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Citizen Engagement Report

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Summary

Citizen Engagement Report based on: 1. Analysis of history and cultural background, as well as existing national and local knowledge of public perception of SMR technology (possible national citizen surveys) of nuclear energy technology and use in local level (ENEN, UJV, FORTUM), 2. Mapping of citizen stakeholder groups, and inviting them to the workshops (FORATOM), 3. Planning and arranging the workshops (VTT).

Approval

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Abbreviations and Acronyms

Acronym	Description
WP	Work Package
SLO	Social Lisence to Operate
SMR	Small Modular Reactor

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Executive Summary

The aim of this deliverable is to provide practical insights and findings to industry and public organizations to help them plan and execute effective engagement events, fostering a more informed and engaged community for the successful integration of Small Modular Reactors (SMRs). First this report summarises public perceptions of SMRs in Finland, the Czech Republic, Belgium and Italy, highlighting general support for SMRs and factors influencing public opinion. It details the planning and execution of citizen workshops involving key stakeholders and nuclear experts to engage diverse groups. Collaborative planning with local stakeholders and nuclear experts has proven highly effective, addressing specific needs and concerns of the participants. This approach builds competences and sincerity among all involved, enabling continuous learning and improvement.

Facilitating events to ensure interactive dialogue, rather than a technically oriented monologue, is crucial. This approach also allows participants to provide valuable insights and even nuclear safety information about siting and enables learning for both the industry and public organizations. Additionally, participants can learn from the discussions, enhancing their understanding of the benefits, alternatives and nuclear safety of the SMR technologies. Creating a welcoming environment and providing accurate information while taking participants' concerns seriously are essential for building trust and fostering mutual learning. Effective integration of SMRs into urban energy systems relies on continuous stakeholder engagement and a strategic, long-term commitment to citizen involvement.

Keywords

TANDEM, SMR, hybrid energy systems, public participation, citizen engagement, technology acceptance, social lisence to operate, citizen workshops

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1 Introduction

Small Modular Reactors (SMRs) represent a novel approach to clean energy integrated into hybrid energy systems that combine various energy sources, storage solutions, and conversion applications. These reactors can provide not only electricity but also heat and hydrogen, contributing significantly to the decarbonization of the entire energy system. Positioning SMRs as primary heat producers in urban energy systems, rather than for industrial use, means they will be located closer to residential areas. Consequently, nuclear energy will become more accessible to the general public, unlike larger nuclear units typically situated far from cities.

Citizen engagement is necessary to ensure public acceptance and support for SMRs. As these reactors will be closer to residential areas, it is crucial to address public concerns, provide transparent information, and involve communities in the decision-making process. Effective engagement can build trust, enhance understanding, and foster a positive perception of nuclear energy, which is essential for the successful integration of SMRs into urban environments.

To set the stage for citizen engagement events, we explored public perceptions of SMR technologies in various European countries. This background material provides an overview of the history and culture of nuclear energy, as well as existing national and local knowledge about public perceptions of SMR technology at the local level. It highlights the current state of nuclear energy and public acceptance. Early citizen engagement activities are needed, and city planning processes must begin soon if SMRs are to be operational shortly after 2030. This proactive approach will help align public expectations with project goals and ensure a smoother implementation process.

Finally, we provide a detailed account of the co-planning and organization of four citizen workshops aimed at engaging diverse groups. This section details our planning process with key stakeholders, the execution of the workshops, the questions raised by participants, and the feedback and lessons learned. Additionally, we offer generalized recommendations for improving future engagement activities and conclude with policy recommendations on how citizen engagement can be enhanced, particularly in the context of integrating SMRs into urban energy systems.

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2 Materials and methods

The background country-specific description of nuclear energy and SMR acceptance status is based on existing surveys and publicly available literature for each country.

The method used for citizen engagement was workshops. Four citizen events were organized in collaboration with context-specific partners: the city of Kuopio, women's associations, a Czech conference organization, and an EU one at nucleareurope in Belgium. Recruitment of participants was facilitated through these partners. The planning and organization of the events were also done collaboratively with these partners, ensuring a co-creative and participative approach.

The content of the events focused on providing information and increasing understanding of SMR technology, as well as fostering open discussion and dialogue between the public and experts. The events were held as face-to-face meetings, except for the last one, which was hybrid.

In designing the citizen events, we based our theoretical background on the concept of Social License to Operate (SLO). Originally developed in the mining industry, the SLO concept emphasizes engaging citizens and stakeholders as early as possible in the planning process. Thomson and Boutilier (2011) define SLO as encompassing aspects of economic legitimacy, interactional trust, socio-political legitimacy, and institutionalized trust. Stuart et al. (2023) further claim that the SLO process includes phases such as sources of information, perceptions, cognitive processing, judgments and beliefs, and actions. These aspects were considered in selecting expert speakers for the events and in organizing ample time and facilitation for discussions and dialogue creation.

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3 Public perceptions of SMR technology

In this section, we summarize publicly available survey data on the public perceptions of SMR technology in Finland, the Czech Republic, Belgium, and Italy.

3.1 Finland

Nuclear power has generally been fairly accepted in Finnish public opinion, but this has seen significant growth in the recent years with general approval increasing from roughly 40% in the early 2000s to almost 70% in 2023 based on studies by Nurminen (2023) conducted for Finnish Energy. Similarly, disapproval has fallen from 30-40% to under 10% during the same timeframe. The opinions of younger people (15-24) have followed a similar trendline while they have generally been slightly more negative compared to the overall numbers.

While the trendline for the numbers, outside of some fluctuation, has been pointing towards the direction noted above, there has been a significant spike in towards acceptance after 2019 with both the disapproval dropping significantly and the approval increasing steadily. The approval of utilising nuclear energy to combat climate change has followed a similar path to general approval and this could potentially be assumed as one of the sources for the increase.

When looking at the demographics, the most significant differences are between men and women, with men having a significantly more positive view of nuclear (84% vs. 51% approval rate). The second clearest trend is the high support for nuclear energy among voters for right-from-center parties. All of these trends seem to also apply to other questions regarding the usage of nuclear power.

Public perceptions related to SMR technology:

According to reseach survey conducted in 2022 in the capital area of Finland, almost half of the Finnish-speaking residents of the Helsinki metropolitan area are in favor of the commissioning of a small nuclear power plant in their own municipality. 31% of the respondents had a negative attitude. 23% said they did not have a positive or negative view. Based on the survey, there were need for residents to communicate and have the opportunity to participate in project planning. On the other hand, there were certain groups that had the most negative attitudes towards SMRs: women, non-Finnish speakers and age groups 30-39. Moreover, 24% said they would take part in a protest if a SMR is planned in their own municipality. 57% of respondents were in favor of holding a consultative municipal referendum. (Kojo et al. 2022)

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A survey conducted by Aula Research for Steady Energy Oy reveals that Finnish municipal decision-makers are significantly supportive of building small modular reactors. Among decision-makers in major cities, 86% are in favor, with only 11% opposed. The most supportive cities include Tampere, Espoo, Lahti, Turku, and Helsinki, with younger decision-makers showing even greater positivity. The survey, conducted in May-June 2024, included responses from municipal leaders and officials in the largest cities. Support for SMRs is primarily driven by the desire to reduce emissions, with safety, self-sufficiency, and security also cited as important factors. [1]

3.2 The Czech Republic

The Czech Republic has consistently maintained a high level of public support for nuclear power, with approximately 70% of the population in favor of it. Based on the public opinion poll conducted by the Academy of Sciences of the Czech Republic in 2022[2]:

- A significant majority (56%) of citizens believe that the nuclear share of electricity production should increase in the future. Meanwhile, less than a quarter (24%) think it should remain at the current level, and less than a tenth (9%) feel it should decrease.
- Approximately 71% of citizens support the construction of the new large Dukovany nuclear power plant (NPP) unit, while less than 18% are opposed.
- Compared to previous years, support for the expansion of nuclear power generation and the construction of another unit in Dukovany has significantly increased. This reflects the Czech public's reaction to the energy crisis and the decline in energy security, which were caused by rising energy prices since autumn 2021 and the destabilization of the geopolitical situation due to the war in Ukraine 1 2. Additionally, a historically high value of 44% mistrust in the government when making decisions about nuclear energy was recorded
- When asked how the Czech state deals with nuclear waste from nuclear power plants, 23% of respondents correctly answered that they are currently looking for a deep repository for the disposal of nuclear waste

When asked about the acceptability of building SMRs near the respondant‘s residence [1], the so-called NIMBY (not in my backyard) effect is visible. In the case of developments more than 50 km away from the residence, respondents answered positively in 51% and negatively in 34% of cases. For developments closer than 10 km from the residence, the ratio of negative to positive responses was 55% to 28%. At the same time, people are more likely to respond positively to the

[1] https://www.world-nuclear-news.org/Articles/Finnish-municipal-decision-makers-favourable-to-SM

[2] Veřejnost o jaderné energetice – podzim 2022 (in Czech)

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question of building on sites of current nuclear power plants (66% positive responses) compared to building outside them (46% positive responses). People were mostly positive about the possibility of the Czech Republic supporting research, development and education in nuclear energy. In the case of SMRs, this was true in 69% of cases.

The public acceptability of SMRs may be higher with respect to specific parameters compared to other sources:

- Significantly smaller emergency planning zone compared to large nuclear sources,
- Declared higher safety of equipment and operation compared to large reactors,
- Plant size comparable to existing thermal and coal-fired power plants,
- Lower long-term impact on the environment (e.g., lower demands on water resources and dry cooling) and public health when replacing existing fossil sources.

It is desirable to clearly communicate these positive features to the general public, especially when developing spatial policies and plans for potentially affected localities. In particular, in areas with existing coal-fired power stations, the benefits include employment opportunities, added value to the sector, decarbonization, and securing energy supply, especially heat

The issue of public opinion also has an international overlap due to the involvement of the public from countries neighbouring the Czech Republic in the Environmental Impact Assessment (EIA) process.

From late July to mid-September 2023[3], public opinion polls were devoted to the issue of citizens' opinions on certain characteristics and risks associated with the production of electricity by nuclear fission was included in the regular survey of Czech Academy of Sciences.

The majority of citizens are inclined to believe that nuclear energy makes it possible to ensure a stable supply of energy and to produce energy at a low cost, contributes to measures against climate change and is environmentally friendly. The prevailing opinion among the Czech public is that nuclear energy is one of the safest methods of energy production. Based on this public opinion poll, it can be stated that Czech public is rather skeptical of the opinion that nuclear energy is a transitional energy production technology that will soon be surpassed.

[3] Lidé o vlastnostech a rizicích jaderné energetiky – srpen/září 2023 (in Czech)

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The Czech public sees the greatest risk in connection with nuclear energy in possible misuse or damage to the nuclear power plant as the result of a terrorist attack or war.

From early October to early November 2023, a public opinion poll was conducted near an existing large nuclear power plant (NPP) and a planned site for a SMR (IBRS, 2023). The largest nuclear operator in the Czech Republic, ČEZ, announced its decision to build its first SMR at this site 1 2. The poll indicated that public awareness of SMRs in the vicinity continues to grow, but interest and support have declined compared to the 2022 poll 1 2. However, support for SMRs remains higher than for standard nuclear unitso the 2022 poll. However, it is still higher than in the case of a standard nuclear unit.

The importance of selected parameters for the public when deciding on the construction of a SMR is shown below (in descending order) and also in Figure 1:

1. Safety of operation
2. Ensuring the energy security of the Czech Republic
3. The price of electricity and heat produced
4. Involvement of local companies and residents in construction
5. Ensuring the heating of cities and towns still dependent on coal/gas
6. Construction costs
7. The possibility of a training and service center as an opportunity for employment

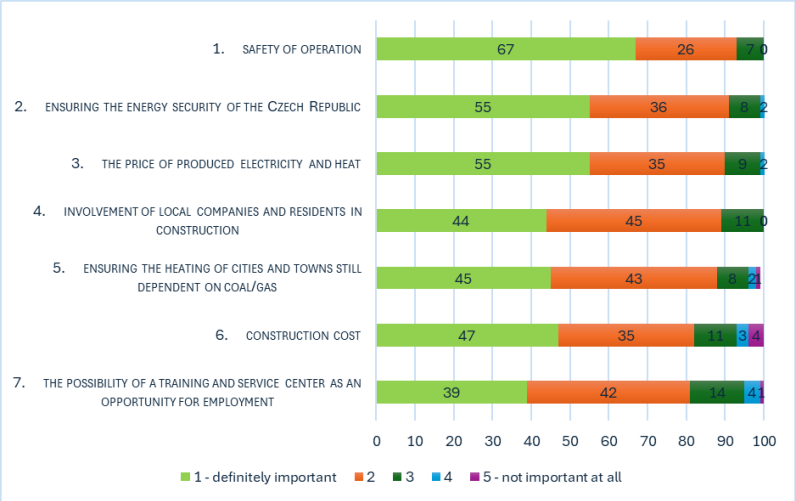

Figure 1: Importance of selected SMR construction parameters for public.

According to the poll, 80% of respondents expressed interest in SMRs, with 8% being very interested and eager to learn more. However, overall interest in SMRs has declined. When it comes to deciding on the construction of an SMR, safety remains the most crucial factor.

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Based on the above-mentioned public opinion surveys, it is crucial to communicate transparently and in advance to the public about the intentions of constructing new nuclear power plants, especially SMRs. This communication should highlight the benefits of SMRs and emphasize ensuring energy needs, employment, and economic benefits.

3.3 Other countries

Belgium: As a result of the recent energy crisis, support for nuclear has grown exponentially over recent years. According to the results of the latest public acceptance survey[4] published in March 2024 by the Belgian Nuclear Forum, 69% of respondents believe that an energy mix composed of both nuclear and renewables is the most realistic option after 2035, with 73% showing support for nuclear. Looking at SMRs in particular, 87% of respondents believed that Belgium should be involved in the development and deployment of SMRs.

Italy: Like Belgium, the ongoing energy crisis has led to growing support for nuclear. According to a survey by SWG published in April 2024, in terms of SMRs/ Advanced Modular Reactors (AMRs) 11% of those surveyed were aware of these technologies whilst 35% had heard of them but did not know anything about them. Of those who had an opinion about SMRs/AMRs, 71% consider them to be a safe technology and 72% consider them to be a zero-emissions technology. From a nuclear technology perspective, 57% of respondents are in favour of GEN III large reactors, 61% are in favour of GEN IV reactors, and 61% are also in favour of SMRs/AMRs.[5]

4 Citizen workshops

The aim of the citizen workshops was to develop and test meaningful citizen engagement approaches and contents to support informed decision-making among participants, while also building skills for engagement within stakeholder organizations. These approaches emphasized the interaction between nuclear professionals, citizens, local communities, and their governments to support joint learning. Additionally, we prioritized providing fact-based information to participants to ensure they could make informed decisions and engage meaningfully. This approach aligns with our commitment to addressing the diverse information needs of attendees during citizen workshops.

[4] https://www.forumnucleaire.be/sondage-nucl%C3%A9aire-politique-2024

[5] https://www.i-week.it/wp-content/uploads/2024/10/Sondaggio_SWG_iWeek_VI_Edizione.pdf

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The approach to stakeholder engagement activities in the project was aligned with a broad definition of stakeholders, encompassing any group or individual who feels affected by an activity, whether physically or emotionally (IAEA, 2021). For each citizen workshop, the relevant stakeholder setup was selected to better address the possible information needs of the attendees.

The TANDEM project organized two face-to-face workshops in Finland by VTT, one seminar in the Czech Republic by UJV, and one international hybrid workshop in Brussels by nucleareurope and VTT. Below are summaries of these events, followed by key findings, learnings, and conclusions.

4.1 Resident workshop about SMRs for district heating in Finland

4.1.1 Background

Small modular reactors are being considered as a future option for district heating in Kuopio which located in the Finnish Lakeland and is the regional capital of North Savo with a population of approximately 126,000 residents.

Kuopion Energia is a local energy company committed to developing cleaner energy production and ensuring reliable electricity and district heating services for the residents of Kuopio. According to local news, the next step in planning for SMRs involves a two-year environmental impact assessment (Table 1). The main advantage of nuclear power is price stability, ensuring predictable heating costs for the next 60 years. The proposed plant would be located either in the Eastern part of Sorsasalo or the Hepomäki industrial area, both of which are undeveloped and far from dense residential areas. The plant would be built underground on a 2-3 hectare site and would house two 50 MW reactors, providing district heating for about 90% of Kuopio's central city residents. Alternatives to nuclear power include a wood-burning plant, waste heat from data centers, or geothermal energy. The decision must be made within five years, with an estimated investment of around 200 million euros. Safety remains a top priority throughout the project[6].

[6] https://www.kuopionenergia.fi/vastuullisuus/pienydinvoima/

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2023 – Scanning of possible locations
2024 – Pre-engineering agreement with Steady Energy Oy
2025 – Environmental Impact Assessment (EIA) and zoning
2026 – Proposal for an amendment to the Nuclear Energy Act to be submitted to Parliament
2028 – The new Nuclear Energy Act enters into force
2029 – Decision on the construction of a small nuclear power plant
2030 – Start of construction of a small nuclear power plant
2035 – Completion of the small nuclear power plant and decommissioning of the Haapaniemi 2 power plant unit

Table 1 Schedule of the SMR power plant in Kuopio, Finland

4.1.2 Joint planning of the event

Given Kuopio's recent news coverage and progress in exploring SMRs, we aimed to plan a meaningful event. We contacted the CEO of Kuopion Energia and the City of Kuopio zoning authorities to gauge their interest in co-organizing an event for Kuopio residents, marking the first of its kind in Finland. Upon receiving their agreement, we collaboratively designed the event to address the local situation and needs through four short online meetings.

The City of Kuopio was chosen as the official organizer to provide the venue—Council Hall, started marketing the event, and handled recordings. The city's role as a neutral party was considered important to ensure an impartial event. It was also agreed to keep the event open to all without any registrations to ensure easy access and attract as many participants as possible. The risks of demonstrations were assessed as minimal.

Based on our joint discussions, we drafted the program and identified experts for the event, as well as ways to facilitate the event to ensure more informal interactions. The workshop was designed in two parts: the first part focused on expert presentations about SMRs, and the second part was dedicated to discussions between the experts and the participants. These discussions took place at stands set up by five organizations during the event: Kuopion Energia, the City of Kuopio, Steady Energy, VTT and STUK. At the end of the workshop, experts presented a summary of the discussions raised. Additionally, a feedback questionnaire was created to gather participants' opinions and suggestions.

4.1.3 The event and feedback

The event was organised on Thursday September 5, 2024, from 17:00 to 19:30.The event began with five short presentations on selected topics:

- Current Status, Motivation, and Alternatives for Small Nuclear Reactor Opportunities by the CEO of Kuopion Energia.

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- Benefits and Opportunities of the LRD District Heating Reactor by the Head of Community Relations at Steady Energy.
- Waste Management for Small Nuclear Reactors by a Senior Scientist at VTT.
- Small Nuclear Power Plant Near Residential Areas – How Does STUK Oversee Safety? by a Lead Expert at STUK - Radiation and Nuclear Safety Authority.
- Planning and Participation in the City by a Planning Engineer from the City of Kuopio.

Following the presentations, there was an extended coffee break during which participants could visit stands and engage in informal discussions with experts from the five organizations. The event concluded with short summaries by the experts, highlighting the key points raised during the stand discussions. The presentations were recorded, and the material is available on the city's website.

Approximately 70 people participated in the event. Most of the participants were middle-aged and men. 27 feedback forms were received and based on that 60% had a positive attitude towards nuclear power and most participants (74%) reported that their attitudes towards nuclear energy did not change during the workshop. Some female participants made strong contributions to the discussion, including speeches against nuclear energy.

The audience raised numerous questions, including those about placement and safety, economic aspects such as as local impact and employment, fuel and waste management, the reliability of the entities building and operating the plant, environmental concerns, and detailed technical issues.

The feedback of the Kuopio workshop was very positive. 89% of the audience evaluated the event to be good or extremely good. The expert presentations were counted also good or extremely good (89%). According to open feedback, discussing and brainstorming in a group after the expert presentations was a good idea, which made sharing ideas with others easier. The atmosphere was good during these discussions. As development ideas, participants suggested that the event could benefit from more time and a calm explanation to the audience about how the event would proceed and the forms of participation. Additionally, they recommended that open public speaking opportunities should have their own designated time in the agenda.

4.1.4 Conclusions and recommendations

The event provided valuable information about use of SMRs to the audience as well as for all stakeholder organizations involved. Organisations learned about residents´ perceptions and information needs related to SMRs, as well as approaches and methods for ensuring effective interaction in the events. The insights gained were used to improve communication within each

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organization. One concrete impact of the event was that Kuopio Energy decided to rule out a potential site near the city center due to concerns about emergency risks raised during the discussions.

Based on the event, we highlight recommendations:

- Co-designing the event with stakeholders provides opportunities to adapt to local conditions and address the concrete needs of residents.
- Impartialty and fact-based information are essential to built and maintain trust
- Genuine engagement and interaction require real methods and allocated time in the program
- Citizen engagement is an ongoing effort that stakeholder organizations need to commit to and learn from—it is not a one-time exercise
- Strategies are needed to attract a wider audience, including women and younger generations

4.2 Workshop for women

4.2.1 Background

In addition to Kuopio, there is interest in SMRs in the Helsinki metropolitan area as the region's district heating production is being renewed to meet carbon neutrality goals[7]. Although the majority of respondents had a positive attitude towards the introduction of SMRs, the attitudes towards SMRs are strongly gendered: women are opposing the use of SMRs more than men. It has been found that gender is statistically a very significant explanatory factor and the strongest indicator behind both the safety and acceptance of SMRs. The impact of gender surpasses all other background factors (Kiviluoma, N., Savela, N. & Kojo, M. 2024).

The motive of the workshop was to better understand the special needs and concerns of women, to provide fact-based information on the use of nuclear power and its boundary conditions, and to promote joint learning through open and polyphonic discussion, especially focused on SMRs. To achieve this, we contacted the Executive Director of The National Council of Women of Finland, a feminist umbrella organization for women's associations founded in 1911 that

[7] https://www.helen.fi/en/about-us/energy/nuclear-energy

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promotes human rights and gender equality. The Council is the largest coalition of women's organizations in the Nordic countries, encompassing 72 member organizations with a total of approximately 400,000 members[8].

Following a positive response to organising a joint event, we engaged the Women in Nuclear Finland (WiN-FIN) which is a working group of the Finnish Nuclear Society (ATS), aimed at promoting the dissemination of information based on facts and scientifically researched knowledge about energy issues, the use of radiation, and radioactivity. Furthermore, we collaborated with LUT University researchers to offer insights about gender issues related to nuclear energy.

4.2.2 Joint planning of the event

The event planning was conducted through brief online meetings, with the primary aim of ensuring the presence of female nuclear experts. This approach was intended to lower the threshold for participation and encourage questions during the event. Smaller groups were planned for enabling discussion after each presentation. Rather than aiming for a large-scale event, the focus was on creating an open and warm environment to foster interaction. Relevant topics were discussed and selected during these meetings.

Additionally, the VTT Nuclear Safety Centre in the capital area was chosen as the venue, providing an opportunity for attendees to visit this recently built nuclear research facility. The event was marketed by the National Council of Women of Finland and Women in Nuclear through various channels. Registration was required for participation and feedback was collected after the event with an online form.

4.2.3 The event and the feedback

The event was organised on Wednesday 4th of December 2024 from 17:15-19:30. The event featured short all-female expert presentations from the authorty, ministry, industry and research representatives on the following topics:

- Use of Nuclear in Finland and What New SMRs Would Bring
- Small Nuclear Power Plant Near Residential Areas – How Does STUK Oversee Safety?
- Lessons Learned from Fortum's New Nuclear Feasibility Study
- Waste Management for Small Nuclear Reactors

[8] https://naisjarjestot.fi/en/

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The originally planned topic on “Gendered attitudes towards nuclear” was canceled due to illness. However, the slides were shared with participants afterwards.

A miniature model of Steady Energy's SMR heat-producing plant (LDR-50) was displayed in the coffee room, where an expert introduced its workings and answered questions raised by the participants. After each presentation, discussions continued in the smaller groups and with the whole group. Presentations were sent to participants afterward.

Thirty women participated in the event, most of whom were highly educated and came from diverse backgrounds. According to the feedback, all participants had neutral or positive attitudes towards nuclear energy. Half of the attendees considered it important to participate in decision-making, while the other half were undecided. The conditions for the use of nuclear energy included strict safety requirements, reliability of the actors, minimization of environmental impacts, profitability, and acceptance by local communities.

All participants rated the event as very good or good. The atmosphere was warm, respectful and the discussions were both critical and constructive. A variety of questions were raised, including topics such as safety, environmental impact, cost and benefits, licensing, nuclear waste, and technology. Risks related to terrorism and national security were also discussed. However, feedback indicated that the discussions were too short. One concrete suggestion was that Women in Nuclear could have a Q&A section on their website to address women's questions and concerns.

4.2.4 Conclusions and recommendations

The event highlighted the need to bring women together for discussions. It was noted that the use of nuclear energy in district heating has not been widely recognized, and some attitudes towards nuclear power may still be influenced by historical events such as the Chernobyl disaster and associations with nuclear weapons and war. The event did not attract women who are opposed to nuclear energy although it attracted women that have more neutral attitudes.

Based on the event, we highlight recommendations:

- Establish networks and connections with organizations that are closely aligned with women's interests.
- Allocate sufficient time and appropriate formats for discussions
- Develop strategies to attract women who are opposed to the use of nuclear energy

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4.3 Czech workshop on SMR – future energy sources

The University of West Bohemia (UWB) in Plzeň (Pilsen), supported by the Ministry of Industry and Trade (MIT), the Pilsen region, energy companies, the power industry, and UJV Řež, organized a fully open event/workshop for citizens on the deployment of small modular reactors (SMRs) in the Czech Republic. This event took place at the UWB Bory Campus in Plzeň on the evening of September 5th, 2024. The invitation to the event was publicly announced through UWB communication channels and other platforms, such as the website of the city of Plzeň [9]. The event was organised as a open part of the conference "Nuclear power – Europe's carbon-free future" within the Nuclear Days 2024 event[10]

The event was prompted by the initiation of official planning for potential SMR placements in the Czech Republic. A key factor is the need to replace current lignite/coal-burning heating plants by 2030, with SMRs being a potential replacement technology. Additionally, several Czech organizations and companies have announced their intentions to design or deploy SMRs in the country. The largest nuclear operator in the Czech Republic, ČEZ, has decided to build its first SMR at its Temelín nuclear site, where two large nuclear units are already in operation. Consequently, many citizens living near the plant, who work or have worked at the nuclear power plant (NPP), generally have a positive attitude towards nuclear energy. (See CEZ's announced intention to build an SMR fleet with a total capacity of 3 GW[11]).

The event was divided in two parts: the first part was focused on expert presentations and discussions with audience about possibility of **using SMR for district heating** and second part was dedicated to expert presentations and discussions with the audience about **SMRs as a possible future energy source.**[12]

Approximately 60-70 people of various ages and genders participated in the event. Among the audience were members of the Association of Nuclear Veterans CZ (ANV). This association brings together distinguished individuals with long-term professional careers in nuclear power and the peaceful use of atomic energy in the Czech Republic. The ANV is unique to the Czech Republic, a country with a long-standing tradition in designing, manufacturing, and constructing research reactors (starting in 1957) and primarily power reactors (with the first reactor, KS-150, in 1972) and nuclear power plants.

[9] Čtrnácté Jaderné dny na ZČU
[10] NUCLEAR DAYS 2024 at UWB in Pilsen, September 12 – October 17 (jadernedny.cz)
[11] ČEZ takes Rolls-Royce SMR stake, plans to deploy 3GW fleet - World Nuclear News
[12] JADERNÉ DNY 2024 na ZČU v Plzni 12. 9. - 17. 10.

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The atmosphere was very positive throughout all presentations and discussions. Questions about siting, the reliability of the intentions to build the SMR plant, and detailed technical issues were raised. A total of 20 questions, including detailed technical inquiries, were discussed between the experts and the audience. These questions can be grouped as follows:

Project implementation and location

- Do you have a confirmed site/location for the first implementation/installation of your project?
- Do you believe that you will be able to build an SMR reactor in Temelín? (question to ČEZ utility)
- Will you cooperate in any way with possible other big units 3,4 in the construction zoning procedure for the Temelín SMR? (question to ČEZ utility)

Project Relationships and Collaborations

- What is the relationship of the Calogena project to the Finnish Steady Energy project (electritically heated safety test facility) and is it a cooperation with the City Heat European project?

Technical Specifications and Systems

- What is the expected lifetime of an SMR?
- Do you have specific systems to compensate the fact that you do not work with soluble boron?
- How is the circulation in the primary circuit of the inner reactor pressure vessel ensured? (question to David SMR project)?
- What are the parameters of the Organic Rankine cycle and where do you connect it?

Energy Storage and Alternatives

- The Association for the District Heating of the Czech Republic (ADH CR) consider the deployment of sand heat storage or some such heat storage at the level from 10MWh to 20 GWh, which is done, for example, by the Finnish company Polar Night Energy, which is preparing it: is something like this also in your plans?
- What are the possibilities for using wind energy and photovoltaics in central heating systems?

Reactor Types and Modularity

- What is modularity?
- Will SMRs fulfill the role of existing cogeneration power plants?

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- It is known that some High-Temperature Reactors (HTRs) that are cooled by gas are safer and are more suitable for cogeneration. Why are you excluding those HTRs cooled by gas from the selection of reactors for heating use in the Czech Republic?
- How big (SMR) you are considering? (question to SUAS Group)
- Why did you not include reactors using thorium fuel or reactor technologies with lead cooling. These reactor types are usually known as ”Generation 4 reactor tehnologies”? (question to the study comparing the advantages/disadvantages of SMRs)

Legislation and Standards

- There is a precedent where legislation approved in the United States often influences the laws of various countries through the International Atomic Energy Agency (IAEA). Are you considering this with the ADVANCE Act of 2023?
- We know, for example, the security of the operated nuclear facility. Is the same legislation valid for SMRs? Because it greatly increases the operating cost of this facility. How is it from a legislative perspective?

Terminology and Definitions

- Does the abbreviation SMR stand for small and modular reactors or small and medium reactors?
- Could you clarify the ambiguity surrounding the terms being used? Specifically, SMR is a term from the International Atomic Energy Agency (IAEA), which has supported the small and medium reactor program since 1964. The term SMR was still used, but about 10-15 years ago, the Americans introduced the term "SMR modular reactor," which is confusing. The IAEA now recommends using "Small, Medium, and Modular Reactors." Additionally, the concept of modularity is still not completely clear. Could you elaborate on this?

4.4 Stakeholder engagement workshop in Brussels

4.4.1 Background

The workshop aimed to facilitate peer-to-peer learning and the exchange of best practices among participants regarding stakeholder engagement strategies. It identifyed key challenges and opportunities for effective stakeholder engagement within the context of nuclear research and SMRs. Additionally, the workshop aimed to develop actionable policy recommendations to enhance stakeholder engagement processes at various levels, including EU, national, regional, and local levels.

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The event was organized on 26th of March in 2025 from 10:30 – 17:00 in Brussels at the nucleareurope facilities with opportunities for online partication. The event brought together 27 participants, with eight attending in person, from various sectors and regions, each contributing unique expertise and perspectives. Participants represented following stakeholder groups:

- Research centers and universities
- Companies in the nuclear energy, consultancy, and green energy sectors
- Nuclear research facilities, energy reform teams, and regulatory organizations
- Professional development, gender balance, and advocacy groups focused on promoting nuclear energy.
- International bodies promoting the peaceful use of nuclear energy and enhancing nuclear education and expertise.
- Strategic communications and media relations.

The workshop program included a series of sessions designed to facilitate learning and discussion among participants. It began with a welcome and introduction by CEA, followed by a short overview of the TANDEM project. VTT then provided insights and lessons learned on the stakeholder engagement actions undertaken by TANDEM, as described in the previous chapter.

The first round table session focused on experience sharing, where participants discussed their own experiences with stakeholder engagement, including the challenges they had faced. The second round table session involved brainstorming on various topics. Participants explored which stakeholders should be engaged in the debate and at which levels (EU, national, regional, local). They also identified different ways of building and maintaining trust, engaged with specific audiences such as women and immigrants, and identified useful tools. Finally, the workshop moved to a discussion on policy recommendations, allowing all participants to contribute their insights. The program concluded with remarks and next steps provided by VTT.

The brainstorming sessions were conducted in small groups under the guidance of a facilitator. One group was present in person, while the others participated remotely. After each session, the groups shared their insights with the whole group. At the beginning of each session, there was also a short introduction to the topic.

The brainstorming session featured vivid discussions with participants sharing their insights and experiences in a respectful atmosphere. Remote participation was appreciated, as well as engagement in small working groups, making the session feel like a workshop. The format kept everyone actively involved. However, the lengthy online meeting, extending from morning to afternoon, left some feeling exhausted. Overall, feedback highlighted the benefits of remote

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participation and the engaging format, while acknowledging the challenges of long online sessions.

4.4.2 Outcome of the brainstorming

4.4.2.1 Experiences about stakeholder engagement

During the first brainstorming session, participants shared their experiences and challenges related to stakeholder engagement in the context of nuclear energy projects, particularly Small Modular Reactors (SMRs). Key points included:

- **Starting from scratch**: Countries without existing nuclear infrastructure, like Serbia and Poland emphasized the importance of stakeholder engagement from the outset, even if there is strong public support for nuclear energy.
- **Best practices:** The UK highlighted the use of surveys and roundtables at academic events to share best practices in stakeholder engagement.
- **Public opinion:** The ECOSENS project revealed mixed public opinions on nuclear energy, with significant concerns expressed by protestors at environmental Non-Governmental Organization(NGO)-organized protests.
- **Outreach activities**: Effective outreach activities, such as engaging youth at music festivals and using information buses, were noted as successful strategies.
- **Challenges:** Participants identified several challenges, including the current status of SMRs as 'paper' projects, the need for clear timelines, waste management, production costs, safety concerns, economic viability, and the lack of skills and supply chains.
- **Trust and communication**: Building and maintaining trust was highlighted as crucial, with open and transparent communication being essential to address fears of accidents, waste management, and disinformation.
- **Local contexts**: Experiences from Ukraine and Poland showed the importance of direct engagement with local communities and addressing specific concerns such as security and local benefits.
- **Engaging diverse groups**: The importance of involving diverse groups, including women and immigrants, in the conversation was emphasized.
- **Policy support**: High-level policy support, long-term views, and financing were identified as necessary for successful stakeholder engagement.

Overall, the discussions underscored the need for tailored, transparent communication and proactive engagement strategies to build trust and address concerns across different stakeholder groups.

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4.4.2.2 Identifying relevant stakeholders

During this brainstorming session, participants discussed which stakeholders should be engaged in the debate and at which levels (EU, national, regional, local). Key stakeholder groups included:

Educational and youth engagement:

- Young generation: Including primary and secondary schools to foster early awareness and education
- Education & training: Institutions involved in energy sector training

Local and community engagement:

- Local communities: Directly affected by the projects and crucial for local support
- Regional & local authorities: Essential for regulatory approval and local governance
- Cities: Urban areas that may benefit from district heating and other services
- Land owners: Those with interests in land use, such as farmers

Industry and energy sector:

- Energy consumers: Industry, data centers, and transport sectors that will utilize the energy produced
- Other energy sectors: Renewables, fossil sectors, and hydrogen economy
- Energy sectors: Grid operators, energy providers, and logistics companies
- Supply chain: Companies involved in the supply chain for construction and operation
- Industry: Various sectors including nuclear operators and experts
- Flexibility providers: Players in energy markets and new business models

Workforce and skills development:

- Skills/reskilling organizations: Trade unions, vocational training organizations, and job centers to address workforce needs
- Workers: Competent individuals with new abilities required for the project

Diverse and minority groups:

- Minorities: Including immigrants to tackle language barriers and trust issues
- Women: Ensuring gender inclusivity in the conversation

Environmental and community organizations:

- Local NGOs/conservation groups: Environmental and community-focused organizations
- NGOs: Environmental associations and networks connecting with citizens

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Communication and media:

- Media: Both print and digital, for effective communication and public outreach

Financial stakeholders:

- Investors interested in the project's viability

Operational stakeholders:

- Operators responsible for running the nuclear facilities

Safety, security and emergency planning:

- Emergency responders: Critical for safety and emergency planning
- Military actors: Involved in national security and strategic aspects

Government and policy makers:

- Government, regulators, lawmakers, policymakers: At local, national, EU, and global levels for policy support and regulation
- General public: Both local and broader communities affected by the project

Scientific and academic communities: Universities and academic sectors for research and development

4.4.2.3 Gaining trust

During this brainstorming session, participants discussed various strategies and actions to gain trust for SMRs. Key points included:

Effective communication:

- Better interaction: Engage with communities by asking about **their concerns** rather than assuming them
- Engage in **their** conversation: Focus on broader topics rather than solely on nuclear energy
- Use simple language: Ensure communication is clear and accessible
- Long-term strategy: Develop a marathon-like approach, taking the necessary time to build trust

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Advocacy and messaging:

- Best advocates: Identify trusted stakeholders, such as downstream users (those who consume the energy generated, such as households, businesses, industries, and data centers) and local authorities
- Proactive and reactive messages: Determine what to promote and be prepared to answer questions
- Community needs: Address the question, "What's in it for me?" to meet community expectations

Proactive messaging:

- Low-carbon focus: Emphasize nuclear energy as a low-carbon alternative to fossil fuel
- Job creation: Highlight job opportunities, especially in coal-intensive regions
- Energy independence: Stress the importance of energy sovereignty, particularly in the countries dependent on energy imports
- Energy affordability: Consider system costs and affordability
- Security of supply: Promote reliability and security brought by an integrated energy system
- Safety messaging: Address safety concerns where necessary

Communication and collaboration:

- Increase awareness: Focus on communication and education to raise awareness
- Transparency and engagement: Ensure open and transparent communication with public participation
- Strict regulation: Highlight strict regulatory measures
- Digitalization: Use technologies like blockchain for trust and traceability
- Long-term relationships: Build lasting relationships with communities
- Collaboration: Foster collaboration between different energy sectors and industry

Operating environment:

- Nimby: Address "not in my backyard" concerns
- Geopolitics: Consider geopolitical factors, energy crises, green transitions, and wars
- Unexpected situations: Prepare for accidents and other unforeseen events
- Energy independence: Promote national, regional, and local energy independence

Benefits:

- Compensation activities: Offer benefits and bonuses compared to other energy options

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- Affordable energy: Ensure stable and reliable energy prices
- Climate-friendly energy: Promote clean and climate-friendly energy
- Positive examples: Showcase strong safety performance to build trust

Research and finance:

- Fact-based knowledge: Support research and fact-based knowledge
- Nuclear waste management: Focus on new technologies and recycling of nuclear waste
- Investors: Ensure revenue predictability to attract investors

4.4.2.4 Tools for stakeholder engagement

During this brainstorming session, participants discussed various tools and strategies to enhance stakeholder engagement for SMRs. Key points included:

Referendum:

- Can empower people by allowing them to make a choice, but requires prior public engagement to be successful

Digital and AI-enhanced tools:

- Translation: Engaging local communities in other countries can be beneficial, but Artificial Intelligence (AI) tools require proper training to be effective.
- Interaction with youth: AI can engage younger generations effectively
- Visualization: AI can help visualize projects through models and maquettes
- Chat forums: Facilitating online discussions
- AI concerns: Addressing issues like bias, disinformation, data privacy, and technology gaps

Community benefits:

- Enhancing public infrastructure like schools, hospitals, and pools to improve quality of life

Communication channels:

- Social media: Effective for reaching the young generation, but direct, face-to-face interaction is better for local communities
- Media: Utilizing press and TV for broader outreach
- Influencers: Engaging influencers like YouTubers to reach wider audiences

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Tailored messaging:

- Ensuring messages are tailored to different audiences, recognizing that what matters to young people may differ from other generations

Visual and interactive tools:

- Multi-language availability: Providing materials in multiple languages
- Simple visualization: Using one-sliders, figures, and graphical summaries
- Social media content: Creating memes, short videos, and gamified content
- Printed materials: Distributing flyers and posters
- Thought leaders: Collaborating with well-known authorities and influencers

Collaboration and campaigns:

- Industry collaboration: Encouraging collaboration among nuclear industry and national associations to create public engagement campaigns
- Re-education programs: Developing programs for worker re-education and addressing immigrant labor needs

Sustainability and green initiatives:

- Clean city targets: Setting and labeling performance targets for clean cities
- Energy framework: Establishing clear and understandable energy frameworks and low-carbon transition roadmaps
- Green nuclear energy: Promoting environmentally friendly nuclear energy and its role in the energy mix

Funding mechanisms:

- Crowdfunding: Testing public support through large group funding
- Nuclear bonds: Exploring nuclear bonds as a funding mechanism

4.4.2.5 Policy recommendations

During the last brainstorming session, the following points were raised about policy recommendations:

1. **Early stakeholder engagement**: Local and national policymakers interested in the deployment of SMRs should engage stakeholders early to explain their support for the project and provide recommendations.

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2. **Project clarity**: Policymakers should clearly explain how projects will be undertaken, detailing the process to the communities involved.

3. **Regulatory expertise**: Policymakers need to highlight the expertise of regulators to build trust in the projects.

4. **Facilitation of independent experts**: Policymakers should facilitate the involvement of independent experts by providing accommodation and travel support, ensuring these experts are not perceived as industry-biased.

5. **Resource provision for engagement**: Policymakers should provide resources to enable effective stakeholder engagement, such as neutral spaces for dialogue, meetings, and workshops.

6. **Engaging diverse groups**: Local policymakers could play a crucial role in engaging diverse groups, including immigrants, in the conversation.

7. **Tailored information sharing**: Policymakers should share relevant project information tailored to the specific audience.

8. **Emergency planning communication**: Policymakers should be actively involved in communicating emergency planning measures.

5 Conclusions

Planning citizen workshops and events with key stakeholders and nuclear experts has proven to be highly beneficial. This collaborative approach allows for clear definition of objectives and addresses the specific needs and concerns of residents and stakeholders. Joint planning not only builds competencies and sincerity among all involved but also **enables continuous learning and improvement of citizen engagement activities throughout the SMR projects**. Local stakeholders can better assess what works and what doesn't.

Streamlining the planning process through short online meetings helps crystallize the event's purpose, goals, and target audience with minimal effort. Ensuring a **two-way dialogue** is essential, as it allows both the audience and organizers to learn from the event. **Acknowledging your own position and identifying the information needs and concerns of attendees** are key components of effective event design and facilitation, requiring both expertise and resources. Facilitating interaction and building trust among stakeholders enhances engagement, while emphasizing objectivity and reliability over marketing boosts credibility.

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It's important to foster a **collaborative atmosphere and encourage open discussions** where everyone feels heard. Creating a welcoming environment can help facilitate informal interactions and introductions. Providing accurate information and taking participants' concerns seriously, even if all answers aren't immediately available, is essential for building trust.

Stakeholder engagement is not a tick-box activity at the beginning of the project but **an ongoing effort throughout the lifespan of the plant**. Similarly, citizen engagement should be a strategic, long-term effort. Preparing for unintended occurrences and collecting and analyzing questions and feedback will help improve future events. This iterative process ensures that each event is better than the last, ultimately fostering a more informed and engaged community.

The aim of this research is to provide findings to industry and public organizations to help them plan and execute engagement events effectively. By continuously refining our approach, we can build stronger relationships with the public, enhance the responsiveness of the industry and public organizations, and ensure the safe and successful integration of SMRs into urban energy systems.

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