, the business community, and other key actors had significantly improved since the first NEPN draft. MOPE invited participants to submit their final proposals and comments during the last public consultation phase, which lasted 30 days.

(2) While the involvement of local authorities in the climate and energy dialogue during the preparation of NEPN 2020 was mostly sporadic and individual, active cooperation in the process of drafting the updated NEPN was successfully established through collaboration with the Association of Urban Municipalities of Slovenia (ZMOS), an interest group representing Slovenian urban municipalities at both the national and international levels. As part of the NEPN update process, three consultations were organized, focusing on the revision of NEPN objectives and measures, as well as discussions on the overall NEPN update.

(3) In addition, young people have been recognized as key stakeholders since the preparation of NEPN 2020 and were directly invited to participate in targeted consultations. The NEPN drafting team welcomed the fact that youth involvement has steadily increased over time, taking on more active roles in both the NEPN 2020 process and in the development of the updated NEPN.
Initially, engagement was led only by two youth organizations which participated in expert consultations in the fall 2022 and spring 2023. Both organisations submitted written comments during public consultations in the same periods of involvement in the process. Over time, other youth organizations also joined the discussions.

(4) In November 2023, a professional consultation titled "NEPN: Clear Guidelines for the Green Transformation of the Economy" was held in the National Council of the Republic of Slovenia. Representatives of MOPE and the NEPN Consortium, presented the progress and status of the

NEPN update, focusing on policy and measure revisions in the transport, circular economy, and building sectors. During the discussion, numerous comments and suggestions from participants were actively documented. These inputs were then reviewed, and some were incorporated into NEPN update draft.

Conclusion on stakeholder engagement in NEPN

The development of Slovenia's Updated National Energy and Climate Plan was a transparent and inclusive process that encouraged broad stakeholder and public participation. The process, initiated in 2022, involved multiple phases, including preliminary consultations, public discussions, impact assessments, and expert evaluations, ensuring that diverse perspectives were considered.

To facilitate public engagement, an online platform was established as a central hub for information and feedback collection. Additionally, a public participation plan was implemented to provide clear guidelines for involvement. Throughout the process, targeted thematic consultations and sectoral discussions were conducted, allowing various stakeholders (including local authorities, businesses, civil society organizations, and investors) to contribute to shaping Slovenia's long-term energy strategy.

Despite the fact that not all feedback was incorporated into the final NEPN, the process remained transparent, with each comment receiving a justification for acceptance or rejection. This approach ensured that stakeholders had clarity on decision-making criteria, reinforcing trust in the consultation process. Overall, the NEPN development demonstrated a commitment to open dialogue and participatory policymaking.

3.2.3 Energy Policy Debates in Slovenia: Findings from discussions on Nuclear Power

The discussion on nuclear energy in Slovenia has been gaining momentum due to ongoing political and environmental debates surrounding the country's energy future. In this context, a focus group discussion was conducted in April 2024, bringing together experts from various fields, including environmental sociology, psychology, reactor physics, geography, political science, and representatives of governmental and non-governmental organizations (NGOs). In addition, several interviews were conducted with official representatives of various related organisations during May to June 2024.

How are policy decisions made concerning (new) nuclear technologies?

The primary objective of the discussion was to explore perspectives on Slovenia's nuclear energy policy, particularly regarding the planned NEK2, which is one of the two possible scenarios in NEPN. Participants pointed out, there are three **reasons for bringing nuclear energy in Slovenia to the agenda:** energy crisis and climate change, geopolitical and strategic considerations, and political consensus.

The role and perception of the nuclear energy in Slovenia has evolved significantly over the years. While its share in global electricity production declined from 17.5% in 1996 to below 10% in 2023, public perception in Slovenia has shifted towards nuclear energy mainly in last years. Attitudes are now increasingly influenced by the energy crisis and the push for climate action. This shift in perception aligns with broader European trends. Initially excluded from EU climate strategies, nuclear energy gradually gained political acceptance as a low-carbon alternative, largely due to policy shifts and lobbying efforts in Brussels. Despite ambitious targets (such as some EU members and OECD's goal to triple nuclear capacity by 2050) experts remain sceptical about the feasibility of such plans, because of the supply chain limitations, workforce shortages, and geopolitical constraints. In the discussion, doubts were expressed about whether these targets are feasible or merely serve as political rhetoric.

An overview of global nuclear geopolitics, presented during exchanges, noted a division between ambition and capability. While Western countries advocate for nuclear expansion, they face significant constraints, including weak supply chains and a shortage of skilled personnel. In contrast, China, Russia, and India dominate the reactor construction and the uranium supply, strengthening their position as key players in the industry. Slovenia's nuclear policy reflects this broader geopolitical landscape. Despite

lacking a clear national commitment to nuclear expansion, the country signed a strategic cooperation agreement with the U.S., aligning itself with Western nuclear interests. This agreement, signed in 2020, was driven in part by U.S. political pressure, linking Slovenia's nuclear strategy to NATO's broader geopolitical objectives. The move has raised concerns about external influences on national energy policy and the extent to which Slovenia's nuclear future is shaped by strategic alliances rather than independent decision-making.

Historically, Slovenian political parties were divided on nuclear energy. Today, however, a broad consensus has emerged, with almost all major parties (except the Left, also the coalition member), the majority of public opinion, journalists, and the general population supporting the continuation of the nuclear option. This shift reflects the dominance of a hegemonic discourse that frames nuclear energy as the only viable path for Slovenia's energy future. By marginalizing alternative perspectives, this narrative has effectively discouraged debate, shaping public perception and limiting discussion on potential energy alternatives.

How is Slovenia's nuclear policy shaped

The discussion suggested that **Slovenia's nuclear policy** is shaped by political pragmatism, international pressures, and a lack of transparent public discourse, rather than a fully independent, data-driven evaluation of all energy options. Participants noted that political decisions are top-down, public opinion is manipulated through PR and media, and that there is a lack of consideration for alternative scenarios. Additionally, participants observed that, for the first time, political parties across the spectrum have become largely unified in their support for nuclear energy. This consensus among politicians reinforces the perception that nuclear energy is a predetermined path, rather than one openly contested through democratic deliberation. This is somehow in contradiction with, for example, the deliberative statements on transparency and public participation in the Resolution on peaceful use of nuclear energy or with stakeholders' engagement plan for NEPN, both presented in the report.

Nuclear policy decisions in Slovenia have been shaped by a lack of transparency and democratic engagement. Rather than fostering open discussions, nuclear energy was embedded into long-term energy strategies, effectively positioning it as the default option without a broader debate on alternatives. This pattern of decision-making is further reflected in Slovenia's strategic cooperation agreement with the U.S., which was signed in secrecy by the previous government. The document remained hidden for weeks before being publicly disclosed, raising concerns about the lack of public oversight and informed consent in shaping the country's energy future. The participants also highlighted the geopolitical implications of this agreement, noting that the document mentions NATO twice, raising questions about whether Slovenia's energy strategy is being shaped to align with broader military and strategic interests rather than domestic needs. Some participants expressed concern that energy policy decisions are being driven by external alliances, potentially prioritizing NATO's energy security over national energy sovereignty. The participants noted also the short-term nature of the Slovenian energy policy, which does not extend beyond two years. Attempts by previous administrations to introduce revolutionary energy changes have often been accompanied by misleading narratives, making it difficult to establish a clear, long-term vision for the country's energy strategy.

Participants to the focus group expressed that public perception of nuclear energy in Slovenia has been heavily influenced by well-funded PR (public relation) campaigns, which have shaped the narrative in favour of nuclear power while marginalizing discussions on alternative energy sources. For years, these campaigns have dominated the public space, creating the impression that nuclear is the only viable option for the country's energy future.

The disparity in funding has further reinforced this imbalance. Nuclear energy promotion has received significantly more financial support than campaigns advocating for renewable alternatives, effectively skewing public opinion. At the same time, journalistic coverage has largely mirrored political narratives, leaving the public with limited access to independent, in-depth analysis of alternative energy solutions.

The participants also highlighted the absence of a strong professional public capable of influencing government decision-making. Participants noted that expert discussions on energy policy are largely

confined to narrow professional circles, with little impact on broader public debate. Instead of relying on independent expert assessments, the government places greater emphasis on PR strategies, packaging nuclear energy decisions in a way that appeals to public sentiment, rather than being based on rigorous, transparent analysis. As a result, key energy decisions are being made in an environment shaped more by strategic messaging than by open, evidence-based debate.

Slovenia's national energy plans have never fully explored or financially evaluated the feasibility of a 100% renewable energy scenario, leaving nuclear energy as the default choice without a comprehensive comparison of alternatives. While non-nuclear solutions also present environmental drawbacks, they should be debated equally and not be sidelined in favour of nuclear. Equally targeted debates would ensure that energy policy decisions are based on a thorough and transparent assessment of all available options.

Important factors in decision-making on nuclear

The participants exposed five **important factors in decision-making:** geopolitical and economic dependencies, economic feasibility and corruption risks, security and war risks, ecological modernization, and the need for a fair and transparent evaluation of all energy options.

Slovenia remains heavily dependent on external suppliers for its nuclear fuel, with most uranium sourced from Kazakhstan, Canada, and Russia. The enrichment and processing of uranium are also dominated by Russia, China, and a few Western European countries, leaving Slovenia with little control over its supply chains and vulnerable to geopolitical shifts. At the same time, Western nuclear industries face significant challenges, particularly a shortage of skilled personnel, which has slowed development and innovation. In contrast, China and Russia continue to expand their technological capabilities, raising concerns about the long-term sustainability and independence of nuclear energy strategies in countries reliant on Western supply chains.

Additionally, participants underscored the need for a diverse energy mix and stressed the importance of evaluating which sources can ensure a stable and reliable supply.

There are growing concerns that the NEK2 nuclear project could follow the same corruption-prone trajectory as TEŠ6 (thermos power plant in Šoštanj), where poor financial planning and a lack of oversight led to massive cost overruns. Without thorough economic evaluations, Slovenia risks repeating past mistakes if committing to an energy project with uncertain financial feasibility. Additionally, NEK2 demands at least ten times more funding than previous energy projects in Slovenia, significantly increasing the risk of cost overruns and financial mismanagement. Without rigorous transparency and accountability, such large-scale investments could strain public finances and limit resources for alternative energy solutions.

The example of Zaporizhzhia, Ukraine’s nuclear plant under military threat, exposes the fact that no nuclear facility is designed to withstand military attacks. This situation raises concerns about Slovenia’s energy security, especially in the context of a geopolitical crisis.

Ecological modernization emerged as an important factor shaping Slovenia’s energy policy. Participants noted that this concept, which has shaped European Union policies since 2019–2020, has been integrated into national strategies through RRP (Recovery and Resilience Plans) financial resources and serves as a guiding framework for economic and environmental development. They emphasized that the shift from the sustainable development paradigm toward ecological modernization has structured how economies across EU member states, including Slovenia, approach environmental and energy policies.

The need for a comprehensive and unbiased evaluation of all available energy scenarios was repeatedly emphasized throughout the discussion. Participants criticized the current decision-making process, arguing that it is driven more by political narratives and PR strategies than by an open, evidence-based debate. They stressed the importance of assessing each energy scenario from cradle to grave, considering financial, environmental, security, and social impacts.

Dealing with uncertainties

The participants addressed also the issue of lack of properly **dealing with uncertainties**. While policymakers assume that future technological advancements will solve problems, severely downplaying risks, the issue of nuclear waste is rarely discussed, even though the spent fuel disposal in Slovenia is currently shifted to very far future (earliest 2065, but with tendency to be postponed till 2100), meaning that insufficient resources are collected by the current NPP (Poluters Pays Principle) and the risk of proper management is challenged. Furthermore, the referendum (which was cancelled) was meant solely as a superficial mechanism. The participants expressed scepticism about the then-upcoming referendum on nuclear expansion, with concerns that the public lacks sufficient information to make an informed decision. Moreover, it was expressed that a simple "yes" or "no" vote could lead to unpredictable consequences, potentially locking Slovenia into a nuclear path without a full evaluation of alternatives.

Stakeholders' participation in nuclear energy policy

The participants expressed that **stakeholders' experienced participation in nuclear energy policy** as a complete and deliberate exclusion of expert discussions from the decision-making, which makes it difficult for opponents of nuclear expansion to voice concerns. Slovenia's governance model was described as superficial, where stakeholders are included for appearance's sake, but their opinions do not influence decisions.

The impact of stakeholder participation on energy policy and public discourse is evident in the dominance of pro-nuclear narratives. The Slovenian Chamber of Commerce is one of the strongest pro-nuclear advocates, as nuclear energy aligns with the needs of centralized industrial energy. While polls show 60-70% public support for nuclear energy (REF), some argue this support is driven by biased information and a lack of open debate. The participants highlighted structural barriers to presenting alternative perspectives, as no public funds have been allocated to research non-nuclear energy scenarios, making it difficult to propose viable alternatives. This suggests that stakeholder engagement is limited to those who align with the dominant pro-nuclear stance, thereby restricting the diversity of viewpoints in policy discussions. Additionally, government communication strategies tend to favour nuclear energy, often sidelining discussions about renewable sources, which further skews public perception and policy direction. As a result, the policy context remains heavily shaped by centralized decision-making, where stakeholder influence is unevenly distributed, limiting the impact of actors advocating for alternative energy pathways.

Improving stakeholder engagement

The participants **suggested three improvements regarding stakeholder engagement**: increase transparency and long-term planning, adopt Switzerland's referendum model, and establish a structured interdisciplinary debate.

Long-term planning beyond political cycles, i.e., considering impacts over decades rather than short-term election interests, would bring stability, consistency, optimised resource allocation, better risk management, and would increase public trust and cross-generational responsibility.

Switzerland's example of referendum, where citizens were fully informed about energy alternatives before voting on nuclear expansion, led to a decision that reflected the true interests of the citizens. The benefits of informed decision-making are increased legitimacy of results, better policy outcomes, public trust in government and reduced polarization.

Establishing a structured interdisciplinary debate was identified as essential for improving stakeholder engagement. Participants stressed the need for a platform that enables open, interdisciplinary discussions, where experts from various fields can engage in a broad, evidence-based dialogue on energy policy. Moreover, they emphasized the importance of public accessibility to these debates, suggesting that such discussions should be conducted in visible public spaces, such as television or other widely accessible forums. This would ensure that individuals interested in more in-depth aspects of energy policy have the opportunity to access relevant information, fostering a more informed and participatory public debate.

3.2.4 Conclusion

The focus group participants provided interdisciplinary insights into the current and future role of nuclear power in Slovenia: from economic feasibility to geopolitical and technological challenges, including uranium supply chains, energy independence, and the role of media and public relations in shaping perceptions of nuclear energy. Given the increasing emphasis on green transition and energy security, understanding expert and public perspectives was labelled as crucial for informed policy decisions. The need for transparent public discourse and evidence-based decision-making regarding the country's long-term energy strategy was emphasised.

Experience with development of nuclear policy in Slovenia and also with stakeholder engagement in NEPN showed that some changes has been achieved from the past regarding stakeholder engagement. The process of engagement in case of NEPN has been established with variety of options to be involved and provide the comments. Howevere, the figures from our investigation indicate that the majority of nuclear-related input from stakeholders did not significantly influence the NEPN's final content, raising concerns about the effectiveness of the public consultation process in shaping nuclear energy policy.The lessons learnt with nuclear energy development have not been really reflected and adopted to change approaches and define openly, transparently and with participation of different interested parties the nuclear policy. The example of stakeholders engagement in NEPN development demonstrated that a transparent and inclusive process that encouraged broad stakeholder and public participation was provided; however only few comments and feedback were incorporated into the final NEPN.

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3.3 Slovakia

3.3.1 Introduction

With 61,3% nuclear share in 2023, Slovakia has become a global co-leader alongside France (64,8 %) in terms of nuclear power's share of national electricity production. The third-ranked country, Hungary, has a significantly lower share of 48,8% .

The situation described above was accomplished through various institutional measures and strategic manoeuvres by Slovak politicians (Mihók, 2020a). Notably, these included initiating and establishing the European Nuclear Energy Forum (ENEF) in 2007 in cooperation with their Czech counterparts.

Also from 2007, political initiatives supporting nuclear sector aimed to restrict the public's rights to participate in assessment and licencing procedures. However, after intervention by the European Commission (EC) to enforce compliance with EU acquis, these efforts shifted towards minimising transparency, particularly and solely within the nuclear sector (Ibid; Mihók, 2011).

As a result of the aforementioned political initiatives, it became exceedingly difficult for environmental non governmental organisations (NGOs) and other civil society representatives to meaningfully engage in decision-making and permitting processes related to nuclear sector projects, as well as in associated Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) procedures. Consequently, the number of Slovak environmental NGOs participating in EIA procedures for new nuclear units declined from four, involved in the Mochovce nuclear power plant (NPP) Units 3 and 4 EIA in 2009, to none during the EIA for the new NPP in Jaslovské Bohunice in 2015–16. ECOSENS's primary research in Slovakia, as examined in this case study, had to be adjusted to reflect this empirical reality.

Given the specificities of the national context outlined above,this national case study briefly summarises the statements of political parties relevant to the commercial nuclear sector made prior to the two most recent parliamentary elections. Furthermore, it explains why research into interdisciplinary collaborations related to Slovakia's commercial nuclear energy programme has been deemed unfeasible by the author of this study.

This study complements the national case study focused on public attitudes towards small modular reactors (SMRs), published as part of the publicly available ECOSENS Milestone document No. M1.4, titled 'Case Studies of Public Attitudes to Existing and New Nuclear Energy Technologies'. The complementary study also summarised the reasons why SMRs have been excluded from this national case study.

3.3.2 Overview of relevant stakeholders and their positions (desk research results)

This section presents an overview of desk research findings concerning identification of stakeholders who submitted comments and/or proposals within relevant official public sector procedures regarding:

- The role of commercial nuclear energy in Slovakia's energy policy, and/or
- Investment projects in Slovakia's commercial nuclear energy sector relevant for ECOSENS.

The official public sector procedures considered as relevant for this purpose were:

- Environmental Impact Assessment (EIA)
- Strategic Environmental Assessment (SEA)
- Inter-ministerial consultation process which occurs before documents are submitted to the Slovak Government, and which is also accessible to the public, including non governmental organisations (NGOs) and individuals.

This section reviews the comments raised by those stakeholders involved in commenting on the relevant documents for the ECOSENS activities, given this project's focus on the two major societal challenges: climate change, and energy security (in a structure respecting this focus).

3.3.2.1 Stakeholders active in SEA for the main Energy policy document

General information about the SEA procedure(s)

The primary official energy policy document of Slovakia, valid at the time of writing this report, was titled 'Proposal of the Energy Policy of the Slovak Republic,' dated 29 October 2014. It was approved by the Slovak Government on 5 November 2014 in Resolution No. 548/2014.

The content of this document most relevant to ECOSENS activities in Slovakia was already reviewed in the Milestone document No. M1.4. This review is not included here to avoid repetition.

The first complete draft of the document referred above, dated May 2013, was publicly disclosed within the SEA procedure on 24 June 2013. Stakeholders, including individuals and NGOs, could subsequently submit comments and proposals to this initial draft until 4 July 2013. The public hearing was held on 25 October 2023.

Subsequently, in November 2013, stakeholders could submit comments to the updated, final draft of this document within the Inter-ministerial consultation process that is a mandatory part of the process to submit documents to the government.

The Energy Policy document was updated through the "Integrated National Energy and Climate Plan for 2021-2030," which was approved by Government Resolution No. 606/2019 on 11 December 2019. This update underwent both the SEA procedure and the inter-ministerial consultation process. However, as no new comments were raised regarding the role of commercial nuclear energy in the electricity generation mix during the consultations for this update (Ministry of Environment, 2020), the section

below reviews only stakeholders' activities related to the original Energy Policy document, as reported by the Ministry of Economy (2014). In this context, it needs to be noted that the above referred document might soon be updated in order to implement the recommendations prepared and published by the EC (2023).

Organisations active with regard to climate change

This section reviews stakeholders involved in commenting on the Energy policy document referred above that are relevant for the ECOSENS activities as stakeholders active with regard to climate change.

While various offices of Greenpeace [International] often operate as a unified international organisation, its sole Slovak office in Bratislava can also act as a separate civic entity, 'Greenpeace Slovakia' (formally 'občianske združenie Greenpeace Slovensko' in Slovakia). Under this Slovak legal entity, Greenpeace submitted extensive comments on the aforementioned document during both the SEA procedure and the inter-ministerial consultation process. The following points are particularly relevant to nuclear energy:

- Greenpeace advocated for the gradual phase-out of nuclear energy development, citing a trend observed in several EU member states at the time. Greenpeace argued that safe, environmentally acceptable, and sustainable energy could only be achieved if Slovakia phased out the operation of nuclear power plants by the end of 2030 at the latest;
- Greenpeace opposed plans for uranium mining in Slovakia, which they considered a major environmental and health risk exceeding publicly acceptable levels. Furthermore, Greenpeace argued that uranium mining in Slovakia would not guarantee secure nuclear fuel for Slovak nuclear power plants, as the country lacks nuclear fuel production facilities. As a result, foreign companies would profit from the sale of nuclear fuel, while Slovakia would bear the burden of radioactive waste, environmental consequences, and health impacts;
- Greenpeace noted that the document in question entirely omitted any discussion on addressing liability for nuclear damage or the deficit in the National Nuclear Fund.

In addition to Greenpeace Slovakia, Greenpeace Czech Republic also submitted identical comments. Furthermore, several environmental NGOs explicitly expressed their support for these Greenpeace comments within the SEA procedure mentioned above.

Within the above referred SEA procedure, the Centre for Sustainable Alternatives (CEPTA) submitted these comments relevant with regard to nuclear energy:

- it advocated for the decreased use of commercial nuclear technologies due to a need to import nuclear fuels as well as technologies;
- it requested cost-benefit analyses, inclusive of a full account of nuclear back end related costs and externalities, to precede decisions concerning public support to nuclear energy projects
- it disagreed with considering commercial nuclear energy as a carbon-free way to generate electricity.

Note: while the author of this report is affiliated with CEPTA, the above referred comments were prepared and submitted by Mr. Daniel Lešinský, CEPTA statutory representative, without any involvement of the author of this report in their preparation. After Mr. Lešinský passed away in October 2020, CEPTA was no longer involved in activities related to Energy policy.

Other Slovak environmental NGOs, in particular ‘Slatinka’ and ‘Nádej pre Sad Janka Kráľa’ (and potentially also some other NGOs) formally endorsed and supported the comments submitted by

Greenpeace within the SEA procedure referred above, but they have not prepared their own comments and/or proposals.

Several stakeholders from Austria and the Czech Republic submitted comments during the aforementioned SEA procedure. These included various levels of (self-)governance units, such as municipalities, governance bodies of certain nature-protected areas in Czechia, the Czech NGO 'Calla,' and several individuals from Austria. Overall, the comments from these foreign stakeholders were critical of the plans to construct a new nuclear power plant in Slovakia. In general, far fewer stakeholders participated in the SEA procedures referenced above compared to the EIA procedures for the completion of the Mochovce nuclear power plant and/or the proposed new nuclear power plant at Jaslovské Bohunice (as discussed below).

Within SEA procedure, separate consultations with several stakeholders from Austria took place in Bratislava on 23 April 2014. A large part of the summary of the content of these consultations concerned Austrian stakeholders' questions concerning commercial nuclear energy related plans and projects, as well as various proposals with regard to increasing the share of renewables in electricity generation.

Organisations active with regard to energy security

While no standard NGOs (i.e., civic associations representing primarily the public) focused on energy security actively commented on the energy policy document mentioned above, submissions from two organisations during the inter-ministerial consultation process are worth noting:

- The Employers' Unions Association of the Slovak Republic, the main umbrella organisation representing employers' interests, noted that with the commissioning of two new nuclear reactors at the Mochovce NPP and the planned lifetime extension of the V2 NPP in Jaslovské Bohunice, Slovakia was poised to become a major electricity exporter. Consequently, the anticipated surplus in electricity generation would require substantial upgrades to the country's transmission network to facilitate cross-border electricity trade. Interestingly, while advocating for these nuclear developments, the organisation also supported maintaining the operation of the coal power plant in Nováky, citing the need to ensure a secure electricity supply;

- The Association of Industrial Ecology, a non-profit organisation with around 20 members from the business sector and four faculties representing three universities, noted that the high proportion of nuclear power plants in Slovakia's energy mix could limit the electricity grid's regulating capability, particularly during periods of export constraints.

3.3.2.2 Stakeholders involved in the EIA procedure for the new NPP at Jaslovské Bohunice

On its own initiative, in April 2008, the Ministry of Economy submitted to the government a documentation[9] requesting the government to approve the preparation a project for a new nuclear unit at Jaslovské Bohunice on a parcel owned by the Slovak state-owned Nuclear and Decommissioning Company' (referred to in line with its Slovak acronym as 'JAVYS'). Although the official interministerial review (5–17 March 2008) was open to the public in a standard manner, no environmental NGOs or public representatives submitted comments. The government approved the proposed site for the new NPP on 7 May 2008 (Resolution No. 275).

[9] The documentation no. 507/2008-1000, dated 24 April 2008, available at: https://hsr.rokovania.sk/12670/6-/?pg=2 (last accessed 10 February 2025).

Environmental NGOs or other public representatives also did not submit comments on the nearly 200-page document[10] in which the Ministry of Economy further detailed its proposal for this new NPP, and which the government approved on 17 December 2008 (Resolution No. 948). According to this approved document, the NPP's construction was proposed by the joint-stock company 'Jadrová energetická spoločnosť Slovenska', referred to in line with its Slovak acronym as 'JESS'.

JESS was registered on 31 December 2009 as a joint venture between JAVYS (which owns 51% of the shares) and the Czech CEZ Group (which owns remaining 49% of the shares). In this regard, it is worth emphasizing that JAVYS is legally responsible for nuclear waste disposal, including the preparation and implementation of the SNF final disposal.

General information about the EIA procedure

In accordance with the Slovak EIA Act, JESS submitted EIA documentation to the Ministry of Environment on 25 August 2015, in which these technologies were mentioned as a reference:

- AP 1000 (Westinghouse),
- AU-APWR (Mitsubishi),
- MIR 1200 (Nuclear Power Alliance consortium: ŠKODA JS, JSC Atomstroyexport (ASE) and JSC OKB GIDROPRESS),
- EPR (Areva),
- ATMEA1 (Areva and Mitsubishi), and
- APR 1400 (KHNP South Korea);

and reference dates proposed:

- Construction start date: 2021
- Date of commissioning: 2027
- Date of commissioning for permanent operation: 2029
- Date of end of operation: 2089

The sole public hearing within this EIA procedure in Slovakia took place on 23 September 2015 at/from 17:00 (5 pm) in the Veľké Kostoľany village. The procedure concluded in April 2016 with the recommendation to construct generation III+ reactor with a maximal net installed electric power up to 1700 MWe (Enviroportal.sk, 2016).

The Ministry of Economy determined that the documents[11] approved by the government that further specified the proposed NPP's anticipated design and financing, amongst other aspects, were not made available for public comment within the official interministerial review procedure. In other words, the Ministry deliberately chose to disregard a standard protocol typically applied to all documents submitted to the government. Subsequently, the 2021 amendment to the Atomic Act enabled the implementation of the 'envelope approach' in the location permit procedure, allowing for the siting approval without specifying a particular NPP technology—both within this procedure and the EIA procedure. Through this mechanism, JESS obtained a legally valid permit for siting the new NPP in Jaslovské Bohunice on 30 May 2024.

[10] The documentation no. 2210/2008-1000, dated 11 December 2008, available at: https://rokovania.gov.sk/RVL/Material/16374/1 (last accessed 10 February 2025).

[11] The key documents in this regard were approved by the government on 10 April 2013 (Resolution No. 175), 3 July 2013 (Resolution No. 342), 15 May 2024 (Resolution No. 279) and 20 November 2024 (Resolution No. 719).

Organisations active with regard to climate change

This section reviews stakeholders involved in the above-referred EIA procedure that are relevant for the ECOSENS activities as stakeholders active with regard to climate change.

Greenpeace Slovakia formally submitted comments identical to those submitted by Jan Haverkamp, who is affiliated with Greenpeace Central and Eastern Europe. He represented both these Greenpeace offices with the same comments. Greenpeace was the only environmental NGO located (also) in Slovakia mentioned in the final EIA opinion document.

Written comments were submitted by the environmental NGOs Global 2000, PLAGE, and Umweltorganisation VIRUS, all from Austria. One representative of the Hungarian office of Greenpeace, whose name was not noted, took part in the public hearing in Hungary.

Organisations active with regard to energy security

The author of this text has not considered any of the Slovak entities involved in this EIA procedure as an organisation active with regard to energy security.

Other entities

The Slovak Association of Towns and Municipalities (ZMO) branch which represents municipalities in the emergency zone of the Jaslovské Bohunice NPP (ZMO Jaslovské Bohunice), submitted its written opinion on the Environmental Assessment (EA) report for the plant's construction on 28 September 2015. However, in a letter dated 6 October 2015, the Microregion nad Holeškou, comprising the municipalities of Rakovice, Borovce, Trebatice, Ostrov, Krakovany, Šterusy, Kočín-Lančár, Dolný Lopašov, Chtelnica, Nižná, Dubovany, and Veselé, expressed disagreement with ZMO's submission. This position was not shared by the municipality of Veľké Kostoľany, which submitted its own stance, nor by the municipality of Prašník. Apart from these organisations, all the other legal bodies from Slovakia that submitted comment represented businesses, state administration organisations and individual municipalities.

Apart from NGOs, there were a lot of different stakeholders present, especially from Austria, but also from Germany, the Czech Republic, Hungary and Poland. They included states/lands of Austria and Germany, municipalities, Universities, among others, as well as a significant amount of individuals who typically only endorsed comments prepared by someone else, but in some cases even prepared own comments.

3.3.2.3 Slovak Environmental NGOs active in the EIA for the NPP Mochovce finalisation

Although this EIA procedure took place in 2009, it is included in this study to highlight that, in addition to Greenpeace, three other Slovak environmental NGOs also submitted written comments as well as participated in the public hearing. These NGOs are (in alphabetical order): Energia 2000, Energy of the 3rd Millennium, and For Mother Earth. Table 1 below, reproduced from the IPPA project Deliverable 2.4, indicates whether and how these four NGOs were involved also in nuclear back-end EIA/SEA procedures between 2006 and 2011. The text of Chapter 2.3 of IPPA Deliverable 2.4, referenced in the table's legend, is copied in Annex 3 of this study.

Table 1: Participation of NGOs in nuclear sector EIA and SEA procedures (2006 –2011)

Short name	Type of procedure	Year	Greenpeace	Energy of the 3rd millenium	For Mother Earth	Energia 2000	CEPTA

NPP V1 Decommissioning	EIA	2007		√		√	
NPP Mochovce cap. increase	EIA	2007		√√			
Strategy of back-end cycle	SEA	2008	*	√ **	*		√√
Mochovce NPP Units 3&4	EIA	2009	√√	√√	√√	√√	

Legend: √ - commenting in writing, √√ - both written comments and participation at the public hearing, * - barriers of participation (see chapter 2.3 of this Deliverable), ** the only relevant NGO representative could not participate at the public hearing due to health and personal reasons.

Source: Mihók, Mršková (2013, p. 15).

3.3.2.4 Environmental NGOs' recently active with regard to the Slovak nuclear back end

The most recent SEA procedure related to the nuclear back end concerned the strategy document 'National Programme for the Management of Spent Nuclear Fuel and Radioactive Waste in the Slovak Republic', dated February 2024. Besides state administration and regional/municipal self-administration authorities, the only Slovak environmental NGO participate in this SEA procedure was **'Chceme zdravú krajinu'** ('We Want a Healthy Country')[12].

3.3.3 Environmental NGOs' interest in nuclear issues (research results)

This section compiles:

- the desk research findings on Slovak environmental NGO umbrella structures relevant to ECOSENS,
- selected findings from the 2013 questionnaire-based research conducted within the project acronymed IPPA (see: Mršková and Mihók, 2013) that are pertinent to ECOSENS,
- and the results of the ECOSENS survey.

The aim of this compilation is to provide deeper insight into why Greenpeace remained the only environmental NGO active in relation to new nuclear builds in Slovakia; moreover, maybe relying exclusively on its non-Slovak staff for this purpose in the EIA procedure for the new NPP at Jaslovské Bohunice.

3.3.3.1 Slovak environmental NGOs'/activists' umbrella structures (desk research results)

As ECOSENS's desk research revealed that none of the Slovak environmental NGOs were active in the EIA procedure for the new NPP in 2015–16, ECOSENS's primary research in Slovakia had to be adjusted accordingly. Among other adjustments, an update of prior research conducted by Matej Bel University on Slovak environmental NGOs' and activists' umbrella structures was undertaken to better align the primary research with ECOSENS's objectives. Given that the political context surrounding the creation of these umbrella structures is crucial for understanding the financial issues discussed later, this section begins with a brief subsection outlining the essential background needed to comprehend the interplay between political and financial addressed in this national case study.

The context of Slovak environmental NGOs' umbrella structures' emergence

[12] See EURAD Deliverable 9.18, section 4.4. Available at: https://www.ejp-eurad.eu/sites/default/files/2024-05/EURAD%20-%20D9.18%20Implementation%20of%20ROUTES%20action%20plan%20third%20phase.pdf (last accessed 28 November 2024).

In the early years following Slovakia's establishment as a separate state in 1993, NGOs had access to a significant amount of grant funding, particularly from various foundations in the USA. One reason for the substantial size of U.S.-based grant programs for Slovak NGOs was that, unlike the Czech Republic, Poland, and Hungary, Slovakia had elected a nationalist government that opposed EU accession and instead fostered strong political and financial ties with Russia. Environmental NGOs also benefited from these U.S. grants, which were sometimes contingent on expanding their environmental protection activities to include promoting democratic principles, such as transparency and public participation. The flow of U.S. funding began to decline significantly only in the early 2000s, when it became clear that Slovakia would join the European Union alongside the other three countries mentioned above.

Largely thanks to the U.S. funding referred above the NGO sector, frequently referred in Slovakia as 'the Third sector', went through specific development in Slovakia in mid 1990s. In this specific context, the umbrella structure titled 'Third Sector Forum' (acronymed G3S from its Slovak name 'Grémium tretieho sektora') was developed in the second half of the 1990s as "the original Slovak phenomenon" (Huba, 2009, p. 143-144). Quickly, the G3S forum became a partner to many institutions and organisations in public and private sectors. Despite that it gained credit both in Slovakia and abroad, after rather short period, it became disintegrated on the basis of internal disagreements and declining mutual trust between key personalities in the leadership, as well as by changing the overall atmosphere in the Slovak society at that time. The first thematic cluster that left G3S was precisely the informal structure of environmentally focused NGOs that later became informally united under the umbrella structure titled 'Ekofórum'. (Huba and Trubíniová, 1997", In: Huba, 2009).

'Ekofórum'

At the turn of the millennium, operating as an informal structure referred in the previous section, under the name 'Forum of Protectors and Creators of the Environment' (Huba, 2020, p. 10), 'Ekofórum' cooperated with the Ministry of Environment (Huba, 2020, p. 18). It was formally established as a legal entity only in 2006 (Laiferová, 2016).

However, by 2007, 'Ekofórum' had ceased issuing press releases on its website. At least until 2013, it continued to exist as an umbrella organisation for environmental NGOs, convening at least once annually.

In 2021, those 'Ekofórum' members active in climate protection joined the Climate Coalition (discussed in the next section), which became the successor umbrella organisation for this area. At the time of the ECOSENS survey preparation, the sole email address listed on 'Ekofórum's' website, info@ekoforum.sk[13], was non-functional. Despite several informal consultations with members of 'Ekofórum' NGOs, the author of this study was unable to identify a contact person for 'Ekofórum' or determine how to contact this legal entity.

Considering the existence of the 2013 'Ekofórum' questionnaire survey the author decided to cease efforts to involve 'Ekofórum' in ECOSENS activities before launching the survey referred to Slovak results.

The Climate Coalition

The Climate Coalition was established launched in 2021 as a platform of environmental NGOs that aims to promote solutions that are both environmentally and economically sustainable. It is a follow-up

[13] https://ekoforum.sk/o-nas/kontakt (last accessed 20 November 2024).

platform to the 'Green Restart' initiative focused on climate and environmental responsibility within post-CoViD-pandemic economic recovery. It is the only Slovak environmental NGOs umbrella structure referred in this case study whose website contains also English language section at https://klimatickakoalicia.sk/en/home-en/, where readers can find information about this platform's members, vision, aims, activities, etc.

'Slovak [Environment] Protectors' Assembly' (SOS)

The 'Slovak [Environment] Protectors' Assembly' (acronymed SOS in line with the Slovak acronym used by its members), was established gradually during 2015 and 2016 as an informal cluster of individuals based on the results of a large-scale survey conducted in spring 2015 (Huba and Trubíniová, 2019). According to its website, as of 9 May 2023, SOS had 114 members, out of which seven were suspended due to their political careers.

3.3.3.2 ECOSENS survey results (primary research results)

This section summarizes the findings obtained from the survey and whose respondents were introduced in the preceding section.

Climate Coalition

The survey, whose unofficial English translation is in Annex 1, was distributed to 12 contact emails disclosed at this umbrella's website[14]. With 4 responses and 33% response rate, this survey findings cannot be reported as representative.

According to one of the respondents, "*the topic is dealt with [in the NGO that he is a member of] in a very narrow section (due to the capacities and communication demands of the topic) in the context of 'renewables development'".*

Other two respondents indicated that the NGOs they *represented "are only interested in information on the topic [of commercial nuclear energy] (for a general overview), but are not interested in actively following the topi"c.* The last respondent declared a lack of interest in this topic, leaving a comment that "*We do not deal with the topic of energy, [and] we consider it relevant [only] in connection with nuclear power plants as an employer that could support its employees with [an option to cycle to work using] dedicated separate cycling roads from/to the surrounding settlements".*

All the respondents responded anonymously, and did not indicate any interest in ECOSENS activities.

'Slovak [Environment] Protectors' Assembly' (SOS)

The same survey as to 'Climate Coalition' was distributed in the internal email list of SOS (note: this was possible because the author of this case study is also a SOS member). With 10 responses, given the number of SOS members, the response rate was less than 10 % (note: the author of this case study has not been able to obtain information about the number of emails subscribed to the SOS internal email list used to distribute the survey).

Out of 10 survey respondents, only one chose the survey option declaring that he/she was not interested in the topic of commercial nuclear energy. Four respondents chose the survey option declaring that they were "*interested in information on the topic (for a general overview) but not interested in actively following the topic".* Three respondents chose the survey option declaring that "*under circumstances*

[14] https://klimatickakoalicia.sk/en/contacts/ (last accessed 23 January 2023).

different than the present ones, [they] would be interested in an active involvement in this topic, but [they] do not currently have (and probably will not have in 2024) the capacity to undertake any activities related to this topic". Two respondents chose not to select a pre-written option but instead described their interest in their own words. One of them wrote: "*I'm interested in the topic and close to the last of the answers [to this survey question], but I have a doubt as to whether I can be useful - it's my personal interest in the topic, not my ability to address it professionally".* The other one wrote: "*Yes I am extremely interested in climate change, but not in the constantly confusing and misleading claim that CO2 is the main contributor to climate change. It's a 'physics nonesense' that benefits all those who profit from climate change programs".*

Some respondents wrote comments on a voluntary basis, which were mostly positive towards nuclear power use for electricity generation. For example, one left a note that "*I was, on principle, AGAINST nuclear power. Now, unfortunately, with the confluence of the energy crisis, the climate [change] threat and the Russian war in Ukraine, I am not sure about the opposition to small modular reactors".* Another respondent declared interest in issues like such as "*investment intensity, speed of construction, life cycle, share of public budgets, state guarantees, etc."* One commented that "*We have enough electricity for now, and your question requires a broad discussion."*

All the respondents responded anonymously, and did not indicate any interest in ECOSENS activities.

3.3.3.3 The 2013 IPPA questionnaire of 'Ekofórum' (summary of relevant results)

The key finding of the IPPA project questionnaire that, apart from Greenpeace as an invited non-Ekofórum member, two Ekofórum member NGOs were considering raising funds for activities related to the commercial nuclear sector, is discussed. This is because the analysis draws not only on the author's insights from notes left on the paper questionnaires used in this survey but also on various informal consultations conducted between 2011 and 2024.

Respondents expressed mixed views regarding the potential for accessing funding for the aforementioned activities. However, they appeared to agree on the challenges stemming from a fundamental shift from established core funding models to short-term, project-specific financing—a transition significantly influenced by European funding frameworks following Slovakia's accession to the EU, which markedly differed from the earlier support mechanisms provided by US foundations.

Respondents almost unanimously agreed that the a need to repeatedly prepare new project proposals introduces significant operational risks, potentially undermining the long-term strategic continuity and the value of resources invested in previous activities (Appendix L, Graphs 3–4). They also appeared to strongly agree that the primary impediments to NGO activities on nuclear issues arise from two interconnected challenges: (a) finding personnel with sufficient expertise and sustained commitment, and (b) securing long-term funding to sustain such personnel.

3.3.4 Pre-Election Statements of Slovak Political Parties

The author of this case study, Mihók (2020b), reviewed the statements of relevant Slovak political parties prior to the 2020 parliamentary elections (in the Slovak language). This section not only summarises the findings of that review but also briefly updates it with statements from official documents related to the 2023 parliamentary elections and/or the government formed on 25 October 2023. The review below includes only the parties represented in Parliament following the most recent elections, presented in the order of their electoral results.

SMER - SD

After winning the 2023 elections with 22.94% of the votes, the 'Smer - Slovenská sociálna demokracia' party (translated as 'Direction – Slovak Social Democracy'), hereafter referred to by the Slovak acronym 'SMER – SD', formed a coalition government with the Hlas party and the Slovak National Party. Its only two pre-election statements regarding the energy sector advocated for prohibiting further privatisation of energy companies and, "in case of efficiency, supporting the return of the state to the ownership structure in the Slovak energy sector"[15].

Smer's statements prior to the 2020 elections regarding its position on nuclear energy have been rather very vague, mentioning just that actions in the nuclear sector should be based on professionally informed decisions and [public] debate (Mihók, 2020b).

Progresívne Slovensko (PS)

Progresívne Slovensko (translated as 'Progressive Slovakia'), hereafter referred to by the Slovak acronym 'PS', is currently the strongest opposition party's (17,96 % of votes in 2023 elections). Its only statement on nuclear energy addressed overseeing the safe completion of Mochovce 4 and its associated costs, while also mentioning support for the application of market principles to any future nuclear projects[16].

Prior to the 2020 election, the party, then in a coalition with 'Spolu' (Together), declared a commitment to energy efficiency and innovation. However, instead of at least outlining its framework intentions in the nuclear sector in this regard, the party solely promoted a narrative of technological optimism, suggesting that *"Slovakia and humanity would presumably possess transformative technological solutions enabling significantly reduced energy consumption through novel energy production methodologies"* (Mihók, 2020b). Furthermore, on the critical issue of delay in Slovakia's SNF final solution, this party only made a reference to "innovative solutions" through potential international collaboration (Ibid.).

Hlas

The second strongest party in the government (14,80 % of votes in 2023 elections), Hlas (in Englis 'Voice') made a clear pre-election statement that it *would "develop nuclear projects, including small modular reactors (SMRs), in cooperation with experienced energy companies or other partners who are already active in this area"*[17]. It further advocated that the state's priority should be *"the completion of the fourth unit of the Mochovce NPP and the preparation of the construction of a new NPP (up to 1200 MW) by JESS, p.l.c. at the Jaslovské Bohunice site"*[18]. This political party was established only after the 2020 parliamentary elections.

Hnutie Slovensko

The leading party of the 2020–2023 government, now in opposition (having secured 8.89% of the votes in the 2023 elections), is officially translated as [Political] 'Movement Slovakia' but is better known by its former official name, 'Obyčajní ľudia a nezávislé osobnosti' (translated as 'Ordinary People and Independent Personalities'), acronymised in Slovak as 'OĽaNO'. It is also referred to by its subsequent

[15] https://www.strana-smer.sk/aktuality/blogy/post/volby-2023 (last accessed 21 November 2024).

[16] https://progresivne.sk/programy/energetika/ (last accessed 21 November 2024).
[17] https://strana-hlas.sk/wp-content/uploads/2023/09/Rezortny-program-HLAS.pdf (p. 52, last accessed 21 November 2024).
[18] Ibid.

name, 'OĽaNO a priatelia' (translated as 'OĽaNO and Friends'). During its 2023 election campaign, the party advocated for an energy mix that would include nuclear power, oil, gas, and renewable energy sources such as solar, hydro, wind, geothermal, and biomass. It also declared that after completing NPP projects, it would focus its efforts on electricity production through water electrolysis, i.e., hydrogen utilisation[19].

In the 2023 elections manifesto, this party also stated that during the 2020-2023 parliamentary term, i.e. when it led the government, it successfully fostered in Parliament an amendment of the Atomic Energy Act in order to create the preconditions for the construction of the new NPP in Jaslovské Bohunice[20].

Prior to the 2012, this party declared that it did not support further development of commercial nuclear energy in Slovakia. But it changed its position, declaring in 2019 that due to their new knowledge, they recognized the necessity of the further use of nuclear energy, and therefore also the construction of NPPs, with the condition a significant increase in their present (already considerable) safety, especially against threats related to sophisticated terrorist attacks (Mihók, 2020b).

KDH

This party, also referred to as the 'Christian Democrats,' returned to Parliament in 2023 with 6.82% of the votes. In its 2023 pre-election manifesto, it stated that *"Slovakia has the potential to become one of the centres of nuclear energy development, benefiting from the experience gained so far"*[21]. In this context, the party advocated for self-sufficiency in electricity production, based on a mix of nuclear power and variable, weather-dependent renewable energy sources. It expressed support for the construction of a new NPP, which should in their opinion be operational in Jaslovské Bohunice by the time the existing reactors at the site reach the end of their operational lifespan[22]. This party's manifesto also advocated that with regard to the compulsory stocks of operators of nuclear energy sources and/or state material reserves, there should be approved a requirement to maintain a stockpile of nuclear fuel for a minimum period of three years[23].

Interestingly, the previous pre-election manifesto of this traditionally 'pro-nuclear party' did not mention nuclear energy at all (Mihók, 2020b).

SAS

The weakest opposition party following the 2023 elections (6.32% of the votes), 'Sloboda a solidarita' (translated as 'Freedom and Solidarity'), hereafter referred to by the Slovak acronym 'SAS', declared prior to the elections that, should it be in government (note: this party nominated the Minister of Economy after the previous 2020 elections), it would utilise the powers stemming from its 51% stake in the JESS company to continue supporting the preparation of the new NPP project at the Jaslovské Bohunice site. The party declared that this support should not require direct financial participation from the state. In this context, the manifesto also included a footnote stating that, for this new NPP project, the party would seek an experienced investor who has already demonstrated the ability to build an NPP within the promised time and budget[24].

[19] https://www.obycajniludia.sk/volebny-program-2023/ (p. 206, last accessed 21 November 2024).
[20] Ibid., p. 204.
[21] https://kdh.sk/volebny-program-kdh/ (p. 12, last accessed 21 November 2024).
[22] Ibid., p. 27.
[23] Ibid., p. 28.
[24] https://drive.google.com/file/d/1LtK9nyf9Rl1KKWEbGn3ro3I0zAqbavwk/view?pli=1 (p. 33, last accessed 21 November 2024).

Prior to the 2020 election, the party had somewhat conflicting statements with regard to a need to foster the above-referred new NPP construction (Mihók, 2020b). However, this party never expressed a clearly anti-nuclear position, but in contrast it would focus its narratives against direct financial participation from the state (note: this might be one of the crucial priorities of this party in the economy sector in general). Interestingly, prior to the 2020 election, the party might have implicitly suggested that a suitable location for SNF final repository should be selected solely by geologists (Ibid.).

Slovenská národná strana

The Slovak National Party, the smallest party in the government coalition (with 5.62% of the votes), advocated for a pragmatic approach that challenges existing ideological constraints, specifically proposing the reinstatement of Russian energy imports and nuclear fuel. The party also supported strategic state control over critical infrastructure and the diversification of energy partnerships, with a particular focus on strengthening regional cooperation within the Visegrád Group to enhance energy self-sufficiency[25].

Traditionally, the party's pre-election manifestos have been extremely brief, sometimes just three pages long for all policy areas[26], and have supported both nuclear and renewable electricity prior to the 2020 elections (Mihók, 2020b), in which the party failed to secure a seat in Parliament.

3.3.5 Interdisciplinary collaborations

One of the subtasks of the ECOSENS project, which had to be addressed in this national case study, concerned interdisciplinary collaborations related to the development of the Slovak commercial nuclear sector. However, this task was not pursued. The primary reason stemmed from the outcomes of a nearly identical task undertaken within the PLATENSO project.

The PLATENSO project aimed to propose a legal framework for establishing a European Entity on socio-economic matters related to nuclear technology and to develop research strategy recommendations for PLATENSO countries. The key finding of this project in Slovakia was that, apart from Matej Bel University in Banská Bystrica (UMB)—the author's affiliated institution—no other institution or person expressed interest in this Entity.

In order to implement the outcomes of the PLATENSO project as well as several other projects funded by EURATOM[27], the legal entity [under the Belgian Law] titled 'SHARE - European Platform for Social Sciences and Humanities research relating to Ionising Radiation', acronymed SHARE, was established in 2019[28]. The only SHARE's member from Slovakia is UMB, represented by this case study's author.

During the ECOSENS project implementation, the author of this text did not identify any relevant entity and/or a person from Slovakia who could have been contacted with regard to interdisciplinary collaborations related to the Slovak commercial nuclear sector development.

[25] https://www.sns.sk/wp-content/uploads/2023/09/VP_Web.pdf (last accessed 21 November 2024).
[26] See for ex.: Ibid.
[27] Note: These were the projects acronymed INSOTEC, MoDeRn, MODERN2020, ENGAGE, TERRITORIES, CONFIDENCE, SHAMISEN and SHAMISEN-SINGS; see: https://www.ssh-share.eu/wp-content/uploads/2020/10/Revision-SSH-SRA-After-consultationAugust2020-October-2020-FINAL.pdf (last accessed 26 November 2024).
[28] https://www.ssh-share.eu/wp-content/uploads/2019/11/SHARE-Statutes.pdf (last accessed 26 November 2024).

3.3.6 Slovak environmental NGOs declined interest in nuclear issues (Discussion)

This section examines changes in Slovak environmental NGOs' participation in nuclear sector procedures. The key fact to emphasize in this regard is that, in 2009, three Slovak environmental NGOs cooperated with Slovakia's Greenpeace office during the time of the EIA for the Mochovce NPP finalisation, but the EIA procedure for the new NPP in Jaslovské Bohunice saw different patterns of Slovak environmental NGOs engagement.

As of 2024, the NGO 'Chceme zdravú krajinu' ('We Want a Healthy Country') was the only Slovak environmental NGO that was actively involved in nuclear sector related issues, with its activities limited to nuclear waste related issues. The organisation's director, Michal Daniška, describes this NGO's position as "neither anti-nuclear nor pro-nuclear" (Meaker, 2022). The mission of this NGO focuses on reducing environmental and health impacts from various industrial activities, both nuclear and non-nuclear. The NGO operates primarily in the region surrounding the Jaslovské Bohunice NPP. In the nuclear sector, this NGO carried out a significant amount of activities that addressed environmental and health considerations related to radioactive waste management in this area.[29]

Building upon the research findings mentioned above and the objectives of ECOSENS, while respecting the environmental NGOs' right to maintain confidentiality regarding their internal matters, this section seeks to explore the probable reasons behind the significant decline in Slovak environmental NGOs' interest in nuclear issues during the 2010s and early 2020s.

3.3.6.1 Environmental NGOs' financial and expert capacities' related challenges

As noted findings from the IPPA project questionnaire (Appendix K) indicated that, aside from the Slovak office of Greenpeace, two members of the main Slovak environmental NGO umbrella organisation, 'Ekofórum,' were considering raising funds for activities related to the Slovak commercial nuclear sector.

In May 2013, i.e. when the IPPA questionnaires referred above were filled, the statutory representative of the 'Za Matku Zem', who was also this NGO's only campaigner on energy issues, Pavol Široký, worked professionally for the Slovak office of Greenpeace as its Energy campaign coordinator[30]. According to his CV at LinkedIn[31], he left Greenpeace in 2015, and started to work as Senior Environmental Analyst at the public sector institution 'Inštitút environmentálnej politiky – IEP' which is an analytical unit of the Ministry of the Environment of the Slovak Republic[32]. While the 'Za Matku Zem' NGO was active on Facebook until the finalisation of this case study[33], the author of this report has not observed any activity by this NGO concerning the Slovak commercial nuclear sector since approximately mid-2010s.

The 'VIA IURIS' was legally established as an NGO in 2006. Before that, it existed as the program titled 'Law for public interest' within the NGO 'Centre for Environmental Public Advocacy – CEPA'. This NGO is dominantly composed of lawyers who "provide legal assistance in the area of public interest law"[34]. Its website lists legal assistance to Greenpeace Slovakia's Mochovce NPP related

[29] See national case study in EURAD Deliverable 9.16, section 4.2. Available at: https://igdtp.eu/wp-content/uploads/2022/06/EURAD-D9.16-Implementation-of-the-ROUTES-ICS-action-plan-first-phase.pdf (last accessed 28 November 2024).
[30] See: https://www.greenpeace.org/slovakia/tlacova-sprava/659/pocitacova-hra-alebo-smutna-realita-nenechajme-sa-zozrat-uholnym-pacmanom/ (last accessed 27 November 2024).
[31] https://www.linkedin.com/in/pavol-siroky/details/organizations/ (last accessed 27 November 2024).
[32] https://iep.sk/Domov#onas (last accessed 27 November 2024).
[33] See: https://www.facebook.com/zamatkuzem/?locale=sk_SK (last accessed 27 November 2024).
[34] https://viaiuris.sk/en/about-us/history/ (last accessed 27 November 2024).

campaign[35] among the most important cases in which this NGO's lawyers assisted. However, the evidence available to the author of this text suggests that this campaign, briefly discussed in a separate work (Mihók, 2020), marked VIA IURIS's final involvement in issues related to the Slovak nuclear energy programme.

As briefly mentioned, respondents to the IPPA project questionnaire highlighted the challenges of transitioning from traditional long- or mid-term core funding models of U.S.-based foundations to short-term, project-specific financing, particularly under the European funding frameworks introduced following Slovakia's EU accession. They unanimously identified two major obstacles for NGOs working on nuclear issues: the difficulty of recruiting and retaining personnel with the specialised expertise essential for work on nuclear energy related issues, and the critical challenge of securing long-term funding, which is vital not only for covering salaries for such experts, but also for meeting other costs related to nuclear sector related campaigns, thereby ensuring the strategic continuity of any NGO's efforts in this field.

While the author of this case study gained many additional insights into these challenges through informal consultations, these pertain to the internal operations of environmental NGOs and are therefore not discussed in this document. Similarly, information regarding internal matters of Greenpeace's Slovak office that relate to a substantial reduction of their activities concerning Slovakia's commercial nuclear energy program are not discussed in this document.

3.3.6.2 Intentionally and significantly limited transparency of nuclear sector information

In the Introduction of the Slovak case study, it was noted that Slovak politicians' implementation of measures to significantly limit the transparency of Slovakia's commercial nuclear sector information occurred in the context of an EU infringement procedure against Slovakia concerning EIA related laws. Due to the complex and intricate nature of numerous legal amendments in this specific context—often introduced through indirect modifications (such as amending Freedom of Information Act provisions via changes to the EIA Act)—a comprehensive and detailed tracking of all relevant legal modifications has not been feasible within the ECOSENS project's capacity.

For the purposes of this project, understanding the broader historical and political context is more important than providing an exhaustive account of all legislative amendments to the Freedom of Information Act, Atomic Act, EIA regulations, and other relevant Slovak legislation. Consequently, this subsection summarizes the context and key content of the selected legal amendments that are the most relevant to the ECOSENS project, substantiating the discussion with evidence from peer-reviewed academic literature whenever possible.

Since Slovakia joined the EU in mid-2004, the below presented historical analysis of non-compliance with EU and international legal norms—prepared for ECOSENS-related purposes—logically begins at this point, when Slovakia's initial compliance with the EU acquis was verified prior to accession.

The disregard for the EU Acquis concerning EIA/SEA procedures began during Robert Fico's first government (2006–2010). In 2007, the Slovak Parliament approved several controversial amendments to various laws, prepared by the government with the clear intention of restricting NGOs' participation in these procedures. Among other effects, these amendments *"'de facto enabled authorities with a legal right to ignore comments and proposals submitted by NGOs within EIA procedures"* (Mihók, 2011,

[35] Ibid.

p. 231). NGOs responded to these amendments by submitting an appeal to the EC in February 2008, prompting the EU to consider infringement proceedings against Slovakia.

In the specific context outlined above, the implementation of the Slovak transparency and EIA procedure-related laws with regard to the commercial nuclear sector was, for the first time, researched within the ARGONA project's focus group discussion conducted in Bratislava on 3 September 2008. The findings revealed that, for example, representatives from the Slovak office of Greenpeace and 'For the Mother Earth – Bratislava' NGO reported their inability to obtain documentation regarding Slovak SNF final disposal plans. They claimed that such documents—including restricted public-use versions—existed, but had not been disclosed to them with reasonings that they were de jure owned by Slovenske elektrárne, a joint-stock company (Drottz Sjöberg et al., 2009, p. 39). Subsequent research revealed that even the Slovak Nuclear Regulatory Authority refused to disclose non-classified information such as *"comparisons of sizes of accident zones planned for the NPPs in Slovakia and in selected countries"* (Mihók, 2011, p. 230).

In September 2008, i.e. shortly after the ARGONA focus group mentioned above, the EC confirmed the validity of the above-referred claims made by Slovak environmental NGOs in February 2008, and initiated infringement proceedings against Slovakia. The EC explicitly requested that Slovak EIA legislation be amended significantly to ensure compliance with the EU acquis. Despite the threat that within the EU infringement procedure, the EC could refer the Slovak authorities to the European Court of Justice, the Slovak politicians ignored the proven non-compliance for long. *"Only when the EC informed the Slovak authorities that it could disapprove co-financing of large infrastructure projects from the Structural Funds and the Cohesion Funds, worth almost € 8 billion"* (Mihók, 2020, p. 4) should these projects be permitted under the non-compliant laws referred above in this paragraph, did the Slovak Government ask the Ministry of Environment to prepare correcting amendments.

In this specific context, as outlined above, in March 2010, the Slovak Parliament finally amended the EIA Act in line with EC requirements. However, the very same amendment it included *"a very controversial indirect amendment to the FOIA that significantly limited transparency, specifically and solely for commercial nuclear sector information"* (Ibid.). This amendment, considered as *"the most serious change in Slovak transparency legislation"* (Mihók, 2010, p. 229-30), reclassified most previously non-classified nuclear sector EIA process information as confidential. Furthermore, *"it enabled the Nuclear Regulatory Authority to announce new nuclear investment project reviews solely via a notice board at its Bratislava headquarters"* (Ibid.). Most probably, the changes made to limit transparency in 2010 concerned solely the nuclear sector, leaving other industrial sectors unaffected.

Furthermore, during Robert Fico's second (2012–2016) and third (2016–2018) governments, additional measures emerged that further influenced limits in the transparency of information related to the commercial nuclear sector. Among other things, the new amendments sought to misuse the general principles of bank, postal and telecommunication confidentiality in order to further limit public access to nuclear sector information. The complexity of these measures is implicitly evident in the 'Overview of [Slovak] Activists' Submissions Addressing the Lack of Public Access to Nuclear Sector Information in Slovakia', prepared by the author of this text for Nuclear Transparency Watch (2020).

Due to this specific legal context, environmental NGOs, academics, and other parties interested in information related to Slovakia's commercial nuclear sector are typically required to submit formal requests under the FOIA to obtain a non-classified information concerning Slovakia's nuclear sector.

This appears necessary even to access non-classified information crucial for the environmental and public health advocacy objectives outlined in the Aarhus Convention[36].

Consultations conducted by the author of this text with representatives of Slovak environmental NGOs within the ARGONA, IPPA, PLATENSO, and ECOSENS projects revealed frequent discussions about the unexpected necessity for Slovak environmental NGOs to allocate substantial, previously unplanned temporal and professional resources solely to obtain non-classified information covered by the Aarhus Convention. This has often been due to the need to lodge administrative appeals to secure proper responses to FOIA requests—a procedural requirement under the Slovak FOIA framework when public authorities, state-owned companies, or state-affiliated entities refuse to disclose non-classified information. The intricate and frequently amended legal provisions concerning nuclear sector information often appeared to require environmental NGOs to pursue judicial review in order to challenge the legal tactics employed not to release requested information.

Given the findings discussed above, Slovak NGOs appear to be compelled to invest significantly more time and resources in obtaining non-classified nuclear sector information than their counterparts in countries that fully comply with the Aarhus Convention[37]. While no scientifically validated evidence conclusively proves that Slovak politicians' long-term manoeuvres to eliminate transparency in the commercial nuclear sector have directly caused a decline in environmental NGOs' activities in this domain, these political manoeuvres have undeniably created substantial barriers to meaningful NGO and civic engagement in assessment, decision-making, and/or permit procedures related to Slovakia's commercial nuclear sector.

3.3.6.3 Political factors

Since 2006, with two exceptions that both ended prematurely, Slovakia has predominantly been governed by four different administrations led by the 'SMER – SD' party. These administrations are often collectively referred to by the name of their Prime Minister as '[Robert] Fico's four governments.

'SMER – SD', despite its obviously non-critical support for Slovakia's commercial nuclear programme, appears intent on eliminating transparency surrounding this commercial industry not only within the public sector, but also with regard to this party's pre-election statements. Its representatives have repeatedly evaded questions especially regarding SNF final disposal plans. This persistent reluctance to address key questions related to Slovakia's nuclear sector—sometimes even evidenced by perfunctory website referrals or cursory email communications filled with vague generalities (see Mihók, 2020b)—strongly suggests a deliberate strategy to avoid public discussion on environmental and health considerations related to Slovakia's commercial nuclear programme at all costs.

Perhaps similar to 'SMER – SD', the strongest opposition party, 'PS', also appeared to systematically avoid providing honest and transparent responses to questions regarding its pre-election positions and plans concerning Slovakia's commercial nuclear sector. During the 2020 pre-election campaign, while advocating for automotive electrification, the party appeared unable to provide answers regarding its plans to address the inevitable increase in electrical energy demand resulting from a large-scale transition to electric vehicles. Rather than presenting relevant expertise or a concrete policy framework, the party articulated a nebulous and speculative discourse, postulating that indeterminate technological

[36] See: EURAD Deliverable 9.17, section 4.1.7. Available at: https://www.ejp-eurad.eu/sites/default/files/2023-10/EURAD%20-%20D9.17%20Implementation%20of%20ROUTES%20ICS%20action%20plan%20second%20phase.pdf (last accessed 28 November 2024).

[37] See: Ibid, p. 22 and 33.

innovations spanning the subsequent two to three decades would autonomously ameliorate energy challenges through inherent technological progression and self-induced energy consumption reduction. Moreover, the party obscured its stance on Slovakia's delays in addressing the final disposal of SNF (Ibid.). The Energy Policy section of the party's 2023 election manifesto has been drafted by party members possessing backgrounds in genetics and political science, i.e. disciplines utterly incongruous with the specialized knowledge required to develop credible energy sector policies addressing contemporary climate change challenges.

A political discourse prioritising theoretical constructs over empirically substantiated solutions can be exemplified, for instance, by the pre-election statement from the party 'SAS' that it would mandate the new NPP project in Jaslovské Bohunice be managed by an investor with a proven track record of successfully completing similar NPP projects within prescribed temporal and financial parameters[38]. In this regard, the critical analytical inquiry emerges regarding the specific investor contemplated by the political actors, given that contemporary empirical observations of nuclear infrastructure development in democratic jurisdictions have consistently evidenced substantial delays and/or significant budgetary escalations substantially divergent from original projective estimations.

In the context of the empiric facts discussed above, it is perhaps reasonable to question that Slovak politicians, together with their Czech counterparts, retained their position as ENEF's sole hosts. This is especially relevant as the EC not only 'endorsed' this controversial event, but, moreover, assumed a co-organisational role. Instead of watchdogging this nuclear industry-dominated event most probably co funded from Czech, Slovak as well as European public funds, even the large international organisations such as Greenpeace and Friends of the Earth repeatedly refused to participate at ENEF. In this regard, it is important to emphasize that both these NGOs explained their refusal by stating that ENEF *"acts a lot like a nuclear lobby group"*[39].

3.3.7 Concluding remarks

This national case study draws not only on ECOSENS's own research, but also largely on the author's three peer-reviewed studies (Mihók, 2020a, 2018, 2011) and relevant findings from EURATOM-funded projects acronymed ARGONA, IPPA, and PLATENSO. Rather than solely focusing on an overview of stakeholder engagement in Slovakia's nuclear programme, as the title might suggest, this case study presents a comprehensive set of research findings. Inevitably, a significant part of this study concerns public authorities' long-term attempts to eliminate transparency and public participation, particularly in the public sector procedures relevant to Slovakia's commercial nuclear programme. Together, the findings presented in this case study provide complementary insights into why no Slovak environmental NGOs participated in the most recent EIA procedure for the new NPP in Slovakia.

Since 2006, Slovakia has largely been governed by four administrations led by Mr. Fico, the leader of the SMER–SD party. The research findings summarised in this study suggest that this political party, in particular, can be characterised by its long-term actions to limit the rights of environmental NGOs under the Aarhus Convention and the related EU Acquis Communautaire. Moreover, it is not only this ruling political party but also several Slovak opposition parties, including the strongest, acronymed PS, that have demonstrated a lack of substantive engagement or expertise in addressing key energy sector issues,

[38] https://drive.google.com/file/d/1LtK9nyf9Rl1KKWEbGn3ro3I0zAqbavwk/view?pli=1 (footnote 33 on p. 33, last accessed 21 November 2024).
[39] https://friendsoftheearth.eu/press-release/ngos-walk-out-of-industry-dominated-nuclear-talking-shop/ (last accessed 28 November 2024).

often relying on vague promises and empty political phrases. Furthermore, it appears that all Slovak political parties have tended to ignore the accumulation of delays in addressing the final disposal of SNF.

Overall, there appears to be a near-complete absence of critical positions regarding the public accountability of Slovakia's global co-leadership in terms of nuclear power's share of national electricity production. Moreover, this absence is evident not only among all relevant Slovak political parties (Mihók, 2020b) but also among Slovak environmental NGOs. The only exception in this regard is the 'Chceme zdravú krajinu' ('We Want a Healthy Country') NGO's activities concerning the repeated political acceptance of importing dangerous foreign radioactive waste to Slovakia, particularly when it is imported in order to be incinerated[40].

The risks associated with the potential avoidance of accountability by Slovak politicians, alongside the limited watchdog function implementation of environmental NGOs with respect to Slovakia's commercial nuclear sector—as implicitly illustrated in this document—raise serious concerns about the quality of democratic processes in Slovakia, particularly in relation to nuclear energy policy and implicitly also nuclear safety. Perhaps the first logical question for further research in this context concerns the long-term failure to ensure transparency in relation to Slovak commercial nuclear sector information (see also: Nuclear Transparency Watch, 2020). This is because practical consequences of Slovak political manoeuvres aimed at eliminating transparency, as discussed above, have created a hostile regulatory environment that significantly impedes the participation of environmental NGOs in assessment, decision-making, and permit procedures related to Slovakia's commercial nuclear sector. Consequently, these barriers may have undermined the fundamental principles of democratic oversight within Slovakia's commercial nuclear energy sector.

3.3.8 References

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[40] Note: Due to the amendment to the 'Critical Infrastructure Act' approved on 27 November 2024, radioactive waste from abroad will once again be allowed to be imported into Slovakia, as members of the Slovak Parliament have lifted the ban on the import of such waste, which was introduced in 2021. Further information in English can be found at: https://enrsi.rtvs.sk/articles/news/384800/nrsr-slovakia-will-again-be-able-to-import-radioactive-waste-from-abroad (last accessed 28 November 2024)."

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3.4 Spain: Stakeholder engagement in Spanish nuclear phase-out and decommissioning

First, this section presents the results of the documentary analysis contextualizing the organizational structure of nuclear energy in Spain and the current debate regarding the nuclear phase-out and decommissioning decision. Subsequently, interviews addressing then topic of stakeholder engagement in this decision-making process in Spain are analyzed, considering the possible impacts and the recommended forms of participation to better involve stakeholders in low-carbon energy transitions. Finally, it also shows the media approach and a brief review of parliamentary questions on the subject.

3.4.1 Documentary analysis

3.4.1.1 Organizational structure of nuclear energy in Spain

The development of nuclear energy in Spain began in 1947, initiated by the Spanish National Research Council (CSIC). In 1948, the Nuclear Energy Board (JEN) was created as the main organization responsible for overseeing nuclear activities. These efforts were further formalized in 1964 with the promulgation of Law No. 25 on Nuclear Energy, which laid the foundation and structure for the country's nuclear energy program.

As nuclear activities expanded, additional organizations were created, including ENUSA[41], the Nuclear Safety Council (CSN[42]), and ENRESA[43]. In 1986, JEN was replaced by the Center for Energy, Environmental and Technological Research (CIEMAT). The ongoing activities of these entities continue to play an important role in Spain's nuclear energy program (IAEA, 2018)[44]. Figure 24 shows the structure of nuclear energy in Spain.

At present, Spain has seven power reactors in operation in five sites: Almaraz I and II, Ascó I and II, Cofrentes, Trillo and Vandellós II. Three other power reactors have already been shut down: José Cabrera, Vandellós I and Santa María de Garoña (IAEA, 2018).

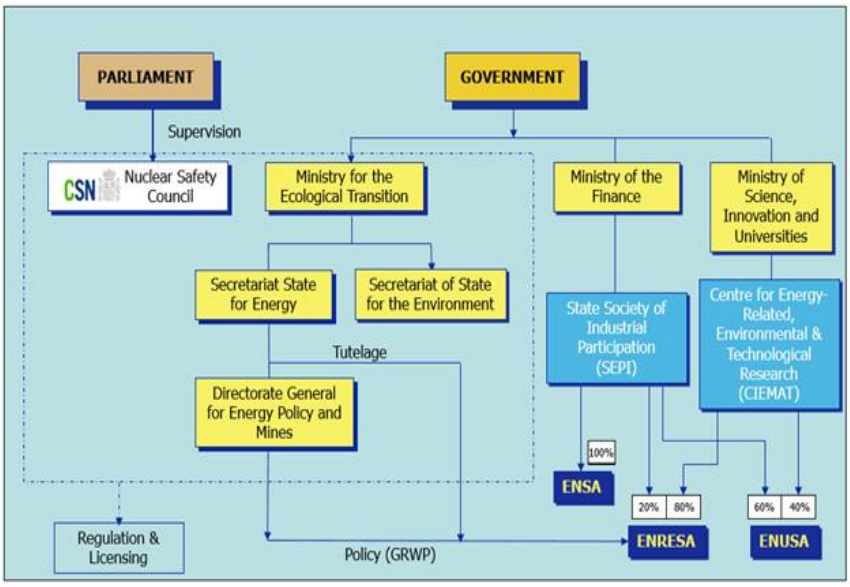


FIG. 24. Organizational structure of nuclear power in Spain, taken from IAEA (2018)

3.4.1.2 A general overview of the development and current nuclear energy context in Spain

The current position of the Spanish Government is the closure of nuclear power plants in the period 2025-2035, as contained in the draft of the National Integrated Energy and Climate Plan (PNIEC in Spanish) submitted to the EU in February 2019. The PNIEC defines the objectives for reducing greenhouse gas emissions and the energy system measures in the face of climate change. It highlights the design of an energy mix with a greater presence of renewable energies. Regarding the gradual and orderly closure of Spanish nuclear power plants, this document argues the companies that own the nuclear park and the National Radioactive Waste Company (Enresa) have unanimously agreed on an orderly and staggered schedule for closing the seven nuclear reactors that remain active, an agreement that has received the government's approval. It is also stated that this plan is fully compatible with

[41] ENUSA is a state owned company to manage all nuclear fuel cycle front end activities

[42] CSN is the sole organization competent in nuclear safety and radiological protection matters in Spain

[43] ENRESA is in charge of the management of radioactive waste, including spent fuel, as well as the dismantling and decommissioning of nuclear installations. Its tutelage corresponds to MITECO through the Secretariat of State for Energy.

[44] https://www-pub.iaea.org/MTCD/Publications/PDF/CNPP-2021/countryprofiles/Spain/Spain.htm

achieving a 20% reduction in emissions by 2030 compared to 1990 and ensuring the security of Spain's electricity supply.

The PNIEC plans to reduce the installed capacity of nuclear power from the current 7.39 GW to just 3 GW by 2030, with the ultimate goal of completely phasing out this energy source by 2035 (Bello, 2020). This reduction in nuclear power will be offset by an increase in renewable technologies, particularly wind and solar energy. The closure of nuclear power plants (NPPs), as agreed upon by the government and electricity companies, will be conducted in an orderly, staggered, and flexible manner. Four of the seven existing reactors are scheduled to close between 2021 and 2030, while the remaining three will be shut down between 2030 and 2035 (Morcillo, 2022).

Priority lines of research and technologies are long-term safe operation, management of irradiated fuel and waste, and participation and acquisition of know-how. It will be carried out in collaboration with other EU nuclear countries with experience of closing their nuclear parks (PNIEC, 2019).

According to Cámara, Martínez, and Rodríguez (2018), in line with the Paris Agreement on Climate, the closure of nuclear plants and the transition towards a model with a greater participation of renewable energies could represent a significant incentive for the Spanish economy with a significant volume of investments, which would contribute to the creation of both high and low-skilled jobs. However, contrary to this forecast, Membrado-Tena & Hermosilla-Pla (2019) studied the territorial reality of the Valencian region of the Ayora-Cofrentes Valley, whose economy largely depends on a nuclear power plant that has generated employment and income for the community for almost 40 years. Progressive political groups have called for its definitive closure in 2021, while Iberdrola (one of the main electricity companies in Spain, which owns some of the nuclear power plants still in operation) and conservative political parties want to extend its life by another 10 years. The closure of the NPP will represent numerous job losses and will impact the economic and demographic viability of this area.

In the four years since the PNIEC was defined, significant changes have occurred in the energy transition field. These changes concern, on the one hand, the acceleration of decarbonisation targets and the set of required factors (penetration of renewables, efficiency, amog others) across the European Union. On the other hand, the outbreak of COVID-19, followed by the war in Ukraine and its consequences, has significantly changed the economic and geopolitical context of the energy transition (Rodríguez, 2023).

In this scenario, countries are seeking formulas that ensure a constant electricity supply with more stable competitive prices - less susceptible to volatility - and compatible with low carbon emissions (Morcillo, 2022). While the European Commission believes that nuclear energy guarantees the principle of no major damage during the transition to climate neutrality, countries such as Spain, Austria, Denmark and Luxembourg are against.

A recent bibliometric review of global nuclear energy strategies reveals a renewed interest in nuclear energy as a key part of the energy transition and the fight against climate change. The findings highlight an emerging leadership of China and other Asian countries in scientific output, although the United States and European countries maintain a greater research impact. There is an evolution from a purely technical focus towards a greater focus on security, energy policy, climate change and sustainability, reflecting a more holistic understanding of the role of nuclear energy (Fernández-Arias, et al 2024).

In this regard, the NGO WWF (2022) resists greenwashing in the European taxonomy. It argues that the European Parliament gave the green light for the taxonomy to consider gas and nuclear power as ‘green’ despite the high emissions from natural gas and radioactive waste produced by nuclear power.

The NGO WWF (2022) strongly opposed what it described as greenwashing in the EU taxonomy. It criticized the European Parliament's decision to label natural gas and nuclear energy as "green" investments, despite the significant greenhouse gas emissions associated with natural gas and the hazardous radioactive waste generated by nuclear power. WWF argued that this classification undermines the EU's climate commitments by diverting financial resources away from truly sustainable energy sources such as wind and solar. In response, WWF, along with other environmental organizations, launched legal action against the European Commission, asserting that the inclusion of gas and nuclear in the taxonomy violates the EU Taxonomy Regulation, the European Climate Law, and the Paris Agreement. Environmental groups such as Ecologistas en acción argue that NPPs are an obstacle to the development of renewable energy and the fight against climate change. They pose a high risk during operation and leave a legacy of radioactive waste, the cost of which is not borne by the utilities. They believe that although it is not a great time for nuclear power, the industry's incessant propaganda and the public's ignorance are struggling to play a role (Rois, 2022).

Greenpeace (2024) also argues that nuclear energy is not neutral concerning greenhouse gas emissions and is not profitable if it is operated safely and taking into account its entire life cycle, from design to decommissioning and waste management. Therefore, the closure and dismantling of the nuclear fleet in Spain is necessary and cannot be postponed to make way for a 100% renewable system. The electricity companies (Endesa, Iberdrola, Naturgy and EDP) and the energy oligopoly must stop having privileged access to the government, which gives it illegitimate power over the public and other interest groups with fewer resources. "*We cannot afford to go backwards".*

The latest update of the PNIEC-24 by the Spanish government maintains the same scenario as the PNIEC-2020: progressive closure of four nuclear groups by 2030, maintenance of the current generation capacity in combined cycles, and closure of the current residual capacity in coal generation. In contrast, the target for installed wind generation capacity is increased for 2030 from 50.3 GW to 62.0 GW, which is just over double the current installed capacity. This implies that in the next seven years, an average of 4.4 GW per year in wind generation capacity must be installed in Spain, which is in turn double the maximum annual installation in the last decade (2.25 GW). The photovoltaic capacity is expanded very considerably, increasing from 39.2 GW to 76.4 GW which is the most significant change in the installed capacity mix introduced in the PNIEC-2024.(Rodríguez, 2023)

Recently, the Ministry for Ecological Transition and the Demographic Challenge (Miteco) confirmed they will maintain the schedule for closing Spanish nuclear power plants, despite the proposal from the conservative political party PP with the support of two right-wing and far-right political parties (PNV and VOX) and with the abstention of two political parties from Catalonia, both left-wing (ERC) and right-wing(Junts) in Congress, that urged the Government to extend the lifespan of the plants[45] . This initiative arises in the context of the controversy over the Almaraz (the next to be closed), proposing to reconsider a tax reduction for the companies owning the Almaraz Nuclear Power Plant. Taxes on nuclear energy are another point of contention between Miteco and the sector. Especially the Enresa Fee, which the Government increased by 30% in 2024.

[45] https://elperiodicodelaenergia.com/el-gobierno-mantendra-el-calendario-de-cierre-de-las-nucleares-pese-a-la-peticion-del-congreso/

The nuclear industry have shown their interest in reconsidering the decision agreed upon in the PNIEC. An example of this is a recent press release dated 02/21/25[46], where the president of Foro Nuclear[47] stated that *"there is indeed a desire for dialogue"* regarding the schedule for closing nuclear power plants, emphasizing that the way to proceed is to open a dialogue, assuring that "*the ministerial order establishing the closure of nuclear power plants can be annulled at any time*." The companies are seeking to maintain their operations and are asking the Government for flexibility. For instance, more than twenty companies from the electricity sector involved in the Spanish nuclear industry have signed a manifesto[48] on 02/25/25 in favour of extending the life of Spanish nuclear power plants, with which they intend to provide arguments to the Ministry for Ecological Transition and the Demographic Challenge.

> *"We urge the opening of a dialogue and the review of the 2019 agreement on the staggered closure of nuclear power plants. The context in which this agreement was adopted - industrial, geopolitical, social and economic - is completely different from the current situation".*

Likewise, the General Director of the World Nuclear Association (WNA) has expressed her concern for Spain's economic future and has also called for a reconsideration of this decision. It also assured that *"a large number of countries have recognized that it is not possible to achieve the objectives of the Paris Agreement, in a sustainable, economical, fast, and equitable manner without nuclear energy".* In addition to the negative impacts in Spain in terms of competitiveness from an industrial perspective, she argues that it will also lead to higher carbon emissions, higher electricity prices and negative effects on citizens.

Regarding public perceptions, at the end of 2023, the Elcano Royal Institute (REF) conducted a survey of 1,000 subjects, representative of Spanish society, with the aim of analyzing their opinions on climate change and the energy transition. The results showed a widespread support for the deployment of renewable energies, even for the case where such deployment involves the presence of large infrastructures (a presence that sometimes arouses local opposition). Regarding nuclear energy, there is a significant increase in support for extending the lifetime of nuclear power plants. The results showed that 43% of respondents agree or strongly agree with life extension (34% and 9%, respectively), a figure significantly higher than the 2019 survey's report of 24% (20% and 4%).

The Spectrum project of the Universitat Rovira i Virgili (URV)[49] of Tarragona has found that 48.3% of Spaniards are in favor of closing nuclear power plants in Spain. There is an important sector of the population that 'neither agrees nor disagrees' (14.3%) while 30% show some level of disagreement. An important finding is that these results vary by region. In communities such as the Basque Country, Ceuta and Melilla (which do not have reactors in operation) 63.5% and 61.5% strongly or somewhat agreed with the closure of the plants. On the contrary, in some communities with nuclear activity, support for the closure of nuclear power plants was 53.3% in Catalonia and 50.9% in the Community of Valencia.

[46] https://elperiodicodelaenergia.com/foro-nuclear-responde-a-aagesen-que-la-industria-si-quiere-un-dialogo-sobre-el-calendario-de-cierre-de-las-centrales/

[47] The Nuclear Forum is made up of the large electricity companies that own the power plants - Endesa, Iberdrola, Naturgy and EDP

[48] https://www.eleconomista.es/energia/noticias/13238134/02/25/empresas-del-sector-electrico-firman-un-manifiesto-a-favor-de-la-extension-de-vida-de-las-centrales-nucleares.html

[49] https://www.europapress.es/catalunya/noticia-48-espanoles-favor-cerrar-centrales-nucleares-proyecto-urv-20240603142415.html

While in other regions support is lower: Extremadura (35.9%), Castilla La Mancha (35.2%), and La Rioja (32.5%).

The perceived scenario with the closure of Almaraz is that the government ignores the requests of various stakeholders to extend the lifespan of the plants. The closure is causing a lot of distress among the residents near the plant, as many of them will be left without jobs, and no occupational alternatives are offered. The neighbouring towns also believe this is a political decision, and protests have erupted in the streets, demanding that nuclear plants be included in the energy mix, alongside with renewable energies (Viagrio, 2024)[50].

3.4.2 The next section presents the results of 14 interviews carried out with different nuclear energy stakeholders in Spain. Interviews analysis

3.4.2.1 Stakeholder participation in decision-making process regarding the nuclear phase-out

In Spain, in general, decisions are made in accordance with the current regulations: the electric sector law, the nuclear energy law, the law creating the CSN, the regulation of nuclear and radioactive installations, the health protection regulation (regulatory pyramid), and the Executive and the Parliament, each in the performance of their functions (as stated by and stakeholder representative of the industry). Most of the interviewees considered that energy policy decisions in Spain are made with a markedly short-term vision and are usually linked to political cycles, which makes it difficult to be continued by subsequent governments. Instead, energy policies which should be long-term, end up being subordinated to immediate decisions.

The nuclear energy is no exception. Several interviewees mentioned the lack of inclusion of experts. A representative of a research organisation commented that decisions on nuclear energy in Spain are strongly politicized and used as an object of transaction between parties. This situation contrasts with practices in other countries, such as Finland, where energy decisions tend to be depoliticized and delegated to experts, who are trusted more than politicians. Limited citizen debate was also referred. These political decisions, with huge social, economic and environmental impacts, are often taken without a real public deliberation process.

Public participation in strategic environmental impact statements, apply only to specific projects. The most relevant decisions are not subject to consultation established in the Aarhus Convention; which has not been fully implemented in practice (as stated by a public authorities). In this regard an NGO stakeholder, pointed out that the rights of citizens are being violated at all political levels, both regional and national. An attempt is made to cover this fact with publications in the Official State Gazette (BOE in spanish) of the political decisions that are made. *"Nothing happens policy."*

Regarding the decision-making process to close and subsequently dismantle nuclear energy in Spain, there is unanimity that resolutions on nuclear power plants involve the government and the owner companies (Endesa, Iberdrola, Naturgy). Some interviewees also referred to other actors who participated in the decision, such as the Nuclear Safety Council and Enresa. In this context, the participation of experts, civil society and other relevant actors is perceived as practically non-existent.

[50] Vigario, (2023). La sentencia de muerte de Almaraz: "juegan con el pan de la gente". El mundo. https://bv.unir.net:3770/hu/api/noticies/?tipus=pdf&idDocument=00001419-20240802-001004&fromHemeroteca=True

From the industry's perspective, the lack of inclusion of experts in such a significant decision for the future of the country's energy was notably questioned. Like the rest of the stakeholders, the industry also considers that the decision to close the plants was made "*unilaterally*" without technical advice "*is a decision taken by the current executive in 2018 or 2019 with the electricity companies*". In general, there is a perception that the vision and acceptance of nuclear energy has been politicized, creating two camps: those in favor, associated with a right-wing ideology, and those against, linked to left-wing positioning. This polarization is reflected in the current position of the PSOE (explain what this is?), which follows the trend of closing plants because "*it is in its DNA*".

In addition to political motives the economic factor has been a crucial factor. According to the reasoning provided by an interviewee from the industry, the economic operating regime of the NPP (marked by the wholesale market) was deteriorating with a significant part of the revenues (not the profits) are taxes, which creates economic uncertainty in a not very favorable prospects. Another important point is that Enresa is financed with a fee of euros per megawatt-hour produced. If the nuclear plant is dismantled prematurely, there would not be enough funds for the dismantling or for the management of spent fuel. These circumstances prompted the decision for a phased closure by 2035, which guaranteed supply, relieved political pressure (the left-wing political party Podemos demanded an immediate closure), facilitated the renewal sector request, and allowed ENRESA to raise the funds needed to proceed with the decommissioning. The protocol and its schedule are signed, and the government makes it law via the PNIEC (National Integrated Energy and Climate Plan).

> *"The government did not say that the nuclear power plants had to close, but it put all the obstacles in the way of the electric companies, so that in the end they would have to close."*

Energy security and energy transition were the aspects of greatest concern for the government, as it coincided with the closure of gas and coal plants. Some interviwees from the industry questioned the PNIEC's ability to ensure a constant supply because it was not designed with the appropriate scientific rigor nor was the industry involved. The government's ambitions for the growth of renewable energies are perceived as unrealistic.

Another important decision that illustrate the same pattern of unilateral decision-making was the waste management plan, which went from one Centralised Temporary Storage Facility to seven Individualised Temporary Storage Facilities, which has an impact of billions of euros and was taken without taking into account technical, scientific or industrial opinions. '*It is more unilateral than the closure decision (which was a pact), and this will have a significant economic impact that goes beyond the owners... the government says that the utilities will pay for it, and that is not the case, we are all going to pay for it'*.

In contrast, France and Sweden were mentioned as examples of best practices, as they have maintained an energy mix with a significant presence of nuclear energy to ensure stability and competitive costs. However, both countries face consequences from the European Union for not meeting the required renewable energy quota, despite having achieved their climate goals. This situation is perceived by several stakeholders as inconsistent and inexplicable and they end up referring to the *"renewable fashion"*. Instead of banning one energy source, it is necessary to find a balance between all options to ensure a stable and efficient energy supply.

> *"Technology should not have been chosen, but all the necessary possibilities should have been put on the table to achieve the set objectives of low-emission electricity production."*

According to a media representative, the electric corporations agreed to put pressure on the government to lower taxes, but the administration did not cave: *"Not only have they not lowered taxes, but they have increased them"*. Industry stakeholders agree that the current situation has fundamentally changed since the agreement was made. With rising electricity rates, power plants' profitability has improved, and corporations are now requesting equitable taxation to continue functioning. Nonetheless, the administration has refused to negotiate. Paradoxically, although the government has refused to reconsider the role of existing nuclear power plants in Spain, it now endorses small modular reactors (SMRs) as part of the European energy strategy, evidencing a contradiction in its position and the political background of decision-making[51] (as reported by a stakeholder from the media).

The view of the different NGOs and associations is that the decision-making process in Spain is reduced to a "*closed-door negotiation*" between the Government, the CSN, the electricity utilities and Enresa, (as mediator), without the participation of other stakeholders. There are some available mechanisms for citizen participation, but they are perceived as insufficient or not fully carried out. One example is the allegations both at the personal and institutional levels, such as administrations. One of these institutions interviewed presented allegations about the PNIEC to the closure of nuclear power plants, pointing out that these infrastructures should be closed before they reach 40 years of operation, while in the plan there is the possibility that their life may be extended to 48 years. It also denounced the lack of Environmental Impact Assessments (EIA), which violates European regulations, which dictate the obligation to carry out these assessments when the consequences of a decision have a certain impact on the environment. All these practices are evidence of the power of electric companies, favoured by the so-called "*revolving doors*" and the influence of lobbyists. Another key player in these negotiations is the CSN, an independent body whose decisions are binding, although its autonomy is called into question due to the lack of public participation in its decisions.

A representative of an NGO further stated that there is a rumour about the NPP's shutdown as a political move by MITECO, which is completely wrong. It was a political proposal based on the European Commission, and the three owners agreed. They submitted a technical evaluation report, which was approved by the CSN. The Ministry advocated for the PNIEC. It was a cost-driven market choice. Others can express their thoughts, but they are not involved in the decision-making process. *"What happens is that what should replace nuclear (combined cycle, storage, etc.) fails to fulfil the timetables; this is what has raised the blisters."*

From the authorities perspective, "*the lack of public debate reflects a democratic deficit"*. Although Spain is a party to the Aarhus Convention, it has not been fully implemented in practice. In countries such as France, there are bodies dedicated to public debate, where experts identify relevant issues and mechanisms are created to integrate both stakeholders and citizens. Also, in France, debates were held on the construction of nuclear reactors, where five possible sites were considered, and the population had the opportunity to choose one, even if it was not the most technically adequate option. This type of process does not exist in Spain, where the spirit of promoting equal debate is lacking. Regarding the phase out of nuclear power plants, no participatory process was carried out. There was a day of debate in the Congress of Deputies, organized by the nuclear safety committee, which included round tables with the participation of experts, the private sector and deputies. However, that was the only engagement event on the subject.

[51] The interviewer refers to the former Minister of MITECO (Spain) who is currently the Executive Vice President for a clean, fair, and competitive transition at the European Commission.

There has never been an official referendum on nuclear energy in Spain. The debate has been kept in the background because of the fear that the majority of the population will vote against this technology, which could jeopardize certain political decisions. In contrast, countries such as Italy have held referendums, such as the 1989 referendum, which allowed citizens to express their opinion on the issue. In Spain, however, there is still a certain underlying fear of referendums due to the lack of tradition in their use as a tool for democratic participation (as stated by an authority stakeholder).

Representatives of the research sector perceive that the government imposes energy decisions without having reached a consensus with the companies, which generates their opposition, partly due to the costs that end up being borne by consumers. One of the interviewees puts forward two perspectives on the closure of nuclear power plants. On the one hand, that of the affected companies and municipalities, who feel that their needs have not been considered and that the decision has been imposed by third parties, i.e., the government or the companies themselves. On the other hand, that of the business sector, which in cases such as Garoña NPP made the closure decision based on an economic motivation, determined by Iberdrola, after evaluating the costs following the Fukushima accident. From the perspective of research stakeholders, there is a generalized view that neither the government nor the industry assumes the responsibility of involving society in energy decision-making. While the public is informed, communication is one-way and lacks a real dialogue with society.

> *"No one considers the need to talk with potentially affected communities. There is no communication or dialogue. And we are doing that wrong".*

From the media's perspective, the closure of nuclear power plants in Spain responds more to a political strategy than to a technical or economic analysis, with decisions guided by electoral interests and pressure from sectors that benefit from the disappearance of nuclear energy. There are other actors who promote the nuclear shutdown and are beneficiaries in this negotiation. Some political parties (PNV, ERC, Podemos, Bildu, etc.) as well as the interests of other industrial sectors that could also be influencing (gas companies or renewable energies sector) and would benefit from it.

The lack of citizen participation in these processes is often due to the influence of powerful economic interests that prioritise their profits over collective needs. When people are not allowed to have a say, those in power can act unilaterally, favouring only their own interests (as stated by a representative of public authorities).

3.4.2.2 Impact of (no) stakeholder participation in decision-making on the nuclear phase-out

Based on the analysis of the interviews, respondents agree that the lack of engagement of all stakeholders in the decision-making process has significant social, economic, and environmental effects.

From authorities' perspective the lack of citizen participation leads to a disconnection of citizens from energy policies and, consequently, to a growing disenchantment. For example, although many people are in favour of this green energy, they change their minds when the installations could affect their immediate surroundings. Encouraging debate and consultation would lead to a greater degree of public understanding of the measures adopted and a greater degree of acceptance of energy infrastructure.

A stakeholder representing NGOs criticized the lack of transparency in the nuclear sector, which has a major impact on public confidence. In addition, they point out that the nuclear industry has a unidirectional direction and does not encourage participation but believes that in this area the industry does not want to let the public have a say *"on this matter, people cannot be allowed to have an opinion"*. When it comes to purely technical decisions, it is understandable, but when it has some level of impact

on the population, it would be correct to explain, for example, how the risk increases over time when the intention is to exceed the lifespan after 40 years. The population should be informed about and have the right to express their opinion.

The economic and social consequences of the closure have been emphasized. Firstly, the economic impact that the closure will have on consumers: since 22% of energy production will be lost, it will have to be supplied with renewables and imported gas. Industry representatives also highlight the significant effects related to the lack of stability and clarity during the closure process. In fact, one of the respondents' claims that the existing energy transition strategy is unrealistic because the expectations for wind and photovoltaic construction are deemed unattainable even by the responsible sector itself. This context will generate a generalized price increase "*It goes back into everyone's pocket"* and it will suppose a greater dependence on gas from other countries because Spain does not produce it.

> *"It will lead to greater instability in energy prices, greater strategic dependence on other countries and less autonomy in our energy capacity... It can lead us to possible blackouts."*

Interviewees also reflected on the economic effects that the closure has on local communities. Significant impacts on the workforce were constantly mentioned. "*What is going to happen to people working in the nuclear field is not being taken into account"*. Stakeholders referred to the loss of jobs and economy in the regions affected. Despite being a decision scheduled for 2035, generational changes are not being considered. *"It is increasingly difficult to find talent who wants to dedicate themselves to an industry that knows that it is going to close",* which affects both qualified personnel and construction personnel. When people are looking for a job, it is not motivating to go to an industry that in a few years is going to close. The country will be decapitalized in terms of industry and talent specialized.

The lack of socioeconomic assessments was also criticized by research stakeholders. Although after many years of struggle, environmental assessments have been implemented, the same is not true for socioeconomic assessments, which are not carried out with few exceptions.

Regarding environmental impacts, several stakeholders from the industry, associations and the media reflected that the closure of nuclear power usually causes an increase in the consumption of fossil fuels (such as natural gas) and will have an impact on the increase of pollutants in contrast to climate objectives. Thus, these effects will imply more pollution, but also more payments for CO_2 emissions, which in turn causes an increase in the price of electricity and the country's deficit. Some interviewees mentioned the case of Germany, which today produces more or less the same electricity with coal as nuclear energy produced before the closure. It was also pointed out that renewable energies also have an impact on the environment due to the use of substances such as silicon.

On the other hand, NGO voices commented that the NPP in Spain are getting old and there are other ways to produce electricity more cheaply. In addition, some effects of radioactivity in the environment have been demonstrated, citing two examples in Catalonia (Ebro waters and the Erkimia case). Also mentioned was the risk of an accident, the impossibility of solving or paying for it, as well as the permanence of radioactive waste, which is greater than any other industry, which is why it requires a constant supervision body. Its impact lasts a long time and could suddenly change the destiny of a country in the event of a nuclear accident.

Some NGO stakeholders also commented that a characteristic of the nuclear sector is the lack of transparency *"There is no culture of transparency",* which has a significant impact on public trust. The nuclear sector does not show openness to listening either. They have a one-sided attitude: *"You can't let*

people give their opinion on this." Although it is true that if there were a lot of public discusssion, the nuclear industry would not be able to sustain itself (because it would create alarm), that is just what democracy represents. Another stakeholder also commented that the sector has been very silent in the public debate and warned about the lack of sustainability of the nuclear sector in the long term if a more open debate is not promoted. Companies such as Iberdrola and Naturgy are also questioned for having removed references to nuclear energy from their websites.

A research representative also reflected that the participation of stakeholders (businesses, local communities) in decision-making can be affected by power relations, where technology promoters may use participation only as a legitimation mechanism. In this way the "social license to operate" is used by companies to manage their relationships with communities, which can imply a more complex dependence than the simple trust of communities in institutions.

3.4.2.3 Forms of participation observed in other nuclear contexts in Spain

The importance of participation in the decision-making process on the closure of NPPs was highlighted. It is essential to create channels so that the public can be aware of the associated risks and have the opportunity to give their opinion on the matter (asstated by representatives of NGOs and associations). According to the media representative, television debates should include expert stakeholders with in-depth knowledge and experience in the field, to enable a balanced debate.

It was also suggested that these experts should be part of an advisory committee for the government and parliamentarians. A good practice could be to hold public meetings in which scientists and engineers advise politicians, while the public can listen. Furthermore, politicians should explain *"decisions to citizens with arguments and scientific reports"*, leaving aside political slogans. Energy policy should be planned for the long term and led by experts in the field, avoiding constant changes with each new government.

Other situations where stakeholder engagement would be necessary were mentioned: radioactive waste temporary storage (which needs to be explained well, openly and in depth), extension of the operation of NPPs (explaining how the risk increases over time), and the management of contaminated areas (people need to know and be able to express their opinion). For example, one stakeholder mentioned the Finnish, Swedish and now the French cases in terms of waste disposal, the participatory way in which they do it, which implies explaining a lot to the people, but in a way that is understandable to the public, not from a purely technical and expert approach. "*You have to explain a lot to the people, and that implies many years and here we are very green"* (NGO member).

Also from an industry perspective, some interviewees mentioned that it is important to involve stakeholders in long-term strategic planning and decision-making, arguing for different reasons. Firstly, the need to define the country's energy needs and what direction it should take in this field, especially in the European context, where nuclear energy is becoming increasingly important: *"we are going against what is happening around the world. It is important to take advice from what is happening elsewhere as well".* On the other hand, it is mentioned that decisions should be taken on the basis of a global analysis of the energy system. The lack of dialogue with the industry in decision-making has resulted in scenarios of instability and high economic costs

> *'In other countries, more account is taken of the industry that has to carry out these plans, and if the industry tells you that it is not going to reach 63 gigawatts in 2030 (renewable energy), you don't set that target. Even if they can put more money, it is not about money, but also about talent, technical means and capacity in general'.*

In addition, one industry interviewee stressed that while decisions cannot be based solely on public debate, open channels of communication that provide accessible and transparent information are essential. To involve also research experts as advisors in decision making, as for example, has been done at the European Commission level, where they involved the Joint Research Centre (JRC) who made an analysis of the impact of the different energy sources on the environment, and from there derived the inclusion of nuclear energy as a green energy in the taxonomy.

Researchers emphasize the importance of involving communities from the initial stages of the implementation of this technology, since, at present, information usually reaches the population when the processes are already underway. It is also pointed out that the low perception of the benefits of nuclear energy reinforces scepticism and social resistance. Therefore, it is essential to establish participation mechanisms that allow the population to understand how these technologies can have a positive impact on their communities.

Additionally, all interviewees agreed on the need for greater stakeholder participation in nuclear decommissioning processes. They emphasize the importance of involving as many stakeholders as possible, given the long-term impact of this issue. As an example of good practice, they mention *Salvemos Almaraz* and *Jóvenes Nucleares*, organizations that are promoting debate and raising public awareness about the closure of the Almaraz NPP.

NGOs and associations representatives also highlighted the need to involve society in the management of radioactive waste, ensuring that the decommissioning process guarantees the safety of all and does not only benefit certain actors. To this end, a participatory process is proposed to inform the population about risks and solutions, following the example of countries such as Finland, Sweden and France, which have developed mechanisms for dialogue and education in this area.

In sum, there seems to be some consensus from all stakeholders on the need to implement more inclusive forms of participation, including openness to dialogue, more communication and transparency from the early stages of decision-making.

3.4.2.4 Stakeholder engagement in low-carbon energy transitions

NGOs and associations considered it essential to have a public debate in which both sides, those who defend nuclear energy and those who oppose it, have the same opportunities and resources. In these discussions, in addition to both positions, the affected populations should be involved and should move from a passive role, in which they simply accept donations without speaking out, to actively debating who are the beneficiaries of these infrastructures and who are not.

There is also noted a need to involve citizens, potential recipients and consumers in low carbon energy transitions. It is necessary to create differential listening processes that take into account the opinions of local councils and industry. Stakeholders proposed to replicate for the nuclear municipalities the transition plans that were created for the coal mines municipalities in Asturias. These plans should be protocolised and adapted to the local reality of each area, ensuring that these proposals are specific and take into account the characteristics of the localities.

Industry stakeholders propose different ways of integrating the parties in the energy transition process. First, they highlight the need to approach these decisions as matters of state, prioritizing the general interest and generating political and social consensus. Another industry representative emphasizes that energy decisions should not depend on private companies, but should be backed by a State pact that transcends the changes of government each year. Technological neutrality must be pursued, beyond the

number of percentages of each technology, what is important is to know what is the mix that allows you to have energy at competitive prices and that does not produce greenhouse gases. This is a very specific reality in each country. The approach should be guided by the 'energy trilemma', which seeks to balance three fundamental objectives: affordability, environmental sustainability, and security of supply.

It was also highlighted the importance of improving Spain's energy interconnections with other countries, particularly with France, to reduce its isolation and dependence on external sources such as gas from Algeria. It is also mentioned that although the government has not promoted surveys to measure public opinion on nuclear energy, independent studies show growing public support for this energy source. The participation of society in decision making should go beyond voting in elections and translate into a constant dialogue based on technical and scientific information.

The authorities recommend encouraging citizen participation, especially on issues of waste management and just transition. They also pointed out the decommissioning process, on what is done from the time the closure is announced until the end of decommissioning. This period, which usually lasts 15 years, is considered as an opportunity to ask the population what alternatives they want to develop, since they are the ones who best know the needs and characteristics of the locality. For this reason, it is proposed to create alternative development commissions before a plant closes. Sometimes, environmentalists insist on closing first and debating later, but the authorities consider it more appropriate to work together on designs that sustain the territory. This participation should not be limited only to gather their opinion, but should include concrete proposals. This type of involvement is what guarantees a just and sustainable transition for the affected communities.

The media representative stated that, in energy transition, there has been a great deal of propaganda to promote renewables in order to combat climate change, which has confused the end with the means. Humanity's goal should not be to operate with 100% renewables but to have a sustainable, clean, cheap, abundant and stable energy supply. Therefore, both renewable energy and nuclear energy are indispensable to achieve decarbonization. It is essential to listen to everyone who has something to contribute in relation to this subject. To this end, it is recommended to hold public meetings, not necessarily open meetings with a microphone, but with a subsequent explanation of who has met and what has been said. This approach would help to improve the level of advice and increase transparency during the low carbon transition process.

3.4.2.5 Recommendations for ensuring effective participatory decision-making processes

NGOs and associations put forward several recommendations aimed at improving participation processes and transparency in the nuclear sector. Firstly, they stress the importance of having neutral, transparent and accessible information that inspires confidence and security. Although this information is sometimes available, its interpretation is extremely difficult, which encourages the proliferation of hoaxes and misinformation. In addition, relevant unknowns persist, such as waste storage, its costs, and the risks and effects that nuclear energy may have, issues that need to be clearly addressed so that the public can understand them.

It is also crucial to pay attention to how these complex challenges are communicated through the media. Maintaining a traditional, independent press is essential, as is to ensure that journalists are properly trained to ask relevant questions and convey information accurately. This would help combat opacity and provide balanced reporting on key issues, such as whether all the necessary investments are being made to ensure the safety of the facilities or how much the nuclear sector contributes to paying for the management of its waste.

In this context, it is proposed that a technical body be set up within Parliament to make nuclear-related expertise comprehensible. This body should take responsibility for translating technical information into terms accessible to the general public, forcing experts and politicians to explain their decisions in a clear and understandable way. Another important recommendation is to design different scenarios that reflect the views of various stakeholders, such as representatives of the nuclear sector, petrochemical companies, academics, economists and environmentalists. This inclusive approach would make it possible to work more effectively on the possible future trajectories of the sector. At the same time, the need to incorporate ethical processes in nuclear management and to give a more relevant role to women in this field, promoting diversity and equity, is highlighted.

From an economic perspective, it is considered essential to audit the real costs of nuclear energy so that the population can have a clearer vision of its viability. This would allow citizens to assess whether this technology is profitable or, as some argue, economically unviable.

With regard to citizen participation, it is recommended that more channels be established, both direct and indirect, to facilitate dialogue between the population and the different actors involved. The creation of information committees made up of diverse representatives could help to resolve citizens' queries and reduce the feeling of opacity. Several interviewees pointed out the need to report not only on the radioactive contamination resulting from nuclear waste but also on radioactive emissions into air and water during plant operation, which would allow a more complete assessment of this technology, for example, with a view to its viability in 2035.

Finally, international best practices are highlighted that could serve as a reference. In countries such as Sweden, public debates allow the different stakeholders to participate actively in decision-making, especially about waste and its treatment. Finland, for its part, has made progress along these lines by exposing nuclear issues publicly and establishing a direct dialogue with the population, thus fostering greater trust and understanding on the part of society.

The industry recommends modifying the current position based on technical knowledge and actively listening to the population. It suggests integrating the population in the decision-making process and developing communication channels based on sincerity to generate a sense of security and confidence in the population. To this end, it is crucial to publish information so that it reaches the public in an neutral and balanced way and without ideological conditioning. In addition, it is suggested to include new tools so that the dissemination reaches more people, such as digital media.

The political class is encouraged to be more realistic, taking other countries as a reference, and prioritizing scientific knowledge in decision-making. The good practices implemented in Finland and Norway are mentioned, as well as the debate in Denmark, where a nuclear moratorium is being considered. More honesty is requested from the political class, to be more pragmatic, prioritizing scientific knowledge in decision making and rigorously evaluating the best option. In turn, it is expected that citizens should also do their part, actively informing themselves and getting involved in the debate.

The Aarhus Convention and its corresponding European directive establish principles of public participation in decision-making. To achieve a good participation process, stakeholders such as the energy industry, auxiliary industry, renewable energy industry, utilities professionals, scientists, social, and trade unions should be included. Consultative processes, such as those carried out in Spain during the selection of locations to host a nuclear waste repository, can gather opinions and concerns of affected communities, favoring greater consensus. However, referendums for each energy policy would be delayed. Instead, it is proposed that the government design adjustable scenarios that reflect changing

realities, including geopolitical and economic factors. A strong team and continuous work are required to achieve this goal, including education, campaigns and independent studies to support scientific ideas.

According to stakeholders in the research field, what a good public debate requires is that its participants are well informed about the assumptions and hypotheses that support the figures presented. To this end, it is important to implement tools that facilitate access to information and promote transparency. In addition, this information must be filtered by criteria of importance, by objective people, based on its relevance and the topic being addressed. It is also crucial to advocate methods that favour a greater disaggregation of issues and avoid comparing topics that are not equivalent.

It is very important to favour a process of early dialogue with local residents and to ensure that project planning is done well in advance. It is also essential to clearly answer the specific questions and concerns of the locals and to provide them with an environmental, social and economic impact study that assesses the impact of implementing the technology.

Regarding the closure, although in this case the locals have a secondary role due to the magnitude of the decision to be taken, it is important that their voices are heard, since they are the most affected by the closure. On the other hand, generational replacement could be considered as a more human dimension of the project. That is, it is important to assess the real impact on the local population, especially with regard to the continuity of nuclear operation, which may be limited by the lack of trained human resources.

Finally, it would also be useful to review the parliamentary questions and their answers, so that the public can deeply understand the rationale and underlying information of the debate.

The authorities highlighted several relevant experiences in this field that can be a good example for the design of participatory processes. This is the case of the conferences organised in Cuenca and Guadalajara, two candidate municipalities for the installation of a Centralised Temporary Radioactive Waste Storage Facility. This experience of citizen participation was very enriching, where initiatives such as the creation of local participation councils,. In these processes, participation should include the city councils, the county, people residing in the area and other local actors. One of the key proposals was to open up participation to entrepreneurs of all kinds. Instead of allocating funds exclusively to the local authorities, it was suggested that they should go directly to specific projects, thus promoting more efficient development tailored to local needs.

From the media representatives, it is recommended to organize a summit of 2 to 4 days to promote the debate on nuclear power plants. In this event, different stakeholders could meet to discuss from an energy, scientific and technical perspective. The government, in this case, would play the role of observer, giving the lead role to nuclear energy experts. In this way, the public has a tool that allows them to gain perspective on the issue and compare ideas.

3.4.3 Analysis of parliamentary questions: political debate on the phase out of nuclear energy in Spain

Since 2018, several questions have been raised in the Senate regarding nuclear energy, particularly concerning government management and the decision to close and decommission all nuclear power plants in the coming years. Below is a review of the most frequently asked questions by senators and parliamentarians.

Firstly, there is a call to reconsider the criteria surrounding the closure of nuclear power plants. Discussions have occurred regarding the possibility of delaying closures until alternative energy sources

are more established. The government has been asked whether it will meet with representatives from the Nuclear Forum to discuss their concerns (Castillo Rodríguez, Patricio Zafra, and Rivas de la Torre, 2024a). In response, the Ministry for Ecological Transition and the Demographic Challenge stated that it maintains regular dialogue with the Nuclear Forum and other institutional, economic, and social stakeholders affected by the planned closures (Castillo Rodríguez, Patricio Zafra, and Rivas de la Torre, 2024b).

Additionally, in 2024, questions were raised about how Teresa Ribera's change in stance on nuclear energy would affect the closure schedule (Mallada de Castro, 2024). The government's reply indicated that it will adhere to the orderly closure protocol agreed upon in 2019 between the plant owners and Enresa (Gobierno de España, 2024).

In 2023, it was asked if a technical study had been carried out to evaluate the extension of operating life of the Almaraz plant and if there were plans to reverse the "nuclear blackout" and extend the life of the Spanish plants (Gordillo Moreno, 2023a). The answer received stated that there were no plans to extend the useful life of the nuclear power plants beyond those contemplated in the PNIEC (Gordillo Moreno, 2023b).

The schedule and transparency in decommissioning are also a topic of interest. In 2018, a question was asked about the date of the decommissioning of the Cofrentes power plant (Mulet García, 2018a). In the Government's response, different factors are taken into account, of which it mentions: the guarantee of supply of the system, the decommissioning and fuel management plans, and the general plan of substitution by renewables. In addition, it mentions that the PNIEC is in the process of being drafted (Gobierno de España, 2019c).

In 2018, a question was raised about the decommissioning date of the Cofrentes power plant (Mulet García, 2018a). In response, the Government highlighted several factors that affect this timeline, including the guarantee of supply for the energy system, plans for decommissioning and fuel management, and the need to incorporate these plans into a broader strategy for transitioning to renewable energy sources. Additionally, the Government noted that the National Integrated Energy and Climate Plan (PNIEC) is currently being drafted (Gobierno de España, 2019c).

Several parliamentary groups have expressed concern about the transparency and communication surrounding the decommissioning of the Santa María de Garoña nuclear plant. Their inquiries focused on the frequency of communication with institutions in the Basque Country and Álava, the convening of meetings under the Burgos Nuclear Emergency Plan, and the activities of both the Advisory Committee for Information and Public Participation and the Inter-institutional Commission responsible for monitoring the process. The goal is to ensure that both institutions and the general public remain well-informed. In response, the Government outlined the steps taken to improve coordination and information-sharing, including a meeting of the Information Committee following the transfer of ownership in July 2023 and another scheduled for June 2025 (Estarrona Elizondo, Bideguren Gabantxo, Elejabarrieta Díaz, 2024; Ministerio para la Transición Ecológica y el Reto Demográfico, 2024). The economic and labor impact of the potential closure on local communities is a recurring theme. In the first month of 2025, several specific questions were asked about this, although no formal replies have been received yet. One notable example is the Almaraz nuclear power plant in Extremadura, which is considered a key pillar for both the local economy and power generation in Spain. There are requests for data regarding the government's projections on the closure's impact in terms of employment and economic activity, both locally and regionally (Monago Terraza, 2025a). Monago Terraza (2025d) further elaborates on the Almaraz power plant, noting that it is the second-largest employer in the region,

contributing 60% of the tax revenue for local municipalities. However, the closure could lead to a loss of jobs for 36% of the workforce.

The issue of employment has been raised by several senators. Mulet García (2018c) emphasizes the need for a Reindustrialization Plan in Miranda de Ebro to prevent job losses and the outflow of young people following the closure of the Garoña power plant. This brings out the question of what measures the Government plans was implementing to tackle this problem. According to the Government of Spain (2018c), there were two main options available. First, the General Secretariat of Industry and Small and Medium Enterprises developed programs aimed at supporting industrial investment. These programs are designed to enhance competitiveness and prevent the relocation of businesses. They include 10-year loans to finance reindustrialization and technological modernization projects. Second, the Government mentioned an Economic Revitalization Plan that was launched in 2010 to support the area affected by the Garoña power plant, which included aid amounting to 25 million euros. However, this plan was suspended in 2011 due to a change in government. Regarding the permanent closure of the plant in 2017, the current administration is working to establish a schedule of actions aimed at minimizing the socioeconomic impact on the region, focusing on the decommissioning process as a way to create employment opportunities.

In a separate inquiry, he questions the Government about whether it believes that the Spanish nuclear reactors are fully depreciated from an economic perspective (Román Jasanada, 2023c). The specific response indicates that this assessment depends on the accounting criteria established by the owner companies (Román Jasanada, 2023d).

The tax burden and the limited governmental support for the nuclear sector are also topics of discussion. One recent question addresses the increase in nuclear fuel prices and the lack of fiscal measures to ensure the viability of the facilities. Consequently, there is a query regarding how the continuity of nuclear power plants is being evaluated within the context of the National Integrated Energy and Climate Plan (PNIEC) (Monago Terraza, 2025c). Taxation issues are discussed in specific cases as well. For instance, there is a question about whether the taxation of the Trillo plant makes its operation financially viable (Román Jasanada, 2023a). The Government's response suggests that there is no reason to believe that its operation is not viable.

A new concern that has emerged in the past year is the installation of data centers in the country, which significantly increases energy demand. This demand may not be met solely by renewable energy sources. This situation raises questions for the government regarding the impact of eliminating nuclear energy on Spain's ability to attract investments in technology and data centers (Monago Terraza, 2025e). Another point of discussion involves an agreement between Google and Kairos Power to utilize small modular reactors (SMRs) as a power source for data centers, particularly those focused on artificial intelligence. According to Monago Terraza, Kairos Power aims to have these reactors operational by 2030 to provide Google with energy in a more sustainable manner. In light of this situation, the possibility of authorizing the installation of SMRs in the country has been presented to the government (Monago Terraza, 2024a). In response, the government referred to the closure schedule established in the National Integrated Energy and Climate Plan (PNIEC), which does not include plans for the installation of any new nuclear power plants, regardless of their size (Monago Terraza, 2024b).

Finally, the risks to electricity supply that may arise from the closure of nuclear power plants was also asked, focusing on the regions of Madrid, Catalonia, and Valencia. According to a study by PwC, the combination of inadequate energy storage and the need for reliable energy sources could result in blackouts, particularly in industrial areas and regions with high electricity consumption. The electricity

sector has also requested an extension of the operational lifespan of these power plants by at least five more years, arguing that the economic cost of maintaining them is lower than the potential consequences of energy shortages (Monago Terraza, 2025c).

Additionally, a question was raised in 2018 regarding the Government's decision to continue paying €74,600 per day to France for the storage of radioactive waste from the Vandellós I NPP. Unfortunately, this question remains unanswered (Martínez González, 2018).

In Parliament, Vox inquired whether the Government has considered modifying the PNIEC to give a greater role to nuclear energy. The response indicated that the PNIEC aims to reduce dependence on foreign energy sources, enhance energy security, and improve the trade balance. It outlines an efficient roadmap for the energy transition, which is aligned with both European and national legislation, and seeks to maximize economic, environmental, and social benefits.

The PNIEC update, in compliance with the Energy Union Governance Regulation, was due in 2023 and 2024, adapting it to new European climate and energy targets. Targets on renewable energies, electrification, and renewable gases such as green hydrogen and biogas are reinforced. The More Energy Security Plan (+SE Plan) introduces immediate and structural measures to mitigate the impact of energy prices and strengthen the security of supply. According to technical analyses, the security of the electricity supply with the PNIEC 2030 generation mix is guaranteed.

In summary, the most frequently asked questions include reconsidering the closure criteria, discussing a delay for the nuclear phase-out until alternative energy sources are in place, and ensuring transparency. The government's responses note that it has maintained regular dialogue with stakeholders affected by planned closures and will adhere to the orderly closure protocol agreed in 2019. Concerns have been repeatedly raised about energy security and decommissioning plans. Responses indicate that steps have been taken to improve communication and coordination during the decommissioning process. The political debate in Spain is also focused on specific cases such as the Almaraz nuclear power plant, which could lead to a significant loss of jobs and the economy of the affected region. The government is proposing to support industrial investment and an economic revitalization plan while addressing the fiscal burden on the nuclear sector.

3.4.4 Media coverage of the nuclear phase-out in Spain

When examining the number of annual publications related to the nuclear phase-out in Spain, several key periods stand out (see Figure 25). In 2019, there were 7 recorded press releases. This number slightly decreased in 2020 and 2021, with only 5 articles published each year. However, 2022 saw a significant increase, with publications rising to 14, nearly tripling the counts from the previous years.

In 2023, publications dipped again to 7 articles, returning to the level observed in 2019. Yet, in 2024, the highest number of publications in a single year was achieved, reaching 16 articles. As of early 2025, less than two months in, 12 publications have already been recorded. This trend highlights the critical and significant moment that nuclear energy is currently experiencing in Spain.

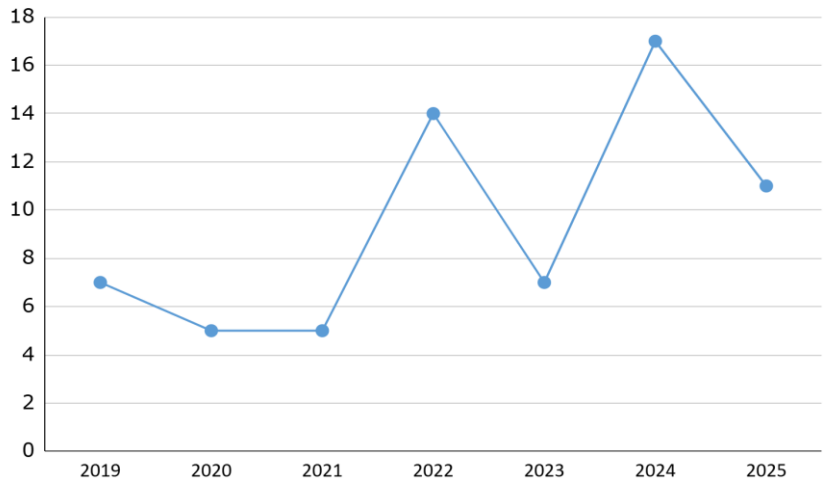


Figure 25. Articles about the phase-out nuclear energy in Spain by year

Most of the analysed press releases have a national scope (53 articles out of 66), which represents the most predominant category (Figure 26). These are followed by those with both a national and international vision, with 12 publications, which indicates that there is some comparison between Spanish nuclear policy with the approach that other countries are taking. On the other hand, only one has a full international scope, reflecting a lower presence in this area. In addition, one article with a national and regional scope is registered.



Figure 26. Geographical scope of the articles about the nuclear phase-out in Spain

Most of the publications are news articles, with a total of 54 articles, indicating a clear focus on disseminating current and relevant information. To a lesser extent, 8 interviews have been published, a format that allows for in-depth analysis and opinions of experts on the matter. Only 3 publications were reports, representing a smaller part of the press releases, as do the editorials, with a single article as well (Figure 27).



Figure 27. Articles about the phase-out of nuclear energy in Spain by genre

Most of the articles were written by journalists, with a total of 49 publications, which demonstrates there exists a professional approach in writing and disseminating information on this field. On the other hand, 13 articles were written by authors that do not identify themselves. News agencies contributed with 3 publications, while only 1 article came from an expert or academic (Figure 28).



Figure 28. Articles about the phase-out of nuclear energy in Spain by type of author

The image conveyed about nuclear energy is mostly neutral, with 41 mentions (64%), indicating an informative treatment that tends to present the facts objectively (Figure 29). A positive image was used in 13 pieces (24%), reflecting a certain recognition of the benefits or contributions of nuclear energy. On the other hand, 8 (12%) pieces that provided a negative image were recorded, suggesting the presence of certain criticism or concerns about its use and its implications.

Regarding the image of the closure or dismantling of nuclear facilities, a neutral view also predominates, with 40 (62%) press releases, suggesting that a neutral and balanced image predominates. However, press releases presenting a negative image is higher in this case, with 14 pieces (26%), which shows some concerns or criticisms associated with the closure processes. Positive image pieces are reduced to 8 (12%), indicating that the perceived benefits of dismantling have a lower presence in the informative discourse.

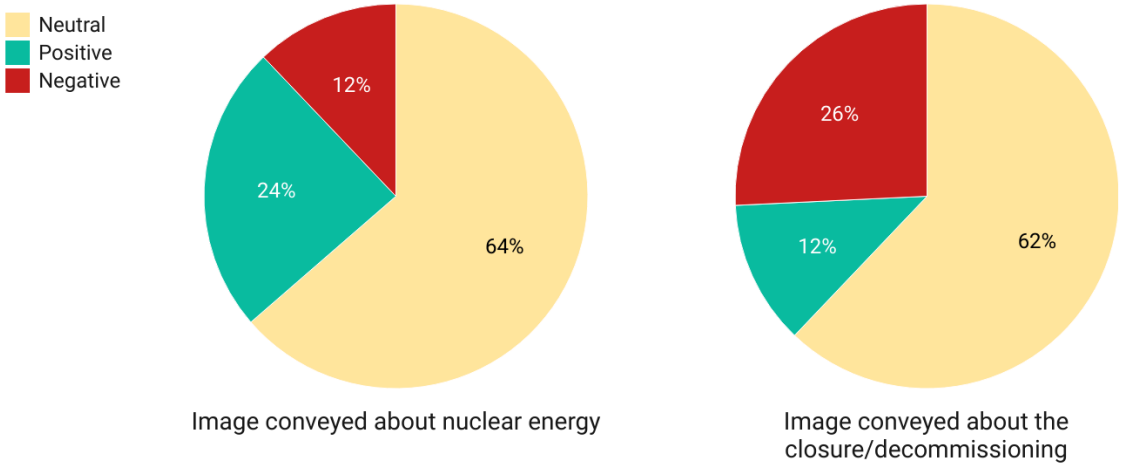


Figure 29. Articles on nuclear phase-out and decommissioning by image type

The analysis of the actors involved in the discussion on nuclear energy shows a predominance of administration and government, with 47 mentions (29,9%), indicating their central role in decision-making and communication on this topic (Figure 30). This is followed by the industrial sector, with 33 references (22,2), reflecting the relevance of electricity companies and the economic sector in the development and management of nuclear energy. In addition, politicians have a prominent presence, with 21 mentions, suggesting that the debate on this topic is also a matter of political interest.

On the other hand, the academic and research sphere appears on 16 occasions, while international organisations are mentioned 11 times, showing their influence on regulation and the generation of specialised knowledge.

Civil society groups, such as NGOs and community-based organisations (CSOs), as well as the public and citizens, appear with 12 mentions each, indicating a lower level of participation compared to the government and industrial sectors. Finally, journalists have a minimal presence, with only 3 mentions, which could suggest a more limited role in shaping the discourse on nuclear energy.

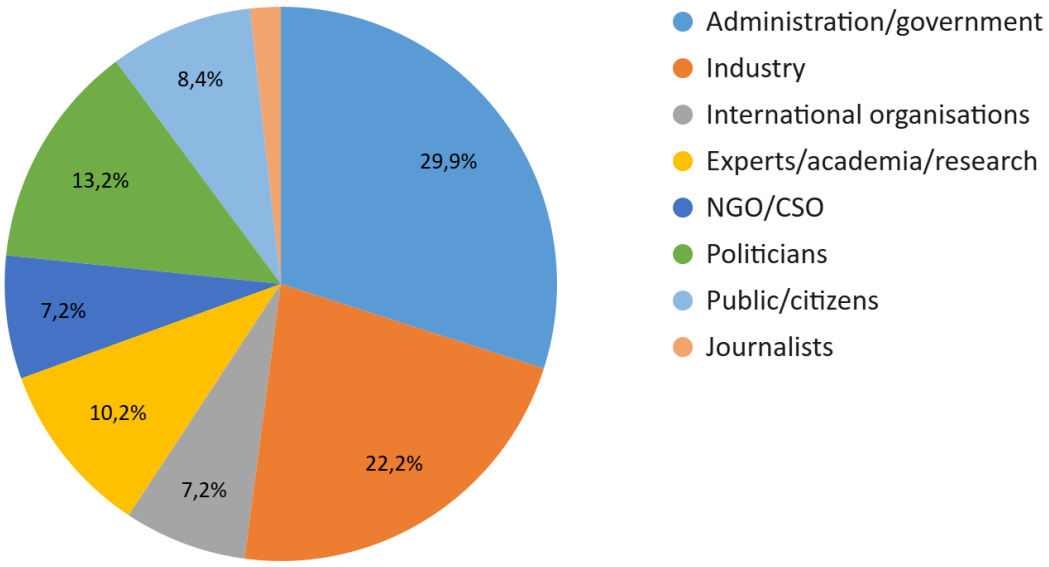


Figure 30. Main actors mentioned in the articles

The results of the analysis show that the number of publications on the phase-out of nuclear energy in Spain has increased significantly in recent years, reaching a peak of articles in 2024 and significant coverage so far in 2025, which highlights the relevance of this decision in the current energy context of Spain. National news prevails, and overall, the coverage remains neutral. The main sources of information are the government, the administration, the industry, and the politicians. To a lesser extent, media articles refer to experts, NGOs, civil society, and journalists. This analysis also reflects the low participation of these stakeholders in media reporting.

3.4.5 Conclusions

Based on the points of consensus between the different perspectives analysed, we can conclude that the decision-making process concerning the progressive phase-out of nuclear power in Spain (and its subsequent decommissioning) has not involved all stakeholders who will be affected by the impacts of this decision. The way in which this decision has been handled shows gaps in the governance of energy policies in the nuclear sector in Spain, leading to procedural injustices such as lack of transparency, lack of scientific advice, lack of expert debate and lack of public participation.

Despite the availability of tools to involve citizens and stakeholders, these have not been used. The prevailing perception is that decisions have been driven by political and economic interests rather than scientific considerations, which it will have significant impacts across the country.

Stakeholder participation in decision-making on the gradual closure and decommissioning of nuclear power plants was made exclusively between the Government and the electricity companies, with the participation of the Nuclear Safety Council and Enresa. Stakeholders have criticised the lack of participation of other actors, particularly experts in the field. These issues are seen as non-compliance with the Aarhus Convention and the consequent violation of the rights of Spanish citizens. The fact that decisions are made in the short term is also raised, as they are too closely linked to political cycles. Stakeholders argued that these decisions should be approached with long-term policies.

In Spain, there have been examples of structured participation processes, such as the Centralised Temporary Storage Facility. Public participation was used to determine the site for this facility, but the final decision was ultimately a political one. Consultation processes are often seen as merely informational, with short response times, rather than as truly deliberative processes that encourage dialogue between different stakeholders and civil society. These practices are widely seen as inadequate. In addition, there is considerable concern about the lack of transparency in decision-making by both the government and the nuclear industry.

Regarding low-carbon energy transition, stakeholders agree on the need to implement more inclusive forms of participation. These include greater openness to dialogue, more effective communication and greater transparency from the earliest stages of decision-making. Adopting these practices would not only strengthen the legitimacy of the decisions that are made, but would also make it possible to include the views and concerns of the communities and other stakeholders that are affected by these decisions. Emphasis is placed on the importance of involving different scientific and technical experts, as well as experts from the socio-economic field.

Stakeholders have made several key recommendations focused on improving communication. These suggestions vary and encompass different aspects. Notably, they include the establishment of communication channels between the public and various stakeholders, organizing debates featuring expert participants on the topic, and publishing accurate cost data. The goal of these initiatives is to ensure the public has a clear understanding and can take an informed stance on nuclear energy.

Additionally, guidelines for government action are proposed. Firstly, the government is encouraged to adopt a “more realistic” perspective, making decisions based on scientific evidence. There is also an emphasis on actively listening to the concerns of the population. Finally, stakeholders recommend looking to other countries for examples and adopting their best practices, as these could serve as valuable references for Spain.

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3.5 Applying recommendations regarding stakeholder involvement in the decision-making process related to nuclear energy investments in Romania

3.5.1 Nuclear energy programme in Romania: current context and future perspectives

Nuclear energy is part of the Romanian energy mix with a share of arround18% of the electricity production, provided by 2 CANDU 660MWe Units at the Cervavoda NPP. The national nuclear programme includes as well:

- a comprehensive nuclear regulatory framework;
- R&D activities devoted to ensure the national scientific and technical support to the nuclear programme;
- nuclear fuel production;
- a radioactive waste management programme, addressing both operational and institutional waste.

In the global context marked by concerns about climate change, Romania has committed to policies and measures aligned with European objectives, which include, among others, increasing the share of nuclear energy by expanding its production capacity in the next 15 years [1].

The *Integrated National Energy and Climate Plan of Romania, 2025-2030, updated in October 2024,* the main strategic document in energy for the next 15 years, identified the main strategic objectives related to the five key aspects in combatting climate change: energy security, reducing carbon emissions, enhancing energy efficiency, strengthening the internal energy market, and promoting research, innovation, and competitiveness.

Nuclear has been found necessary to reach the goals of *energy security and* to contribute to decarbonization and research & innovation by life extension of the two existing CANDU Units, construction of new nuclear units, and participating in advanced nuclear technology development.

Romania's energy matrix is characterized by diversity, incorporating a mix of fossil fuels, renewables, and nuclear energy. Historically, Romania heavily depended on fossil fuels, particularly coal and natural gas, to meet its energy demands. In recent times, driven by EU directives and a growing emphasis on sustainability, Romania has embarked on a path to diversify its energy sources. Renewable energy has emerged as a key player in this transformation. The country has witnessed substantial growth in wind and solar energy production. In the midst of this transition, the Cernavodă Nuclear Power Plant has maintained its significance. Equipped with two operational reactors, the nuclear plant contributes substantially to Romania's electricity generation capacity. Nuclear energy is recognized for the fact that it does not emit greenhouse gases and for its excellent reliability, contributing significantly to the diversity of Romania's energy sources.

The current energy and climate policies and measures related to decarbonization foresee equally further development of renewable energy sources and nuclear energy. The plans for future include:

- refurbishment of Unit 1 (2027 – 2029) and Unit 2 (2036 - 2038)
- construction of Unit 3 (2031) and Unit 4 (2032) (both CANDU) in total 1400MWe
- construction of SMR (water based) – 462 MWe by 2030

3.5.2 The ALFRED project

In addition, as part of the research and innovation activities dedicated to the diversification of nuclear energy technologies, Romania has committed to contributing to the development of LFR technology, to host and build the ALFRED demonstration reactor by 2040. The ALFRED project is included in the National Strategy for the Development of Nuclear Energy [2], currently undergoing the environmental assessment procedure and preparation of the environmental impact assessment study [3] and in the National Program for Research, Development and Innovation 2022-2027 [4].

The involvement in the development of LFR technology began in the early 2000s, with the participation of the Romanian Nuclear Research Institute (RATEN ICN) in European projects dedicated to advanced reactor concepts.

In 2011, a government memorandum assumed Romania's availability to host and build the SMR LFR demonstrator, a decision consolidated a few years later by designating the Mioveni nuclear platform as the preferred site and RATEN ICN as the institution responsible for implementing the project, in collaboration with ANSALDO and ENEA from Italy.

The ALFRED project aims to demonstrate the technical and economic viability of LFR technology and includes the construction of a set of supporting research infrastructures (ATHENA, CHEMLAB, HELENA2, ELF, MELTIN POT and HANDS ON) and the ALFRED demonstrator in Romania [5, 6].

To support its implementation, the ALFRED project was endorsed in the above-mentioned Strategies, as well as in the Government programmes and included in the Research Infrastructure Roadmaps 2011 and 2017.

3.5.3 Consultations and involvement of national and Union entities and their outcome

Stakeholders' engagement in Integrated National Energy and Climate Plan (NECP)

A total of 32 institutions and organizations, including the European Commission, actively contributed to the revision of the NECP. Their feedback was instrumental in improving the plan's quality and scope.

The development process of the NECP is as crucial as its content. Creation of the NECP was seen not just as a strategic document exercise but as an opportunity to align national strategies with local realities. To achieve the EU's 2030 energy and climate objectives, input from local authorities, citizens' organizations, the private sector, and other stakeholders has been collected through continuous multi-level dialogues and public consultations [1].

In the elaboration process, the Chamber of Deputies of the Romanian Parliament provided recommendations to the first version of the document with an aim to enhance Romania's energy and climate planning. In this regard, the Ministry of Energy ensured the involvement of local and regional authorities by including them in the NECP inter-institutional working group, and facilitating their participation in all stages of elaboration and review, as well as in the public consultation.

According to the NECP, to facilitate the involvement of local and regional authorities,

> *"the Energy Cities in Romania Association (OER) organized, between March 2023 and October 2024, dialogue sessions involving several levels of governance and key actors in the process of updating the document, through the development of ... the Energy and Climate Dialogue Platform". [1]*

This Platform supported

> *"the establishment and management of permanent multi-level dialogue platforms in the climate and energy field. The NECPlatform dialogues were attended by representatives of the Ministry of Energy and the Ministry of Environment, Water and Forests, together with representatives of local public authorities, civil society, and other interested factors. The dialogues addressed the main challenges that Romania has to face in updating and implementing the NECP, and the participants in the dialogue debated the challenges regarding the alignment of the updated Plan with the recommendations of the European Commission". [1]*

Public consultations of stakeholders, including the social partners, and engagement of civil society and the general public in NECP

In the process of revising the NECP, various stakeholders, social partners, and civil society organizations played an active role, providing valuable feedback to enhance the document. Among the stakeholders, civil society organizations such as Cities Energy in Romania Association, Bankwatch, 2Celsius, Declic, Greenpeace, Organization of Women Entrepreneurs participated in three public debates which addressed crucial aspects of Romania's energy transition crucial for developing of the NECP.

In addition to public consultation, institutions and organisations have provided feedback and suggestions for Romania's NECP and highlighted several key focus areas across different chapters, and policies and

measures. The focus was around decarbonisation, improving Renewable Energy Sources (RES), Energy Efficiency, building and transport, energy security, and enhancing research and innovation.

Nuclear energy was subject of requests for measures to be incorporated in the energy policies and strategies, and comments which addressed energy security, as well as of some of the general themes that most of the organizations and institutions were focused on such as:

- *Decarbonization and Energy Security: Feedback highlighted the necessity of robust decarbonization policies, including the role of nuclear energy, hydrogen, and carbon capture and storage (CCS) in achieving energy security.*
- *Research and Innovation: There was a significant focus on aligning NECP with innovation and competitiveness strategies to foster new technologies and renewable energy solutions.*

Public engagement in ALFRED project

In Romania, public participation in the decision-making process regarding the construction of nuclear or radiological facilities is legally required in the preparation of the Environmental Impact Assessment (EIA). At this stage, the public can consult the technical documentation, participate in dedicated public hearings, ask questions or make observations. In addition, according to the Espoo Convention, the consultation process is also open to neighboring countries.

The feedback received during the consultation process must be taken into account and responded to and, if relevant, included in the project.

This is the procedure followed for any nuclear investment implemented in Romania. For example, the public consultation process has just ended for the de-tritiation facility to be built at Unit 1 Cernavodă, while an EIA process is currently underway for the NuScale SMR to be built in Doicești.

The ALFRED project made an exception. Based on the knowledge and experience gained in projects such as COWAM2, CIP and IPPA, RATEN ICN launched the public engagement process from the very beginning. In order to address this issue in a systematic way, RATEN ICN initiated in 2015 the creation of the ALFRED Local Dialogue Group as an interface between the local community and the implementer (FALCON consortium). The role of this group is to inform citizens about the status and evolution of the ALFRED project. During the group meetings, the sustainability of the development from the community's point of view was discussed, as well as the benefits, potential risks perceived by citizens and expectations regarding the investment [7].

The composition of the ALFRED Local Dialogue Group includes: from the city of Mioveni: the mayor, two local councilors and three citizens' representatives, and from RATEN ICN: the scientific director and two specialists involved in the project.

This initiative was welcomed by the community, who appreciated the ALFRED project as a potential for further development of the local economy and for raising the standard of living due to direct and indirect contributions.

The impact of the investment at the local level, as emerged during the discussions, concerns the following aspects:

- Creation of new jobs, mostly highly specialized (75% of the permanent positions will be filled by the local or regional workforce);
- Stimulation of local development due to the large size of the investment;
- Positive impact on the service sector (due to international interest and the open access option);

- Improving human capital (including by maintaining young talents in attractive jobs from a career perspective);
- Creating a high-performance research infrastructure of international interest;
- Stimulating the innovative spirit and quality in research (creating technologies with impact through the dimension of intellectual property rights);
- Increasing the visibility and reputation of the community.

The open discussions between members of the Local Dialogue Group and RATEN ICN representatives revealed a high confidence of the citizens of Mioveni in the capacities of RATEN ICN to manage large projects and operate complex nuclear facilities, as some of them work or have relatives or neighbors employed by the institute. The proximity of the TRIGA reactor and the Fuel Fabrication Plant, which have been operated for more than 50 years without any radiological impact on the surroundings, has strengthened this confidence.

Contact with the Local Dialogue Group is maintained by informing its members on the progress made in the implementation of the ALFRED project and facilitating their participation in relevant events dedicated to the ALFRED project (such as Conferences, workshops, etc.) or technical visits to the Institute laboratories and experimental installations.

3.5.4 Concluding remarks

The Romanian legal framework has implemented the provisions of the Aarhus and Espoo Conventions on public information, participation and access to justice, as well as transboundary consultations.

Public participation in decision-making is mandatory by law as part of the environmental impact assessment (EIA). For each individual project, public consultations and public hearings are organised during the EIA process, giving stakeholders the opportunity to be informed, debate and react to the investment project proposal with a view to its implementation.

However, public consultations are possible from the conceptual phase of a nuclear project, as is currently the case through the Strategic Environmental Assessment of the Nuclear Energy Strategy and its implementation plan.

The National Strategy for Nuclear Energy Development in Romania foresees the construction of 2 new CANDU units at the CNE, the modernization of Units 1 and 2, the expansion of nuclear capacity with two new CANDU units and a NuScale SMR in the short term, as well as the construction of the SMR LFR-ALFRED demonstrator, by RATEN ICN at the Mioveni site, in the medium term.

While for Units 3 and 4 and NuScale, public involvement is foreseen in the Environmental Impact Assessment phase, in the case of the ALFRED project, the local community has been involved since the early phase.

In 2015, representatives of the Local Council and citizens of Mioveni were invited by RATEN to create a local dialogue group and discuss the opportunity to host this facility, to analyze the benefits for the community, as well as the potential risks. This initiative was well received by both the local public and local authorities, with a positive impact on their favorability towards the ALFRED project. The communication process is maintained, keeping them involved in the events and activities related to the implementation of the ALFRED project.

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3.6 Stakeholder engagement with the UK Nuclear Roadmap and SMR development

3.6.1 A Roadmap for a nuclear energy future

In January 2024, the UK government, via its Department for Energy Security and Net Zero (DESNZ), launched the policy document 'Civil Nuclear: Roadmap to 2050'. Seeing nuclear energy as part of the UK decarbonisation strategy, the document paths out the UK government strategy towards the deployment of new nuclear builds for civil nuclear energy production in the UK, targeting 24GW of nuclear generating capacity by 2050 (DESNZ, 2024). The roadmap showcased the UK government ambitions on nuclear energy matters to industry, investors and the public. *"The civil nuclear roadmap sets out the government's vision for a dynamic civil nuclear sector, supporting the ambition to achieve net zero by 2050. The document covers a range of topics pertaining to the development of civil nuclear energy in the UK: domestic fuel production, investment decisions, skills development, and supply chain."* (ibid).

The document noted that *'The purpose of this Roadmap is to send an unambiguous signal to the nuclear sector and investors, setting out how we expect UK nuclear deployment to happen, a timeline for the key decisions and actions, and clarity over the role government and industry should play in supporting and enabling this delivery.'* (DESNZ, 2024: 6). The Roadmap was widely welcomed by nuclear industry and other nuclear advocates, not least due a decades long period of nuclear energy policy 'flip-flopping' in direction. It was seen by many in the sector as providing a period of certainty and stability. Following

on from the roadmap publication, several consultations were opened on how the government could support investment on nuclear technologies, and the approach to siting new nuclear power stations from 2025 onwards. The latter consultation has led to a revised National Policy Statement for Nuclear Energy Generation in Feb. 2025, and, a further new consultation on that statement. The policy environment around civil nuclear energy is heavily populated with statements, consultations, responses to consultations and revised statements. The policy processes occur over long time periods and are subject to many external influences, not least the national general elections which occur approximately every 5 years. While government departments, responsible organisations and regulators tend to survive changes of government, policy prioritisation, funding resources and attention to many issues, nuclear energy included, tend to vary over time. The timeframes of the government and the nuclear industry are seen by many as incompatible.

Reaching the proposed 24GW nuclear capacity by 2050, as the stated goal of the Roadmap, is ambitious as the current figure stands at 6.5GW (approx. 15% of UK supply). To increase its nuclear portfolio, the UK government is currently undertaking the development of two EPR reactors (EDF) at Hinkley Point C in the southwest of the UK, with a third EPR proposed to be built at Sizewell C on the east coast. The Roadmap also indicates that the development of an additional large scale nuclear reactor will be considered as part of a portfolio approach to building capacity. Alongside the large reactors (around 1600MW each), the government is actively seeking to develop Small Modular Reactors (SMRs) in the short term (first electricity production expected in the early 2030s), while also supporting the development of Advanced Modular Reactors (AMRs) for later prospects (first demonstration plants expected in early 2030s).

Developments at Hinkley Point C and Sizewell C have fuelled discussions on a UK nuclear renaissance over the last decade or so. The possible deployment of SMRs has more recently gained considerable political traction, to large extent prior to the publication of the Roadmap. Despite the options for nuclear energy options broadening then, the range of actors engaged in discussion appears more limited than previously the case. In spring 2023, a new organisation Great British Nuclear (GBN) was set up to oversee the development and deployment of SMRs. Although this government body was created with the ambition to drive the delivery of new nuclear projects, GBN was first assigned the mission of coordinating a competition that will ultimately lead to the selection of SMRs designs that will be supported by the UK government. Through a Final Investment Decision (FID) scheme, the government aims to financially support those technologies that GBN considers most fit for deployment in the UK. In July 2023, GBN opened a competition call, inviting SMRs vendors, both domestic and international, to submit their design proposal to GBN. In Autumn 2023, GBN selected six designs to enter the second phase of the competition. *'GBN's technology selection process has focused on bringing forward those technologies from around the world best able to deploy in the mid-2030s. In autumn 2023, the six companies successfully down-selected were announced. These vendors will be invited to participate in the next stage of the process'* (DESNZ, 2024: 20). SMRs designs from EDF, GE-Hitachi Nuclear Energy International LLC, Holtec Britain Limited, NuScale Power, Rolls Royce SMR and Westinghouse Electric Company UK Limited were submitted for assessment of the technical and economical merits of the designs (Dr Headdock, Environmental Audit Committee, 2023). In Feb 2025, 4 vendors were invited to submit final tenders. At this stage, it is not yet clear how many SMRs technologies will ultimately be supported.

Unlike other sectors in the energy market, the selected SMR developers will benefit from State aid in accessing deployment sites through a partnership with GBN: *'GBN will access sites and establish delivery capability to bring projects forward. The chosen technologies will receive an unprecedented*

level of support: funding to support technology development and site-specific design; a close partnership with GBN, which will be ready and able to provide developer capability; and support in accessing sites' (DESNZ, 2024: 22).

The definition of SMRs in the UK is restricted to those technologies based on water-cooled reactors: essentially Pressurised Water Reactors (PWR) and Boiled Water Reactors (BWR). The designs that rely on 'advanced' technologies (high temperature gas-cooled, fast neutron spectrum, molten salt etc) fall within the category of Advanced Modular Reactors (AMRs). In UK terms, SMRs are essentially scaled-down versions of existing technologies. The SMR design proposed by Westinghouse Electric Company Limited for instance, the AP300, can be considered a 'miniaturised' version of its original design AP1000. It is also worth noting that SMR generating capacities, in the UK definition, are not limited to 300MW but 500MW (DESNZ, 2024: 18). Despite the difference in SMR definitions between the UK and the IAEA, the essential concept in 'SMR' in both definitions is the one of modularity. This modularity entails the possibility to create a manufacturing process. Whereas large scale reactors are essentially bespoke technological projects built on site, SMRs are being proposed with the idea of manufacturing modules on a production line (factory), which can be then transported and assembled on site. Theoretically, such modularity and chain production could foster a more efficient process which will ultimately bring costs down.

Not only does the goal of modularity imply an economic positive in the cost of nuclear activity, a key reason for the recent government and industry enthusiasm for SMRs is due to the costs of traditional nuclear power plants. Traditional nuclear reactors have too high capital costs and the various cost-sharing models that have been used in the past are seen as flawed. Due to their size and the complexity of their designs then, financing of conventional reactors has generated some odd coalitions. The UK government made the explicit choice that energy infrastructures would not be funded by the government: these infrastructures would rather be left in the hands of the 'private' energy market. In a context where many western governments are looking to cut public expenditure, it becomes politically problematic for governments to justify to their taxpayers the investment of billions in projects which will generate benefits (carbon free energy or income) decades after the expense. SMRs have then become an opportunity for the UK government to attract private investment into the energy market: SMRs are promised to be cheaper (per unit), quicker to build, reducing lead time, financial risk, and securing benefits in the short run.

A second issue lying behind a shift in emphasis from large NPP to SMRs is in the siting of large NPP projects. The number of possible new sites to host large nuclear power plants in the UK is scarce. All latest / proposed NPPs are sited on existing nuclear sites. If the UK ambition is to expand the nuclear energy generating capacity, the number of suitable places to site large reactors will quickly run out. In contrast, the number of sites available for SMRs is much larger and are geographically more distributed. The challenge with this distributed approach, however, would be the risk of managing a larger number of siting processes, which are subject to public scrutiny and objection through more localised planning systems, creating uncertainty in siting decisions.

For all these reasons, the prospect of building large conventional nuclear power plants has started to lose commercial sense: *'So you get these great, .. almost goliaths of nuclear generation, which are actually fairly competitive if you were to build a lot of them, but the challenges of getting any of them built are just so huge'* (P1: 304-306). It is in this space that SMRs are seen as viable, even if technologically and sociologically untested. Moving away from the suggested *competitivity* of the economy of scale (bigger is better) offered by large reactors, enthusiasm for SMRs by developers and government is the result of

a paradigm shift where *affordability* becomes prevalent: instead of having one plant that could cause financial and siting issues, SMR enthusiasts see an opportunity to decarbonise the energy grid through multiple smaller units at a lower cost overall. The logic at play here is to start with one unit, start generating revenue, to then finance the second unit; use the revenues of the first two units to build the third, and so on. These SMRs could be sited on existing nuclear licensed sites, on former industrial sites where coal or gas fired plants were previously installed (and where there is already a workforce used to working on energy production and a local community used to such energy infrastructure), or near industrial clusters where energy intensive industries are in place (e.g. steelworks, AI data centres). These industries could co-invest in SMRs and use the energy produced directly (off grid and both in the form of electricity and heat).

The merits of the business case on which SMRs are based, one that sees a shift from the economy of scale (fewer larger units) to the economy of numbers (more smaller units) are doubted by some. '*There comes this idea of 'small is beautiful'. […] We say 'let's make small reactors', which are more expensive per unit, but we will produce them in an automatised fashion in factories, the number will enable to reach the economic optimum. […] But to build a factory, you need a lot of orders!'.* (NGO 1, lines 45-50). A main issue highlighted by our respondents is that the economic feasibility of SMRs is predominantly based on the number of units that will be ordered and deployed. Building SMR factories will be a vastly expensive undertaking and their construction may be tied to the state of order books and the success (or failure) of marketing. *'The relative economics of SMR production remains unproven until very many SMR units have been produced'* (NGO 2, lines 289-291). A key assumption of SMR supporters is that deployment will be large-scale, both domestically and internationally. However, the stage of current SMR technologies does not allow the assessment in practice of their merits: *'it's difficult to distinguish sometimes between the 'public relations' for SMRs and the reality of SMRs'* (NGO 2, lines 170-171).

Reminders of the failed historical promises of nuclear power remain (e.g. 'too cheap to meter'), and now new promises are being made. For example, SMRs critics suggest there is a 'fantasy' at play: '*By what means is the fantasy of this sort of mini reactor, sort of providing sort of vast amounts of power, to solve our climate issues, which is the fantasy; how and by what means is that proliferating and for what reason?'* (NGO2, lines 553-556). SMRs as the solution to climate mitigation is questioned: *'Whether you like nuclear, whether you don't like nuclear, whether you like SMRs, whether you don't like SMRs, in terms of practicality, unfortunately, in terms of climate, they will be too late'* (ibid., lines 653-659).

In sum, economics is a key driver alongside 'net zero' goals in the UK nuclear energy policy sphere and this may, in part, explain why stakeholder engagement is limited to primarily governmental and industrial actors. Economic policy is not open to consultation other than by normal voting processes in national elections and stakeholder engagement is not usually a feature of either economic or industrial policy. By positioning civil nuclear energy futures as an economic issue, subjugating the climate challenge, the nuclear debate is effectively restricted.

3.6.2 The long road in SMR design choices

An SMR design competition was first launched by the UK government in 2016. Although the 'prize' of the competition was not made clear, one criterion to enter the competition was for SMR designs to be deployable by 2030: *'the first thing that happened was every reactor, every SMR company rewrote their brochure to show that they could be deployed by 2030. If your brochure said 2031, you were going to rule yourself out […] So everybody's designs suddenly were deployable by the end of 2029'* (Nuclear

industry policy expert, lines 1088-1097). This quote suggests SMR developers can amend their promises on demand, to meet the audience expectation. Second, the criterion set by the government signals a willingness to make things happen rather quickly. But despite over 30 design proposals submitted (BEIS, 2016), this first SMR competition was closed in 2017 without further development. The energy minister then in charge did not know what the best marking criteria would be to assess technologies. Such assessment criteria could potentially cover a wide range of aspects: safety, waste volumes and form of waste outputs, date of deployment, maturity of the design, cost, UK intellectual property, etcetera. The lack of clarity in the competition process caused concerns among SMR developers: *'the SMR industry was 'angry' with being told there was a competition, not told what the rules were, everybody entering and nobody winning'* (ibid, lines 1127-1129).

A decision on a grid of criteria, or the prioritisation of assessment criteria, had to be made and the choice revolved around the political imperatives at the time*: 'If you're in the energy bit of government and you're running an SMR competition, the thing that you want is a reactor that you can get on the UK grid as soon as possible in large numbers to deliver you clean, safe, affordable, reliable, low carbon electricity. So, you're looking for an SMR design that is effectively in the shop window. It's already there. If you're in the business bit of government, what you want is a reactor design that isn't finished yet, where we can get UK companies to come in and participate in finalising that design'*. (ibid, lines 1141-1162). On the one hand, the imperatives of energy security and energy production decarbonisation are supported by the department of energy; on the other hand, the imperative of fostering UK industrial development and innovation is supported by the business department. *'there's quite a strong economic argument, using SMRs, not just to improve energy security but also to drive economic growth and rebuild the UK nuclear industry, with an eye to securing export opportunities and global market'* (Government Advisor, lines 525-531). Both imperatives are interwoven but it is an open question whether the two imperatives can be met simultaneously. While politics based on the urgency of energy security would give preference to technologies that are already mature and perhaps already deployed elsewhere (for example, an international design that has proven successful), politics based on industrial and economic development would favour designs that are not yet mature so that intellectual property and value for the UK can be maximised. Such mitigation of competing interests requires a comprise, which the UK government struggled to find back in 2016: *'the government was trying to find that sweet spot of overlap where you've got a bit of each and they completely failed. So that's why there was no winner of that competition'* (Nuclear Industry Policy Advisor, lines 1191-1193).

With the current (GBN-led) SMR competition, a compromise between the two political imperatives may also condition how the design selection unfolds, although in public it is energy security which is stated as paramount. During the Environmental Audit Committee hearings, Simon Bowen (Chair of GBN) explained that *'the way we decided to go with the six that we have gone with is that our prime objective was about energy security and the journey to net zero. Energy security means that you need to go for the technologies that are closest to being commercialised and that we can operate at scale. We looked at both of those—hence the reason we chose the ones we did.'* (Environmental Audit Committee, 2023: 20). Yet, GBN could still use other criteria: for example, in choosing the design from Rolls Royce, GBN would meet the criteria around UK industrial development. It could then simultaneously select a design from an international developer, which will have proved its technical and economic feasibility elsewhere in the world, which will guarantee pace of development in the UK and energy security. The decision-making process is ongoing but the shortlist of 4 design keeps the options open as of spring 2025. The next stage is being described as a "negotiation" between GBN and the reactor designers; again, there is

no opportunity for input beyond the two parties (government and industry) to the negotiation and no attempt at wider stakeholder engagement is apparent.

3.6.3 The challenge of a nuclear skills shortage and the opportunity of SMR design choice

Rebuilding nuclear industrial capacity presents a challenge to the UK: '*We've lost our skills in in many respects in the nuclear sector. […] We built one [reactor] in the 80s and nothing since. So all the people involved in that are either very old or dead'* (Anon, lines 916-927). Over the time since the UK built its last conventional nuclear reactor, UK industries lost knowledge and skills and saw other countries becoming more prominent on the nuclear market: other countries have already attempted to reignite their nuclear industry (e.g. France with the EPR) or developed a bespoke nuclear industry (e.g., China) which makes it difficult for the UK to catch up on the market of large scale reactors: *'I think a big part of the UK Government's interest here is, you know, we don't have the capability to build the GW, the large scale reactors anymore. […] But we do have an opportunity to build an industry around SMR.'* (Government Advisor, lines 510-520). SMR developers are flourishing worldwide, and in what appears to be a forthcoming competitive market, there is an urgency for the UK to position itself. There is a desire to amend the loss of competency, which could also be a driver in GBN decisions on SMR technology choice. First, GBN selected SMR designs that are based on light water reactors, technologies that are known due to their historical use in conventional reactors. Second, GBN could favour a SMR developer that has an ongoing capacity in building reactors, in which case a Rolls Royce design would likely be selected: *'they're the one company in the UK that's still has the skill set because they've been doing it for the defence program'* (Anon, lines 943-944). Rolls Royce has been manufacturing the small nuclear reactors used for propulsion in UK submarines. With such experience, the company possesses transferable skills that could be mobilised in the manufacturing of SMRs.

Some have noted that engaging in a wider public dialogue around SMR development would have a strategic benefit for the nuclear industry longer term, namely, generating a potential workforce. *'They need to attract more people into the industry. So, over the next 10 years or so, if we are going to deliver 24 gigawatts by 2050, we need another 100,000 people entering the nuclear industry'* (Policy Director (academia & industry): 848-851). This issue of attracting a skilled workforce into the nuclear industry is one the government is already aware of, and it has commissioned the Nuclear Skills Strategy Group (NSSG) on this task: *'The Nuclear Skills Strategy Group (NSSG) estimates that in 2023 the UK had around 83,000 people working in the civil and defence nuclear sectors. Their latest modelling, from employer data, indicates the number of workers in the sectors will need to increase to between around 150,000 to 180,000 by 2043 in a 24GW scenario'* (DESNZ, 2024: 56).

3.6.4 Stakeholder engagement

The status of stakeholder engagement in relation to the Roadmap and the current work of GBN, and towards decisions on future SMR designs and deployment, reflects the long-standing approach of government and industry to broader stakeholder engagement in the nuclear energy space i.e., it is highly constrained in terms of scope, and it is highly restricted in terms of who can have a voice.

Our analysis shows that UK government nuclear aspirations are being discussed among a limited range of stakeholders who share a similar vision. Critical voices, or even ambivalent voices, are left out of the exchange. Ultimately, such limitations restrict the conversation on new nuclear projects around issues that the UK government finds of political importance (UK energy security, UK industrial development, skills and employment) and so is arguably self-defeating. Restriction over the terms of debate also puts

to the side any discussion of other challenges in the nuclear space e.g., radioactive waste, proliferation risks etc.

3.6.4.1 The restriction of voices

The government priority of 'providing confidence' and giving stability in the policy sphere has led to an absence of a wider, formal societal conversation on the role of nuclear in the energy mix. Evidence suggests that the government is reaching out to two categories of interlocutors: i) those who are convinced of the merits of enacting a new civil nuclear programme in the UK; ii) those who are ready to invest their expertise and financial capacities in its materialisation. This restriction in the range of voices allowed into formal policy debate is apparent also in the way a parliamentary consultation on SMRs unfolded. The range of stakeholders invited did not reflect the existing plurality of views in the UK. Although some critical input was provided in the form of written evidence and was mentioned during the parliamentary inquiry, the committee did not hear a diversity of voices in oral evidence.

There is of course a wide diversity of views on nuclear energy among the population. There is vigorous debate between actors that plays out in the print and online media, across civil society groups and also a diversity in views among political parties and individual elected representatives. This diversity is far less apparent in policy decision making processes, however.

The restriction of voices in the government approach to nuclear policy making raises questions on the state of democratic processes at the heart of technological projects: *'it's not really a reach to ask the question whether UK parliamentary committees have evolved from being questions of participatory democratic institutions to unfortunately what may be nuclear autocratic institutions'* (NGO 2, lines 708-712). The closed character of nuclear debate has been tangible to nuclear critics over recent years: *'so about two or so years ago, guys like me could absolutely get on the BBC, the Guardian, the Times, the Telegraph, the FT without a problem. These kinds of discussions could be heard quite freely in the UK, no problem. About two years ago, they started to be limited and now I personally struggle to even get a letter published in The Guardian. Something very significant has happened in terms of the potential to speak freely in a democracy about what is an absolutely key risk'* (NGO 2, lines 1230-1246). This phenomenon may not be specific to the UK, but also be occurring in other nations: '*and in France, guys like [NGO 1], … in America, the same thing, [Y]… Everybody is saying the same thing. It's very, very difficult to get heard at the moment'* (NGO 2, lines 1275-1278). It seems that critical voices are finding themselves ignored or demonised: one NGO spokesperson condemned the systematic 'anti-nuclear' badge that is automatically put on reasonable critiques of nuclear energy: *'Anyone who is critical of nuclear power, me for instance… (are told) "It's inacceptable", "it's being 'anti-nuclear'". And being anti-nuclear is a sin'* (NGO 1, lines 122-123).

During the Environmental Audit Committee, the Head of Nuclear Industry body was confronted with the findings from the World Nuclear Industry Status report which cast doubt over the economic viability of SMRs. They replied: *'the authors of that report— which I think is an annual report—are a group of nuclear-sceptic academics. […] The titling of the report you mention is often used to present it as though it is completely objective, and it is not. I just want to make that point. I do not necessarily agree with the conclusions or the statement you have just quoted from that report'* (Head of Industry Body, transcript of EAC, 2023: 9). Rather than providing counter evidence, the response is based on a claim of intellectual bias and a suggestion the evidence could be doubted on ideological grounds. This implies that arguments supported by SMR proponents are facts, whereas arguments supported by sceptics are ideological. This positioning is questionable, given the prospective performance of SMRs are still being

debated among nuclear technical experts. On waste for instance, there are a range of analyses that make different claims for the volumes of radioactive wastes from SMRs.

For the UK government, the materialisation of a new civil nuclear programme and the technological choices it entails appear to be solely a matter of industrial and financial capacity: *'[…] it is likely this capacity will constitute a combination of technologies, across SMRs, AMRs and large-scale projects. Over time, it will become clear which offer the best value for money and delivery certainty'* (DESNZ, 2024: 21). The priority placed by the government on industrial and financial considerations can explain the range of stakeholders it chooses to consult in its decision-making processes. In this approach, the government leaves out of the conversation those who think beyond issues of industrialisation and investment. On the one hand, it leaves out of the conversation those who argue against the merits of a new civil nuclear programme. But also, it restricts the conversation. By focusing on technological capacity and affordability, the government omits to consider other nuclear concerns that would make the conversation worthwhile, for instance those of radioactive waste management and proliferation risk.

On proliferation risks, the Roadmap signals an emphasis by the government to enact *'measures applied to sites and materials to prevent the misuse of civil nuclear sites and proliferation of materials for military purposes'* (DESNZ 2024: 34) and recalls that the UK is a signatory of major international agreements (e.g., IAEA NPT) with a strong security culture. However, it fails to consider the implications of the emergence of a possible multitude of nuclear sites on the governance of security. On the management of radioactive waste produced through new nuclear projects, the information provided in the Roadmap is scarce. The UK remains in a process of searching for a site to locate its Geological Disposal Facility (GDF), the interim storage of radioactive wastes appears to be the way forward for the time being: *'As interim storage has proved safe and secure for over 50 years, we are confident that radioactive waste and spent fuel from new nuclear projects can be safely stored pending final disposal in a GDF'* (DESNZ, 2024: 53). The consideration given by the UK government to the issue of radioactive waste management in its 70-page roadmap is summed up in three pages (see DESNZ, 2024: 53-55).

Opening up the debate to include a wider range of stakeholders, as all of our interviewees suggested, would have repercussions. Even though some respondents were convinced that such wider dialogue would lead to a majority in favour of the nuclear choice, this outcome cannot be taken for granted. Opening the conversation could allow alternative visions of the future to be expressed; counter arguments could alter the nuclear promises; longstanding nuclear issues could be brought up. In opening the conversation, the nuclear industry and government inevitably take the risk of seeing communities shutting their doors to new nuclear projects. The options for upstream engagement are therefore shut down.

3.6.4.2 Downstream engagement with communities

The message of past and current governments is clear: nuclear power is the way forward and the government wants to give confidence to investors and to the nuclear industry that the development of new nuclear projects will be politically supported and incentivised. Limited consideration has been given to bringing along the population with this vision and arguably even less to how they may engage likely siting communities.

The policy experts we interviewed were critical of the ways the nuclear industry approaches communities. *'The nuclear industry has a dreadful track record of going to the public and talking about itself. It turns up somewhere to talk about nuclear, and they never turn up in a community and talk about*

the community first' (Nuclear Industry Policy Expert, lines 1324-1327). A typical format would involve visiting a community to ask whether these communities want nuclear energy, then structuring the conversation around the advocacy that nuclear energy is safe. *'If you go to a bunch of people and say, would you like some nuclear or not, it's very easy to say, 'no thank you''* (ibid., lines 1345-1347). Some interview respondents acknowledged a wide range of reasons why people would feel concerned about nuclear energy and reject it, for instance health impacts of radiation, unclear procedures in the case of radiation exposure, the possibility of a major nuclear accident, the legacy of waste, or the historical link with nuclear weapons. In the wake of these aspects, communities feel a suggested sense of powerlessness, with no other alternative than trusting the technical experts in ensuring safety, which may legitimately raise concerns (ibid.). The industry tends to approach these concerns with technical responses, going into deep technical details on how safe the reactors are, which is not an effective approach: '*the nuclear industry just goes in and tells them how safe their reactor is. And you know, you could draw those parallels with the airline industry […]. When you get on a plane, they have to do the safety brief, but they don't tell you in great detail how firmly their wings are bolted onto the plane. […] You know, if they started to tell you how firmly the wings were bolted onto the plane, the first thing you feel is s***, the wings are going to fall off the plane!'* (ibid., lines 1428-1432). Making a parallel with other industries (airline, automotive), the nuclear industry often starts a public conversation with a strong emphasis on safety, rather than a focus on the possible benefits of the technology: *'So you get on a plane and they say, you know, 'sit back in your seats. We're going to take you to Honolulu and do you want the fish or the chicken when the trolley comes around?' The nuclear industry starts showing you graphs of how few accidents we have and all the safety systems we have to keep the plane in the air. And that just makes you more worried'* (ibid., lines 1460-1464). An alternative strategy to 'convince' communities to opt in new nuclear projects would be to move away from a conversation on risks and rather emphasise the benefits they will receive, for instance through a reduction in electricity bills (several respondents). The conversation could also emphasise the role of nuclear in the decarbonisation strategy e.g. asking: *'do you want clean energy infrastructure and a reduction in your bills and to be playing your part in saving the planet?'* (ibid, lines 1614-1615).

3.6.5 Conclusions

The rationale for nuclear energy futures in the UK varies across time, place and interlocutors. Within recent times, the reasoning to increase nuclear capacity has ranged across economic savings, reigniting a national industrial base, energy security and climate mitigation towards a net zero goal. Despite the varied policy imperatives and their centrality to national needs, there is limited evidence of systematic stakeholder engagement across relevant actors. A democratic deficit in the nuclear energy policy realm in the UK is apparent. There are few directly available means to input to discussions on nuclear policy and virtually zero opportunities on specific elements of policy such as the development of SMRs. The opportunities for public engagement with the focus, scale, direction and decision making in relation to energy policy are highly limited. Openings to comment on government policy are restricted to specific forms of input e.g. written evidence to formal government processes. Calls for consultation on specific items and to submit to hearings of Parliamentary Select Committees, are published on the government website and not advertised. It should be noted these are consultations on draft policy and draft decisions, not stakeholder engagement as commonly understood.

The majority of policy implementation work is devolved to a large range of quasi-governmental or quasi-independent organisations. The regulatory regime is similarly complex in terms of multiple organisations sharing out, sometimes seemingly overlapping, responsibilities. Many of these

organisations engage with industry stakeholders regularly but few groups beyond those. Opportunity for members of the public to interact with such organisations do occur but infrequently, and information on this tends to be available only on organisational websites. Members of the public would need to be highly active, and info-seeking constantly, in order to come across these opportunities.

Our analysis suggests further, that SMRs are political artefacts that have been defined in UK terminology as those more tangible technologies that can meet short term political imperatives; AMRs belong to the realm of future -hypothetical- possibilities that may be brought to the fore as new political imperatives arise: *'I remember somebody saying what the nuclear industry needs is a reactor that you can design, plan, build and operate, all between two general elections.'* (Industry policy expert, lines 685-687).

How / why is (new) nuclear coming on the agenda?

In an effort to decarbonise energy production systems, the UK government has manifested a growing interest in re(developing) nuclear energy production. The UK government launched the 'Civil Nuclear: Roadmap to 2050' (DESNZ, 2024) to path out the strategy towards deployment of new nuclear build for civil nuclear energy production from the current generating capacity of 6GW, to 24GW by 2050. The suggested UK nuclear renaissance will rely on the development of three types of nuclear energy technologies: large scale reactors, SMRs, and AMRs. Although new large reactors are under construction, the majority of the 24GW will be sustained through SMRs and AMRs. SMRs are expected to start delivering electricity in the early 2030s. In Spring 2023, Great British Nuclear (GBN) was set up to deliver the strategy. GBN's first mission is to coordinate a competition that will ultimately lead to the selection of SMRs designs that will be supported by the UK government. The justification for a focus on SMR in the nuclear roadmap relates to i) economics, ii) anticipated speed of deployment, and iii) the opportunity to rebuild an industrial skills base.

How are policy decisions made?

The energy policy regime is held by the national UK government. The majority of political parties are in agreement on Net Zero goals but there is some difference in policies between parties on how this could be achieved. The main political parties all support nuclear as part of the future energy mix so there is little differentiation in terms of how voters can engage in energy policy choices. More specifically, technological choices relating to SMRs are prone to differing government logics. On the one hand, selected designs must fulfil a need for energy security: at least one of the chosen SMR designs will have to be readily deployable in the UK, with both technical and economic performances already proven. On the other hand, selected designs must foster the development of the UK expertise in the nuclear supply chain: at least one of the selected designs will maximise UK intellectual property, allowing the possibility to see a UK design exported worldwide. As a result, SMR designs have been narrowed to scaled-down versions of PWR and BWR. For the UK government, SMRs based on water-cooled reactors are best fit for quick development and for the fulfilment of energy security and industry development imperatives.

How have stakeholders experienced participation in relation to nuclear energy?

The Roadmap issued by the government is indicative of the conversation around nuclear strategy being a three-way dialogue between the government, the nuclear industry, and possible investors. Parliamentary committees that have conducted consultations have invited oral evidence from industry and SMR proponents. All other stakeholders (NGOs, individuals, other interested groups) can submit written evidence only and it's unclear whether this is taken into consideration. Public voices are (literally) unheard. Overall, no societal engagement on new nuclear prospects has yet occurred, and there

is no indication that such debate will be organised. The organisation of nuclear policy and its implementation in the UK in effect reduces the possibility of public engagement to downstream opportunities in the planning regime i.e. when applications for siting of reactors are put before local councils. Even then, as more of the energy system becomes designated as a 'Nationally Significant Infrastructure Project' (a new planning regime to 'streamline' the deployment of key, but potentially unpopular, infrastructure) the opportunities to engage become further reduced. Some specific bodies involved in the implementation of nuclear strategy e.g. the Office for Nuclear Regulation, the Environment Agency, do offer opportunities for people to submit views at certain points in time, but these opportunities are not widely visible nor are they framed for active engagement.

What suggestions can be made in view of improving stakeholder engagement?

Stakeholder engagement can be improved on several levels and particularly in terms of the diversity of perspectives that are brought into the nuclear conversation. There is need for a forum where actors of the nuclear industry could meet to discuss what the industry needs, and what it can offer the government. Second, the nuclear industry needs to engage with broader society to raise the workforce that it will need. Third, all our respondents recognised the need for an open and transparent conversation within broader society. Articulating the conversation around new nuclear builds in relation to the UK decarbonisation strategy and climate goals requires democratic processes to be enacted. The benefits of such conversation are twofold: i) the conversation could determine whether or not nuclear energy should be integrated in the UK decarbonisation strategy, possibly leading down the line to a better acceptance of choices made (e.g., more willingness for new nuclear builds); ii) the conversation should include those voices currently left out (nuclear critiques), with the potential to bring to the debate those nuclear issues currently disregarded (e.g., nuclear waste, security.)

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4 Synthesis of findings from case studies

In this section we present a synthesis of results from the case studies, organised along three themes:

- Main findings from the cases, including recommendations related to stakeholder engagement in nuclear energy policy,
- Drivers - Why Engage Stakeholders?

- Forms – How to Engage Stakeholders?

4.1 Case study Belgium

4.1.1 Main Findings

- The nuclear energy debate on X in Flanders is highly politicized, with different parties emphasizing distinct energy policy frames. While clean energy frames are adopted across parties, the prevalence of other frames varies significantly by political ideology.
- The Russian invasion of Ukraine and the energy crisis significantly influenced the discourse, leading to a rise in the energy security frame at the expense of energy affordability and clean energy.
- The discussion on small modular reactors differs from the general nuclear energy debate, attracting center-right parties and emphasizing nuclear safety and economic growth rather than energy security or affordability. The distinct characteristics of the SMR debate show potential for reframing nuclear energy discussions in ways that engage different (political) stakeholders.
- Politicians' use of X can enhance transparency by enabling direct communication with the public, fostering real-time updates on nuclear energy policies and decisions to which citizens can react. However, the dominance of oppositional parties in online discourse suggests that online discussion might be driven more by political rivalry and strategic decisions than by transparency and encouraging stakeholder engagement.

4.1.2 Drivers – Why Engage Stakeholders?.

- Shifts in framing (e.g., increased focus on energy security post-Ukraine invasion) highlight the importance of adapting engagement strategies to geopolitical realities.

4.1.3 Forms – How to Engage Stakeholders?

- Adjusting the use of energy policy frames to align with stakeholders may increase the likelihood of their engagement. For example, focus on clean energy with stakeholders worried about climate change (such as certain NGOs) or use energy security frames with stakeholders worried about blackouts (such as industries relying on a stable energy supply).

4.2 Case study Slovenia

While Slovenia implemented a formally structured participatory and transparent approach, the analyses of public participation in nuclear issues suggests that the depth of stakeholder influence is limited. The exclusion of key civil society perspectives, the annulment of the referendum, and the dominance of pro-nuclear narratives raise concerns about true democratic engagement. Future decision-making processes could benefit from stronger mechanisms ensuring meaningful public participation and greater consideration of alternative perspectives.

4.2.1 Main findings

- Policy inconsistency and top-down governance: While Slovenia has a strong operational record in nuclear energy (notably with Krško NPP), its policy trajectory remains heavily top-down, driven by political consensus and international alliances (e.g. U.S. strategic agreements) rather than open, transparent stakeholder participation.

- Symbolism vs. participation: Slovenia's nuclear policy is often framed through national pride and technical competence narratives, which obscure broader societal deliberation. Public consultations (e.g., on the NEPN) included diverse stakeholders but had limited influence on final decisions. The cancellation of the 2024 referendum on NEK2 undermined declared democratic aspirations.
- Selective stakeholder inclusion: While multiple public consultations were conducted (e.g., NEPN 2022–2024), most stakeholder feedback, particularly critical or alternative viewpoints, was not meaningfully incorporated into final plans. Comments from civil society and NGOs were often ignored or categorised as general remarks.
- Dominant voices: The nuclear industry, governmental bodies, and affiliated academic institutions dominate the discourse. Environmental NGOs and alternative energy advocates are underrepresented and often sidelined.
- Current drivers: The rationale for expanding nuclear power includes energy security (post-Ukraine war), climate goals, and geopolitical alignment. However, there is limited critical assessment of feasibility, risks, or non-nuclear alternatives.

4.2.2 *Drivers – Why Engage Stakeholders?*

- Legitimacy and trust: The nuclear expansion path, particularly NEK2, risks losing legitimacy due to its opaque decision-making processes. Public trust in institutions is weakened when consultations are symbolic or retroactively justified.
- Diversity of perspectives: The dominance of pro-nuclear narratives restricts policy robustness. Broader engagement, especially with dissenting voices (e.g., environmental NGOs, independent researchers), is necessary for democratic resilience and comprehensive risk assessment.
- Complex societal impacts: Nuclear energy involves long-term commitments, high financial stakes, and complex ecological considerations. Inclusive stakeholder involvement ensures these are responsibly evaluated and publicly accepted.
- Intergenerational justice: Given long-term waste management and decommissioning issues, decisions made today impact future generations. Stakeholders, including youth and local communities, must have genuine influence in shaping outcomes.

4.2.3 *Forms – How to Engage Stakeholders?*

- Structured, inclusive forums: Establish durable platforms for interdisciplinary and cross-sector dialogue, ensuring representation across the quintuple helix model (industry, academia, environmental NGOs, political institutions, civil society). Lessons from Switzerland's referendum model suggest that informed public deliberation leads to more legitimate outcomes.
- Beyond consultation – co-decision: Move from informative or consultative stages to participatory or deliberative models, where stakeholder input can shape policies and options. For instance, prior to committing to NEK2, a full comparative analysis with 100% renewable scenarios should be publicly debated.
- Transparency and accountability: Guarantee public access to all background documents, risk assessments, and justifications for decisions (e.g., why certain comments were accepted or rejected in NEPN consultation). Establish independent oversight bodies to evaluate stakeholder engagement quality.
- Rebalance communication: Counter the current PR-heavy pro-nuclear messaging by funding outreach and research on alternative energy paths. This will help level the informational playing field and foster more balanced public debate.
- Youth and local engagement: Continue involving youth groups and local communities not just in consultations, but in long-term planning and oversight. Their inclusion is vital for intergenerational legitimacy and sustained societal acceptance.

4.3 Case study Slovakia

4.3.1 Main Findings

- There is an almost complete absence of critical perspectives on Slovakia's global co-leadership in share of nuclear power in electricity production.
- The only Slovak environmental NGO active in nuclear sector related oversight deals solely with nuclear waste management issues in the region near J. Bohunice NPP.
- Three Slovak NGOs plus Greenpeace, which all participated in the Environmental Impact Assessment (EIA) for Mochovce NPP completion in 2009, stopped their activities related to Slovakia's commercial nuclear program since about 2010 – 2012.
- Slovak policymakers have deliberately restricted the application of the Aarhus Convention since 2006, particularly for the nuclear sector since 2010.
- A controversial 2010 amendment to the Freedom of Information Act reclassified substantial nuclear information as confidential.
- Multiple governments led by SMER-SD have intentionally implemented actions limiting NGOs' rights under the Aarhus Convention and related EU directives.
- Both ruling and opposition parties fail to provide clear responses on spent nuclear fuel final disposal solution, and generally prefer vague promises.

4.3.2 Drivers – Why Engage Stakeholders?

- In the past, NGOs played a key role at the European level in providing critical perspectives and democratic oversight of nuclear energy policy and projects.
- Slovak environmental NGO participation in EIA procedures used to be the main form of representing public interests in health, environment and safety in this field.
- Stakeholder engagement helps ensure transparency and accountability in spent nuclear fuel disposal planning and other nuclear sector decisions.
- NGO watchdog functions are vital for ensuring compliance with international agreements like the Aarhus Convention and related EU directives.

4.3.3 Forms – How to Engage Stakeholders in Slovakia?

- It seems that relevant stakeholders with sufficient expert capacities for meaningful engagement in this field cannot sustain without being provided with sufficient long-term core financing of stakeholder engagement activities from public finance.
- New funding mechanism(s) seem to be needed to replace the short-term, project-specific financing that followed Slovakia's EU accession. Multi-annual core funding for strategic continuity, as used to be provided by USA-based foundations prior to Slovakia's accession into the EU, seems to be needed for environmental NGOs to be able to recruit and retain personnel with the inherently required specialized expertise.
- Public funding seems needed to support the legal expertise needed to navigate the intentionally complex and frequently amended legal provisions on transparency and participation.
- Public financing is crucial for establishing collaborative networks between academic institutions and environmental NGOs to develop and maintain the specialized knowledge required for effective nuclear sector oversight.
- Implementing actions inspired by good practices from abroad seems to inevitably require these to be tailored to Slovakia's local specifics.

4.4 Case study Spain

4.4.1 Main Findings

- The decision-making process regarding the gradual phase-out of nuclear power in Spain did not include all relevant stakeholders. The government reached this decision through negotiations with the electricity companies that own the nuclear power stations.
- Decisions are perceived as primarily influenced by political and economic interests, leading to significant problems, including inadequate stakeholder involvement, a worrying lack of transparency, limited scientific advice, insufficient expert debate, and a noticeable lack of public engagement.
- Lack of transparency on the part of both the government and the nuclear sector. The validity of the government's decisions is questioned, as they appear to lack a sound scientific basis and to be motivated by a desire to win votes rather than to develop government policies that meet the country's needs. Furthermore, the electricity companies are criticised for their 'opacity' in managing information that the public should know.
- The Aarhus Convention has not been complied with in Spain. The only case of effective citizen participation occurred in 2010 when municipalities were involved in discussions regarding a potential centralized temporary storage facility for radioactive waste. Ultimately, however, the decision was political, and the government chose a decentralized disposal method instead.
- The debate in parliament has included requests to reconsider the nuclear closure criteria, the possible delay of the phase-out, and transparency issues. In addition, the main concerns raised include energy security, decommissioning plans, and the socio-economic impact of these decisions.

4.4.2 Drivers – Why Engage Stakeholders?

- The limited involvement of a wide range of stakeholders in the decision-making process for phasing out nuclear power in Spain has resulted in significant economic, social, and environmental challenges. To address these issues, it is crucial to promote an open and transparent dialogue that includes the perspectives of all parties, including experts and citizens, from the early stages of decision-making.

4.4.3 Forms – How to Engage Stakeholders?

- Transparent and legitimate decisions that include the participation of experts in different areas (technicians, sectors of the energy industry, socio-economic analysis) to base decisions on facts and verified information.
- Strategic decision-making process with a long-term vision within a state policy, taking into account the needs and concerns of the population.
- Open channels of communication between citizens and public authorities, including public debates and the dissemination of accurate and easily understandable information.
- Open dialogue and cooperation with different stakeholders and civil society is essential.
- Consider implementing similar actions from pioneering countries with good practices in participatory governance policies.

4.5 Case study Romania

4.5.1 Main findings

- Romania has a longstanding commitment to nuclear energy, currently providing around 18–20% of its electricity, with plans to expand to 40% in the medium to long term.
- The ALFRED project (Advanced Lead-cooled Fast Reactor European Demonstrator) is a major initiative aimed at developing advanced Small Modular Reactor (AMR) technology, with strong political and institutional support.
- The decision-making process for ALFRED siting combined technical and social criteria, emphasising infrastructure readiness, nuclear expertise, and strong public support at the local level.
- Stakeholder engagement efforts for ALFRED were proactive and structured from the early stages, distinguishing it from traditional approaches limited to formal Environmental Impact Assessment (EIA) stages.
- The creation of the ALFRED Local Dialogue Group (2015) played a crucial role in building trust, ensuring transparency, and actively involving local community members, authorities, and technical experts.
- Public perception of nuclear development in Mioveni is largely positive, supported by RATEN ICN's historical presence and safe operations of its nuclear installations, reinforcing community confidence.

4.5.2 Drivers – Why engage stakeholders?

- Building public trust and acceptance: Early and continuous engagement was essential to foster confidence in a highly technical and sensitive project like ALFRED, which proposes a completely new technolgy. Trust was crucial given the proximity of existing nuclear facilities.
- Enhancing project sustainability: Engaging stakeholders from the start allowed concerns about risks, benefits, and community expectations to be openly discussed, contributing to a sustainable project framework.
- Facilitating licensing and political support: Strong community and local government backing streamlined administrative processes such as issuing Urban Planning Certificates and Construction Authorisations for the experimental facilities of the ALFRED research infrastructure
- Applying best practices from EU projects: Romania incorporated lessons learned from European initiatives (like COWAM2, CIP, IPPA, PLATENSO, and EAGLE), emphasising public participation and social acceptance.

4.5.3 Forms – How to engage stakeholders?

- Proactive creation of dialogue structures: The ALFRED Local Dialogue Group included representatives from both the local authorities (mayor, councillors, citizens) and project experts (scientific director and specialists from RATEN ICN).

- Continuous information and participation: The group provided regular updates, discussions on project evolution, and opportunities for citizens to raise concerns and expectations.
- Integration of feedback into project development: Topics discussed included community benefits (job creation, infrastructure development, international visibility), risk perceptions, and sustainability aspects, ensuring community viewpoints shaped project planning.
- Promotion of long-term relationships: The engagement evolved into a Local Committee to maintain a permanent link with the community throughout project phases, reinforcing a participatory governance model.

4.6 Case study UK

4.6.1 Main findings

- Nuclear energy policy has been inconsistent over decades leading to a loss of skills, a lack of industrial infrastructure and an inability to perform effective stakeholder engagement.
- The Civil Nuclear Roadmap proposes a step-change in the energy available via nuclear projects but without concomitant step change in stakeholder engagement.
- Government, nuclear industry and investors are the key actors whose voices are present in policy making and debate on technological choices.
- Current policy drivers for the development of SMRs include economic savings, reestablishing the national nuclear skills base, energy security and climate mitigation towards net zero.

4.6.2 Drivers – Why engage stakeholders?

- The crucial role of wider society in the transition to net zero needs to be better understood and become integral to discussions on how the transition will be achieved through an acceptable mix of energy supplies.
- The limited number of voices present in current debates will result in a lack of resilience in policy and decisions.

4.6.3 Forms – How to engage stakeholders?

- Map and recognise the range of actors with a stake in the decision making and policy making processes, at all scales, and ensure those actors are included in discussions. Create durable structures and processes which engage stakeholders effectively and at appropriate times.
- A change in rhetoric from industry may promote more effective engagement. For example, a need to move away from a discourse based on the exceptionalism of nuclear technologies, that depicts nuclear energy as a complex technology that requires high emphasis on safety and security, towards a discourse that depicts nuclear technologies as normal engineering projects which offer many benefits.

- Drawing on the comprehensive taskforce report "Making a Net Zero Society: Follow the *Social* Science" (Bickerstaff et.al. 2024), we agree with the recommendation to establish a Net Zero Social Science Advisory Committee in the Department of Energy Security and Net Zero.

4.7 Nuclear Energy in Political Discourse: Belgium vs. Slovakia

Indirectly, ECOSENS research results also revealed significant differences regarding political parties' statements and related political discourse concerning commercial nuclear energy between Flanders (the Dutch-speaking part of Belgium) and Slovakia. In particular, analysis of Flemish political parties' posts and comments on the social network 'X' (formerly Twitter) revealed that political discourse on the issue is highly polarised and frame-dependent. In contrast, analysis of Slovak political parties' official pre-election statements revealed that a vast majority explicitly endorsed nuclear development, with not a single party opposing.

Moreover, Flemish parties seem to debate nuclear issues through different policy lenses: right-wing parties dominate the discourse volume, centre parties focus on economic growth, and left-wing parties emphasise affordability. In sharp contrast, Slovak parties typically expressed support for completing Mochovce NPP (Unit 4) without any specific justification, i.e., without applying any political lens. While most Slovak parties are transparent about backing a new NPP at Jaslovské Bohunice, none honestly addresses the significantly delayed SNF final disposal solution.

Furthermore, there is an emerging discussion specifically focused on small modular reactors (SMRs) in Flanders, led by centre-right parties. This discussion focuses on safety and economic growth rather than the security and affordability frames that dominate general nuclear energy debates. In contrast, in Slovakia, political parties rarely mention SMRs, seeming to rely on mass media and nuclear sector companies to present SMRs as a natural future component in Slovakia's already long, strong and unquestioned commercial nuclear programme.

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Glossary of terms

Stakeholder[52]	Actors (individuals or groups, institutional and non-institutional) with a tangible or intangible (yet to be shaped or discerned) interest in the radiation exposure situation and the related radiological protection issues. These may affect decisions, be affected by the formulation and resolution of a problem or challenge, or represent an affected party (humans or the environment). Stakeholders are constructed in interaction with actors, issues, contexts. Source: Turcanu C et al. 2020. Stakeholder engagement in radiological protection: Developing theory, practice and guidelines. Radioprotection 55(HS2). https://doi.org/10.1051/radiopro/2020008.
Levels of involvement	Participation can take different forms, involving uni- or multi-directional interactions; being institutional or citizen-led; having lower or higher influence on agenda-setting and decision making. It can range from providing information (low involvement), through to gathering information and dialogue (moderate involvement), to collaboration or partnership (high involvement). Source: Health Canada (2006). When analysing stakeholder involvement in nuclear waste management, Ferraro (2018) distinguishes for instance between information (the public knows things), consultation (the public says things), and participation (the public does things).
Types of stakeholders	One possible categorisation is the following. 1. Political stakeholders, e.g. government officials (local, regional, national), political action groups; 2. Industry stakeholders, e.g. nuclear energy producers, nuclear energy suppliers, nuclear energy industry associations; 3. Academic stakeholders, e.g. research centres, and universities; 4. Societal stakeholders, e.g. community groups, local residents, civil society organisations, NGOs; 5. Environment, e.g. environmental NGOs. Other descriptions distinguish between: statutory vs. non-statutory stakeholders (IAEA) or primary vs. secondary stakeholders (Aaltonen et al, 2010)
Governance	formal and informal actors and processes /structures involved in the interaction between government and society. Patterns of governance: the

[52] NEA: 'any actor – institution, group or individual – with an interest or a role to play in the radioactive waste management process' (OECD, NEA, Stakeholder Confidence in Radioactive Waste Management: An Annotated Glossary of Key Terms, 2022 Update, OECD, 2022, p. 49.)

IAEA: 'any group or individual who feels affected by an activity, whether physically or emotionally' (IAEA, Stakeholder Engagement in Nuclear Programmes, IAEA, Vienna, 2021, p. 5.).

Related dichotomies: statutory vs. non-statutory stakeholders (IAEA) or primary vs. secondary stakeholders (K. Aaltonen, J. Kujala, A project lifecycle perspective on stakeholder influence strategies in global projects, Scand. J. Manag. 26 (2010) 381–397.)

	societal context to which policy makers seek to respond; possibilities for governing: options they have and perceive to have for responding. Source: https://www.sciencedirect.com/science/article/pii/S0048733319300186
Risk governance	the various ways in which many actors, individuals, and institutions, public and private, deal with risks surrounded by uncertainty, complexity, and/or ambiguity. Source: Van Asselt, M. B., & Renn, O. (2011). Risk governance. Journal of risk research, 14(4), 431-449.
Value based premises for good risk governance	considers both the 'factual' and the 'socio-cultural' dimension of risk and is inclusive, with early and meaningful involvement of all stakeholders and, in particular, civil society. Source: Renn O. (2005). International Risk Governance Council. (2005). Risk governance: Towards an integrative approach. White Paper No. 1.
Principles of 'good' Governance	include, beyond participation, "transparency, effectiveness and efficiency, accountability, strategic focus, sustainability, equity and fairness, respect for the rule of law and the need for the chosen solution to be politically and legally realisable, as well as ethically and publicly acceptable" (pp.12). Source: Renn O. (2005). International Risk Governance Council. (2005). Risk governance: Towards an integrative approach. White Paper No. 1.
Transparency	The Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste defines transparency as ensuring effective public information and providing the necessary opportunities for all stakeholders concerned, including local authorities and the public, to participate in decision-making processes regarding spent fuel and radioactive waste management, in accordance with national and international obligations". However, in the EURATOM Nuclear Safety Directive transparency refers only to the obligation of EU Member States to make available the necessary information in relation to the regulation of nuclear safety of nuclear installations to the workers and the general public, with specific consideration to local authorities, population and other stakeholders in the vicinity of a nuclear installation, in accordance with national legislation and international obligations, and provided that this does not jeopardise other interests such as, inter alia, security, recognised in national legislation or international obligations.
Transdisciplinarity	an approach to research involving the integration of insights from multiple knowledge systems throughout the entire research process, i.e. different disciplines (natural sciences, social sciences, humanities, and arts); and multiple actors (civil society, practitioners, researchers, and policy makers).

Appendix A. Example of interview protocol

Adapted from Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Methods of data collection in qualitative research: interviews and focus groups. British dental journal, 204(6), 291-295; and B. Abelshausen (2018)). Semi-structured interviews for macro discourse that justify and/or prescribe stakeholder participation in Radiation Protection. CONCERT-ENGAGE project. (unpublished report, cited in Zeleznik et al., 2019: Report on venues, challenges, opportunities and recommendations for stakeholder engagement in emergency and recovery preparedness and response. CONCERT Deliverable D9.90. ENGAGE project.).

a. Description

Goal [adapt depending on case studies]: The purpose of the research interview is to explore the views and experiences concerning stakeholder engagement in nuclear energy policy, with a particular focus on….

Method: Semi-structured interviews consist of several key topics that help to discuss and define the broad areas of research interest, but also "*allow the interviewer or interviewee to diverge in order to pursue an idea or response in more detail. The flexibility of this approach, particularly compared to structured interviews, also allows for the discovery or elaboration of information that is important to participants but may not have previously been thought of as pertinent by the research team*" (Gill et al., 2008; pp. 291).

Questions are open-ended (i.e., **require more than a yes/no answer**), "***neutral, sensitive and understandable***". The questionnaire starts with questions that participants can answer easily and then proceed to more complex or sensitive topics.

The interviewer is encouraged to use **follow-up questioning.** Probing questions such as 'Can you tell me a bit more about that?' 'When you said … what did you mean?' can help to explore a topic in more detail.

Protocol: Before an interview takes place, respondents should be "*informed about* [the ECOSENS project and the research in detail], *and given assurance about ethical principles, such as anonymity and/or confidentiality"*. According to Gill et al., (2018; pp. 292), this "*gives respondents some idea of what to expect from the interview, increases the likelihood of honesty and is also a fundamental aspect of the informed consent process*".

Wherever possible, interviews should be conducted in areas free from distractions, preferably in a location chosen by the respondent.

During an interview, the interviewers should (Gill et al., 2008):

- *listen attentively* to what is being said, so that participants are able to recount their experiences as fully as possible, without unnecessary interruptions.
- *adopt an open and emotionally neutral body language, nodding, smiling, looking interested and making encouraging noises (e.g., 'Mmmm') during the interview*.
- *use silence, if appropriately, to allow respondents to contemplate their responses, talk more, elaborate or clarify particular issues*.
- *avoid the use of 'leading' or 'loaded' questions that may unduly influence responses*.
- *thank participants for their time and ask them if there is anything they would like to add at the end of the interview*.

- *debrief* respondents about the next stages of study after the interview has finished.

If the respondent consents to this, interviews should be audio-recorded and transcribed afterwards, as this "*protects against bias and provides a permanent record of what was and was not said*" (Gill et al., 2018; pp. 293). In addition, *'field notes' during and immediately after each interview* will be done to record "*observations, thoughts and ideas about the interview, as this can help in the data analysis process"* (idem).

b. Information for the interviewer

BEFORE AN INTERVIEW	
1	• Introduce yourself
2	• Explain the purpose of the study
3	• Ask the respondent to participate in a study conducted for a scientific purpose (as described in instructions). Explain that participation entails being interviewed on the topic of the study and that full anonymity is not guaranteed, i.e. it will be possible to identify the organization or institute of the participant. Personal names or very specific functions will however be anonymized (unless the respondent prefers otherwise).
4	• Ensure the participant that the interview will take between 30 min and 1 h.
6	• Ask for permission to record the interview. "*This helps us to analyze the questions correctly and more in depth."*
8	• Ask the respondent to say, whenever they have questions or problems with understanding the question.
DURING THE INTERVIEW	
1	• Write down the possible questions of the participants during the interview.
2	• Write notes or key words, also to remember for follow-up questions later in the interview.
AFTER THE INTERVIEW	
1	• Thank the participant
2	• Send a letter of thanks, if appropriate
3	• Share the main output generated based on the interview data (e.g. report, article, …) to obtain pre-publication feedback

c. Topic list [adapt depending on case study]:

Introduction

- Respondent information
    - What is the role of the organisation in the field of (nuclear) energy?

What is the role of the interviewee in the organisation? (potential probes: how long in the organisation? Previous functions and/or employments? Educational background? …)

Key topics [53]*:* Topic 1 at the start and topic 4 should towards the very end, but other topics might be interchangeable, depending on flow of conversation.

- TOPIC 1: **Context of participation.** In which context did you experience participation (e.g. regulatory requirement or other (e.g. scoping of a SEA, SEA, other; or policy formulation vs. implementation or evaluation)? What was the reason for engagement [with stakeholders] in this context? How did you experience participation? What were particular challenges? What went well in your opinion? Can you give also other examples of experiences you have?
- TOPIC 2: **Impact of participation**. What has the impact been of participation? Examples? Things that would have better been done differently in light of generated impact?
- TOPIC 3: **Forms of participation**. Possible question within this topic: Are there (other) situations where you encounter the need for stakeholder engagement in the field of nuclear energy [can be specified, depending on professional background respondent]? Why?
- TOPIC 4: **Low-carbon energy transitions.** In ECOSENS we are particularly interested in stakeholder engagement in low carbon energy transitions. In your view, how should stakeholders be engaged in decision-making on this topic?
- TOPIC 5: **Recommendations** - What constitute a good engagement process? What suggestions do you have for improving stakeholder engagement? And for the particular case of stakeholder involvement in low carbon energy transitions?

Interview ending

Summarizing question: interviewer shortly summarizes some of the main points, asks whether this is correct (possible also throughout interview as probing technique), and whether respondent would like to add something.

Ask whether respondent has any questions.

Thank you.

d. Technical part of the interview (filled by interviewer)

Code of the interview : initials +number+ place (write the same code on the questionnaire and audio file name

[53] These general topics are centred on stakeholder engagement, but they should be adapted to the case study



Q1	Date	
Q2	**Beginning of the interview?**	
Q3	**End of the interview?**	
Q4	Language	
Q5	Place	
Q6	Organisation	
Q10	Name of interviewer	
Interview topics		
Q11	Remarks on TOPIC 1	
Q12	Remarks on TOPIC 2	
Q13	Remarks on TOPIC …	

Appendix B. Informed consent form for participation in an interview

I agree to participate in a research study led by [Name of the Principle Investigator] from the [PI's Organisation]. The purpose of this document is to specify the terms of my participation in the study.

I have been given sufficient information about this research study. The purpose of my participation has been explained to me and is clear.

My participation in this study is voluntary. There is no explicit or implicit coercion whatsoever to participate.

Participation involves:

Being interviewed by (a) researcher(s) from [PI's Organisation]. The interview will last approximately 50 minutes. I allow the researcher(s) to take written notes during the interview. I also allow the recording (by audio tape) of the interview. It is clear to me that in case I do not want the interview to be recorded I am at any point of time fully entitled to request that the interview continues without recording.

I have the right not to answer any of the questions. If I feel uncomfortable in any way during any of the above sessions, I have the right to withdraw from the study.

I have been given the explicit guarantees that, if I wish so, the researcher will not identify me by name in any reports using information obtained from the study, and that my confidentiality as a participant in this study will remain secure. I do however give permission to use the name of my institution or general function within this institution. In all cases subsequent uses of records and data will be subject to standard data use policies at the [PI's Organisation].

I have been given the guarantee that for research problems or any other questions regarding the research project, the [PI's Organisation] Ethical Committee may be contacted through [information of the contact person at the Ethical Committee at [PI's Organisation, contact person]].

I have read and understood the points and statements of this form. I have had all my questions answered to my satisfaction, and I voluntarily agree to participate in this study.

For further information, please contact:

[Name of Principle Investigator]

[Contact Information of PI]

Appendix C. Invitation for an interview in the framework of the ECOSENS project case study

Subject: Invitation for interview in the framework of the European project ECOSENS

Dear ***(name of interviewee)***,

Within the framework of the HORIZON-EURATOM project ECOSENS (https://ecosens-project.eu/), I would like to invite you to partake in an inerview regarding the involvement of stakeholders in nuclear energy governance. ECOSENS stands for "*Economic and Societal Considerations for the Future of Nuclear Energy in Society*" and is coordinated by RATEN, Romania.

ECOSENS (2022-2025) is a European Commission-funded coordination and support action. It brings together specialists of social research and of nuclear energy research and policy to exchange views and collaborate with civil society and other relevant stakeholders with the aims of:

- *Providing a societal perspective on the development and use of existing and new nuclear technologies, in the context of major societal challenges: climate crisis, sustainable development and energy security.*
- *Providing an assessment of nuclear energy sustainability considering the entire life cycle of the current nuclear technologies, possible evolutions of the energy markets and nuclear technologies in the transition toward climate neutrality, and the societal perspective, in order to reveal and evaluate the possible roles of nuclear power within the European energy mix viewed at 2030, 2050 and beyond.*
- *Provide a new economic model, based on the System of Provision, for the assessment of nuclear energy, providing a suite of indicators relevant not just for the investors (e.g. equity holders) but for a broad variety of stakeholders (e.g. consumers, governments, suppliers).*

ECOSENS will involve both technical and social actors to investigate the role of nuclear power in a decarbonized energy system, considering the future evolution of nuclear technologies together with the evolution of other clean and renewable energy technologies, in the context of technological development, environmental requirements, and societal and market evolutions.

Within the frame of the ECOSENS project, I would like to interview you, based on your own expertise and experiences, concerning **[Fill in relevant topics**[54]: e.g. Experiences with stakeholder engagement in nuclear energy governance **]**

As per your preference, the interview can be conducted in person, or if needed also via telephone or Skype. The duration of the interview is approximately 30 minutes to one hour. For the interview your consent (see below) will be requested, stipulating the provision of anonymity (which will be mutually agreed upon). The interview will be audio-recorded, transcribed and analyzed together with other interviews to deduce mutual and divergence experiences with stakeholder engagement. A report on the findings of the research will be made publicly available.

[54] Should not be too detailed.

In case you are interested in participating in the interview, please inform me via return email ***(insert email-address)*** or telephone ***(insert telephone number)***. In case you have any additional questions please contact me.

Best regards,

(Insert signature)

(Insert name and contact details)

Appendix D. Dictionary keywords

clean_energy_frame = ["schoon", "emissie", "duurzaam", "hernieuwbaar", "klimaat", "groen", 'proper', 'co2', 'vervuilen', 'vervuilend', "milieu", "ecologisch", "herbruikbaar", "efficiënt", "energiezuinig", 'transitie', 'fossiel', 'ecologisme', 'koolstofneutraal']

energy_security_frame = ["zekerheid", "stabiel", "betrouwbaar", "veerkrachtig", "afhankelijkheid", "buitenlands", "afhankelijk", "onafhankelijk", "continuïteit", "zekerheidsbeleid", "strategisch", "resilient", "energiebevoorrading", 'zekere kernenergie', 'onzekere energie', "voldoende energie", "voldoende elektriciteit", "winter", 'stabiliteit', 'energievraag', 'basiscapaciteit']

nuclear_safety_frame = ["veiligheid", "risico", "ongeval", "straling", "afval", "protocol", "ramp", "voorzorgen", 'veilig', 'ontmanteling', 'kernafval', "inspectie", "veiligheidsmaatregelen", "radiatie", "gevaar", "haperen"]

economic_growth_frame = ["economisch", 'economie', "groei", "baan", 'jobs', "investering", "industrie", "ontwikkelen", "lokaal", 'globaal', "ontwikkeling", "arbeidsmarkt", "concurrentie", "innovatie"]

energy_affordability_frame = ["rente", 'consument', 'belastingbetaler', "prijs", "kost", "financieel", "toegang", "stijgen", "goedkoop", "consument", "betaalbaar", "huishoudens", "verbruikskosten", "financiële druk", "economische last", 'belastingsgeld', 'taks', 'factuur', 'energiearmoede']

Appendix E. List of politicians by party

Political party	Politician
CD&V	Annelies Verlinden
CD&V	cd&v
CD&V	Hendrik Bogaert
CD&V	Hilde Crevits
CD&V	Koen Geens
CD&V	Mieke Schauvliege
CD&V	Peter Van Rompuy
CD&V	Sammy Mahdi
CD&V	Servais Verherstraeten
CD&V	Verherstraeten
Groen	Bert Anciaux
Groen	Björn Rzoska
Groen	Bogdan Vanden Berghe
Groen	Filip Watteeuw
Groen	Groen
Groen	Jeremie Vaneeckhout
Groen	Kristof Calvo
Groen	Lies Corneillie
Groen	Meyrem Almaci
Groen	Nadia Naji
Groen	Petra De Sutter
Groen	Piet De Zaeger
N-VA	Andries Gryffroy
N-VA	Anneleen Van Bossuyt
N-VA	AnnickDeRidder
N-VA	Assita KANKO
N-VA	Bart_DeWever
N-VA	Ben Weyts
N-VA	Bert Wollants
N-VA	Darya Safai
N-VA	de_NVA
N-VA	Geert Bourgeois
N-VA	Jan Jambon
N-VA	Jasper Pillen
N-VA	Jean Marie Dedecker
N-VA	Johan Van Overtveldt
N-VA	Karl Vanlouwe
N-VA	Koen Daniëls
N-VA	lorinparys
N-VA	N-VA

N-VA	Peter De Roover
N-VA	Sophie De Wit
N-VA	Theo Francken
N-VA	Zuhal Demir
N-VA	**Sander Loones**
Open VLD	Alexander De Croo
Open VLD	Christian Leysen
Open VLD	Egbert Lachaert
Open VLD	ElsAmpe
Open VLD	Gwendolyn Rutten
Open VLD	Hilde Vautmans
Open VLD	Maggie De Block
Open VLD	Maurits Vande Reyde
Open VLD	Open Vld
Open VLD	Stephanie D'Hose
Open VLD	Sven Gatz
Open VLD	Tinne Van der Straeten
Open VLD	Vincent Van Quickenborne
PTB-PVDA	David Pestieau
PTB-PVDA	Jos D'Haese
PTB-PVDA	Partij van de Arbeid
PTB-PVDA	Peter Mertens
PTB-PVDA	Raoul Hedebouw
PTB-PVDA	Sofie Merckx
Vlaams Belang	Barbara Pas
Vlaams Belang	Chris Janssens
Vlaams Belang	Dries Van Langenhove
Vlaams Belang	Filip Dewinter
Vlaams Belang	Gerolf Annemans
Vlaams Belang	Sam van Rooy
Vlaams Belang	Tom Van Grieken
Vlaams Belang	Vlaams Belang
Vooruit	Ben Segers
Vooruit	Conner Rousseau
Vooruit	Hannelore Goeman
Vooruit	Kathleen Van Brempt
Vooruit	Melissa Depraetere
Vooruit	Robrecht Bothuyne
Vooruit	Vooruit

Appendix F. Prompt for Meta-Llama-3.1-8B-Instruct and gpt-4o-mini

"""

Task: Identify the frame(s) used in a Dutch Twitter post about nuclear energy.

What is a Frame? A frame is a way of presenting or structuring information that shapes how it is perceived and interpreted. It highlights specific aspects, provides particular interpretations, and guides the audience's response. Frames influence how issues are understood by focusing on certain elements and guiding interpretation.

There are 5 relevant Frames for Energy:

- Clean Energy Frame: This frame emphasizes the environmental benefits and sustainability of energy. It highlights aspects such as reduced pollution, lower CO2 emissions, and contributions to the fight against climate change. This frame may be used to argue that a certain source of energy is a cleaner alternative compared to fossil fuels, or worse than wind or solar power.

- Energy Security Frame: This frame emphasizes the need for a stable, reliable, and continuous energy supply. It sometimes involves metaphors, such as references to difficult winters or fears of the "lights going out." Additionally, concerns about dependence on foreign or unstable energy sources are relevant to this frame, along with ensuring that the energy system is both resilient and secure.

- Nuclear Safety Frame: This frame deals with the safety measures and risk management around nuclear energy. It addresses concerns about nuclear accidents, radiation risks, and waste management, focusing on the safety protocols and technologies in place to mitigate these risks.

- Economic Growth Frame: This frame highlights the broader economic benefits of energy production, such as job creation, economic impact, investment opportunities, and industrial growth. It focuses on the economic impact of energy production facilities, including its role in boosting local economies and supporting industrial development.

- Energy Affordability Frame: This frame focuses on the cost aspects of energy and its impact on the affordability of energy for consumers and businesses. It addresses concerns about energy prices, cost-effectiveness, and financial accessibility to energy.

Additional Guidance:

- A single post may use multiple frames. Annotate all frames that are used in relation to energy, not just the most prominent one.

- Posts may not always fit neatly into one of the frames. Some terms can apply to multiple frames (e.g., "energy efficiency" could relate to both Clean Energy and Economic Growth frames, and keeping nuclear plants open may relate to energy security but also to affordability). Do not annotate anything unless it's clear which frame it belongs to.

- Some posts may discuss other issues, such as political processes. Focus on frames directly related to energy and disregard others.

- Frames can present a certain energy source in a positive or negative light.

- A higher recall is preferred over a high precision, so in case of doubt: annotate!

Guidelines for your answer:

1. Your answer should be in json format.

2. For each frame, you should explain why you think the frame is (not) present; You should explictly refer to the relevant words or phrases that contributed to your interpretation.

Answer structure:

It is crucial that you format the answer as a JSON-object with the following 10 keys: "Energy Security","Energy Security-rationale","Clean Energy","Clean Energy-rationale","Economic Growth","Economic Growth-rationale","Nuclear Safety","Nuclear Safety-rationale","Energy affordability","Energy affordability-rationale".

Do not add anything else or use different formatting.

Examples:

- This is the Twitter post you need to analyse: "Hoewel kernenergie bijdraagt aan een stabiele energievoorziening, zijn de veiligheidsrisico's en hoge kosten een groot probleem voor veel huishoudens."

{

"Energy Security": 1,

"Energy Security-rationale": "The post mentions nuclear energy contributing to a stable energy supply, which relates to Energy Security.",

"Clean Energy": 0,

"Clean Energy-rationale": "Clean energy is not discussed.",

"Economic Growth": 0,

"Economic Growth-rationale": "Economic growth is not mentioned.",

"Nuclear Safety": 1,

"Nuclear Safety-rationale": "The post mentions safety risks associated with nuclear energy, relating to the Nuclear Safety frame.",

"Energy affordability": 1,

"Energy affordability-rationale": "The post refers to high costs impacting households, which relates to Energy affordability."

}

- This is the Twitter post you need to analyse: "Door investeringen in kernenergie kunnen we onze afhankelijkheid van fossiele brandstoffen verminderen en bijdragen aan de duurzame energietransitie."

Answer:

{

"Energy Security": 0,

"Energy Security-rationale": "While the post mentions reducing dependence, this relates to fossil fuels, not Energy Security.",

"Clean Energy": 1,

"Clean Energy-rationale": "The reference to contributing to a "duurzame energietransitie", a sustainable energy transition, indicates a Clean Energy frame.",

"Economic Growth": 0,

"Economic Growth-rationale": "Economic growth is not referenced.",

"Nuclear Safety": 0,

"Nuclear Safety-rationale": "Nuclear safety is not discussed.",

"Energy affordability": 0,

"Energy affordability-rationale": "Energy affordability is not mentioned."

}

- This is the Twitter post you need to analyse: "We hebben het onderwijs gemoderniseerd, gezondheidszorg hervormd, infrastructuurprojecten gerealiseerd, kerncentrales operationeel gehouden en belastingregels aangepast. Deze zijn duidelijke verwezenlijkingen."

Answer:

{

"Energy Security": 0,

"Energy Security-rationale": "There is no mention of energy security issues around nuclear energy.",

"Clean Energy": 0,

"Clean Energy-rationale": "There is no mention of environmental benefits or sustainability related to nuclear energy.",

"Economic Growth": 0,

"Economic Growth-rationale": "Economic growth is not explicitly discussed or linked to the efficiency of energy production in this post.",

"Nuclear Safety": 0,

"Nuclear Safety-rationale": "Nuclear safety is not mentioned in this context.",

"Energy affordability": 0,

"Energy affordability-rationale": "Energy affordability is not addressed in the post."

}

- This is the Twitter post you need to analyse: "De integratie van kernenergie in de energiemix kan bijdragen aan de economische ontwikkeling door het creëren van nieuwe industrieën en werkgelegenheid."

Answer:

{

"Energy Security": 0,

"Energy Security-rationale": "Energy security is not mentioned in the post.",

"Clean Energy": 0,

"Clean Energy-rationale": "Clean energy is not discussed.",

"Economic Growth": 1,

"Economic Growth-rationale": "The post directly connects nuclear energy with economic development, job creation, and new industries, clearly indicating the Economic Growth frame.",

"Nuclear Safety": 0,

"Nuclear Safety-rationale": "Nuclear safety is not discussed.",

"Energy affordability": 0,

"Energy affordability-rationale": "Energy affordability is not addressed."

}

- This is the Twitter post you need to analyse: "Nucleaire energie biedt een schone en betrouwbare energiebron die bijdraagt aan de economische groei, maar we moeten ook letten op de kosten die kunnen oplopen voor huishoudens."

Answer:

{

"Energy Security": 1,

"Energy Security-rationale": "The post mentions nuclear energy as a reliable energy source, which relates to the Energy Security frame.",

"Clean Energy": 1,

"Clean Energy-rationale": "The post describes nuclear energy as a 'schone' (clean) energy source, indicating the Clean Energy frame.",

"Economic Growth": 1,

"Economic Growth-rationale": "The post refers to the contribution of nuclear energy to economic growth, which fits the Economic Growth frame.",

"Nuclear Safety": 0,

"Nuclear Safety-rationale": "Nuclear safety is not discussed in the post.",

"Energy affordability": 1,

"Energy affordability-rationale": "The post mentions the potential for higher costs impacting household energy expenses, relating to the Energy Affordability frame."

}

- This is the Twitter post you need to analyse: "Onze partij heeft er voor gezorgd dat kerncentrales zijn opengebleven."

Answer:

{

"Energy Security": 0,

"Energy Security-rationale": "No elements of energy security are mentioned. Keeping nuclear power plants open does not necessarily equal a security frame. ",

"Clean Energy": 0,

"Clean Energy-rationale": "There is nothing in the post that relates to clean energy.",

"Economic Growth": 0,

"Economic Growth-rationale": "Economic growth is not referenced.",

"Nuclear Safety": 0,

"Nuclear Safety-rationale": "Nuclear safety is not discussed.",

"Energy affordability": 0,

"Energy affordability-rationale": "Energy affordability is not mentioned."

}

- This is the Twitter post you need to analyse: "De recente stijging van de kosten voor nucleaire energie verhoogt de energieprijzen voor consumenten en kan schadelijk zijn voor de economische stabiliteit."

Answer:

{

"Energy Security": 0,

"Energy Security-rationale": "Energy security is not mentioned.",

"Clean Energy": 0,

"Clean Energy-rationale": "Clean energy is not discussed.",

"Economic Growth": 1,

"Economic Growth-rationale": "The post implies that higher nuclear energy costs can negatively impact economic stability, which relates to Economic Growth.",

"Nuclear Safety": 0,

"Nuclear Safety-rationale": "Nuclear safety is not mentioned.",

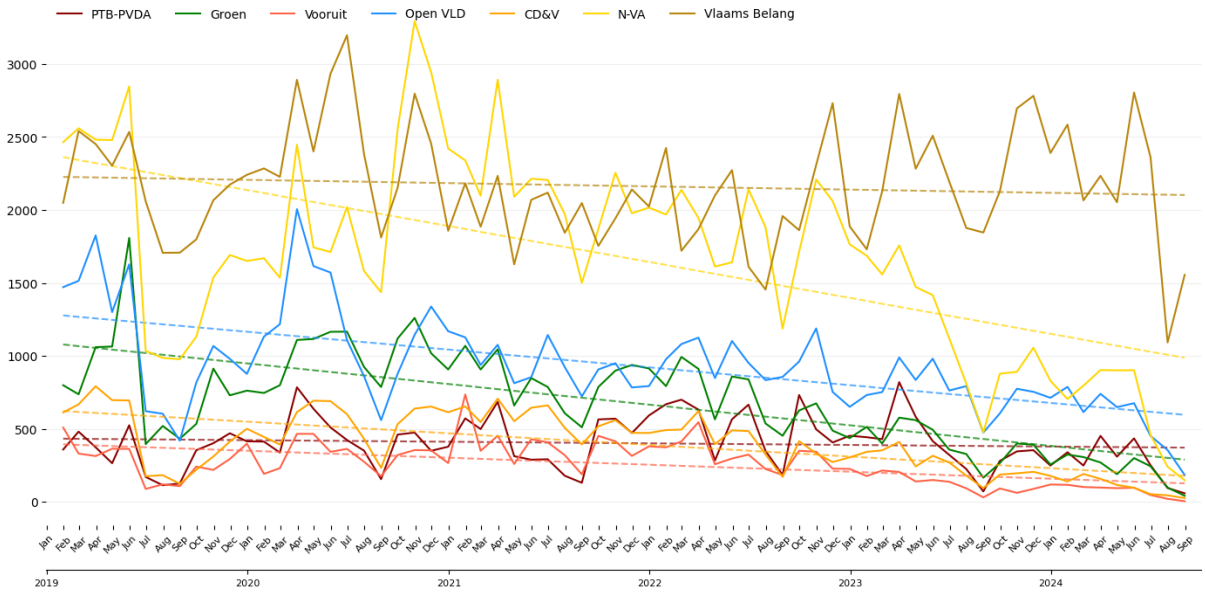
"Energy affordability": 1,

"Energy affordability-rationale": "The post focuses on how rising nuclear energy costs are increasing consumer energy prices, relating to Energy affordability."

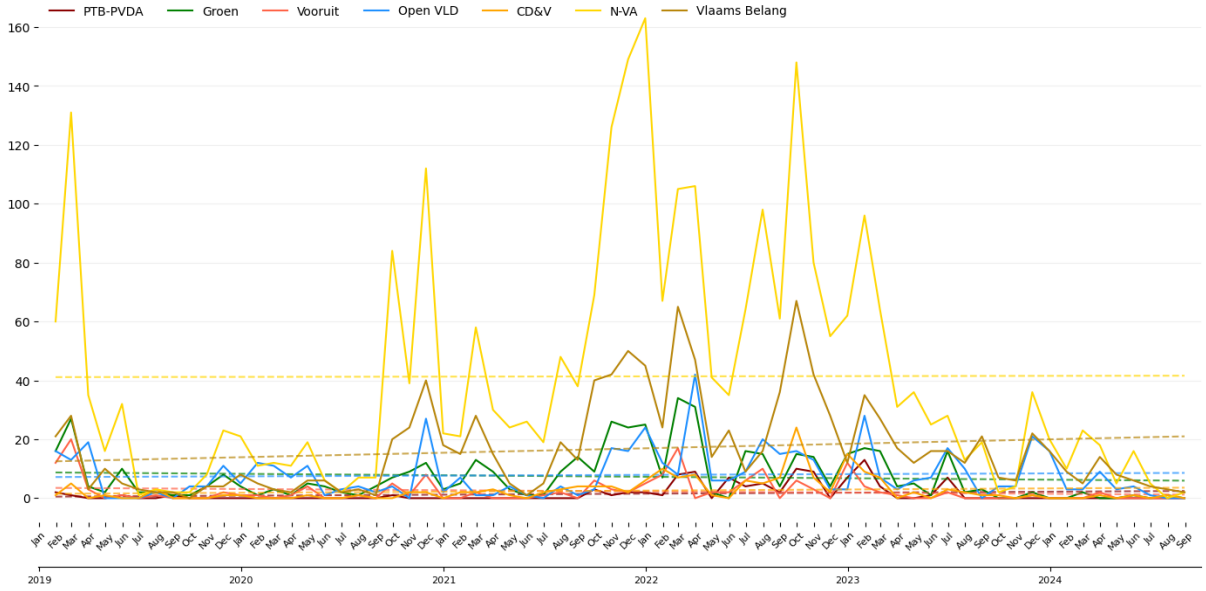
}

"""

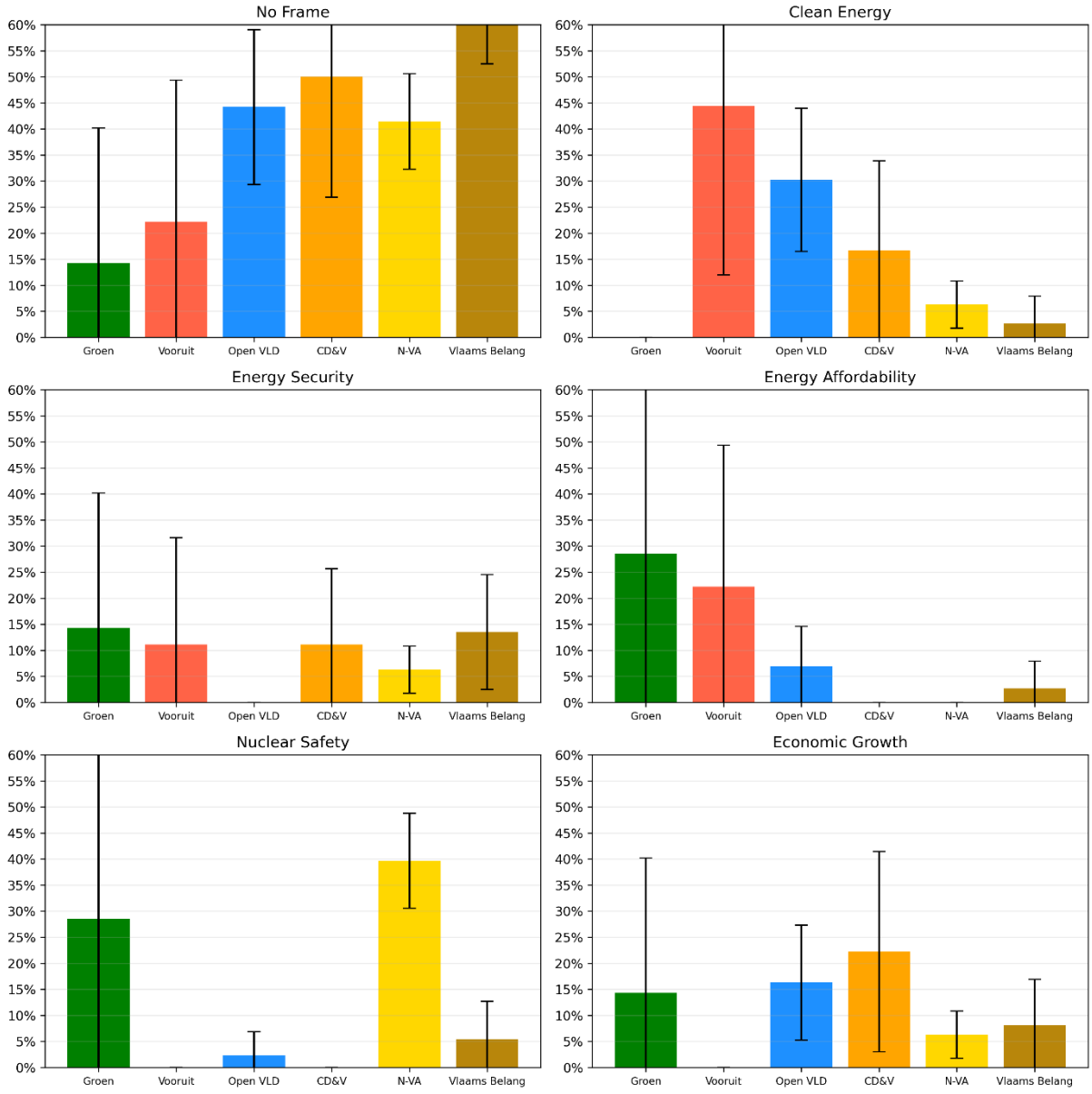
Appendix G. Number of tweets by party



Appendix H. Number of tweets on nuclear energy by party



Appendix I. The proportion of each energy policy frame, by party, relative to the tweets mentioning SMRs by that party



Appendix J. An unofficial translation of the text of the 2024 questionnaire to Slovak environmental NGOs

Note: this Annex contains unofficial translation of the questionnaire referred in Methods Section. This questionnaire was intentionally as extremely brief as possible in order to try to get replies from respondents being aware that they are extremely occupied and therefore lack time to respond to questionnaires.

Questionnaire for Climate Coalition focal points / Questionnaire for members of the Slovak the 'Slovak [Environment] Protectors' Assembly

Thank you in advance for your responses up to and including 12 February 2024!

Your answers will be used exclusively to improve the activities of Matej Bel University in Banská Bystrica in the ECOSENS project (https://ecosens-project.eu/) concerning the Slovak Republic.

1. Are you (as an organisation) interested in a topic related to the relationship between commercial nuclear power and addressing current climate change challenges?

□ We are not interested in the topic

□ We are only interested in information on the topic (for a general overview) but are not interested in actively following the topic

□ under circumstances different than the present ones, we would be interested in an active involvement in this topic, but we do not currently have (and probably will not have in 2024) the staff/capacity to undertake any activities related to this topic

□ we have at least partial capacity to cover the topic, and our representative should therefore be able to find time during March 2024 to participate in a conversation on the topic (at his/her place of residence or at the location of our organisation's headquarters, etc.).

□ other (please specify): ……

2. If you would like your views on commercial nuclear energy (including small modular reactors, the completion/commissioning of Unit 3/4 of the Mochovce nuclear power plant and/or the new nuclear power plant project in Slovakia (https://www.jess.sk/) to be taken into account in the ECOSENS project (https://ecosens-project.eu/), you can write them in the form below completely anonymously (or even sign it), thank you very much in advance!

Appendix K. The results of 2013 IPPA project questionnaire research of Slovak environmental NGOs

Note: this is the copy of the text published in the Annex 3 of the IPPA project Deliverable 2.5 (Mršková and Mihók, 2013, pp. 33 – 40).

The motivation to carry out research of the Slovak environmental NGOs arose from the knowledge gained by the application of the RISCOM model in the Czech Republic in the 2008 -09 period, as reported in the Deliverable 14[55] of the ARGONA project. In particular, the impetus for the research planned in Slovakia resulted from the issues related to the selection and nomination of the national level environmental NGOs into RISCOM reference and working groups (RG and WG). As was pointed out by Hana Gabrielova from the Czech NGO Calla in relation to rather non-transparent nomination of the NGO Calla into the Czech WG for dialogue, *the non-profit-making organizations usually elect their representatives by means of the Green Circle platform*[56]. In Slovakia, the umbrella organisation for environmental NGOs which can be considered as an equivalent to the Czech Green Circle is undoubtedly the Ekofórum platform[57]. From this reason, a questionnaire research of Ekofórum platform member NGOs before selecting and nominating 1 - 2 of its member NGOs into 'the planned Slovak RISCOM RG/WG' was aimed also with intentions to both ensure the timely transparency of the selection process and propose the 'rules for selection' based on the opinions of Ekofórum platform member NGOs representatives which would be presented via questionnaire research.

Throughout the IPPA project WP 2.2 desk research, it was found out that out of 5 Slovak environmental NGOs that were actively involved in the nuclear sector EIA procedures in the 2008 – 09 period[58], only Greenpeace was actively working on the nuclear issues in the IPPA implementation period. In parallel, the decision that instead of attempting to establish national level RISCOM RG and WG for dialogue concerning 'the final SNF solution', IPPA WP 2 activities in Slovakia would be re-focused on the issues related to RAW facilities operated and/or planned in the Mochovce region. From these two reasons, the originally planned research question(s) for Ekofórum platform member NGOs concerning selection of the two out of five or more NGOs into RISCOM WG/RG in a transparent and democratic way had to be abandoned. On the contrary, new key research questions arose due to a need for the IPPA WP 2.2 implementers to know "why majority of 5 NGOs mentioned in the Deliverable 2.4 stopped working on the nuclear issues in after 2009, and only Greenpeace (not a member of Ekofórum platform) was working steadily on nuclear issues in the 2011 and 2012.

At first, two informal interviews were held with the representative of Greenpeace Slovakia working on the nuclear issues and with the representative of former nuclear sector focused NGO Za Matku Zem (who started to work for Greenpeace Slovakia) concerning the issues referred in the previous paragraph. After this interviews, taking into account also own experience with the Slovak NGO sector and NGO activities concerning the nuclear sector issues, several 'hypotheses' potentially explaining the significant decrease in NGOs work on the nuclear issues in Slovakia were formulated. These hypotheses were, sometimes in their 'reverted forms into positively formulated hypotheses', used as the questionnaire items in the research of Ekofórum platform member NGOs whose results are presented in the text below.

[55] See: http://www.argonaproject.eu/docs/argona-del-d14-riscom-application-czech-republic.pdf (last accessed 2013-12-05).
[56] Ibid., Annex No.3, p. 38.
[57] See: www.ekoforum.sk (Note: the website has only Slovak language mutation).
[58] See: IPPA Deliverable 2.4, p. 14 – 16. Available at: http://www.ippaproject.eu/sites/default/files/deliverables/IPPA-Deliverable-2_4-Slovak-EIA-SEA.pdf (last accessed 2013-12-05).

The questionnaire research of the Slovak Environmental NGOs was carried out in the two phases. In the first phase, held at the Ekofórum platform members' meeting on 8 May 2013, the paper questionnaire was filled by all the 13 meeting's participants (12 statutory representatives of Ekofórum member NGOs and the director of Greenpeace office in Slovakia). In the second phase shortly after this Ekofórum's event, the same questionnaire was in its electronic form distributed on the Ekofórum's email list in order to reach all the other Ekofórum member NGOs, i.e. all those representatives which were not present at the 8 May 2013 event. Two additional filled questionnaire were obtained in the second phase, i.e. over emails. As Ekofórum reported 21 member NGOs on its webpage[59], the response rate of 14 filled questionnaires by Ekofórum members corresponds with 2/3, i.e. 66,7 %, what can be considered highly representative.

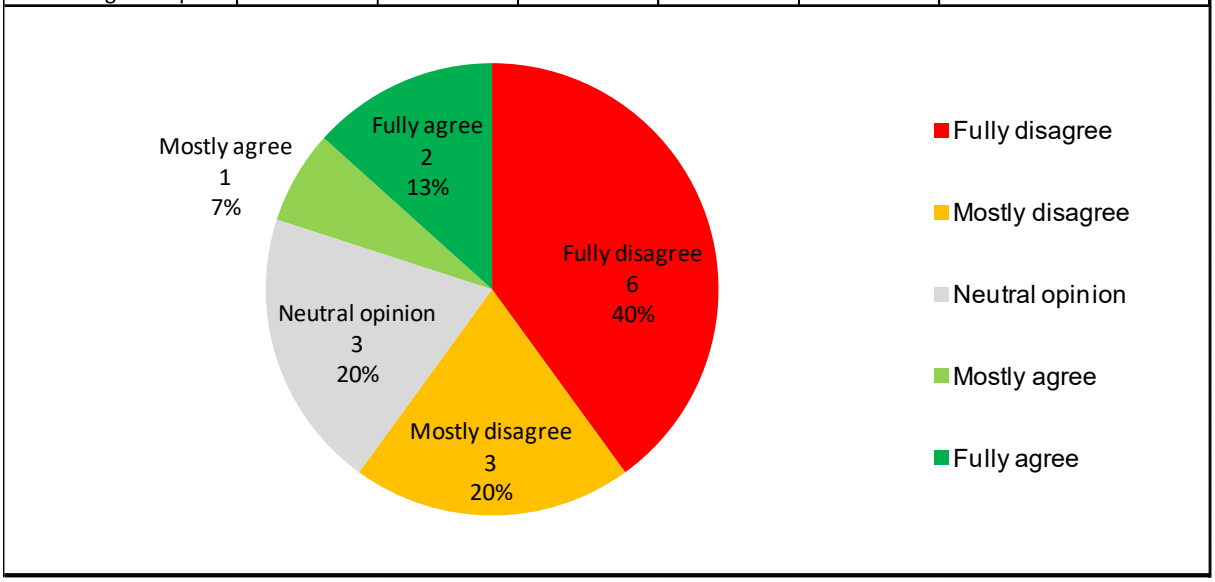
The questionnaire had 7 different items, which were all related to the different aspects mentioned in previous interviews and discussions concerning potential causes of decrease of work of the Slovak environmental NGOs on the nuclear issues. The reverted formulations of some of the hypotheses were used with an attempt for the questionnaire not to be too suggestive, i.e. not to be leading the respondents to the anticipated answers. The aim of the questionnaire was not 'to reveal the truth about the decline of work of the Slovak NGOs in the nuclear issues and the reasons behind it', but rather the research was aimed to find out how the Ekofórum member NGOs representatives perceive the recent and planned work of the Slovak NGOs on the nuclear issues in the context of the recent significant decline of capacities of NGOs devoted to the nuclear issues.

Despite the research results suggesting that 2 NGOs planned to perform activities related to the nuclear sector in cca. 09/2013 - 12/2014 period (see the Graph 3-1 below), the important research finding has to be emphasized that in one case the relation of planned activities to the nuclear sector was only indirect, with the planned activity being generally aimed at increased participation of NGOs in decision-making (in all the sectors where NGOs are active). The author of this text would also like to emphasize the paradox that with more general projects aimed at increased participation of NGOs there are actually less NGOs that could benefit from such project(s) in the nuclear sector related political decision-making – on a contrary, the Greenpeace Slovakia had de facto a monopoly for work on nuclear issues in Slovakia, respectively more realistically this NGOs had to bear all the pressure relating from a need of environmental NGOs to be involved in nuclear sector decision-making and equally importantly Energy policy decision-making. One NGO representative mentioned that his/her NGO was considering, but yet not planning activities related to the nuclear sector. Three NGOs had neutral position towards activities on the nuclear issues, i.e. that they would consider it for ex. in case donor(s) would directly approach them with the proposal to work on specific nuclear sector issues. Three other NGOs admitted that they might be considering working on the nuclear issues in case of unexpected serious negative development or serious threats would appear in a way interfering with the content and/or geographical areas of their work. Six Ekofórum member NGOs would not consider inclusion of activities related to the nuclear sector into their agenda even under exceptional circumstances.

[59] See: http://www.ekoforum.sk/o-nas/clenovia (last accessed 2013-12-05).

Graph 3-1 – Responses to the questionnaire item *For cca. 09/2013 - 12/2014 period, is your NGO planning or assuming performance or fundraising for activities related to the current development in the nuclear sector in Slovakia (EU)?*

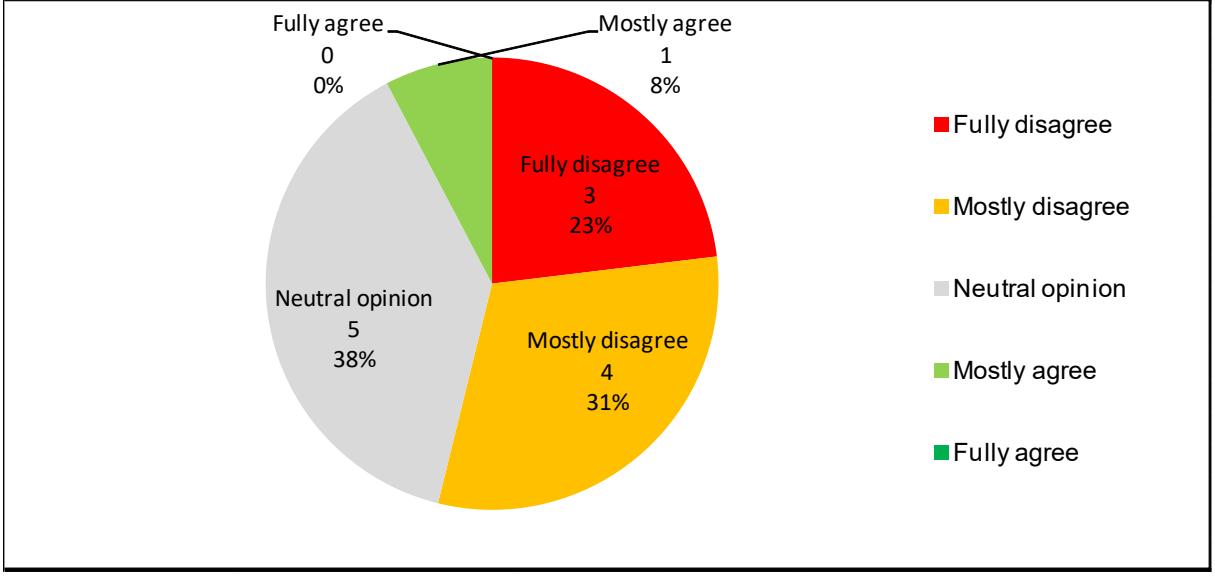
Response:	Fully disagree	Mostly disagree	Neutral opinion	Mostly agree	Fully agree	Total number of responses / response rate
Number of replies:	**6**	**3**	**3**	**1**	**2**	**15**
Percentage of replies:	40%	20%	20%	7%	13%	100%



Source: IPPA project's own questionnaire research carried out in May 2013.

Graph 3-2 – Responses to the questionnaire item *Slovak NGOs have sufficient access to funding for nuclear sector activities. Should they consider this topic amongst the priorities, NGOs could prepare project proposals for ex. from the Norwegian, Swiss or NIL Funds mechanisms, and these proposals would be treated equally amongst the other proposals in these grant schemes.*

Response:	Fully disagree	Mostly disagree	Neutral opinion	Mostly agree	Fully agree	Total number of responses / response rate
Number of replies:	**3**	**4**	**5**	**1**	**0**	**13**
Percentage of replies:	23%	31%	38%	8%	0%	87%



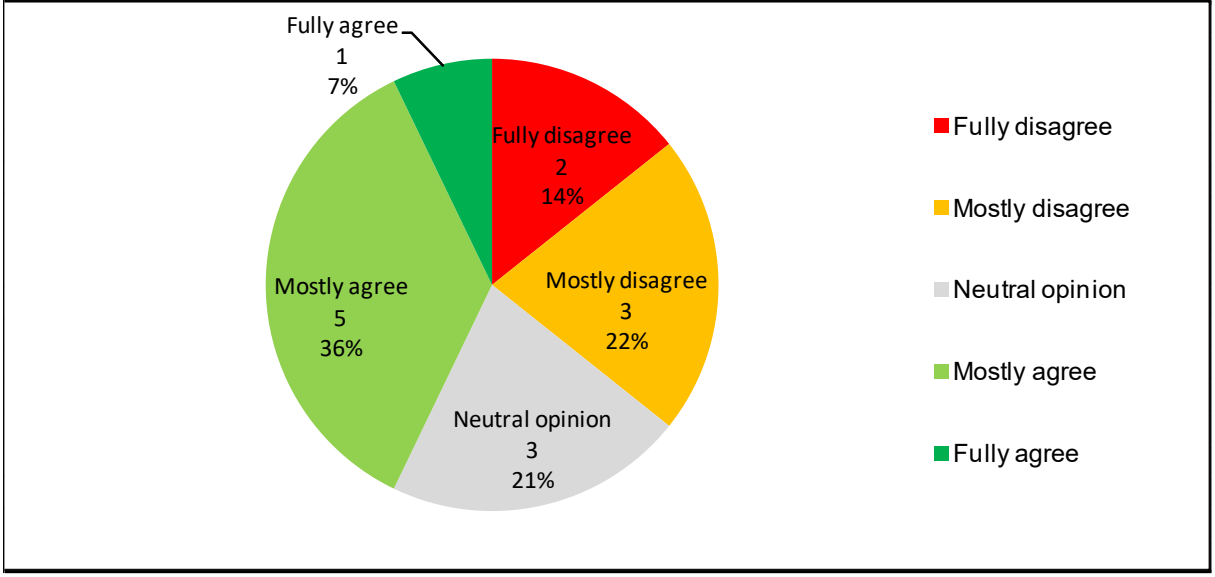
Source: IPPA project's own questionnaire research carried out in May 2013.

The second questionnaire item responded to a hypothesis that *Slovak NGOs do not have sufficient access to funding for nuclear sector activities.* In order not to be suggestive, the reverted statement, i.e. positive formulation was used. The text explaining the most important source of finance for the Slovak NGOs *Should they consider this topic amongst the priorities, NGOs could prepare project proposals for ex. from the Norwegian, Swiss or NIL Funds mechanisms, and these proposals would be treated equally amongst the other proposals in these grant schemes* was added to the formulation of the questionnaire item in order to better explain to the respondents what exactly was being researched. The responses, presented in the Graph 3-2 above, suggested that Slovak NGOs do not have sufficient access to funding for nuclear sector activities. Not even one NGO representative fully agreed with the abovementioned positive statement, and only one representative agreed partially.

The above presented results have to be compared with the results on the third questionnaire item, in which also a positive formulation was used. The respondents had to present their agreement or disagreement with the statement *The accession into the EU has not worsened the situation with regards to access to funding for NGOs wanting to be active in a nuclear field. The decline in Slovak NGOs activities in nuclear sector is not related to accession of Slovakia into the EU or to respective changes in access to funding for NGOs.* As the results of responses to this questionnaire item presented in the Graph 3-3 below show, the level of disagreement with this positive statement was lower that on the previous 'reversed hypothesis'. More importantly, due to rather mixed, i.e. contradictory responses to this questionnaire item, the results of IPPA research de facto implicitly suggest that more research might be carried out in order to shed more light into this complex and difficult 'funding opportunities for the nuclear sector activities' issue.

Graph 3-3 – Responses to the questionnaire item *The accession into the EU has not worsened the situation with regards to access to funding for NGOs wanting to be active in a nuclear field. The decline in Slovak NGOs activities in nuclear sector is not related to accession of Slovakia into the EU or to respective changes in access to funding for NGOs.*

Response:	Fully disagree	Mostly disagree	Neutral opinion	Mostly agree	Fully agree	Total number of responses / response rate
Number of replies:	**2**	**3**	**3**	**5**	**1**	**14**
Percentage of replies:	14%	21%	21%	36%	7%	93%

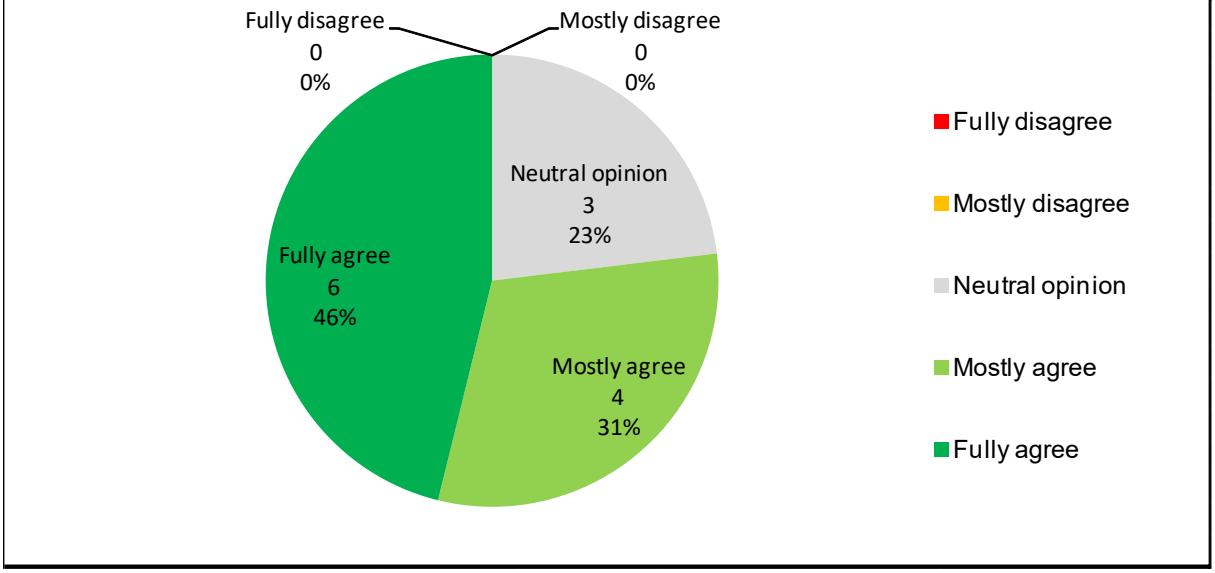


Source: IPPA project's own questionnaire research carried out in May 2013.

Much more convincing results were obtained concerning the hypothesis that 'project based financing' is challenging NGO activities in the nuclear sector, as these *need long term conceptual work, where a need to re-cycle project proposals annually, with a risk of not getting financial support in the end, comprises too much risk of jeopardising with the necessary long-term continuity of necessary activities, thus posing a risk that resources invested in previous years would end up without any of the desired effects/impacts.* As the vast majority of respondents either fully or at least partially agreed with this hypothesis (see Graph 3-4 below), and not a single respondent disagreed, this research finding from 2013 may be considered the most crucial impetus for further research and implementation activities amongst all those that were identified via interviewing two nuclear sector NGO representatives in 2011 and 2012.

Graph 3-4 – Responses to the questionnaire item *For activities of Slovak NGOs on nuclear sector topics, the project based financing is not appropriate. NGO activities in a nuclear sector need long term conceptual work, where a need to re-cycle project proposals annually, with a risk of not getting financial support in the end, comprises too much risk of jeopardising with the necessary long-term continuity of necessary activities, thus posing a risk that resources invested in previous years would end up without any of the desired effects/impacts.*

Response:	Fully disagree	Mostly disagree	Neutral opinion	Mostly agree	Fully agree	Total number of responses / response rate
Number of replies:	**0**	**0**	**3**	**4**	**6**	**13**
Percentage of replies:	0%	0%	23%	31%	46%	87%



Source: IPPA project's own questionnaire research from May – June 2013.

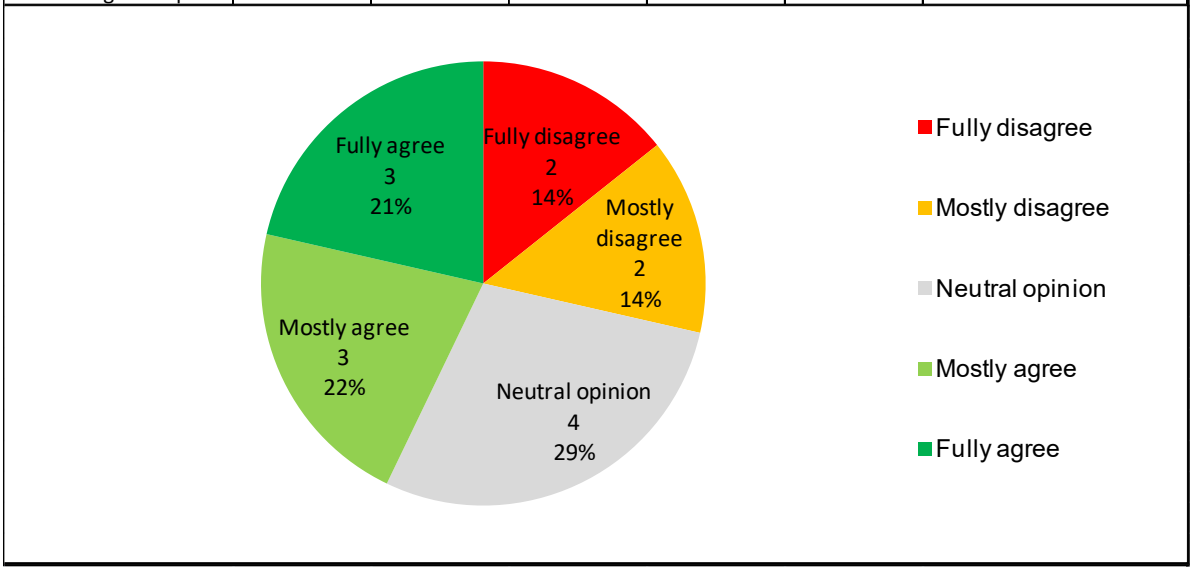
Three concluding questionnaire items contained the three different hypotheses concerning three different challenges for NGOs to work on the nuclear sector issues. The most tough of these three challenges was reported to be the expert nature of required NGO activities in the nuclear sector in the context of the difficulties to hire necessarily educated and experienced staff and pay the competitive salary for such persons under the financial conditions and context in which the Slovak NGOs work (see Graph 3-5 below). Out of the three challenges identified and explained during the interviews with NGO

campaigners working on the nuclear issues held in 2011 and 2012, only this one seems to be equally perceived in 2013 by the representatives of the other environmental NGOs.

The hypotheses concerning a) the impacts of *strong political support for commercial use of nuclear energy from the Slovak political parties all across the political spectrum* on chances that NGOs inputs for ex. in EIA procedures and decision-making procedures would be taken due account of (see Graph 3-5 below) and b) *exhaustion, long term weariness, resp. the burn-out syndrome of former NGO sector staff forking on nuclear issues* (see Graph 3-5 below) may be considered related to each other (note: from this reason, the questionnaire item concerning expert nature was placed between these two items). While for both of these items the wide spectrum of responses was filled in the questionnaires by the NGO staff mostly not working on the nuclear issues, one interesting observation can be made – the responses on the item concerning *exhaustion, long term weariness, resp. the burn-out syndrome* of the NGO staff were much more "softer" than on the other items (i.e. no full agreements or disagreements, with one exception), which may be explained by the sensitivity of the issue.

Graph 3-5 – Responses to the questionnaire item *One of the key reasons behind absence of Slovak environmental NGOs activities in a nuclear sector is a strong political support for commercial use of nuclear energy from the Slovak political parties all across the political spectrum. For NGOs it is important to focus their activities on such areas where they perceive a real opportunity to influence decision-making procedures, resp. have impact on projects, activities, etc.*

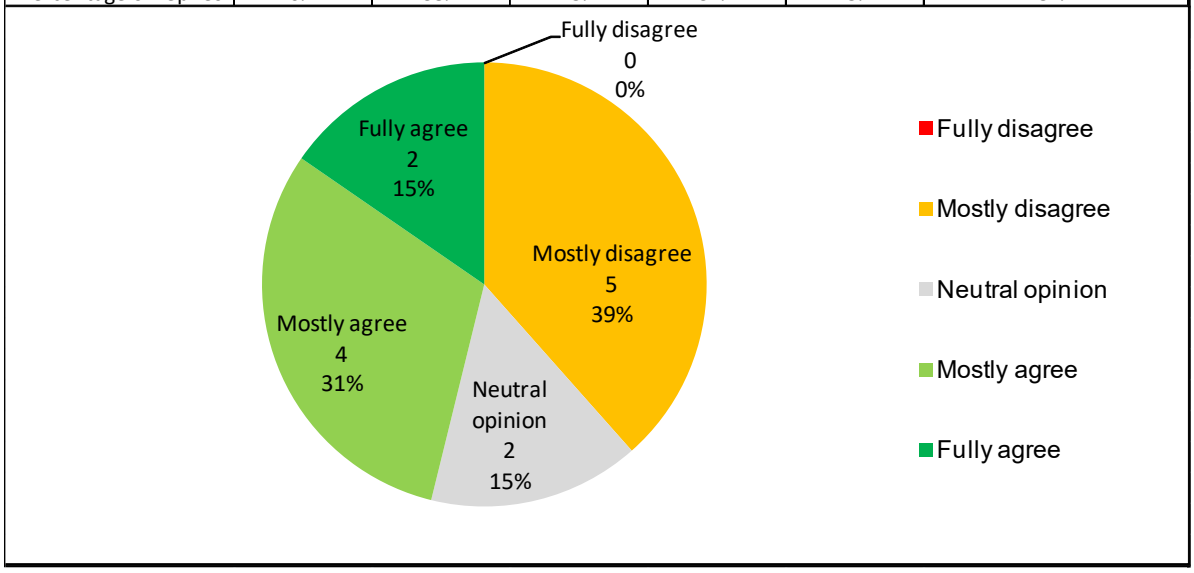
Response:	Fully disagree	Mostly disagree	Neutral opinion	Mostly agree	Fully agree	Total number of responses / response rate
Number of replies:	**2**	**2**	**4**	**3**	**3**	**14**
Percentage of replies:	14%	14%	29%	21%	21%	93%



Source: IPPA project's own questionnaire research carried out in May 2013.

Graph 3-6 – Responses to the questionnaire item *One of the key reasons behind absence of Slovak environmental NGOs activities in a nuclear sector is an expert nature of necessary NGO activities. Even if some Slovak environmental NGOs would be motivated to work on nuclear issues, they would find it very difficult to hire necessary staff, especially under the present salary and other related conditions typical for Slovak environmental NGO sector.*

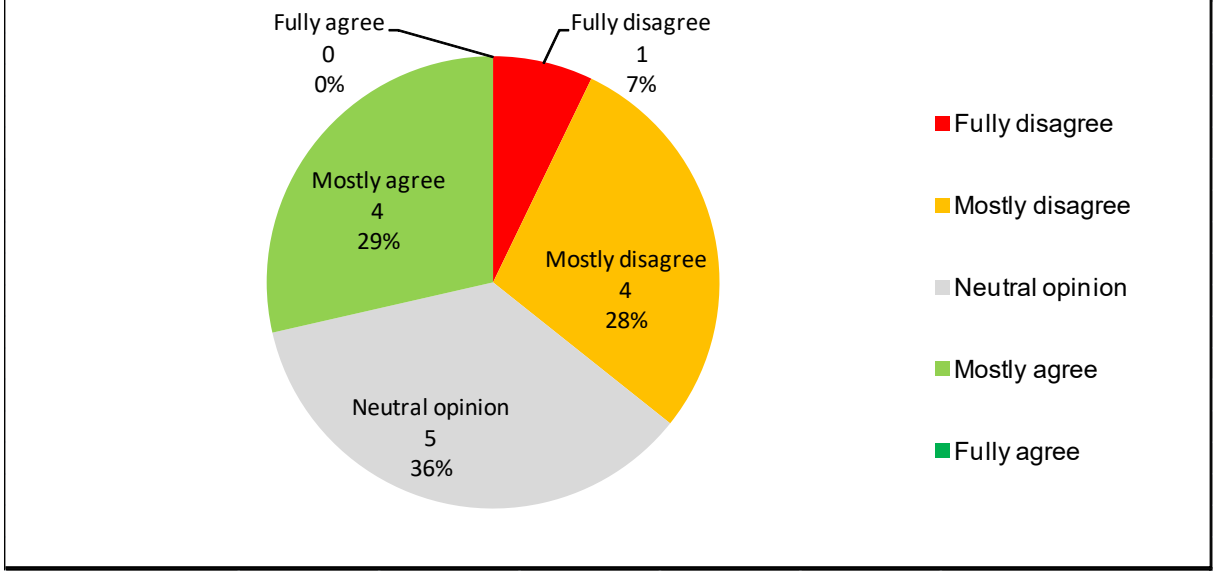
Response:	Fully disagree	Mostly disagree	Neutral opinion	Mostly agree	Fully agree	Total number of responses / response rate
Number of replies:	**0**	**5**	**2**	**4**	**2**	**13**
Percentage of replies:	0%	38%	15%	31%	15%	87%



Source: IPPA project's own questionnaire research carried out in May 2013.

Graph 3-7 – Responses to the questionnaire item *One of the key reasons behind absence of Slovak environmental NGOs activities in a nuclear sector is the exhaustion, long term weariness, resp. the burn-out syndrome of former NGO sector staff forking on nuclear issues (this factor is stronger for NGO staff that in a past worked on nuclear issues compared to other themes of Slovak environmental NGO activities*).

Response:	Fully disagree	Mostly disagree	Neutral opinion	Mostly agree	Fully agree	Total number of responses / response rate
Number of replies:	**1**	**4**	**5**	**4**	**0**	**14**
Percentage of replies:	7%	29%	36%	29%	0%	93%



Source: IPPA project's own questionnaire research carried out in May 2013.

Concluding remarks

The research of opinions of Ekofórum member NGOs and Greenpeace Slovakia statutory representatives was improvised due to a needed of the IPPA project team to have 'more light shed' on the rather radical decrease of the Slovak NGOs working on the nuclear issues from 5 NGOs to 1 NGO in the 2009 – 2011 period. The author of this text would like to thank to all the respondents, thanks to whom the results are highly representative. Despite highly suggestive presentation of potential hypotheses of reasons behind the decline of NGOs activities in the nuclear sector, rather mixed responses were obtained for four out of six questionnaire items (i.e. hypotheses that resulted from informal interviews by the author of this text and the two NGO antinuclear campaigners). These results are therefore of a high value for the IPPA team in the ongoing effort to be able to distinguish between the highly influential and less influential factors behind the serious decline of environmental NGOs focus of activities on the nuclear sector issues.

The results of research suggested that the primary cause of the decline of NGOs activities in the nuclear sector should be related to the combined challenges of a) both the relevant education and experience needed for the NGO staff to be capable of carrying out nuclear sector NGO activities, i.e. a need for long term commitments from staff; and b) a need for NGOs to secure both sufficient and long-term funding for salaries corresponding to the education and experience needed. In the view of the vast majority of the respondents, these combined challenges can very hardly be faced in the new economic context of NGOs work in Slovakia characterised by the change from 'medium or long term so called core funding of NGOs' into the 'short term project funding of NGOs activities'. The relevant changes were fostered mainly by the funding conditions imposed by the 'Europe based foundations and funders' after the accession of Slovakia into the EU which significantly differed from the conditions of the US Foundations which have been supporting development and stabilisation of the NGO sector in Slovakia since 1990 until cca. 2005 – 05 period.

Additional interviews carried out in 2013 brought new impetuses for the further research on the 'decline of NGOs working on the nuclear issues in Slovakia'. Some of the Slovak NGOs working on the nuclear issues in and before 2009 in a past most probably lacked capacities (or the willingness) needed to fulfil the formal conditions and requirements for submitting grant proposals and financial reports in a combination with the threat that these proposals/reports would not be accepted. Furthermore, there seemed to have been much more generous funding opportunities for the activities related to 'the climate change', for which former antinuclear NGO campaigners often gained sufficient knowledge and experience due to the fact that their past work to some extent had to concern 'Energy sector' as such. The two Slovak NGOs that worked on the nuclear issues in the early and middle 2000s have deleted their official registrations due to the fact that original staff has retired and new younger staff was not hired into these NGOs, resp. decided to quit the work in one case. As this research task was both very minor and improvised within the IPPA project, and sufficient results were brought for the purposes needed in relation to 'direct actions' within IPPA or its potential follow up project, additional research activities towards the respondents of the research from May 2013 were not carried out in late 2013 (also due to the fact that several other priorities of work of the IPPA team in Slovakia arose in the second half of 2013 in relation to the IPPA work package 3 and 4 activities).

Appendix L. Copy IPPA project Deliverable 2.4 (section 2.3)

2.3. Barriers of public participation in the Slovak nuclear sector EIA and SEA procedures

2.3.1. Transparency of nuclear sector documentation

Representatives of the public encountered problems related to incompleteness of EIA documentation in the procedure for Mochovce Units 3 and 4 completion. Two important pieces of information were missing at the relevant EIA documentation: a) improvements made into the original Soviet design of Mochovce NPP in the recent two decades and b) assessment of probability of an accident which would result in leakage of radioactivity into the environment. According to the project promoter, the information referred above was not included in the EIA documentation because it has already been available in the project"s preliminary safety report. But the relevant parts of this Preliminary safety report were not disclosed even after the subsequent separate requests under the Freedom of information Act which were submitted by the Slovak NGOs (see Mihók, 2001, p. 233).

We find worthwhile to add that, outside of EIA procedures, Slovak public experienced denied access to nuclear sector information in relation to the Slovak the deep geological SNF repository development programme. In the 2001 – 2009 period, none of the Slovak NGOs was able to obtain annual reports on the progress in the programme from the Ministry of Economy. NGOs were denied access even to the limited versions of these annual reports that were prepared with an aim to be disclosed to the public. The Ministry of Economy justified its decisions not to disclose any parts of the annual reports to NGOs by the fact that these documents were de iure owned by the Slovenské elektrárne company (see ARGONA Del. 9, pp. 39 – 40). These reports were, for the first time, disclosed to NGOs only in 2010.

2.3.2. Shortening of deadlines

In the case of the only relevant SEA procedure (referred as no. 9 in the Table 2), participation of at least two NGOs (Greenpeace and For mother Earth) was not made possible because of shortening of deadlines for accepting public comments. Circa 100 pages long strategic document was disclosed on 6 th November 2007, while the public hearing was planned and held on the 20 th November 2007, i.e. within 14 days after the disclosure of the document. Such a short deadline and short notice of the date of the public hearing made it de facto impossible for 2 main Slovak NGOs working on the nuclear issues (Greenpeace and For mother Earth) to take part in this SEA procedure.

2.3.3. Legal standing of the public in EIA and SEA procedures

NGOs were denied legal standing in the EIA procedures in the period 2007/XII – 2009/IX, and individual citizens for even longer period of time between 2007/XII – 2010/V (see Table 1). Within SEA procedures, absence of enforceable rights for both NGOs and individual citizens requested by the SEA Directive was a subject of EU infringement proceedings against Slovakia in 2011. The fact that the public and NGOs were not granted with enforceable rights to participate in EIA and SEA procedures was limiting their motivation to take part in these procedures, as they often were considered only as „tick in a box exercises" (See ARGONA Deliverable no. 9, pp. 40-1).

2.3.4. Cultural barriers between the public officials and NGOs

Impact of selected cultural factors on participation of NGOs in Slovak nuclear sector EIA procedures was researched and analysed already within the ARGONA project (See ARGONA Del. 9, pp. 44-7).

Appendix M. List of parliamentary questions consulted in Spain

Castillo Rodríguez, L., Patricio Zafra, M., & Rivas de la Torre, M. M. (2024a). Pregunta escrita número 684/002596 sobre el proceso de cierre de los reactores nucleares y la disposición del Gobierno para reunirse con Foro Nuclear. Senado de España. https://www.senado.es/web/expedientdocblobservlet?legis=15&id=191255

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- Estarrona Elizondo, J., Bideguren Gabantxo, I., & Elejabarrieta Díaz, G. (2024). Pregunta escrita sobre la comunicación y coordinación en el proceso de desmantelamiento de la central nuclear Santa María de Garoña (Expediente Nº 684/010337). Senado de España. https://www.senado.es/web/expedientdocblobservlet?legis=15&id=213973

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- Gordillo Moreno, Á. P. (2023b). Pregunta escrita número 684/000826 sobre la extensión de la vida útil de las centrales nucleares y la política energética del Gobierno. Senado de España. https://www.senado.es/web/expedientdocblobservlet?legis=15&id=188874

- Mallada de Castro, M. T. (2024). Pregunta escrita número 684/010162 sobre la influencia del cambio de criterio respecto a la energía nuclear en el calendario de cierre de centrales nucleares en España. Senado de España. https://www.senado.es/web/expedientdocblobservlet?legis=15&id=213297

- Martínez González, M. M. (2018). Pregunta escrita número 684/048148 sobre el coste del almacenamiento de residuos radiactivos de la central nuclear de Vandellós I en Francia. Senado de España. https://www.senado.es/web/expedientdocblobservlet?legis=12&id=124807

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- Monago Terraza, J. A. (2024a). Pregunta escrita sobre la posible autorización gubernamental para la instalación de reactores nucleares pequeños (SMR) en España (Expediente Nº 684/009939). Senado de España. https://www.senado.es/web/expedientdocblobservlet?legis=15&id=212125

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- Navarrete Pla, J., & Mulet García, C. (2018). Pregunta escrita número 684/033794 sobre incidentes en la Central Nuclear de Cofrentes. Senado de España. https://www.senado.es/web/expedientdocblobservlet?legis=12&id=82801

- Román Jasanada, A. (2023c). Pregunta escrita sobre la amortización de los reactores nucleares españoles y la central nuclear de Trillo (Expediente Nº 684/065702). Senado de España. https://www.senado.es/web/expedientdocblobservlet?legis=14&id=174095

- Román Jasanada, A. (2023d). Pregunta escrita sobre la viabilidad de la explotación de la central nuclear de Trillo bajo la fiscalidad actual (Expediente Nº 684/065699). Senado de España. https://www.senado.es/web/expedientdocblobservlet?legis=14&id=179080

Appendix N. List of news consulted in Spain

Date	Source	News title	Access link
28/01/2019	El Confidencial	Gobierno y eléctricas plantean el cierre escalonado de las nucleares de 2025 a 2036	https://elconfidencial.com/economia/2019-01-28/gobierno-nucleares-cierre-ribera-iberdrola-endesa-naturgy_1789342/
04/02/2019	El independiente	El Gobierno abre la puerta a subir las tasas a las eléctricas para pagar el apagón nuclear	https://www.elindependiente.com/economia/2019/02/04/el-gobierno-abre-la-puerta-a-subir-las-tasas-a-las-electricas-para-pagar-el-apagon-nuclear/
12/02/2019	El Independiente	Baleares aprueba su Ley de Cambio Climático y prohíbe los diésel desde 2025	https://www.elindependiente.com/futuro/medio-ambiente/2019/02/12/baleares-aprueba-la-primera-ley-de-cambio-climatico-y-prohibe-los-diesel-desde-2025/
23/02/2019	Cinco Días	Gran paquete del clima El Ejecutivo plantea el cierre de todo el parque de carbón y cuatro nucleares hasta 2030	https://cincodias.elpais.com/cincodias/2019/02/22/companias/1550842727_790274.html
05/03/2019	Cinco Días	La tasa aumenta un 20% Las grandes eléctricas firman un pacto con Enresa para desmantelar las nucleares	https://cincodias.elpais.com/cincodias/2019/03/04/companias/1551722946_330839.html
14/03/2019	El independiente	Endesa e Iberdrola trasladan a Vandellós su batalla por el futuro de las nucleares	https://www.elindependiente.com/economia/2019/03/14/endesa-e-iberdrola-trasladan-vandellos-batalla-futuro-las-nucleares/#google_vignette
26/09/2019	El Público	El cierre de la Central Nuclear de Cofrentes: ¿2021 o más allá?	https://www.publico.es/sociedad/cierre-central-nuclear-cofrentes-2021-alla.html
31/05/2020	Naiz	«La fiscalización es imprescindible, la pesadilla de Garoña no ha acabado»	https://www.naiz.eus/eu/hemeroteca/gara/editions/2020-05-31/hemeroteca_articles/la-fiscalizacion-es-imprescindible-la-pesadilla-de-garona-no-ha-acabado
26/06/2020	El Diari de Tarragona	El cierre de las centrales nucleares, entre 2025 y 2035	https://bv.unir.net:3770/hu/api/noticies/?tipus=pdf&idDocument=00000109-20200626-000010&fromHemeroteca=True

23/08/2020	El Correo Web . es	Toda la verdad sobre el cementerio nuclear de El Cabril	https://www.elcorreoweb.es/andalucia/2020/08/19/cementerio-nuclear-cabril-104589229.html
29/09/2020	El Confidencial	"Aspiramos a lograr fondos europeos para invertir hasta 16.000 M en proyectos verdes"	https://www.elconfidencial.com/empresas/2020-09-29/entervista-jose-bogas-endesa-fondos-europeos-proyectos-verdes_2765776/
04/12/2020	La información	El apagón nuclear pactado y los flecos por pactar	https://www.20minutos.es/lainformacion/opinion/apagon-nuclear-pactado-los-flecos-por-pactar-5303030/
09/02/2021	El País	La izquierda valenciana pide el cierre ya de la central nuclear de Cofrentes cuya prolongación acordó Transición Ecológica	https://elpais.com/sociedad/2021-02-09/la-izquierda-valenciana-pide-el-cierre-ya-de-la-central-nuclear-de-cofrentes-cuya-prolongacion-acordo-transicion-ecologica.html
28/04/2021	Servimedia	El Senado frena la amenaza de Feijóo de llevar la Ley de Cambio Climático al Tribunal Constitutional	https://www.servimedia.es/noticias/1838047
16/09/2021	El Confidencial	Iberdrola apunta a 2024 como fecha del cierre nuclear, pero niega, con Endesa, que sea una amenaza al Gobierno	https://www.elconfidencialdigital.com/articulo/ultima-hora/iberdrola-apunta-2024-como-fecha-cierre-nuclear-niega-endesa-que-sea-amenaza-gobierno/20210916184313276467.html
10/11/2021	La Vanguardia	Francia pretende ahora construir nuevas centrales nucleares: ¿Y España?	https://www.lavanguardia.com/natural/20211110/7851580/francia-pretende-construir-nuevas-centrales-nucleares-espana.html
11/11/2021	El País	España se desmarca de Francia y sigue adelante con el plan de apagar las nucleares en 2035	https://elpais.com/economia/2021-11-11/espana-se-desmarca-de-francia-y-sigue-con-el-plan-de-apagar-la-energia-nuclear-en-2035.html
05/02/2022	Diario del Alto Aragón	Ribera califica de "gran error" estimar verdes la nuclear y gas	https://www.diariodelaltoaragon.es/noticias/actualidad/2022/02/05/ribera-califica-de-gran-error-estimar-verdes-la-nuclear-y-gas-1550932-daa.html

12/04/2022	El Economista	El Gobierno abre la puerta a instalar 7 cementerios nucleares en lugar del ATC	https://www.eleconomista.es/energia/noticias/11713661/04/22/El-Gobierno-abre-la-puerta-a-instalar-7-cementerios-nucleares-en-lugar-del-ATC-de-Villar-de-Canas.html
12/04/2022	La Razón	El Gobierno avanza en su plan de cierre nuclear	https://www.larazon.es/economia/20220412/wsxritqdfbeaxpvy2q4n43b4qm.html
12/04/2022	ABC	El Plan de Residuos Radiactivos ratifica la ampliación de El Cabril	https://bv.unir.net:3770/hu/api/noticies/?idDocument=00001257-20220412-005042&tipus=pdf
29/05/2022	Cambio16	La descarbonización del planeta requiere darle otra oportunidad a la energía nuclear	https://www.cambio16.com/la-descarbonizacion-del-planeta-requiere-darle-otra-oportunidad-a-la-energia-nuclear/
30/08/2022	El Confidencial	Feijóo supedita un acuerdo en energía a que Sánchez aplace el cierre de las nucleares	https://www.elconfidencial.com/espana/2022-08-30/feijoo-supedita-un-acuerdo-en-energia-a-que-sanchez-aplace-el-cierre-de-las-nucleares_3482324/
03/09/2022	El Periódico	"No veo a ningún presidente del PP decir que quiere una nuclear en su región"	https://www.elperiodicoextremadura.com/economia/2022/09/03/veo-presidente-pp-decir-quiere-74983694.html
06/09/2022	Diario de León	Vox reaviva el fantasma de la reapertura de la central de Garoña	https://bv.unir.net:3770/hu/api/noticies/?idDocument=00000128-20220906-000027&tipus=pdf
08/09/2022	ABC	La Junta no presionará ni para reabrir Garoña ni las térmicas	https://bv.unir.net:3770/hu/api/noticies/?idDocument=00001255-20220908-001595&tipus=pdf
19/09/2022	El Correo Gallego	Dos grupos de la central de As Pontes seguirán abiertos como garantía de suministramiento	https://www.elcorreogallego.es/galicia/dos-grupos-de-la-central-de-as-pontes-seguiran-abiertos-como-garantia-de-suministro-IC12109818
20/09/2022	Ferrol	Autorizan el cierre de la térmica, que todavía podría funcionar este invierno	https://www.diariodeferrol.com/articulo/comarcas/gobierno-autoriza-cierre-gradual-central-termica-as-pontes-3894448

21/09/2022	Gara	PP y Vox reformulan su ofensiva nuclear: no piden reabrir Garoña, pero sí otra instalación	https://www.naiz.eus/eu/info/noticia/20220921/pp-y-vox-reformulan-su-ofensiva-nuclear-no-piden-reabrir-garona-pero-si-otra-instalacion
02/10/2022	ABC	España se queda sola en su estrategia de cerrar las nucleares	https://www.abc.es/economia/espana-queda-sola-estrategia-cerrar-nucleares-20221002182352-nt.html
06/12/2022	El Mundo	El portazo de Villar divide al CSN	https://www.elmundo.es/economia/empresas/2022/12/05/638a5e9cfdddff310f8b45d0.html
10/03/2023	Econoticias	Fukushima por el retrovisor	https://www.ecoticias.com/medio-ambiente/fukushima-por-el-retrovisor
23/04/2023	Vozpópuli	La industria española y su tabú nuclear	https://www.vozpopuli.com/opinion/industria-espanola-y-tabu-nuclear.html
01/07/2023	ABC	Desmantelar Garoña llevará diez años y un presupuesto de 475 millones	https://www.abc.es/espana/castilla-leon/gobierno-autoriza-desmantelamiento-garona-20230717100245-nt.html
03/07/2023	El nuevo lunes	El PP mete en campaña, con poco éxito, la energía nuclear	https://bv.unir.net:3770/hu/api/noticies/?idDocument=00000166-20230703-000056&tipus=pdf
18/07/2023	El Mundo	El Gobierno autoriza el desmantelamiento de la central de Garoña	https://www.larazon.es/sociedad/energia-nuclear-camino-cementerio_202312316590bc47872b820001076373.html
21/12/2023	El norte de Castilla	"Renunciar a la energía nuclear es un lujo innecesario que no nos podemos permitir"	https://bv.unir.net:3770/hu/api/noticies/?idDocument=00001345-20231221-000063&tipus=pdf
31/12/2023	La Razón	La energía nuclear va camino del cementerio	https://bv.unir.net:3770/hu/api/noticies/?idDocument=00001707-20231231-001048&tipus=pdf
13/01/2024	Expansión	Tasazo a IBerdrola, Endesa y Naturgy por el cierre nuclear	https://www.epe.es/es/activos/20241004/centrales-nucleares-endesa-iberdrola-naturgy-tribunal-supremo-recurso-tasa-enresa-108880862

28/01/2024	El Periódico	Energía nuclear: ¿Salvación o condena?	https://www.informacion.es/medio-ambiente/2024/01/29/energia-nuclear-salvacion-o-condena-97472076.html
28/01/2024	Córdoba	"Los residuos de alta actividad de España caben en un cubo de 13 metros"	https://www.informacion.es/medio-ambiente/2024/01/29/energia-nuclear-salvacion-o-condena-97472076.html
31/01/2024	El Debate	El regulador nuclear llama a buscar "desde ya" el emplazamiento de un cementerio nuclear	https://www.eldebate.com/sociedad/sociedad-medio-ambiente/20240131/regulador-nuclearllama-buscar-desde-emplazamiento-cementerio-nuclear_171089.html
21/02/2024	Ok Diario	El PP hace frente común con Vox en favor de la energía nuclear y contra el cierre de las nucleares	https://okdiario.com/economia/pp-hace-frente-comun-vox-favor-energia-nuclear-contra-cierre-centrales-12408627
05/03/2024	El Periódico	El Gobierno paraliza la subida del 40% de la tasa de las nucleares tras la presión de Endesa e Iberdrola	https://www.elperiodicoextremadura.com/economia/2024/03/05/gobierno-centrales-nucleares-paraliza-subida-tasa-nuclear-enresa-iberdrola-endesa-99064525.html
12/03/2024	El Español	El PP quiere que la central de Trillo siga funcionando: "Genera muchos ingresos"	https://www.elespanol.com/eldigitalcastillalamancha/region/guadalajara/20240312/pp-presentara-mocion-diputacion-guadalajara-favor-centrales-nucleares/839416258_0.html
01/04/2024	El Correo de Andalucía	El choque entre Endesa e Iberdrola por las nucleares resucita: batalla por cuándo cerrar todas las centrales	https://www.elcorreoweb.es/economia/2024/04/01/choque-endesa-iberdrola-cierre-centrales-nucleares-100488093.html
03/06/2024	Europapress	El 48% de españoles está a favor de cerrar las centrales nucleares, según un proyecto de la URV	https://www.europapress.es/catalunya/noticia-48-espanoles-favor-cerrar-centrales-nucleares-proyecto-urv-20240603142415.html
03/06/2024	Diari digital URV	Menos de la mitad de la población está de acuerdo con el cierre de las centrales nucleares españolas	https://diaridigital.urv.cat/es/menos-de-la-mitad-de-la-poblacion-esta-de-acuerdo-con-el-cierre-de-las-centrales-nucleares-espanolas/

25/06/2024	El Periódico	El Gobierno sentencia a la central de Almaraz y arranca ya el plan para desmantelarla	https://www.elperiodicoextremadura.com/extremadura/2024/06/25/centrales-nucleares-gobierno-sentencia-central-nuclear-almaraz-desmantelar-104243923.html
25/06/2024	El Periódico	El Gobierno sentencia a la central de Almaraz y arranca ya el plan para desmantelarla	https://www.elperiodicoextremadura.com/extremadura/2024/06/25/centrales-nucleares-gobierno-sentencia-central-nuclear-almaraz-desmantelar-104243923.html
30/06/2024	Hoy	Almaraz mantiene el primer trimestre de 2025 como fecha límite para revertir su cierre	https://www.hoy.es/extremadura/central-almaraz-fija-primer-trimestre-2025-limite-20240630072337-nt.html
24/07/2024	Cinco Días	Santa María de Garoña, ¿el fin del sueño nuclear?	https://cincodias.elpais.com/companias/2023-07-24/santa-maria-de-garona-el-fin-del-sueno-nuclear.html
02/08/2024	El Mundo	La sentencia de muerte de Almaraz: "juegan con el pan de la gente"	https://www.elmundo.es/economia/2024/08/02/669d512ce4d4d8b2218b4597.html
30/09/2024	ABC	Madrid se une a Extremadura en la lucha por prolongar la vida de las nucleares	https://www.abc.es/economia/madrid-une-extremadura-lucha-prolongar-vida-nucleares-20240930184128-nt.html?ref=https%3A%2F%2Fwww.abc.es%2Feconomia%2Fmadrid-une-extremadura-lucha-prolongar-vida-nucleares-20240930184128-nt.html
10/10/2024	Reunión Anual Sociedad Nuclear Española	España se ha quedado completamente sola en su política de cierre de centrales nucleares	https://www.reunionanualsne.es/noticias/espana-se-ha-quedado-completamente-sola-en-su-politica-de-cierre-de-centrales-nucleares/
18/01/2025	EL Periódico de la Energía	Almaraz reúne a más de 10.000 personas en contra del cierre nuclear: "Será un golpe irreversible"	https://elperiodicodelaenergia.com/almaraz-reune-a-mas-de-10-000-personas-en-contra-del-cierre-nuclear/
18/01/2025	Canal Extremadura	7.000 personas acuden a la manifestación por la continuidad de la Central Nuclear de Almaraz	https://www.canalextremadura.es/noticias/extremadura/7000-personas-acuden-la-manifestacion-por-la-continuidad-de-la-central-nuclear

18/01/2025	La Vanguardia	Extremadura se moviliza ante el cierre de la central de Almaraz con una gran manifestación	https://www.lavanguardia.com/vida/20250118/10295966/extremadura-moviliza-cierre-central-almaraz-gran-manifestacion-agenciaslv20250118.html
18/01/2025	El Español	Prescindir de las nucleares, un suicidio energético	https://www.elespanol.com/opinion/editoriales/20250118/prescindir-nucleares-suicidio-energetico/917298262_14.html
20/01/2025	EL Periódico de la Energía	Las eléctricas piden al Gobierno un nuevo diálogo para tratar el futuro de la nuclear	https://elperiodicodelaenergia.com/las-electricas-piden-al-gobierno-un-nuevo-dialogo-para-tratar-el-futuro-de-la-nuclear/
12/02/2025	La Vanguardia	Los ingenieros catalanes piden una prórroga para el cierre de las centrales nucleares	https://www.lavanguardia.com/natural/20250212/10377730/ingenieros-catalanes-pide-prorroga-cierre-centrales-nucleares.html
12/02/2025	La Razón	Nuevo revés del Congreso al Gobierno: el PP atrae a Junts para rechazar el cierre de las nucleares	https://www.larazon.es/espana/nuevo-reves-congreso-gobierno-atrae-junts-rechazar-cierre-nucleares_2025021267accbca417ec20001f7600a.html
12/02/2025	El País	El debate | ¿Hay que prolongar la vida de las centrales nucleares españolas?	https://elpais.com/opinion/2025-02-12/el-debate-hay-que-prolongar-la-vida-de-las-centrales-nucleares-espanolas.html
21/02/2025	El periódico de la energía	Foro Nuclear responde a Aagesen que la industria "sí quiere un diálogo" sobre el calendario de cierre de las centrales	https://elperiodicodelaenergia.com/foro-nuclear-responde-a-aagesen-que-la-industria-si-quiere-un-dialogo-sobre-el-calendario-de-cierre-de-las-centrales/
13/02/2025	El periódico de la energía	El Gobierno mantendrá el calendario de cierre de las nucleares pese a la petición del Congreso	https://elperiodicodelaenergia.com/el-gobierno-mantendra-el-calendario-de-cierre-de-las-nucleares-pese-a-la-peticion-del-congreso/
25/02/2025	El economista.es	Empresas del sector eléctrico firman un manifiesto a favor de la extensión de vida de las centrales nucleares	https://www.eleconomista.es/energia/noticias/13238134/02/25/empresas-del-sector-electrico-firman-un-manifiesto-a-favor-de-la-extension-de-vida-de-las-centrales-nucleares.html