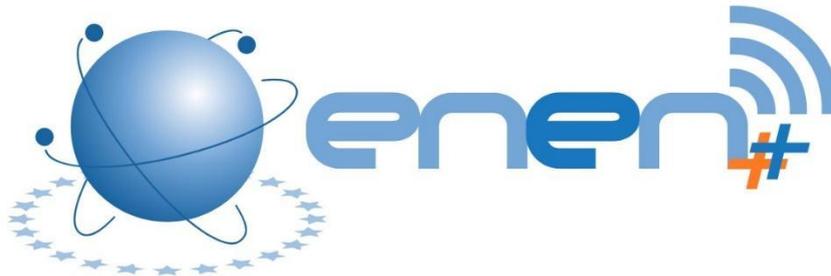




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DELIVERABLE D3.3

Report on the organization of BSc, MSc and PhD competitions and summer schools

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Authors:	Gábor Stelczer, Csilla Pesznyak, Maté Szieberth (BME), Jakob Luyten (SCK CEN), Gareth Law (UHEL), Lois Tovey (UNIVLEEDS), Barbara Ferrucci (ENEA), Stefan Cerba (STU), Jan Kamenik (NPI), Francisco Javier Elorza (UPM), Pavel Gabriel (ENEN)		
Approved by Lead Beneficiary	Reviewed by Work Package Leader	Approved by Coordinator	
Gabor Stelczer (BME) 	Pesznyák Csilla (BME) 	Pavel Gabriel (ENEN) 	

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EXECUTIVE SUMMARY

In a rapidly evolving scientific and technological landscape, the future of the nuclear sector in Europe depends on attracting, developing and retaining the next generation of nuclear workforce, as we have already demonstrated within the framework of the ENEN plus project. Within this context, the ENEN2plus project plays a pivotal role in reinforcing the visibility and appeal of nuclear education, research, and applications across all educational levels.

One of the key strategic tools employed to achieve this aim is the establishment of a diverse portfolio of nuclear competitions and summer schools that recognize excellence, creativity, and engagement in the field, and that can open the door to nuclear science for secondary school pupils, undergraduate and postgraduate students (BSc, MSc and PhD), postdoctoral researchers, and early-career professionals.

This report, Deliverable D3.3, provides an overview of these nuclear competitions and summer schools under the ENEN2plus framework. It showcases a series of impactful nuclear events targeting a wide audience, and through these activities, we aim to bring nuclear science and its peaceful applications closer to the public in an accurate and engaging manner. Two BSc and MSc nuclear competitions, five PhD Event&Prize programmes, and six nuclear summer schools were organized under the ENEN2plus, WP3, T3.3.

International competitions and summer schools in the nuclear field play a crucial role in sustaining and strengthening the future workforce of the nuclear sector. They provide unique opportunities for students and early-career professionals to acquire multidisciplinary knowledge, develop practical and communication skills, and gain exposure to cutting-edge research and innovation.

By fostering collaboration across borders and educational levels, these initiatives help to build a diverse and interconnected community of young professionals who are motivated to pursue careers in nuclear science and technology. They also contribute to raising public awareness and improving the perception of nuclear applications by highlighting their safe, innovative, and socially beneficial uses.

In the long term, such programs address the growing need for skilled experts in nuclear energy, medicine, radioactive waste management, radiation protection and other nuclear disciplines worldwide. By inspiring and preparing the next generation, international competitions and summer schools ensure the sustainability, safety, and innovation capacity of the global nuclear workforce.

The nuclear competitions have reached approximately 200 BSc and MSc students from Europe and around the world. The popularity of our summer schools is also exemplary, as there has been oversubscription every time, and unfortunately there have been students who had to be rejected for financial reasons. In the sections that follow, this report will detail the various nuclear competitions and summer schools.

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1 INTRODUCTION

Organizing a competition for BSc, MSc, and PhD students in the field of nuclear science plays a crucial role in fostering academic and professional development. Such events provide a platform for students to present their research topics, allowing them to gain valuable experience in scientific communication, enhance their presentation skills, and receive constructive feedback from experts in the field.

Furthermore, the competition encourages innovation and critical thinking, helping students to deepen their understanding of nuclear topics while promoting collaboration and knowledge-sharing among participants from various academic levels and institutions. It also helps to raise awareness of ongoing research, supports talent identification, and strengthens the pipeline of future professionals in the nuclear sector [1,2,5].

By showcasing student research, the event contributes to the visibility of young scientists and highlights the importance of nuclear science in addressing global challenges, such as clean energy, medical applications, and radiation safety.

2 NUCLEAR COMPETITIONS -BACHELOR AND MASTER LEVEL

The ENEN MSc and BSc Competition is an action of the European Nuclear Education Network to support the Research and Science in the Nuclear fields promoting the works of the BSc and MSc students.

The ENEN MSc and BSc Competition includes 20 MSc and 20 BSc participants nominated by ENEN Members or other universities and selected by the ENEN2plus Jury. The event is divided into several sessions with different subjects. The participants make a presentation of their research work for 10 minutes followed by 5 minutes of questions and discussion in a competitive but friendly environment.

All presentations are judged by the Jury members taking into account the quality of the submitted paper as well as the quality of the presentation itself. Moreover, the participation in the discussion and the clarity in answering the questions received are also taken into account in selecting the winners.

The best presentations are awarded the ENEN awards. Please see the “Criteria and Procedure for the ENEN Awards”. All nuclear topics and fields are welcome: Nuclear Engineering and Safety, Medical Applications, Radiation Protection, Waste Management and Disposal, Radiochemistry, Nuclear Materials, or any other nuclear-related topics [3].

Two ENEN MSc and BSc Competitions were organized in the ENEN2pus project, the first was organized in 2024 by Slovak University of Technology in Bratislava (STU) Bratislava, Slovakia, and the second was in Budapest University of Technology and Economics (BME), Budapest Hungary in 2025.

On this special occasion, the event accommodates the workshop of the Cross-YGN group structured as follows:

- Career paths in the nuclear world – panel discussion with moderator
- YGNs in Nuclear – open discussion

2.1 Evaluation criteria for application

The members of the evaluation committee evaluated each student based on the following criteria:

- Quality of their research work,

- Motivation letter.
- Recommendation letter.
- Information about the thesis work (extended abstract).
- No balance among the participating countries is taken into account.

All abstracts and presentations provided for the Event were shared among the ENEN Members after the Event. Participants agreed with this rule by submitting their material. All participants were requested to attend the event and the award ceremony of the ENEN BSc and MSc Competition in person.

Topics of the competition and workshop

- Nuclear Energy
- Radiation Protection
- Nuclear Waste Management
- Medical Physics
- Others

Structure of the competition

- All applicants merged into 4 broad nuclear topics.
- The time for presentation is 10 minutes plus extra 5 minutes for discussion.
- 2 parallel sessions in the morning and in the afternoon.
- 4 students' presentations per hour per session given.

Evaluation criteria

- Quality of the paper:
 - Score propagated from the application
- Clarity of the presentation: ability to communicate the message.
- Quality of the answers to the questions following the presentation.
- Ability to communicate the enthusiasm.
- Formal compliance with the rules, respect of the allocated time.
- Active participation in the event:
 - Score received upon active participation in the summer school.

For each criterion the following scores could be given:

- 0 – null,
- 1 – weak,
- 2 – average,

- 3 – good,
- 4 – very good.

The totals were summarized for each participant and an arithmetic ranking was established. The results were discussed until a consensus was found.

Financial Support

- For the ENEN2plus BSc and MSc awards ENEN Association granted a total amount of 15 000 € to the winners:
 - Best MSc in each nuclear domain:
 - 1st place: 750 €.
 - Best BSc in each nuclear domain:
 - 1st place: 750 €.
 - Best progressing BSc student during the competition:
 - 1st place: 750 €.
 - Best progressing MSc student during the competition:
 - 1st place: 750 €.
- Selected applicants received financial support for their travel expenses, and they could participate in the summer school organized by the ENEN2plus. The amount of mobility grant was limited to 1000 € per participant.

Roles and responsibilities of the committees

For each nuclear topic an evaluation committee was set up in advance, to take care of the flow of the competition. Each committee consisted of 4 members from partner institutions of the ENEN2plus project. The chair of the committee was set up upon agreement of all members.

The committees had the following roles and responsibilities.

- Increase the visibility and impact of the event.
- Collect the applications, sort them based on the related nuclear topic.
- Evaluate the applications related to the nuclear topic and select 5 MSc and 5 BSc students for each topic, who will take part in the competition in person.
- Welcome the participants of the event, get actively involved in the students' presentations and evaluate their performance.
- Select the winner.
- Representatives of the Jury can prepare for 60 min. thematic presentation for the summer school.

2.2 1st BSc and MSc Nuclear Competition and Summer School, Bratislava, Slovakia

The 1st BSc and MSc Nuclear Competition and Summer School was organized in 2024, 1-5 July, in Bratislava Slovakia by the Slovak University of Technology in Bratislava.

The event took place at the Faculty of Electrical Engineering and Information Technology of the Slovak University of Technology in Bratislava.

Based on the collected applications the students have been merged into the following nuclear topics:

- Medical Physics.
- Nuclear Physics and Engineering.
- Nuclear Waste Management and Safety.
- Radiation Protection and Nuclear Fusion.

Personal structure of the committees

Chair of the organizing committee: Š. Čerba (STU)

Chair of the jury: Cs. Pesznyák (BME)

Members of the jury: Detailed program of the event

Agenda

Time	08:00	09:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00
Day 1 1.7.2024 Monday	Start	Registration	Welcome speeches	Coffee break	Introduction of participants and the agenda	Lunch break	Cross YGN workshop	Coffee break	Cross YGN workshop	Networking	Welcome party	End
Day 2 2.7.2024 Tuesday	Start	Nuclear Competition - paralell sessions		Coffee break	Nuclear Competition - paralell sessions	Lunch break	Nuclear Competition - paralell sessions	Coffee break	Nuclear Competition - paralell sessions	End		
Day 3 3.7.2024 Wednesday	Start	Theoretical lectures	Theoretical lectures	Coffee break	Hands-on exercises - paralell activities	Lunch break	Hands-on exercises - paralell activities	Coffee break	Hands-on exercises - paralell activities	Transport	Social Evening	End
Day 4 4.7.2024 Thursday	Start	Theoretical lectures	Theoretical lectures	Coffee break	Hands-on exercises - paralell activities	Lunch break	Hands-on exercises - paralell activities	Coffee break	Hands-on exercises - paralell activities	End		
Day 5 5.7.2024 Friday	Start	Hands-on exercises - paralell activities	Coffee break	Hands-on exercises - paralell activities	Lunch break	Evaluation of the event	Awarding ceremony	Coffee break	Feedback and discussion	End		

Figure 1 – Agenda of the first ENEN2plus BSc and MSc nuclear competition and summer school

Description of the thematic blocks

- **Theoretical lecture 1:**
 - Duration: 60 min
 - Topic: Nuclear Energy
 - Title: Passive safety systems in Nuclear Power Reactors
 - Presenter: B. Ferrucci (ENEA)
 - Attendance: all groups together, 1 session
- **Theoretical lecture 2:**
 - Duration: 60 min
 - Topic: Nuclear Waste Management
 - Title: Nuclear waste disposal in Finland

- Presenter: *G. Law (UHEL)*
- Attendance: all groups together, 1 session
- **Theoretical lecture 3:**
 - Duration: 60 min
 - Topic: *Radiation Protection*
 - Title: Measurement of radionuclides in environmental samples
 - Presenter: *J. Kamenik (NPI)*
 - Attendance: all groups together, 1 session
- **Theoretical lecture 4:**
 - Duration: 60 min
 - Topic: *Medical Applications*
 - Title: *Radiation therapy*
 - Presenter: *G. Stelczer (BME)*
 - Attendance: all groups together, 1 session
- **Hands-on exercise 1:**
 - Duration: 180 minutes
 - Topic: *Tools for nuclear data processing and visualization*
 - Presenter: *B. Vrban (STU)*
 - Attendance: 10 students per group, 4 sessions
- **Hands-on exercise 2:**
 - Duration: 180 minutes
 - Topic: *Engineering tools for reactor core calculations*
 - Presenter: *J. Lüley / M. Melichárek (STU)*
 - Attendance: 10 students per group, 4 sessions
- **Hands-on exercise 2:**
 - Duration: 180 minutes
 - Topic: *Radiation protection exercises*
 - Presenter: *Š. Čerba (STU)*
 - Attendance: 10 students per group, 4 sessions
- **Hands-on exercise 4:**
 - Duration: 180 minutes
 - Topic: *Radiation treatment planning*
 - Presenter: *M. Dobroňová (STU)*
 - Attendance: 10 students per group, 4 sessions



Figure 2 – Graphical abstract of the first ENEN2plus BSc and MSc nuclear competition and summer school.



Figure 3 – Official flyer of the first ENEN2plus BSc and MSc nuclear competition and summer school

Website can be found under the link: <https://nuclearcompetition2024.enen.bme.hu/>

2.2.1 Cross-YGN workshops

The Young Generation Networks (YGNs) representing students and young professionals in different sectors in the nuclear field organised two workshops for the attendees of the ENEN2Plus Summer School.

Representatives of:

- European Nuclear Society – Young Generation Network (ENS-YGN),
- European Federation of Organisations for Medical Physics (EFOMP),
- International Radiation Protection Association – Young Generation (IRPA-YG),
- FuseNet.

Shared their stories to explore the multiple opportunities that nuclear education paths can offer, as well as to present the active networks that gather nuclear youth all over Europe!

- **Workshop I – Your Future in Nuclear: Exploring a World of Career Opportunities**

How many job opportunities does the nuclear sector offer? How many career paths can take shape during your studies?

Let's start by sharing experiences and stories of young professionals from different nuclear fields. By learning more about their professions, we aim to highlight multiple education paths, different career opportunities, but also the interconnections between the many sectors of nuclear science and technology.

Time duration: 45m/1hr

- **Workshop II - YGNs in Nuclear**

Did you know that Young Generation Networks gather nuclear students and young professionals all over Europe? And these networks are working together for a cross-sectorial commitment?

Be the protagonist and share with us your expectations, your interests, your future goals! Let's talk together about youth in nuclear energy and its potential! Learn more about the Cross-YGN project and its member associations, and their role in supporting and activating young generations.

Time duration: 45m/1hr

2.2.2 Results of the 1st Nuclear BSc and MSc Competition and Summer School

Following the comprehensive activities of the ENEN2plus consortium to make the event visible, 84 unique applications were received, among which 17 applied for the BSc competition and 67 for the MSc competition. The evaluation process resulted in 40 qualified participants while another 10 participants were placed on the waiting list, to replace some of the participants who did not confirm their participation. The remaining applicants have been found ineligible, 21 due to low score and 12 due to the country of origin. Finally 11 BSc and 29 MSc students were selected for the event and distributed to nuclear domains as follows:

- Nuclear physics and engineering – MSc competition: 8.
- Radiation protection and nuclear fusion – MSc competition: 6 .
- Medical physics – MSc competition: 8.
- Nuclear waste management – MSc competition: 7.
- Nuclear physics, engineering, safety and waste management – BSc competition: 6.
- Radiation protection, nuclear fusion and medical physics – BSc competition: 5.

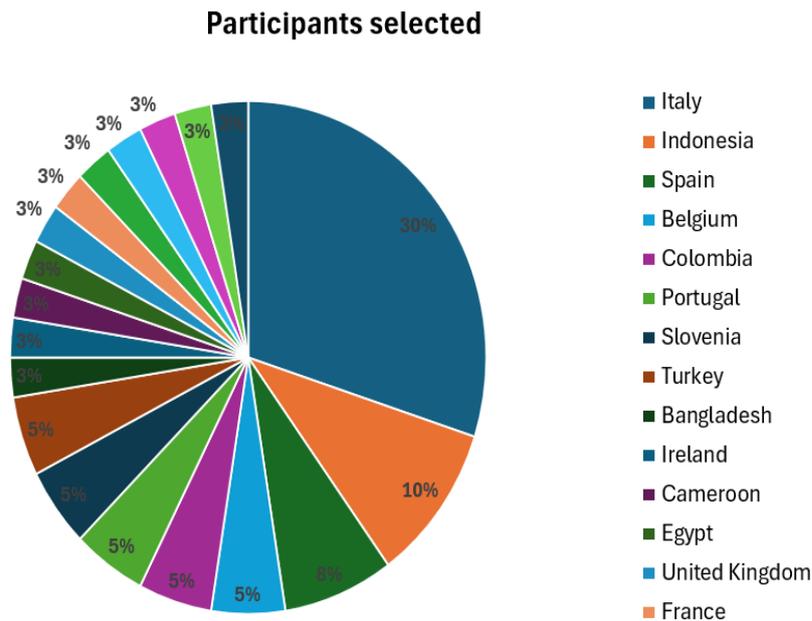


Figure 4 – Distribution of the involved countries in the first BSc and MSc Nuclear competition

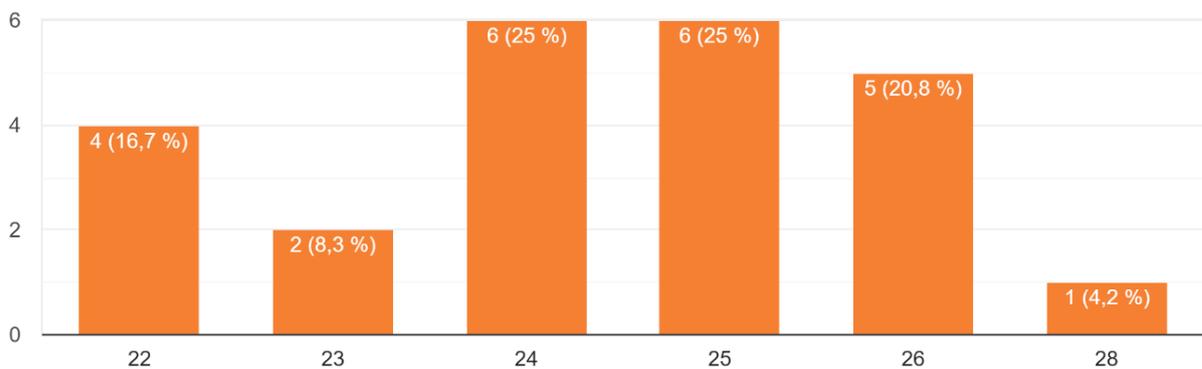


Figure 5 – Age distribution of the MSc participants in the first ENEN2plus BSc and MSc Nuclear competition

The competition consisted of two parts, the presentation of the students' work and the active participation in the lectures and hands-on exercises through quizzes, while the total score consisted of 80 % from the first part and 20 % from the second part. The theoretical lectures and practical exercises covered in the summer school were the following:

- Lecture 1: Radiation therapy.
- Lecture 2: Nuclear waste disposal in Finland.
- Lecture 3: Measurement of radionuclides in environmental samples.
- Lecture 4: Materials for sustainable nuclear energy for current and future nuclear. systems
- Exercise 1: Tools for nuclear data processing and visualization.
- Exercise 2: Engineering tools for reactor core calculations.
- Exercise 3: Radiation protection exercise.
- Exercise 4: Radiation treatment planning.

The plan has been changed; having all parts of the event completed, 3 awards were given for the best BSc students, 8 awards for the best MSc students (2 per nuclear domain) and 3 special awards for the students receiving the highest scores from the quizzes.

2.2.3 Feedback from the participants

As this competition was the very first of its kind, it was very important to identify areas in which the quality and the structure of the event have potential for improvement. The feedback forms were distributed to the participants after the event, as well as a short Slido poll was completed during closing session of the event. The results are as follows.

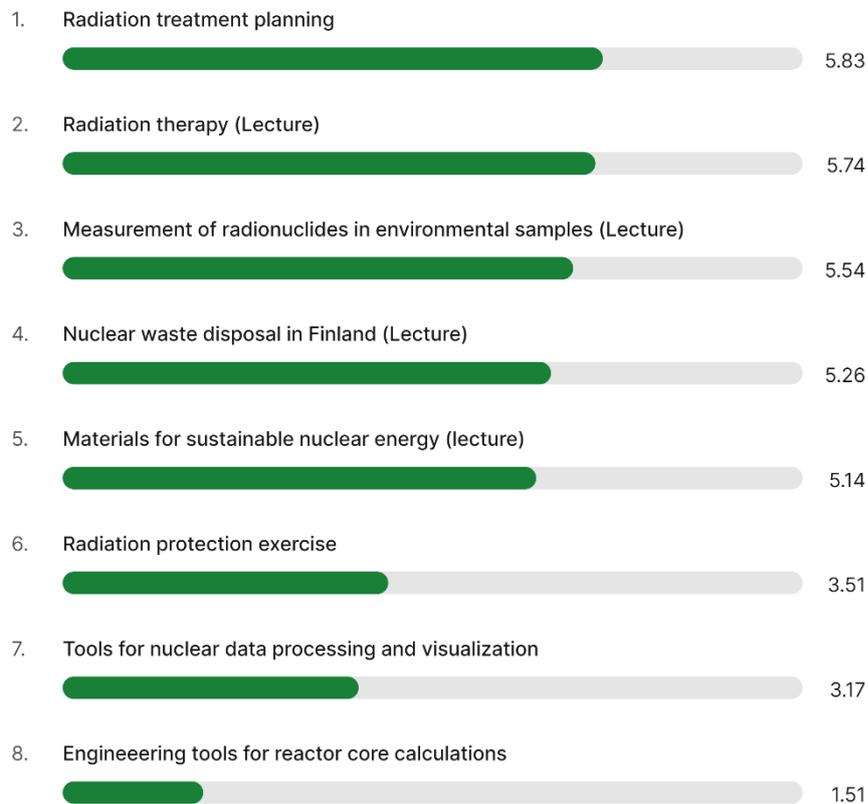


Figure 6 – Ranking of quizzes from the easiest to the most difficult

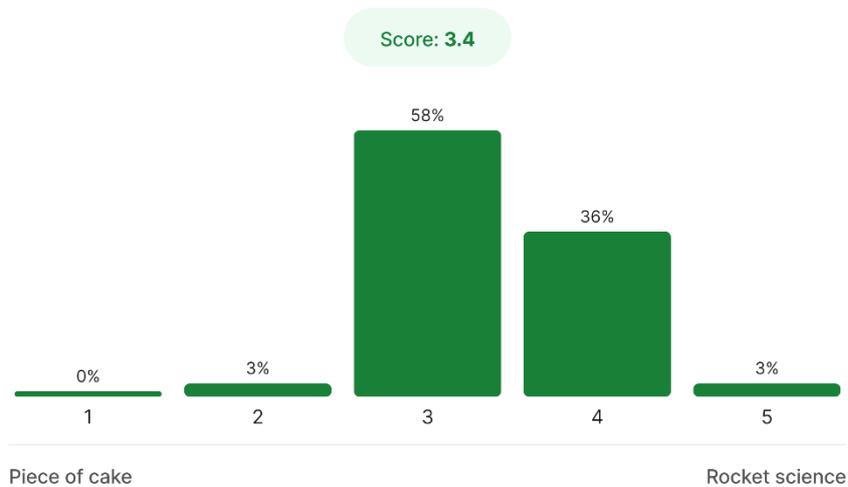


Figure 7 – Overall difficulty of the quizzes

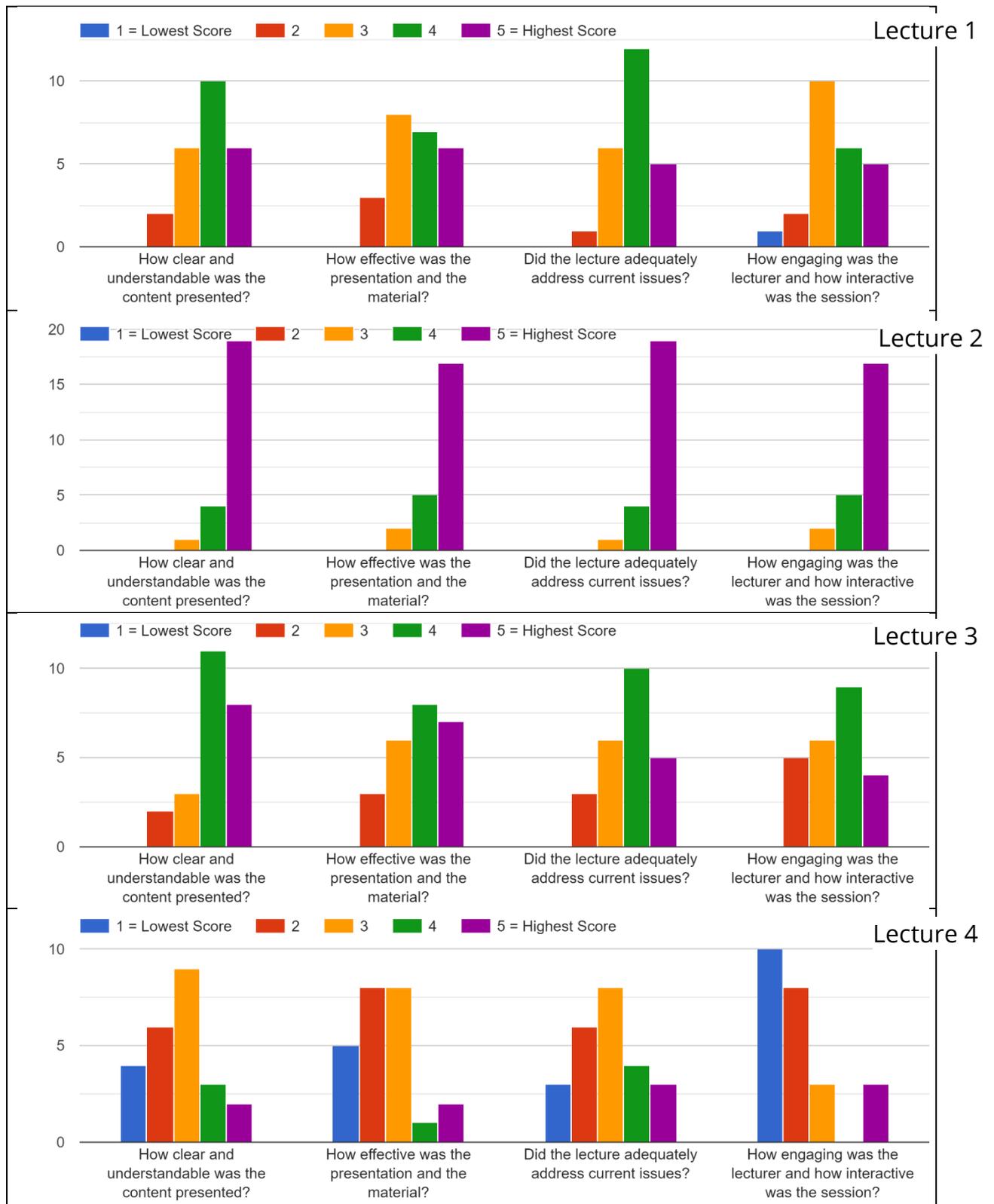


Figure 8 – Feedback on the theoretical lectures from the participants.

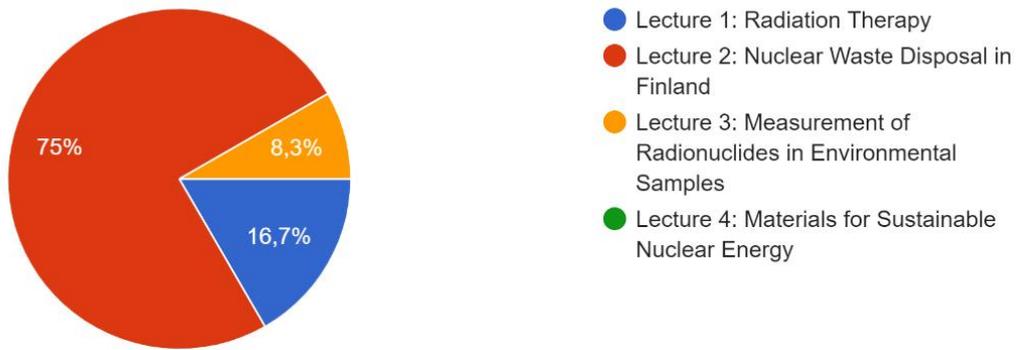


Figure 9 – Interest of the students in the lectures

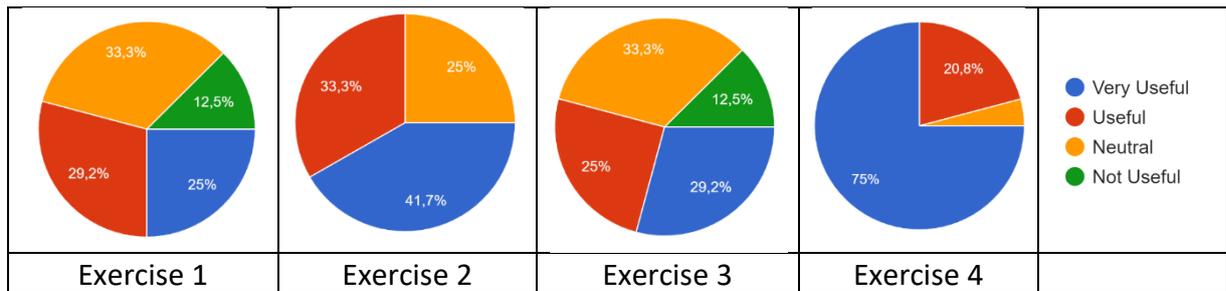


Figure 10 – Usefulness of the exercises according to the students

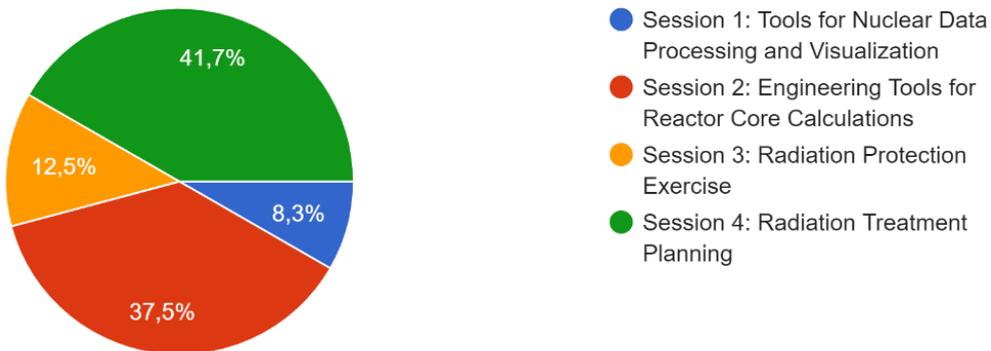


Figure 11 – Interest of the students in the exercises

2.2.4 Photos from 1st BSc and MSc Nuclear Competition

The winners of the competition can be found in the next figure 12.



Figure 12 – Winners of the competition

2.3 2nd Nuclear BSc and MSc Nuclear Competition and Summer School

The 2nd Nuclear BSc and MSc Nuclear Competition and Summer School was organized in 2025, between 30th June and 4th July by the Budapest University of Technology and Economics, Budapest, Hungary. Venues of the competition were:

- Monday, Tuesday and Friday: Budapest University of Technology and Economics Q Building; 1111 Budapest, Magyar Tudósok Körútja 2. Room QBF09 and QBF10
- Wednesday and Thursday: Budapest University of Technology and Economics, R Building R215 and Training reactor and the National Institute of Oncology; 1122 Budapest, Kék Golyó utca 13.

Based on the collected applications the students have been merged into the following nuclear topics:

- Medical Physics
- Nuclear Physics and Engineering
- Nuclear Waste Management and Radioactive Materials
- Radiation Protection

Personal structure of the committees

Chair of organizing committee: Cs. Pesznyák (BME)

Chair of the jury: Š. Čerba (STU)

Members of the Nuclear Physics and Engineering committee:

- W. Ambrosini (UNIPI)
- G. Pavel (ENEN)
- M. Sziebert (BME)
- L. Tovey (UNILEDs)

Members of the Radiation Protection committee:

- T. Póczy (BME)/C. Pesznyak (BME)
- B. Vrban (STU)
- R. Elek (NNGYK)
- M. Kirejczyk (NCBJ)

Members of the Nuclear Waste Management and Other committee:

- G. Law (UHEL)
- F.J. Elorza (UPM)
- P. Zagyvai (BME)
- S. Holgersson (CHALMERS)/ Š. Čerba (STU)

Members of the Medical Physics committee:

- A. Jreije (EFOMP)
- T. Clarijs (SCK CEN)

- A. Herein (BME)
- G. Stelzer (BME)

Members of the jury:

<https://nuclearcompetition2025.enen.bme.hu/scientific-committee-and-jury/>



Figure 13 – Graphical abstract of the event

Detailed program of the event

2nd BSc and MSc Nuclear Competition and Summer School 2025 June 30-July 4, 2025, Budapest, Hungary https://nuclearcompetition2025.enen.bme.hu/				
Monday - BME, Q Building, QBF09				
9:00-10:45	Registration			
10:45-11:45	Opening ceremony		moderator: Csilla Pesznyak	
10:45-11:10	Gabriel Pavel, Executive director of the ENEN	European Nuclear Education Network Budapest University of Technology and Economics		
11:10-11:30	Szabolcs Czifrus, Director of the Institute of Nuclear Techniques	Slovak University of Technology and Economics		
11:30-11:45	Štefan Čerba, Chair of the Scientific Committee and Jury	Slovak University of Technology in Bratislava		
11:45-12:15	Csilla Pesznyak, Chair of the Organizing Committee	BME; National Institute of Oncology		
12:15-13:30	Lunch break			
Cross-YGN Workshop "Nuclear Paths – Education, Networks and Career Opportunities"				
<i>2nd Cross-YGN workshop with BSc and MSc graduates</i>				
<i>o Education and career paths – From the speakers' personal experiences to the ambitions of students in the many sectors of nuclear science and technology.</i> <i>o Networking in the nuclear field - Young Generation Networks actively support and involve young professionals in nuclear, but sometimes they lack visibility. This section aims at showcasing opportunities and projects that these international networks offer.</i>				
13:30-15:00	<i>Education and career paths</i>	Mattia Baldoni (ENS, Belgium); Zsofia Szallasi and Adam Both (YGN-ENS Hungary)		
15:00-15:15	Coffee break	Victoria Herzner (IRPA YG) Antonio Jreij (EFOMP YG); Albert Civit (Fusenet)		
15:15-16:30	<i>Networking in the nuclear field</i>			
16:30	Welcome party			
Tuesday - BME, Q Building, QBF09 and QBF10				
	Title	Group	Jury	Room
9:00-10:30	Competition	GA1	JA1	QBF09
		GA2	JA2	QBF10
10:30-10:45	Coffee break			
10:45-12:15	Competition	GB1	JA1	QBF09
		GB2	JA2	QBF10
12:15-13:30	Lunch break			
13:30-15:00	Competition	GC1	JA1	QBF09
		GC2	JA2	QBF10
15:00-15:15	Coffee break			
15:15-16:45	Competition	GD1	JA1	QBF09
		GD2	JA2	QBF10
19:30-21:30	Social event – Boat name: Prestige - Address: Jászai Mari tér (square) 9th port on the Danube			

MSc group Wednesday - BME, R Building - 2 nd July (24 MSc students)				
	Title	Group	Lecturer	Room
9:00-10:30	Challenges of the electric power system	MSc1	B. Bíró	R215
		MSc2		
10:30-10:45 Break				
10:45-12:15	Technical tour in the Training Reactor	MSc1	M. Szieberth, A. Horváth, G. Zsíros	Training Reactor
		MSc2		
12:15-13:30 Lunch break				
13:30-15:00	PC2+ NPP simulation software demonstration	MSc1	J. Kópházi	R316
	TRANSPARENT ThERmal hydraulic Loop LOCA demonstration	MSc2	G. Zsíros	R417
15:00-15:15 Break				
15:15-16:45	TRANSPARENT ThERmal hydraulic Loop LOCA demonstration	MSc1	G. Zsíros	R417
	PC2+ NPP simulation software demonstration	MSc2	J. Kópházi	R316

BSc group Wednesday – 2 nd July (15 BSc students) - National Institute of Oncology				
	Title	Lecturer	Group	Room
9:00-9:30	Radiotherapy	Gábor Stelcer	all	Building 3, Aula
9:30-10:00	Radiation protection	Csilla Pesznyák		
10:00-10:15	Introduction in the laboratory work			
10:15-10:30 Coffee brake				
10:30-12:30	Film dosimetry	Enikő Koszta	BScG1 BScG2 BScG3 BScG4	Building 3, Aula
10:30-12:30	Water phantom	Gábor Stelcer	BScG2 BScG3 BScG4 BScG1	
10:30-12:30	Ion chamber stability QA	Domonkos Szegedi	BScG3 BScG4 BScG1 BScG2	
10:30-12:30	Radiobiology	Zsuzsa Kocsis	BScG4 BScG1 BScG2 BScG3	
12:30-13:30 Lunch break				
13:30-14:30	Treatment planning system	András Herein	BScG1 and BScG2	
	Radiation equipment	Tamás Pócza	BScG3 and BScG4	
14:30-15:30	Treatment planning system	András Herein	BScG3 and BScG4	
	Radiation equipment	Tamás Pócza	BScG1 and BScG2	
15:30-15:45 Coffee brake				
15:15-16:45	Q&A session with closing remarks			

BSc group Thursday - BME, R Building – 3 rd July (15 BSc students)				
	Title	Lecturer	Group	Room
9:00-10:30	Fusion science and technology	Gergő Pokol	BScGNE1	R215
			BScGNE2	
10:30-10:45 Break				
10:45-12:15	Technical tour in the Training Reactor	Máté Szieberth	BScGNE1	Training Reactor
		András Horváth	BScGNE2	
12:15-13:30 Lunch break				
13:30-15:00	PC2+ NPP simulation software demonstration	Szabolcs Czifrus	BScGNE1	R316
	TRANSPARENT ThERmal hydraulic Loop LOCA demonstration	Gergely Orosz	BScGNE2	R417
15:00-15:15 Break				
15:15-16:45	TRANSPARENT ThERmal hydraulic Loop LOCA demonstration	Gergely Orosz	BScGNE1	R417
	PC2+ NPP simulation software demonstration	Tamás Varjú	BScGNE2	R316

MSc group Thursday - 3 rd July (24 MSc students) – National Institute of Oncology				
	Title	Lecturer	Group	Room
9:00-9:15	Welcome, opening ceremony	Prof. Dr. Magdolna Dank, General Director	all	Building 3, Aula
9:15-9:45	Radiotherapy	Gábor Stelcer		
9:45-10:15	Radiation protection	Csilla Pesznyák		
10:15-10:30 Coffee brake				
10:30-12:30	Film dosimetry	Enikő Koszta	MScG1 MScG2 MScG3 MScG4	Building 3, Aula
10:30-12:30	Water phantom	Gábor Stelcer	MScG2 MScG3 MScG4 MScG1	Building 3, Aula
10:30-12:30	Ion chamber stability QA	Domonkos Szegedi	MScG3 MScG4 MScG1 MScG2	Building 3, Aula
10:30-12:30	Radiobiology	Zsuzsa Kocsis	MScG4 MScG1 MScG2 MScG3	Building 3, Aula
12:30-13:30 Lunch break				
13:30-14:30	Treatment planning system	András Herein	MScG1 and MScG2	
	Radiation equipment	Tamás Pócza	MScG3 and MScG4	
14:30-15:30	Treatment planning system	András Herein	MScG3 and MScG4	
	Radiation equipment	Tamás Pócza	MScG1 and MScG2	
15:30-15:45 Coffee brake				
15:15-16:45	Q&A session with closing remarks			

Friday – 4 th July, BME, Q Building, QBF09			
	Title	Group	Room
9:00-10:30	Evaluation/Quiz	All	QBF09
10:30-10:45	Coffee break		
10:45-11:15	Feedback	All	QBF09
11:15-12:00	Award Ceremony	All	QBF09

Figure 14 – Program of the second BSc and MSc Nuclear competition



BUILDING EUROPEAN NUCLEAR COMPETENCE
THROUGH CONTINUOUS ADVANCED AND STRUCTURED EDUCATION AND TRAINING ACTIONS

BSc and MSc Nuclear Competition and Summer School
30 June – 4 July 2025

**Budapest University of Technology and Economics (BME)
Institute of Nuclear Techniques
Budapest, Hungary**

APPLY FOR THE COMPETITION WITH YOUR THESIS WORK.
Nuclear Engineering and Safety
Medical Physics
Radiation Protection
Waste Management and Disposal
Radiochemistry
any other nuclear-related topic

Selected applications will receive financial support for their travel expenses, and they can participate on the summer school organized by the ENEN2plus

A TOTAL AMOUNT OF THE AWARDS IS 7500 €

<https://nuclearcompetition2025.enen.bme.hu/>

NEW deadline for submitting your application: 12 May 2025



Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.



Funded by the European Union

Figure 15 – Poster of the second BSc and MSc competition

Website can be found under the link: <https://nuclearcompetition2025.enen.bme.hu/>.

2.3.1 Cross-YGN workshops

The Young Generation Networks (YGNs) representing students and young professionals in different sectors in the nuclear field organised the workshop for the attendees of the 2nd ENEN2Plus Summer School.

Representatives of:

- European Nuclear Society – Young Generation Network (ENS-YGN),
- European Federation of Organisations for Medical Physics (EFOMP),
- International Radiation Protection Association – Young Generation (IRPA-YG)
- FuseNet,

Workshop: Nuclear Paths – Education, Networks and Career Opportunities

Summary: Second edition of the Cross-YGN workshop with BSc and MSc graduates, which aimed to meet young professionals in different nuclear disciplines to explore:

- o Education and career paths – From the speakers’ personal experiences to the ambitions of students in the many sectors of nuclear science and technology.
- o Networking in the nuclear field - Young Generation Networks actively support and involve young professionals in nuclear, but sometimes they lack visibility. This section aims at showcasing opportunities and projects that these international networks offer.



Figure 16 – Poster of the second Cross-YGN Workshop



Figure 17 – Participant of the second nuclear BSc and MSc competition and summer school

2.3.2 Results of the 2nd Nuclear BSc and MSc Competition and Summer School

Following the comprehensive activities of the ENEN2plus consortium to make the event visible, 99 unique applications were received, among which 33 applied for the BSc competition and 66 for the MSc competition. The evaluation process resulted in 41 qualified participants while another 10 participants were placed on the waiting list, to replace some of the participants who do not confirm their participation. Finally 15 BSc and 26 MSc students were selected for the event and distributed to nuclear domains as follows:

- Nuclear physics and engineering – MSc competition: 9
- Radiation protection – MSc competition: 4
- Medical physics – MSc competition: 6
- Nuclear waste management and other– MSc competition: 7
- Nuclear physics, engineering – BSc competition: 4
- Radiation protection – BSc competition: 3
- Medical physics – BSc competition 5
- Radioactive waste management and others – BSc 3

The applications were received from 40 different countries: Albania, Algeria, Argentina, Belgium, Brazil, Canada, Chad, Colombia, Czech Republik, Egypt, Ecuador, Ethiopia, Philippines, Germany, Ghana, Greece, India, Indonesia, Iraq, Iran, Ireland, Italy, Jordania, China, Malta, Marocco, Mexico, Nigeria, Pakistan, Poland, Portugal, Saudi Arabia, Serbia, Slovakia, Spain, Sri Lanka, Tanzania, Tunisia, Turkey and Zambia.

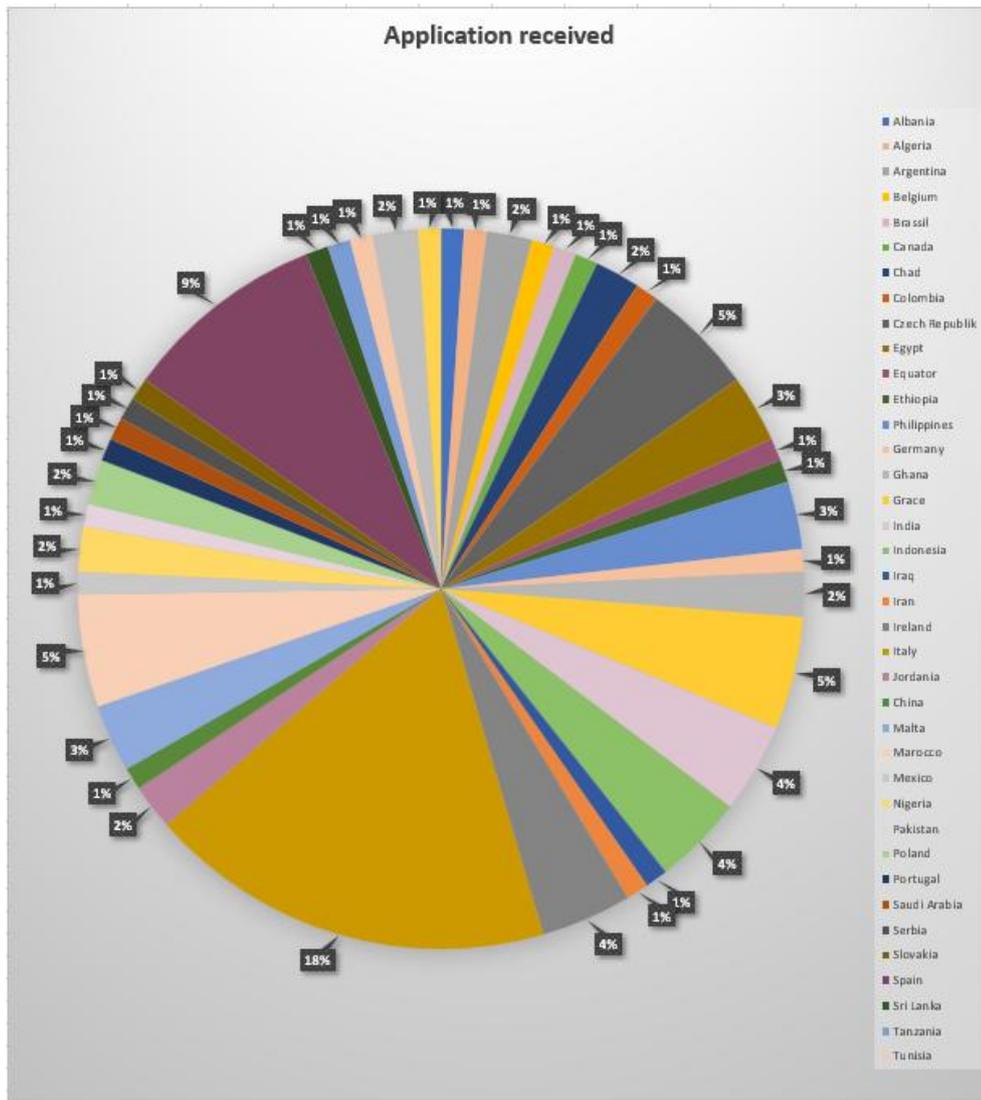


Figure 18 – Application statistics of the second BSc and MSc competition and summer school

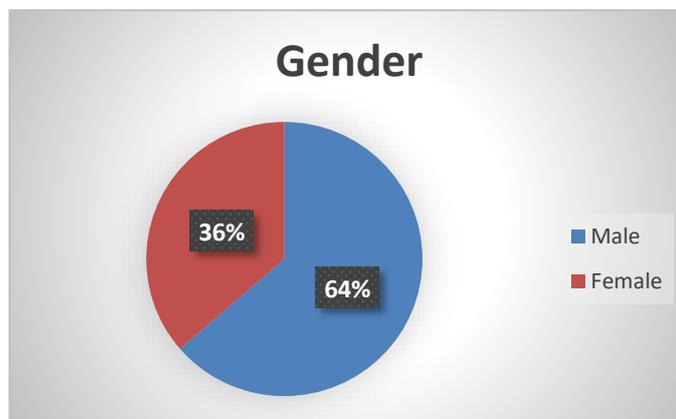


Figure 19 – Gender balance of the second BSc and MSc competition and summer school

2.3.3 Structure of the competition

The event consisted of two parts, the competition and the summer school. In the competition part, the students presented their thesis work for the scientific jury. During the summer school,

which started after the presentations of thesis work, the students attended theoretical lectures and practical exercises.

2.3.3.1 Presentation of thesis work

In the first part of the event the students were divided into eight groups, as it is shown in Figure 20, and presented their thesis work in front of the jury.

Tuesday - BME, Q Building, QBF09 and QBF10				
	Title	Group	Jury	Room
9:00-10:30	Competition	GA1	JA1	QBF09
		GA2	JA2	QBF10
10:30-10:45	Coffee break			
10:45-12:15	Competition	GB1	JA1	QBF09
		GB2	JA2	QBF10
12:15-13:30	Lunch break			
13:30-15:00	Competition	GC1	JA1	QBF09
		GC2	JA2	QBF10
15:00-15:15	Coffee break			
15:15-16:45	Competition	GD1	JA1	QBF09
		GD2	JA2	QBF10
19:30-21:30	Social event – Boat name: Prestige - Address: Jászai Mari tér (square) 9th port on the Danube			

Figure 20 – Timetable of the competition

2.3.3.2 Quiz

The quiz was attended by the students through dedicated google forms accessible through QR codes. The quiz from the lectures and laboratory work were attended by all students together on Friday morning. The best two students received the special quiz award.

2.3.3.3 Selection of the final list of winners

The final list of winners was selected based on the presentation of thesis work. The following awards were distributed for the BSc students:

- Best BSc students in each nuclear domain:
 - 1 winner
 - award 750 €
- Best BSc students in Quiz competition:
 - 1 winner
 - award: 750 €

The following awards were distributed for the MSc students:

- Best MSc students in each nuclear domain:
 - 3 winners – nuclear energy
 - 2 winners – medical physics
 - 2 winners – radioactive waste management
 - 1 winner – radiation protection

- award 750 €
- Best MSc students in Quiz competition:
 - 1 winner
 - award: 750 €

2.3.4 Feedback from the participants



 **Giovanni Gasperini** • 1st
Graduated @Polimi MSc Nuclear Enginee...
4mo • 🌐

🌐 Just came back from an enriching experience at the BSc and MSc Nuclear Competition and Summer School 2025, held in Budapest and organized by ENEN [European Nuclear Education Network!](#)

During the week, I had the chance to explore cutting-edge topics in nuclear science through lectures and hands-on activities at [Budapest University of Technology and Economics \(BME\)](#) — including an inspiring visit to their training reactor and a tour of the National Institute of Oncology.

The Summer School brought together brilliant students from across Europe and beyond, making it a truly international and interdisciplinary environment.

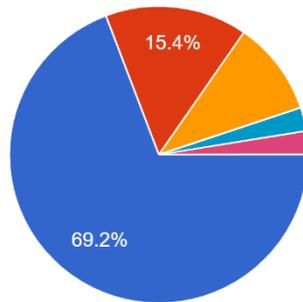
As part of the competition, I presented my thesis project:
"Design and Development of a Gas Nanodosimeter with Segmented Anode: A Machine Learning Based Optimization Approach."
I'm proud to share that I was awarded as the winner in the Medical Physics category 🏆

A heartfelt thank you to ENEN, the organizers, lecturers, and fellow participants for an unforgettable week of science, learning, and exchange!

[#MedicalPhysics](#) [#NuclearScience](#)
[#MachineLearning](#) [#SummerSchool](#) [#ENEN](#) [#BME](#)
[#Budapest](#) [#Nanodosimetry](#) [#StudentResearch](#)

How did you hear about the Competition?

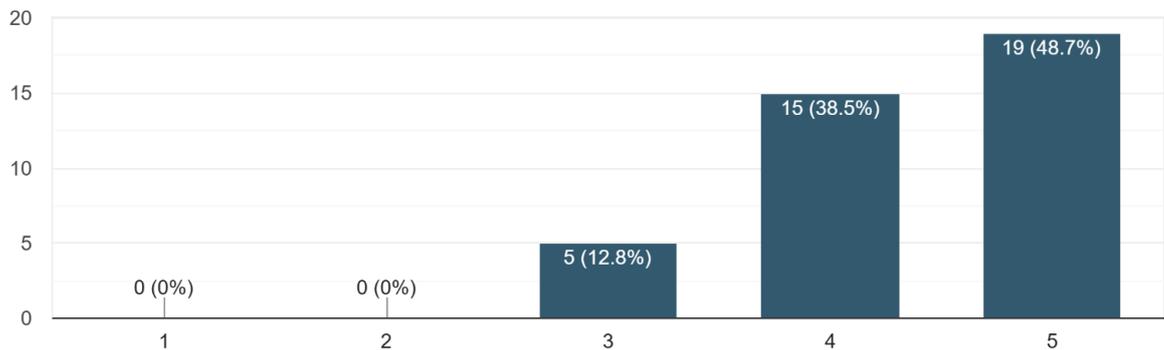
39 responses



- At university / recommended by a professor.
- A friend or acquaintance mentioned it.
- I saw it on a nuclear organization's website / LinkedIn or other social media
- Through a newsletter.
- I found it by chance on the internet.
- LinkedIn
- Previous co worker from internship

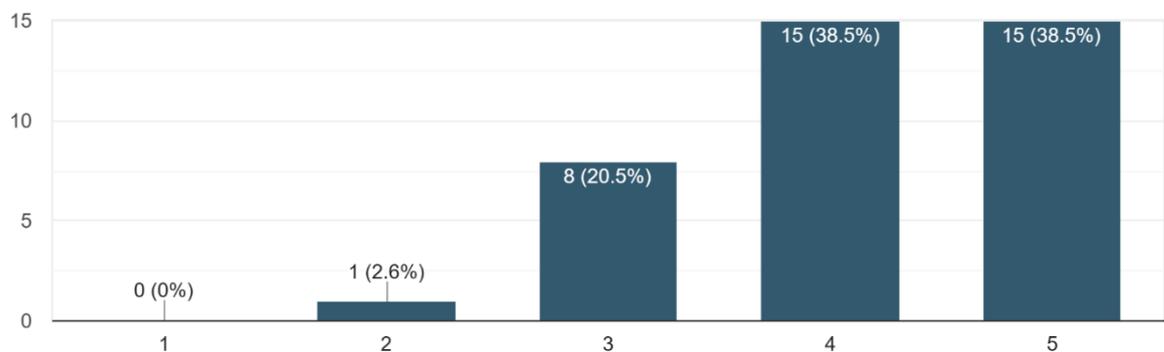
On a scale of 1 to 5, how interesting was the event overall for you?

39 responses

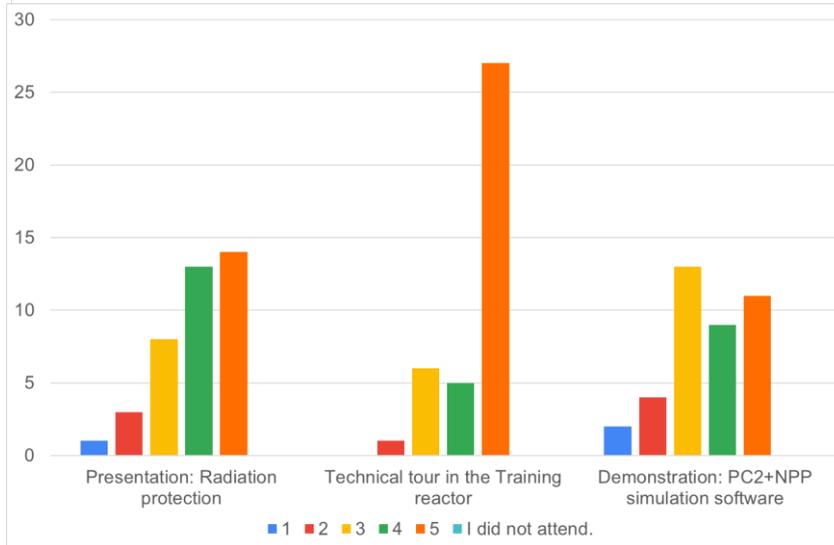
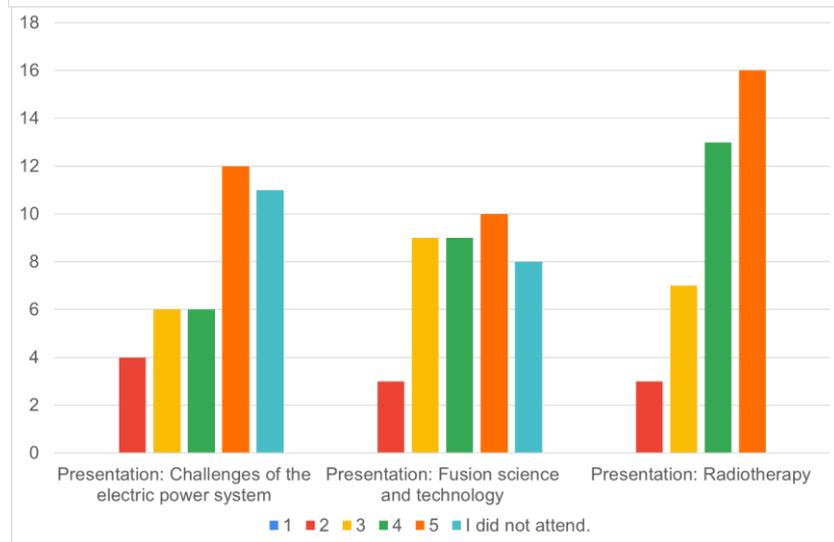
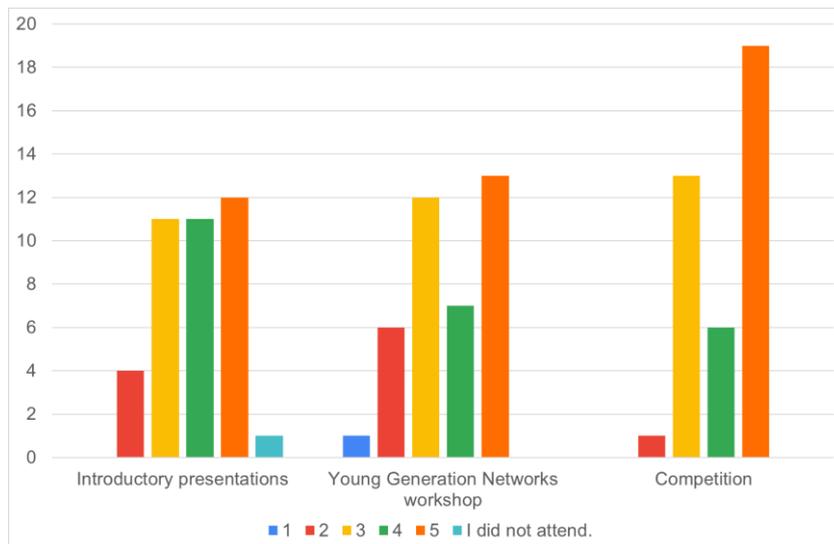


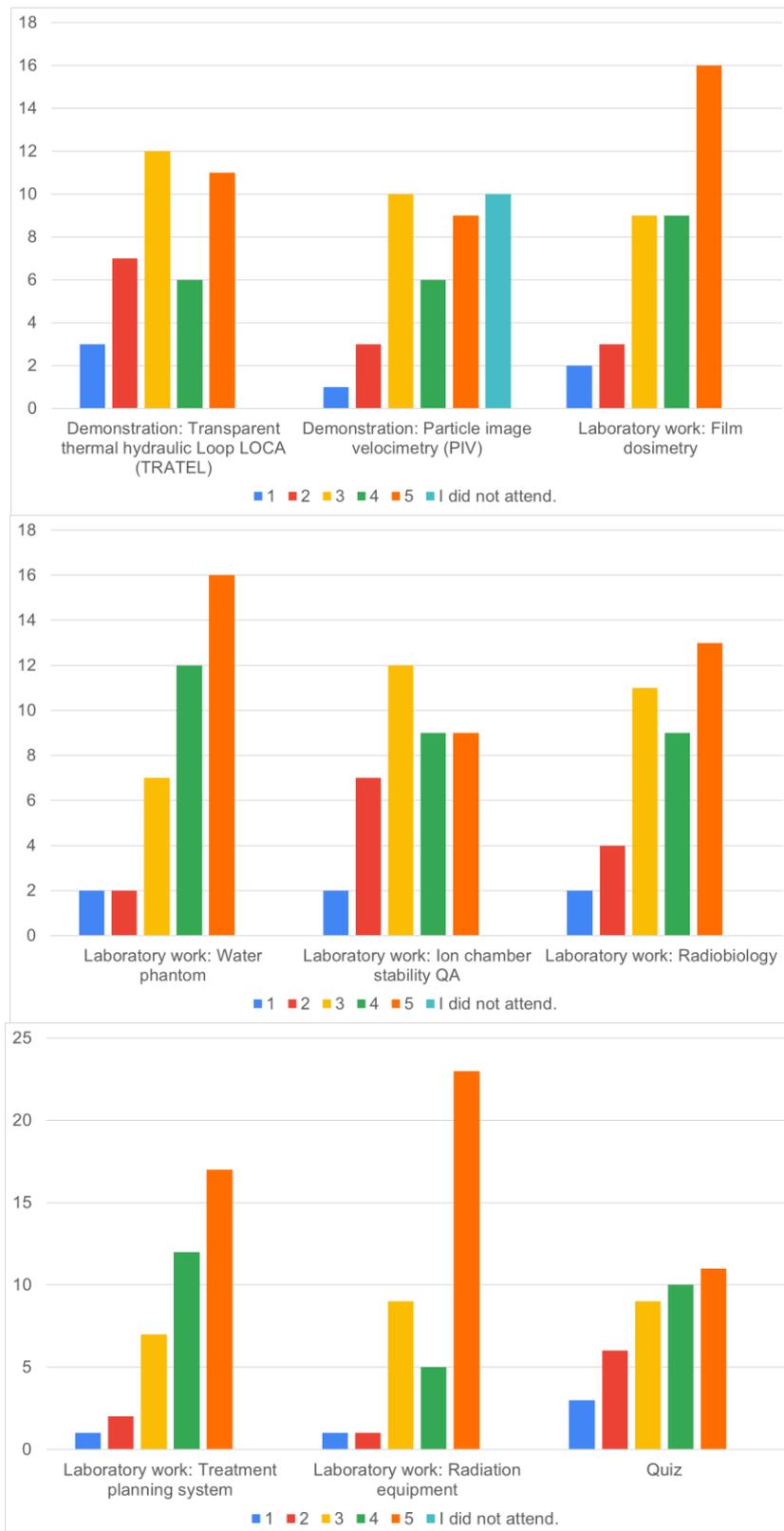
On a scale of 1 to 5, how useful was the event overall for you?

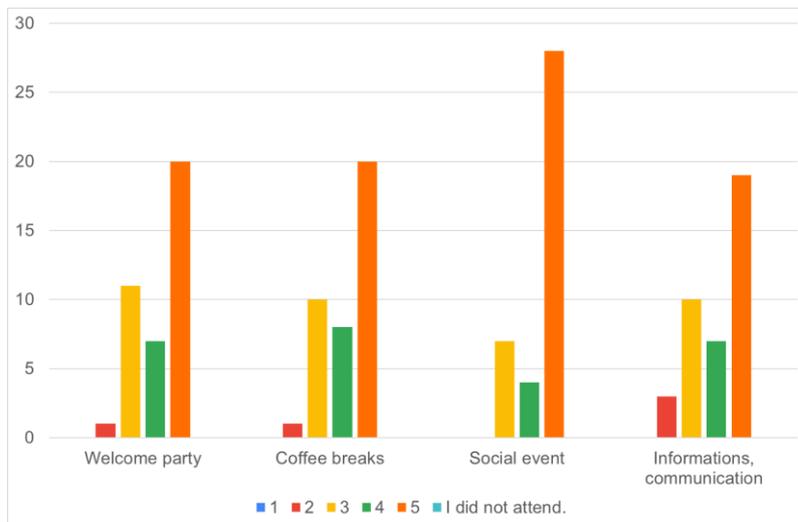
39 responses



Please rate the individual programs on a scale of 1 to 5 (you can also choose "did not attend").
For rating: 1 = Fail, 5 = Excellent

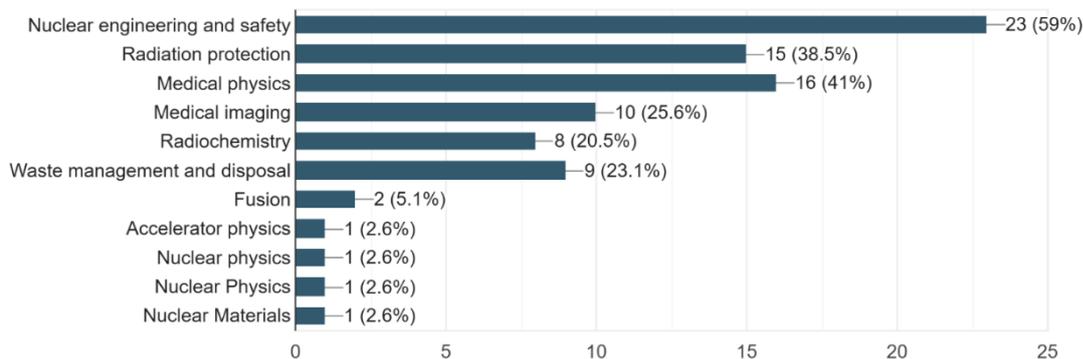






Which nuclear topics are you most interested in? You can select more than one option.

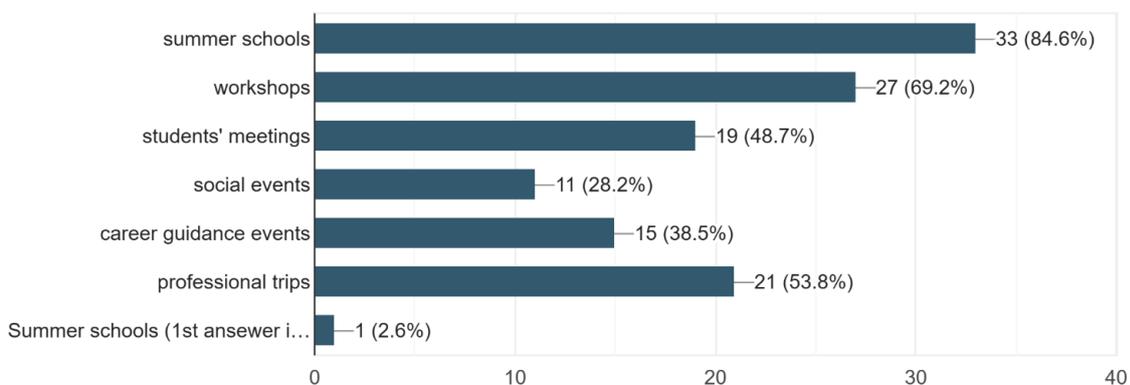
39 responses



What events should ENEN organise to help students get more information about nuclear sciences?

You can choose more than one answer.

39 responses



2.3.5 Photos from 2nd BSc and MSc Nuclear Competition

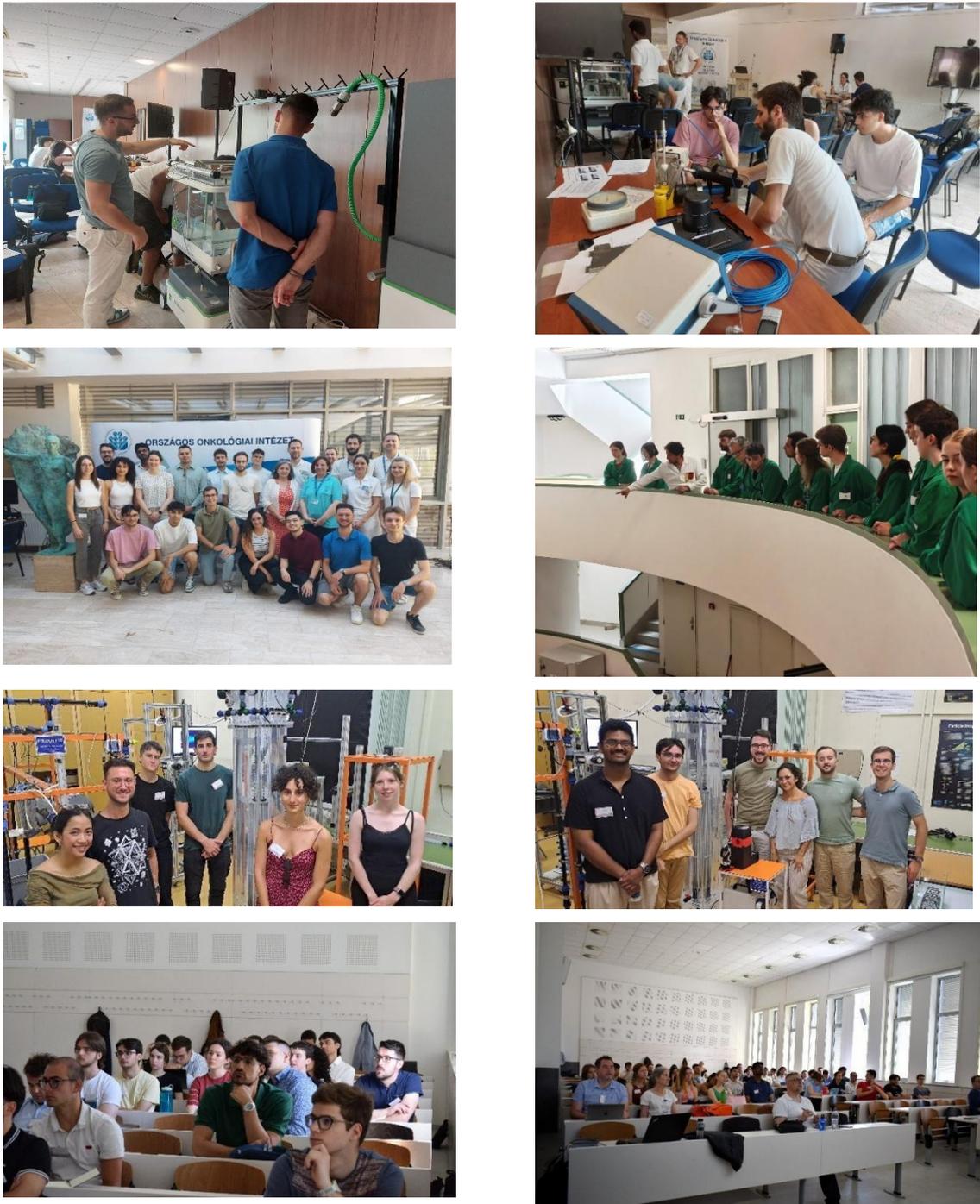


Figure 21 – Collection of photos from second ENEN2plus BSc and MSc Nuclear competition and summer school

2.4 Lessons learned from the ENEN 2plus BSc and MSc competitions and summer schools.

1. **More time for the mobility call** – the mobility action showed that the 2-month time selected for the mobility call is not sufficient, especially for participants outside the EU, when the visa application is needed.
2. **Focus on new social channels to improve visibility for young people** – advertisement through media, LinkedIn and Facebook turned out to be insufficient as most of the applications came prior to the direct request of the student from his/her supervisor. To improve the visibility of such events, a more comprehensive social media campaign should be created, focusing on the social media channels used by the target audience, rather than those used by the event organizers.
3. **A structured and recurrent organisation of these type of events, every one or two years, would allow for conscious preparation from the students** - this is also evident from the fact that 66 competitors applied for the first competition, while 99 people participated in the second.
4. **Management of larger groups is easier when the groups are mixed** – Mixing students with different age, background and nuclear domain into a group helps them to deal with new challenges and enhances self-development.

3 PHD NUCLEAR COMPETITIONS

Every year the ENEN PhD Event & Prize is organized to promote and support the work of junior researchers in Europe. The ENEN PhD Event & Prize is an action of the European Nuclear Education Network to support the Research and Science in the Nuclear fields promoting the works of the young scientists and researchers who start their careers finishing their PhD. It takes place on a yearly basis in the framework of the international congress in the field of nuclear science.

The ENEN PhD Events are co-sponsored by the European Nuclear Education Network Association (ENEN), the European Commission Joint Research Centre (JRC), and the organizer of the international conference.

The ENEN PhD Event was planned to consist of up to 18 PhD presentations nominated by ENEN Members and selected by the ENEN PhD Prize Jury. The event was divided into several sessions according to the subjects. The participants made a presentation of their research work for 15-25 minutes followed by 5 minutes of questions and discussion in a competitive but friendly environment.

All presentations were judged by the Jury members taking into account the quality of the submitted paper as well as the quality of the presentation itself. Moreover, the participation in the discussion and the clarity in answering the questions received were also taken into account in selecting the winners. The best presentations were awarded the ENEN Prize.

All nuclear topics and fields were welcome: Nuclear Engineering and Safety, Medical Applications, Radiation Protection, Waste Management and Disposal, Radiochemistry, Nuclear Materials, or any other nuclear-related topics

3.1 16th ENEN PhD Event & Prize 2022.

The 16th ENEN PhD Event & Prize took place in the framework of the 10th edition of the Euratom research and training conferences on fission safety of reactor systems (FISA 2022) and radioactive waste management (EURADWASTE '22), organised by the French Presidency of the Council of the EU and the European Commission, which was held on Monday 30 May – Friday 3 June 2022 in Lyon, France. Ten finalists were selected among all the received applications, to present their research works in the Event.



Figure 22 – Participants of the ENEN PhD Event in 2022

The jury members present on the day of the event were Francisco Javier Elorza (chair of the jury, UPM), Csilla Pesznyak (BME, remote), Piero Ravetto (CIRTEN), Gabriel Pavel (ENEN), Leon Cizelj (JSI), Jörg Starflinger (USTUTT).

The 3 Winners of the ENEN PhD Event & Prize 2022 were:

- **Lubomír Bureš**, “Fundamental study on microlayer dynamics in nucleate boiling”
- **Chloé Cherpin**, “Measurement of the zeta potentials of corrosion products for their modelling in the primary circuit of PWRs in the OSCAR code”
- **Nicoló Abrate**, “An innovative eigenvalue formulation of the neutron transport problem for reactor design and control”

The three winners were selected from the finalists according to the evaluation of the Jury based on their presentations and the work delivered within the application and the conference. The following Finalists were selected among all the received applications, to present their research works in the Event:

- **Gabriel Pedroche**, “E-lite 360° neutronics model of the ITER tokamak”
- **Jaén Ocádiz Flores**, “Using the Quasi-chemical formalism beyond the phase diagram: density and viscosity models for molten salt fuel systems”
- **Andrea Di Ronco**, “Multiphysics simulation of next generation nuclear reactors: extension to fission product transport modelling”
- **Javier Alguacil**, “Propagation of statistical uncertainty in mesh-based R2S calculations”
- **Manon Delarue**, “Photofission technique coupled to high-resolution gamma spectroscopy for the characterization of large concrete radioactive waste packages”
- **Alessio Magni**, “MOX-fuelled pins for fast reactor conditions: Modelling advancements and assessment”
- **Chengming Shang**, “Implications of recently derived thermodynamic data for (Mg/Ca)_nUO₂(CO₃)_{3(4-2n)}- complexes on the predominance of the Mg-Ca-U(VI)-OH-CO₃ systems, and application to natural waters.”
- **Simone Siriano**, “Numerical simulation of MHD flows in breeding blanket and plasma-facing components”
- **Norma Maria Pereira Machado**, “Rheological study of nuclear glass melts containing Platinum Group Metal aggregates”
- **Didier Bathellier**, “Properties of (U,Pu)O₂ mixed-oxide fuels”

3.2 17th ENEN PhD Event & Prize 2023.

The 17th ENEN PhD event and prize took place on May 10th, 2023 at the ENYGF conference in Krakow, Poland.

The jury members present on the day of the event were Francisco Javier Elorza (chair of the jury, UPM), Csilla Pesznyak (BME), Piero Ravetto (CIRTEN), Gabriel Pavel (ENEN), Jakob Luyten (proxied by Michèle Coeck, SCK CEN) and Manuel Martín Ramos (JRC).

The 3 Winners of the ENEN PhD Event & Prize 2023 are:

- **Emilie BAUDAT**, “Development of highly selective radiochemical methods for strontium-90 characterization in radioactive waste”
- **Lisa LAMPUNIO**, “Data-Driven Gaussian-Process-based Uncertainty Quantification Assessment of Inlet Velocity Profiles on Turbulent Thermal Mixing within T-junctions”

- **Riccardo COCCI**, “Statistical learning and inverse uncertainty quantification in nuclear thermal-hydraulic simulation: application to the condensation modelling at the safety injection”

The three winners were selected from the finalists according to the evaluation of the Jury based on their presentations and the work delivered within the application and at the conference.

The following Finalists were selected among all the received applications, to present their research works in the Event:

- **Matthieu REYMOND**, “Laser heating for the study of the behaviour of nuclear fuel under hypothetical accidental conditions”
- **Antonio JIMÉNEZ-CARRASCOSA**, “Systematic assessment of nuclear data libraries for Sodium-cooled Fast Reactors simulation”
- **Pauline FOUQUET-METIVIER**, “Study of melting temperatures of (U,Pu)O₂ SFR fuels: influence of Pu and Am contents and oxygen stoichiometry”
- **Giacomo GREGORI**, “Electrochemical measurement of thermodynamic properties of corrosion products in lead-bismuth eutectic cooled nuclear reactors”
- **Nadia Curie DEMPOWO**, “Consideration of cationic interdiffusion for modelling the sintering of nuclear ceramics at the grain scale”
- **Cédric SÉNAC**, “Predicting Intergranular Ductile Fracture in Nuclear Materials”
- **Cristiano CIURLUINI**, “Design and thermal hydraulic transient analysis of primary cooling systems for tokamak fusion reactors”
- **Diego MORENO MARTINEZ**, “Molecular Dynamics Study of the Separation of Uranium (VI) on Solid Support”
- **Margot VANHEUKELOM**, “Predicting radiocesium transfer from soil to crop in a global scale: the role of soil weathering stage”



Figure 23a – Participants of the ENEN PhD event in 2023



Figure 23b – Winners of the ENEN PhD event in 2023.

3.3 18th ENEN PhD Event & Prize 2024

The event took place on September 11th, 2024 at the ECMP conference in München, Germany.

Out of 28 applications, 18 finalists were selected by the jury in the first round based on their application and abstract.

The selection committee was composed of: Francisco Javier Elorza (UPM, Spain), Jakob Luyten (SCK CEN, Belgium), Iztok Tiselj (JSI, Slovenia), Piero Ravetto (CIRTEN, Italy), Csilla Pesznyak (BME, Hungary), Gabriel Pavel (ENEN, Belgium).

16 finalists were able to present their work at the conference.



Figure 24 – Participants and winners of the ENEN PhD Event in 2024.

The four laureates presented in Figure 24 were Aurore Caquas, Noélia Fuentes Solis, Catarina Isabel Guilherme Pinto & Carlos Vázquez-Rodríguez.

The finalists originated from 9 different countries (Croatia, Belgium, France, Italy, Lebanon, Mauritania, Mexican, Portugal and Spain) and represented 10 institutes.

After the presentations the in-person jury selected 4 laureates. The certificates and awards were given during the welcome reception of the ECMP.

The in-person jury was composed of: Manuel Martín Ramos (JRS, Belgium), Francisco Javier Elorza (UPM, Spain), Jakob Luyten (SCK CEN, Belgium), Piero Ravetto (CIRTEN, Italy), Csilla Pesznyak (BME, Hungary), Gabriel Lazaro Pavel (ENEN, Belgium).

The 4 Winners of the ENEN PhD Event & Prize 2024 are:

- **CAQUAS Aurore**, “The bathtub vortex: properties of the flow and gas entrainment”
- **VÁZQUEZ-RODRÍGUEZ Carlos**, “Advanced implementation of the spray safety system into a 3D-GOTHIC PWR-W containment model and its impact on the hydrogen combustion risk”
- **FUENTES SOLIS Noelia**, “Effect of Liquid Metal Environment on Nucleation and Propagation of Fatigue Cracks”
- **PINTO Catarina Isabel Guilherme**, “3D cancer models for the theranostic evaluation of $^{64}\text{CuCl}_2$ ”

The following Finalists were selected among all the received applications, to present their research works in the Event:

- **CHEIKH Sidi-Mohamed**, “Fission yields evaluation for the main actinides involved in the nuclear fuel cycle”
- **LONGO Lorenzo**, “Experimental characterization of PWR fuel assemblies mechanical behaviour under hydrodynamic and seismic-like loads”
- **BELGRAND Louis**, “On the accuracy of microscale solutions in modelling the multiscale thermo-mechanical behaviour of heterogeneous materials”
- **CAVALLINI Caterina**, “Investigation of corrosion-erosion phenomena in primary cooling circuits of reactor components”
- **ZULLO Giovanni**, “Development and assessment of an open-source code for gaseous and volatile fission product behaviour in light water reactor fuel”
- **MOUTIN Léo**, “UO₂ ceramics porous network characterization and modelling. Simulation of the thermal conductivity of such microstructures at various temperatures and in different environments”
- **KARIM Hamza**, “Microfluidics and modelling: two tools for determining the kinetic constants of mass transfer in liquid-liquid extraction”
- **GALLUCCIO Francesco**, “Advanced radiochemical methods and green processes to address challenging waste in nuclear decommissioning”
- **REN Emmanuel**, “Screening of the microscopic origins of Xe/Kr separation in nanoporous materials”
- **RAMOISIAUX Eliott**, “Time-dependent evaluation of machine and shielding activation for medical accelerator systems: Self-consistent numerical evaluation of concrete shielding activation for proton therapy systems.”
- **DUNDARA DEBELJUH Dea**, “Characterization of myocardial perfusion imaging systems through the physical descriptors”
- **LAMBRI Nicola**, “Multicentric evaluation of a machine learning model to streamline the radiotherapy patient specific quality assurance process”

3.4 19th ENEN PhD Event & Prize 2025

The 19th ENEN PhD Event & Prize took place on 12th May at the FISA-EURADWASTE & SNETP Forum 2025.

The objectives of the conference and the ENEN PhD Event were to show the dynamism of the nuclear sector by bringing together excellent PhD students from different nuclear disciplines and countries on an inspiring event where they can share and present their state-of-the-art research, in particular experimental work, and connect with other PhD students and professionals on innovative nuclear science in a transdisciplinary environment.

Each submitted application was evaluated by the jury, 17 finalists were able to participate.

The outcome of the evaluation was communicated to the candidate, together with a reference to the ENEN website to officially apply for the ENEN grant.

The members of the jury are: Francisco Javier Elorza (UPM, Spain), Heikki Suikkanen (LUT, Finland), Michèle Coeck (SCK CEN, Belgium), Andreas Pautz (EPFL, Switzerland), Iztok Tiselj (JSI, Slovenia), Piero Ravetto (CIRTEN, Italy), Danny Lathouwers (DUT, The Netherlands), Csilla Pesznyak (BME, Hungary), Teodora Retegan Vollmer (CHALMERS, Sweden), Gabriel Pavel (ENEN, Belgium)



Figure 25 – Participants of the ENEN PhD Event in 2025.

The 4 Winners of the ENEN PhD Event & Prize 2025 are:

- **Thibault Sauzedde:** “Adjoint-based reduced-order modelling for uncertainty quantification in reactor physics”
- **Stefano Riva:** “Advanced Data-Driven Techniques for State Estimation in Nuclear Reactors”
- **Pau Aragón Grabiell:** “Extension of the predictive capabilities of nuclear fuel performance codes to advanced technology fuels”

The three winners were selected from the finalists according to the evaluation of the Jury based on their presentations and the work delivered within the application and at the

conference.



Figure 26 – Winners of the ENEN PhD Event in 2025

3.5 Lessons learnt from the events

Between 2022 and 2025, ENEN received 86 applications for the PhD Event & Prize from which 59 PhD students were invited for the in-person competition. In figure 27 the distribution of the applications for the different events are shown.

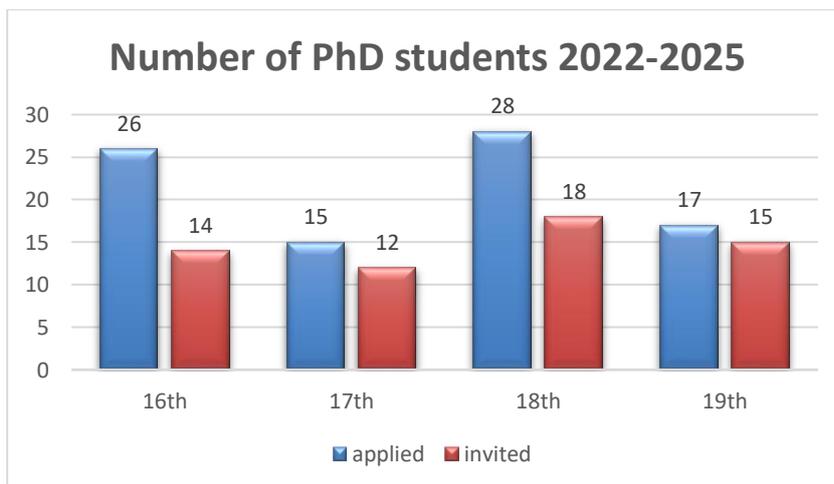


Figure 27 – Application statistics of the PhD events between 2022 and 2025

In figure 28 the overall gender distribution from 2022 to 2025 is shown. From all applicants, 71% were male and 29% were female.

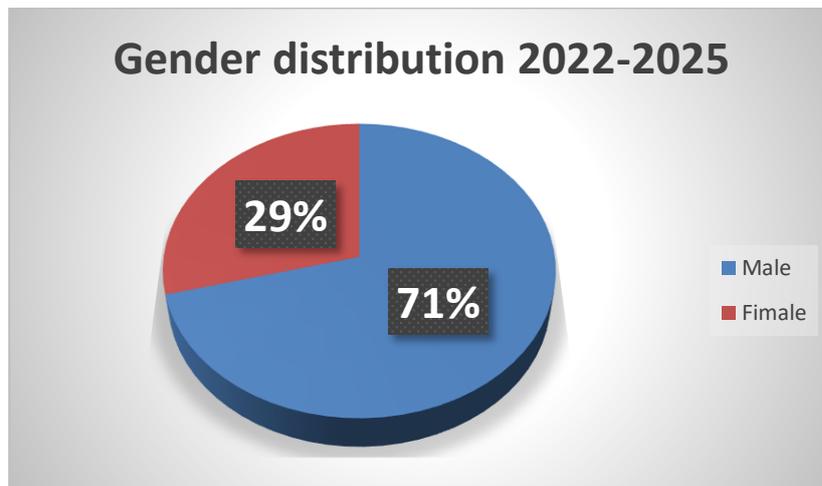


Figure 28 – Gender balance of the PhD events between 2022 and 2025

The ENEN team interviewed some participants of the ENEN PhD Event and Prize 2023 in regard to their feedback from the involvement into PhD Event and Prize activities in 2023.

Do you consider this experience as valuable for your future carrier?

Yes, for sure. This event has a number of added values:

- An opportunity to share and discuss your scientific results with the community.
- A chance to find like-minded colleagues interested in the same research area.
- An opportunity to get new ideas for your research.
- A chance to obtain a prize which will be a good support in further development as researcher: more scientific publications, participation in the conferences, promotion of the research results, etc.

Was it important for you to let everybody know about the research activities of you and your team?

Of course! We implement our research activities to contribute to development of the EU nuclear energy field and innovations in there, and it is very important to have such a platform where we can share our research results and activities.

Was it interesting for you to listen to the presentations of the works of the other ENEN PhD Even and Prize participants?

Frankly speaking, I was rather nervous before delivery of my presentation, that's why was not concentrated into presentations delivered before mine. However, I noticed interesting topics and discussed them with the colleagues during the breaks. We have established a WhatsApp group where we can stay in touch with each other and continue discussion of the points we are commonly interested in.

Have you improved your professional network by the contacts you got in the course of your involvement into ENEN PhD Even and Prize?

It was considerably improved by the new contacts with the other participants of the ENEN PhD Event and Prize 2023. We have even organised a special WhatsApp group to stay in touch. At the same time, we have met a lot of interesting experts and researchers from all over Europe during the various events and workshops of the ENYGF Conference as well as socializing activities.

What are your feelings about the Jury and their attitude during the competition?

I appreciate an opportunity to have such experienced and qualified experts as a jury of the ENEN PhD Even and Prize. The competition was run in a friendly and kind atmosphere which facilitated smooth delivery of the presentations.

What are your feelings about a room where the ENEN PhD Even and Prize took place?

I was happy that the room was rather small and cosy, it enforced a friendly atmosphere we had during the competition. I would have felt much more nervous if I had had to deliver my presentation in a big conference room.

Do you have ideas for improvement of the ENEN PhD Even and Prize? Do you need to add anything else?

All in all, it was excellent, however, if by any chance some experts from the industry could be involved it would be valuable and supportive for cooperation between research and industry.

I support an idea to have ENEN PhD Even and Prize as a side event of the big conferences and similar events, it facilitates communication between researchers.

I would use this opportunity to say a big thank you to ENEN Association team who established and organised this event, supported our attendance of this event and other related activities of ENYGF 2023 and reviewed and acknowledged our research works as those which require attention and even award in some cases.

4 NUCLEAR SUMMER SCHOOLS

Nuclear summer schools play a vital role in the education and development of future professionals in the nuclear field. These programs offer intensive, multidisciplinary training that bridges the gap between academic knowledge and practical application. Participants gain valuable insights into current challenges, technologies, and regulatory frameworks in nuclear science, engineering, and policy.

By bringing together students, researchers, and experts from around the world, nuclear summer schools foster international collaboration, knowledge exchange, and professional networking. They also contribute to building a skilled and informed workforce, which is essential for ensuring the safe, efficient, and sustainable use of nuclear technologies in energy production, medicine, and other critical sectors.

Under the umbrella of the ENEN2plus project six different summer schools were organized in last three years:

4.1 ENEN2plus Helsinki Bachelors School in Nuclear Science and Technology

The school was a premier educational event organized by the Departments of Chemistry and Physics at the University of Helsinki, Finland. The school took place from October 22-24, 2024, in Helsinki. The event aimed to enhance the knowledge and skills of BSc students in related disciplines, preparing them for advanced studies and careers in nuclear technology, radiation protection, radioactive waste management, and the medical applications of radionuclides.

4.1.1 Call for the event

Objectives:

- To provide in-depth knowledge and skills related to nuclear technology and its applications.
- To increase competitiveness and engagement among B.Sc. students interested in pursuing careers or further education in nuclear science and technology subjects.
- To offer practical demonstrations and site visits to reinforce theoretical learning and highlight the exciting study options and careers available in the science area.

Event Highlights:

- **Location:** University of Helsinki, City Centre Campus, Helsinki, Finland.
- **Duration:** October 22-24, 2024 (full days).
- **Target Audience:** BSc students over 18 years old, from diverse scientific backgrounds.
- **Expected Attendees:** 20 students.
- **Educational Content:**
 - Lectures from experts in Finnish academia, research organizations, companies, and regulatory bodies.
 - Topics include the civil nuclear fuel cycle, small modular reactors (SMRs), nuclear decommissioning, radiation safety and regulation, environmental radiation monitoring, radionuclide production and measurement, and medical applications of radioisotopes.

- Tours and practical demonstrations at national facilities: VTT Nuclear Safety Laboratories, Helsinki University Hospital, Nuclear regulator (STUK) laboratories; University of Helsinki Radiochemistry and Accelerator Laboratories.

Outcomes:

To gain valuable insights and practical experience across many areas pertinent to the civil nuclear industry, the medical use of radionuclides, emerging nuclear technologies, and safety regulation in these areas. Attendance will enhance a student's possibilities for further study or a career in these areas.

Funding and Support:

- There were no registration fees for attendees.
- Successful applicants from outside Finland could apply for travel, accommodation, and subsistence funding support through the ENEN2plus mobility grant.
- Finnish applicants could attend the school, but they were not eligible for ENEN2plus support.

The poster features the ENEN2plus logo at the top left. The main title is 'ENEN2plus Bachelors School in Nuclear Science and Technology, Helsinki, Finland' with the dates '22-24 October 2024'. The background is a collage of images showing university buildings and people. The poster is divided into several informational boxes:

- Goal and structure:**
 - To increase the knowledge, skills, competitiveness, and engagement of the selected BSc students with the school's topics
 - The three-day event includes lectures and visits to multiple research institutes
 - Nuclear Science careers and study tracks will be demonstrated
- Venue:** University of Helsinki's city centre campus.
- Organisers:** Dr Susanna Salminen-Paatero, Profs Gareth Law and Filip Tuomisto
- Applications and queries:** applicationoctober2024@gmail.com
- Further details:**
 - Application deadline:** 5 PM CET 02.09.2024
 - Decisions distributed:** 06.09.2024
 - School times (EET) and dates:** 09:00 h 22/10 to 16:00 h 24/10/2024
- Topics covered:**
 - Nuclear technologies
 - Radiation protection and regulation
 - Radioactive waste management
 - Environmental radiation monitoring
 - Materials physics and chemistry
 - Medical applications of radionuclides and safety considerations
- 20 BSc students to be selected:**
 - Submit a proposal
 - Selection committee will inform about decisions in early September
 - Accepted applicants can apply to receive a refund for their travel and subsistence costs from the ENEN2plus project
- Information required in the application:**
 - Candidates should send a letter (max 2 pages) that details their: (i) motivation for attending the school, and (ii) BSc. study details (degree programme, study progress)
 - A short recommendation letter from an academic advisor

At the bottom, it states: 'The event is supported by the ENEN2plus project (HORIZON-EURATOM-2021-NRT-01-13 101061677) founded by the European Union.' and 'All pictures ©Uni Material Bank'.

Figure 29 – Poster of the ENEN2plus Bachelors School in Nuclear Science and Technology in Finland 2024

4.1.2 Participants

Selection Process:

- applications with attachments sent to email address *applicationoctober2024@gmail.com*
- A selection committee consisting of academic experts at the University of Helsinki will evaluate applicants.
- Selection will be based on motivation letters, academic merits, and a recommendation letter that has to be provided by a study tutor of the applicant (e.g., a University Professor).
- Emphasis is placed on ensuring gender diversity and representation of various nationalities.

The selected 20 students included 11 female and 9 males from Hungary (5), Italy (5), UK (4), Slovenia (3) Czech Republic (2) and Estonia (1). Participating students represented Czech technical university, Prague, University of Bologna, Italy, University of Ljubljana, Slovenia, Budapest University of Technology and Economics, Hungary, University of Manchester, UK, Masaryk University, Czech Republic, University of Tartu, Estonia, Karls-Ruprecht University, Germany, and University of Rome La Sapienza, Italy.

4.1.3 Program

	22.10.	23.10.	24.10.
	Tuesday	Wednesday - applications	Thursday - Medical
	coffee, tea & buns	coffee, tea & buns	coffee, tea & buns
9:00-10:00	Lecture Gareth Law (UH Radiochemistry)	Lecture Jussi Paatero (FMI)	Lecture Mirrka Sarparanta (UH Radiochemistry)
	Introduction to radioactive waste management	Radiation and radioactivity in the environment from the Finnish perspective	Radiopharmaceutical development for diagnosis and therapy
10:00-11:00	(end by 10:30)	Lecture Jaakko Leppänen (VTT)	(end by 10:30)
		SMRs	
11:00-12:00	Travel time & lunch in Espoo, Mau-Kas restaurant	Lecture Tomi Vuoriheimo (UH Accelerator laboratory)	Travel to Mellahti, lunch in Unicafe
		Materials research on nuclear fusion	
12:00-13:00	Visit 1 NSC VTT Anumajja Leskinen, Veronika Meriläinen, Antti Rätty, Petri Kotiluoto	Lunch in city campus (Unicafe/other)	Visit 3 HUS Radiochemistry
	Lectures 12:00-14:00 General introduction to VTT, Nuclear decommissioning: Case FIR1 project,	Travel time	Jyri Lehto, Production manager, HUS Diagnostic center, Cyclotron unit
13:00-14:00	Radiochemistry and FIR1 decommissioning		Introduction to radiopharmaceutical production in Finland and at HUS Cyclotron unit
		Visit 2 STUK Pia Keski-Jaskari & Teemu Siiskonen	Jussi Tervonen, Senior pharmacist, HUS Pharmacy
14:00-15:00		General introduction to STUK, Environmental surveillance (national and in the vicinity of nuclear power plants)	Production and quality of radiopharmaceuticals in hospitals
15:00-16:00	14:00-16:00 laboratory tour	Laboratory visit (ends at 16:00)	Teija Koivula, Radiochemist, HUS Diagnostic center, Cyclotron unit
			Research and development of radiopharmaceuticals at the cyclotron unit
			Laboratory visit (ends at 15:30-16:00)

Figure 30 – Program of the ENEN2plus Bachelors School in Nuclear Science and Technology in Finland 2024.

4.1.4 Photos



Figure 31 – Participants of the ENEN2plus Bachelors School in Nuclear Science and Technology in Finland 2024

Participants visited VTT during the Helsinki Bachelor's School. On the right are the hosts of VTT, researchers Anumaija Leskinen and Veronika Meriläinen. In front of the students in the middle is one of the event organisers, Susanna Salminen-Paatero.



Figure 32 – Photos from ENEN2plus Bachelors School in Nuclear Science and Technology in Finland 2024

4.1.5 Feedback from the participants

Soon after the organized event, the participating students were requested to fill in a questionnaire containing both questions directly from the ENEN mobility application manual and a question about practical arrangements of the event organizer. This way both the event organizers and ENEN would receive a feedback summary, about all aspects of the event organization, application procedure, and other possible issues related to the event. In general, the participants were satisfied with the content and the program of the event and several mentioned they were truly impressed and inspired after the visits to the research facilities. On the other hand, some issues to be developed were raised, and the same issues were acknowledged by the event organizers.

It was found out, that there should be a longer time between receiving funding for organizing an event and the actual event, to better ensure ample time to announce the event and receive participants' applications. Based on this experience, we recommend being prepared for applying for mobility funding several times, in case that some formal issue is not correct in the first application, leading to application rejection. Advertisement of the event can be further improved by sending more advertisement emails and utilizing social media even more actively.

Due to schedule restrictions by the visiting hosts, the daily schedule was sometimes tight, as there was not much time for lunches and coffee breaks and traveling around the Helsinki Metropolitan area by public transport took some time between the lectures and visits. In the forthcoming events, the program should be designed to be more flexible, to allow longer breaks and more free discussion among the group. Despite occasional time pressures, the atmosphere among the group was constantly active, knowledge-seeking, and social during the three days.

4.2 ENEN2plus 14C workshop

Date: 15-19/7/2024
Event: ENEN2plus ¹⁴C workshop
Venue: Nuclear Physics Institute, Czech Academy of Sciences, Prague Czech Republic

4.2.1 Call for the event

The event was organized by the Nuclear Physics Institute of the Czech Academy of Sciences (NPI) as part of Task 3.3, WP3 of the ENEN2plus project. The workshop focused on ¹⁴C radiocarbon analysis using nuclear physics methods. The target group was MSc students. The capacity of the workshop was 5 to 7 students.

The event was promoted through the official NPI website, social media and internal contacts.

ENEN2plus ¹⁴C Workshop

Five days hands-on training on radiocarbon for master students. Sample preparation, AMS measurement, and data processing. With your own materials. 15-19 July 2024.

Scan or click for event web

Background
Carbon is essential to life. In nature, it is found as element (diamond, graphite) and in many different organic and inorganic compounds. It occurs as a mixture of two stable isotopes (¹²C and ¹³C) and one radioactive isotope (¹⁴C) with a half-life of 5730 years. The isotopes differ by mass, however, they are very similar chemically. The radioactive ¹⁴C atoms are constantly generated during interactions of cosmic rays with the atmosphere and eventually enter the carbon cycle. ¹⁴C was produced in large quantities by above-ground nuclear tests. Some ¹⁴C has been released from nuclear power plants and reprocessing of spent nuclear fuel. Fossil fuels are free from ¹⁴C as they are too old for survival of this radioactive isotope.
The most sensitive method for ¹⁴C measurement today is accelerator mass spectrometry (AMS). The quantity of ¹⁴C helps in radiocarbon dating, wildlife crime control, forensic analysis of works of art, differentiation between fossil and bio-fuels, monitoring of nuclear power plant releases, to list just a few examples.

Interested master students
Submit proposal
Wait for comitee decision
Selected eight participants
Consult event web for details
Collect samples, send to lab
Summer Workshop (in English)

Proposal structure (two A4 pages)
Consult event web for details
Proposer name, school and class
Motivation in one paragraph
Goal of the measurement
Description of materials of interest and procedures for obtaining samples

Workshop Place
CRL Radiocarbon laboratory
Prague and Rez, Czech Republic
Organizer
Nuclear Physics Institute
Czech Academy of Sciences
Jan Kameník, Ivo Světlík,
Kateřina Pachnerová Brabcová

Timeline
(all in year 2024) Deadline
Proposal submission 11 February
Decision announced 29 February
Samples at laboratory 31 May
Workshop 15-19 July

You do not need to be an expert in nuclear physics. Interesting ideas and representative samples are sufficient. We help you to do the rest.

 The event has been partially supported by the ENEN2plus project (HORIZON-EURATOM-2021-NRT-01-13 101061677) founded by the European Union.

Figure 33 – Poster of the ENEN2plus 14C workshop

The candidates were required to submit a brief proposal with requested structure (to mimic a proposal of a research project) by e-mail. A total of 7 proposals were submitted. From these, one was submitted late. The late proposal was given extra time for completion, however, this failed and the proposal was rejected from consideration as it lacked clear definition of the scope of the project and samples origin.

The proposals were evaluated based on the quality and feasibility. If the samples were risky for processing by the low-level ¹⁴C laboratory, the candidates were requested to modify the proposals.

Six proposals were evaluated as good. Their authors (candidates for the workshop) were asked to submit their proposals to the ENEN2plus mobility website and were accepted for the workshop. They were requested to collect samples for analysis (as described in the proposal) and ship samples to the laboratory by registered mail. The laboratory provided detailed instructions about sample collection and handling.

Later, one candidate decided to withdraw her/his participation in the workshop due to personal reasons. The withdrawal was accepted and the request for mobility money was cancelled prior to the bank transfer of mobility support.

The five remaining participants received mobility money about a week prior to the event. It was a bit of a complication for some of them as they had to buy plane tickets in advance to get an affordable price. It would be more convenient if the money arrived several weeks in advance.

4.2.2 Samples pre-processing

The materials provided by students were checked in the laboratory and the laboratory staff-initiated samples processing by standard procedures prior to the workshop to make sure the data were available at the end of the workshop. It included sample cleaning, controlled oxidization, separation of carbon-dioxide and reduction to graphite matrix. Prepared targets were measured by accelerator mass spectrometers.

4.2.3 Workshop organization

The workshop was a five-day event. The program included theoretical lectures, hands-on training in sample preparation, samples measurement, data reduction and calculation and drafting conclusions. Thanks to that, participants got complete information on how the sample is handled in the AMS laboratory. In addition, the participants visited two sites. As most of them were from the archaeological field, the excursion sites included an archaeological excavation site at Prague Castle (inaccessible for the general public) and restoration laboratory for archaeological objects. The originally planned excursion to training nuclear reactor was cancelled by the reactor operators due to maintenance activities during the workshop. The regular participants were joined for a theoretical lecture and visit to accelerator mass spectrometer by a visiting student from India.

In total, 3 scientists were actively involved in teaching and training (Ivo Svetlik, Katerina Pachnerova Brabcova and Jan Kamenik). Several technicians provided demonstrations and training in the laboratory. These technicians were also active in processing of participants' samples prior to the workshop.

The participants obtained results from the measurement on the last day of the workshop.

4.2.4 Feedback from the participants

The organizers were surprised by low interest from the students. It seems that the early July is unsuitable for many students as it can interfere with the beginning of the summer break, the

others students could have a tight schedule at the end of the semester. Despite this, 6 good proposals were obtained which was appropriate to fill the capacity of the workshop. The topic of the proposals covered expected areas. One proposal was connected with monitoring of the ^{14}C releases from nuclear installations. In one proposal, ^{14}C was used as a tracer for studying the environmental processes. The remaining proposals were exploiting radiocarbon dating. The small group of students allowed active interaction of the scientist and participants which was a very efficient teaching method.

The students were asked to provide their feedback. They were generally satisfied. The measured data were incorporated in their MSc Thesis and research papers. Some results made it for exhibitions. The students recommended for the future intensive advertisement and better assistance with the accommodation arrangements. They had a partial problem to localize the building on the first day of the workshop.

4.2.5 Photos from the event



Figure 34 – Students and their teachers (Katerina Pachnerova Brabcova and Jan Kamenik) on a visit to the Accelerator mass spectrometer



Figure 35 – Students learning about processing samples for radioactive ^{14}C measurement



Figure 36 – Students training glass work and cleaning sample from external conditions



Figure 37 – Students preparing sample for AMS measurement using pneumatic sample press.

4.3 ENEN2plus Bachelor's Summer School on "Nuclear Engineering"

ETSI of Mining and Energy. UPM. Madrid, Spain, 7 – 11 July 2025

A ENEN2plus Bachelor's Summer School on "**Nuclear Engineering**" has been organized by the Universidad Politécnica de Madrid (UPM).

The summer school aimed to attract highly qualified bachelor's degree students to the field of Nuclear Engineering and Radiation Protection.

The course was advertised in various media, including LinkedIn and the ENEN2plus website.

Nuclear Engineering
Bachelor's Summer School
Universidad Politécnica de Madrid
School of Mines and Energy

July 7 – 11 2025
Fundación Gómez Pardo
Alenza, 1. 28003 Madrid

POLITÉCNICA

	Monday 7th	Tuesday 8th	Wednesday 9th	Thursday 10th	Friday 11th
09:00 11:00		Travel to Garoña NPP		Radiological protection (G. García)	Fusion (K. Fernández)
11:00 11:30	Arrival to Madrid		Travel to Madrid	Coffee	Coffee
11:30 13:30		Visit Garoña NPP		Radiological impact (E. Gallego)	Decommissioning (F. J. Elorza)
	Lunch	Lunch	Lunch	Lunch	Lunch
15:00 15:30	Opening remarks	Travel to Burgos	Nuclear safety (C. Qüeral)	Reactor physics (P. Ravetto)	FREE
15:30 17:00	EPR (E. Castro)				
17:00 18:30	FREE	Hotel in Burgos	AP1000 (G. Jiménez)	FREE	

Please register here: <https://forms.gle/PAuxw9gbcMzrDCzt7>

Figure 38 – Official poster of the Bachelor's Summer School on "Nuclear Engineering"

4.3.1 Participants

A total of 63 applications were submitted, of which 30 were initially approved based on the candidates' studies, CVs, and letters of motivation. However, the number had to be reduced to a total of 23 due to problems with visas for students from outside Europe. Of the students from outside Europe who were initially approved, only three were able to attend: two from Morocco and one from Nepal who was studying for a bachelor's degree in Italy.

This group of students are studying at the following universities:

- Budapest University of Technology and Economics, Hungary (2)
- Danmarks Tekniske Universitet, Denmark (1)
- Heidelberg University, Germany (1)
- Ibn Tofail University, Morocco (2)
- IMT Atlantique, France (1)
- Polytechnic University of Bucharest, Romania (8)
- Technical university of Sofia, Bulgaria (1)
- University of Camerino, Italy (1)
- University of Pisa, Italy (6)

4.3.2 Description of the program corresponding to the Bachelor's Summer School on

Objective: The school was intended to provide an overview of different topics related to Nuclear Engineering and Radiation Protection. Presentations will cover the basic principles of nuclear technology, nuclear safety, reactor physics, radiological protection, radiological protection, fusion reactors and decommissioning.

The main objective is to attract highly qualified bachelor's degree students to the field of Nuclear Engineering and Radiation Protection.

The event consisted of different sessions with lectures by specialists in the fields and a technical visit to Garoña Nuclear Power Plant. The Summer School final schedule is shown in the following figure 39.

	Monday	Tuesday	Wednesday	Thursday	Friday
09:00 – 11:00		Travel to Garoña NPP		Radiological Protection (G.Garcia)	Fusion (K.Fernandez)
11:00 – 11:30	Arrival to Madrid		Travel to Madrid	Coffee	Coffee
11:30 – 13:30		Visit Garoña NPP		Nuclear Safety (C.Queral)	Decommissioning (F.J.Elorza)
13:30 – 15:00	Lunch	Lunch	Lunch	Lunch	Lunch
15:00 – 16:30	Opening remarks	Travel to Burgos	Reactor physics (P.Ravetto)	Radiological impact (E.Gallego)	FREE
16:30 – 17:00	-- EPR (E.Castro)		Coffee		
17:00 – 18:30	FREE	Hotel in Burgos	AP1000 (G.Jimenez)	FREE	

Figure 39 – Program of the Summer School

Technical visit to the Sta. M^a de Garoña NPP Dismantling and Decommissioning Center (ENRESA). July 8 and 9, 2025

Figure 40 shows the route taken during the trip to the Garoña NPP Dismantling and Decommissioning Center (ENRESA) in Ctra. BU-530 P.K. 16-17, 09212 Santa María de Garoña, Valle de Tobalina (Burgos), ESPAÑA.

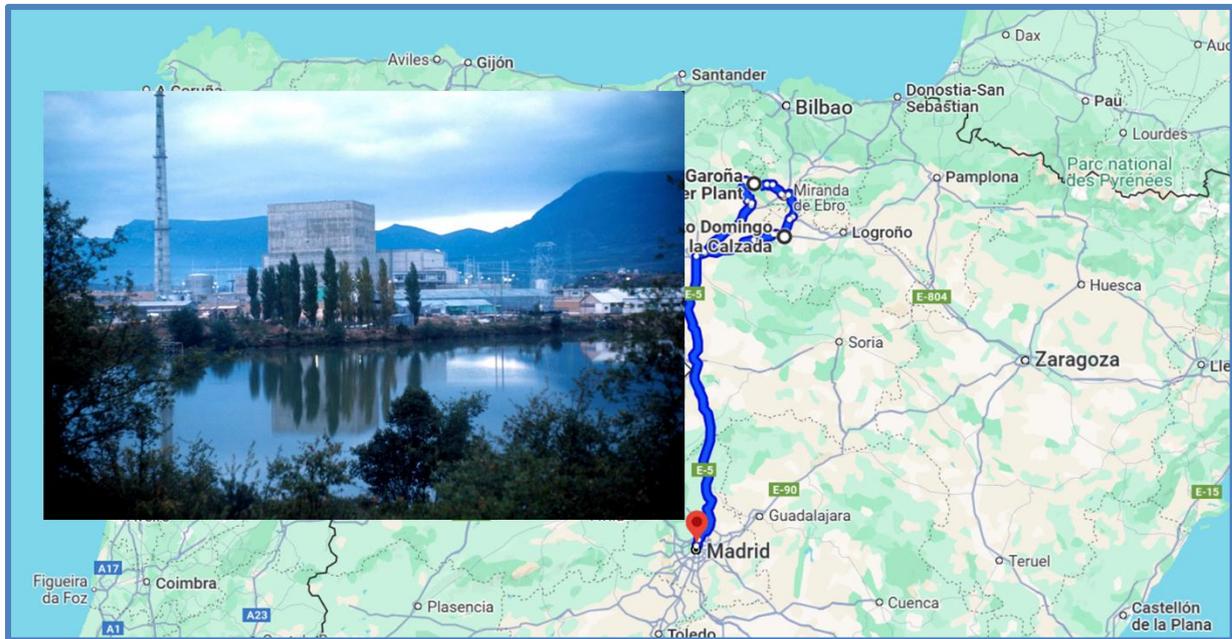


Figure 40 – Map showing the route during the trip to Garona NPP

4.3.3 Photos from the event



Figure 41 – Students during the trip to Garona NPP

After visiting the Garoña NPP, the students spent the night in Santo Domingo de la Calzada and returned to Madrid in the morning of the following day.



Figure 42 – Group photo of the participants of the summer school

Award Ceremony. July 11th, 2025

Included below are some images from the awards ceremony and closing session at ETSIME.



Figure 43a – Photos from the award ceremony



Figure 43b – Photos from the award ceremony

4.3.4 Feedback from the participants

Feedback from participants was collected daily at the end of the activities, as well as through informal conversations during coffee breaks and lunches, by individually asking for opinions about the presentations, topics, and overall organization.

Overall, the course was very successful, as the students showed great interest in all of the lectures. It is also worth noting the good team spirit among the students. Finally, it should also be mentioned that the last night teachers took the students on a guided tour of Madrid and held a farewell dinner, which was attended by all the students.

4.4 ENEN2plus Winter School Nuclear Waste Safety and Management for MSc Students in Nuclear

The Winter School on Nuclear Waste Safety and Management was organized by ENEA in the framework of the Task 3.3 of the ENEN2plus project. The event took place in Bologna at the ENEA Research Center from March 4th to 8th, 2024.

4.4.1 Registration to ENEN2plus Nuclear Summer School

The event was promoted through the official ENEN communication channel:

<https://database.enea.eu/index.php/2023/10/04/winter-school-on-nuclear-waste-safety-and-management/> and through the ENEA website (<https://www.eventi.enea.it/tutti-gli-eventi-enea/winter-school-nuclear-waste-safety-and-management.html>) social media and internal contacts. In the following the official flyer of the winter school.

BUILDING EUROPEAN NUCLEAR COMPETENCE
THROUGH CONTINUOUS ADVANCED AND STRUCTURED EDUCATION AND TRAINING ACTIONS

ENEN++ Winter School in Bologna “Nuclear Waste Safety and Management” for MSc Students in Nuclear

<u>Registration</u> Send your CV including the status of your current study path and the motivation to attend the school, to barbara.ferrucci@enea.it Deadline for application: October 30, 2023 Participation is fee-free ENEN will provide a mobility grants of 900 € intended exclusively to cover mobility (transportation and subsistence). Mobility grants will be in principle provided as lump sums directly to the selected applicants.	<u>Date</u> <u>04-08 March 2024</u> <u>Venue</u> ENEA Research Centre Via Martiri di Monte Sole 4, 40129 Bologna (Italy)
--	---

Views and opinions expressed are however those of the authors only and do not necessarily reflect those of the European Union or the European Commission. Neither the European Union nor the European Commission can be held responsible for them.

 **Funded by the European Union**

Figure 44 – Official Flyer of the Winter School

4.4.2 Participants

The winter school, initially designed for MSc students in nuclear studies with 25 available slots, received a total of 51 applications, consisting of 25 males and 26 females. After the evaluation phase by an evaluation committee of six ENEA researchers' experts in different nuclear fields (B. Ferrucci, C. Telloli, A. Ubaldini, E. Nava, G. Ottaviano, S.Lo Meo), based on the received curricula, 24 participants from 13 different countries, have been selected for participating in person to the competition.



Figure 45 – Group photo of the participants of the Winter School

Table 1: The list of selected participants.

University/Company	Country
Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering (IFIN-HH)	Romania
Charles University	Czech Republic
Tbilisi State University	Georgia
Vuje, a.s. (engineering company)	Slovakia
IMT Atlantique & Universidad Politécnica De Madrid Nantes	Spain 2
University of Oslo, UiO.	Norway
IMT Atlantique, Nantes	France
KEPKO International Nuclear graduate School	Korea
UHasselt & KU Leuven at campus Diepenbeek	Belgium
Slovak University of Technology in Bratislava	Slovakia 3
Università degli Studi di Bologna	Pakistan
KEPCO International Nuclear Graduate School	Korea 2
University of Bristol	UK
Technical University of Sofia	Bulgaria 2
Worley (Chemical, oil and mining Company)	Bulgaria
National Tsing-Hua University	Cina
Hasselt University	Belgium

Based on the ENEN mobility program each participant received a reimbursement of €1000 to attend the event in person.

4.4.3 Agenda of the event

The five-day winter school was organized to cover the main topics and aspects related to nuclear waste safety management. To this end, experts from ENEA were involved to deliver master classes on various areas of interest. Additionally, two online lectures were given by professors from the University of Bristol and the University of Novi Sad, focusing on neutrons and radiation protection models respectively.

A high-level representative from SOGIN, the Italian waste management organization — Dr. A. Mariani, Head of the SOGIN Fuel Cycle Department — also delivered a presentation on SOGIN's activities.

On the third day, a Particle Detectors Exhibition was organized, giving participants the opportunity to visit the ENEA laboratories and learn about the main instruments used.

As a group activity, on the morning of the fourth day, participants were divided into three teams and tasked with developing concepts for how to communicate to far future generations the existence of a geological nuclear waste repository. Each group was asked to prepare a short presentation to share at the end of the exercise.

As an additional component, a two-day training course on the AMBER code was provided by two experts from Quintessa, the UK-based company that owns the software. Temporary licenses were made available to the participants, allowing them to practice the basic functions of the code and gain an overview of its main capabilities.

At the end of each day, an interactive survey on the main topics covered was conducted, highlighting a good level of understanding and engagement among the participants.

In the following the detailed agenda of the winter school

Day 1 – 04.03.2024

- | | |
|-------------|--|
| 8.00-8.30 | Registration |
| 8.30-9.15 | Welcome and Introduction
<i>A. Rizzo (ENEA), B. Ferrucci (ENEA), G. Pavel (ENEN)</i> |
| 9.15-10.15 | Radioactivity
<i>G. Ottaviano (ENEA)</i> |
| 10.15-10:45 | Coffee Break |
| 10.45-11.45 | Radiation Protection: Fundamentals
<i>G. Ottaviano (ENEA)</i> |
| 11.45-12.45 | Neutrons
<i>M. Bakr (University of Bristol)</i> |
| 12.45-14.15 | Lunch |
| 14.15-15.15 | Dosimetry
<i>J. Nikolov (University of Novi Sad)</i> |
| 15.15-16.15 | Radiation Protection: Safety standard and Assessing Models
<i>G. Ottaviano (ENEA)</i> |
| 16.15-16.30 | Coffee Break |
| 16.30-17.30 | Short Exercises and closing remarks |

Day 2 – 05.03.2024

- | | |
|-------------|--|
| 9.00-10.00 | Particle Detectors
<i>A. Ubaldini (ENEA)</i> |
| 10.00-10.30 | Nuclear Materials Regulation Background
<i>B. Ferrucci (ENEA)</i> |
| 10.30-11:00 | Coffee Break |
| 11.00-11.30 | Radioactive Waste Lifecycle: |

11.30-12.30	<i>B. Ferrucci (ENEA)</i> Nuclear Fuel Cycle: Overview of NPP Fuel Technologies <i>S. Gianfelici (ENEA)</i>
12.30-14.00	Lunch
14.00-15.00	Environmental radioactive contamination fundamentals <i>C. Telloli (ENEA)</i>
15.00-16.00	Radioactive Waste Management: from Collection to Safety Storage <i>N. Cherubini (ENEA)</i>
16.00-16.30	Coffee Break
16.30-17.00	Clearance Guidelines and Regulations <i>B. Ferrucci (ENEA)</i>
17:00	closing remarks.
Day 3 – 06.03.2024	
9.30-11.00	Particle Detectors Exhibition <i>ENEA Team</i>
11.00-11.30	Coffee Break
11.30-12:30	Radioactive Waste Disposal Options <i>R. Levizzari (ENEA)</i>
12.30-14.00	Lunch
14.00-15.00	Activities of SOGIN, the Italian National Waste Management Organization
15.00-16.00	Decommissioning of the RB3 Reactor <i>F. Rocchi (ENEA)</i>
16.00-16.30	Coffee Break
16.30-17.30	Storage and Disposal Facilities: Safety Assessment and Safety Case <i>B. Ferrucci (ENEA)</i>
17:30-18.00	SLIDO Survey and closing remarks.
Day 4 – 07.03.2024	
9.00-9.30	Case Study Presentation and working group formation. <i>B. Ferrucci (ENEA), G. Ottaviano (ENEA)</i>
9.30-10:45	Group Exercise
10.45-11.00	Coffee Break
11.00-12:00	Group Exercise
12.00-12:30	Presentation of Results and Discussion
12.30-14.00	Lunch
14.00-14.15	Quintessa Code Development and Modelling Introduction <i>R. Newson & L. Bruffel (Quintessa)</i>
14.15-15.30	Safety Case and Safety Assessment Modelling <i>R. Newson&L. Bruffel (Quintessa)</i>
15.30-16.00	Coffee Break
16.30-17.00	Scenarios Development <i>R. Newson&L. Bruffel (Quintessa)</i>
17:00-17.30	Scenarios Development <i>R. Newson&L. Bruffel (Quintessa)</i>
17:30-18.30	SLIDO Survey and Closing Remarks

Day 5 – 08.03.2024

- 8.30-10.00 AMBER Tour, Demo Model of Geographical Disposal, Total System Modelling
R. Newson & L. Bruffel (Quintessa)
- 10.00-10.30 Representing the Near-Field
R. Newson & L. Bruffel (Quintessa)
- 10.00-10.30 **Coffee Break**
- 10.30-11.30 Representing the Geosphere
R. Newson & L. Bruffel (Quintessa)
- 11.30-12:00 Representing the Biosphere
R. Newson & L. Bruffel (Quintessa)
- 12.00-12:30 Questions and Discussion
R. Newson & L. Bruffel (Quintessa), ENEA Team
- 12.30-14.00 **Lunch**
- 14.00-14.30 Near-Field, Geosphere and Biosphere (Continued)
R. Newson & L. Bruffel (Quintessa)
- 14.30-15.30 Managing Uncertainties
R. Newson & L. Bruffel (Quintessa)
- 15.30-16.00 **Coffee Break**
- 16.00-17.00 International Examples
R. Newson & L. Bruffel (Quintessa)
- 17.00-17.30 Final review and Discussion
R. Newson & L. Bruffel (Quintessa), ENEA team
- 17:30-18.00 SLIDO Survey, Closing Remarks, and delivery of certificates of participation.
ENEA Team

4.4.4 Photos from the event





Figure 46 – Collection of photos from the Winter School

4.4.5 Feedback from the participants

The Winter School was organized to cover the main topics related to waste management in the nuclear field, and primarily to provide participants with insights and inspiration—to make them both curious and well-informed.

Feedback from participants was collected daily at the end of the activities, as well as through informal conversations during coffee breaks and lunches, by individually asking for opinions about the presentations, topics, and overall organization.

Most participants gave positive feedback, particularly regarding the content of the lectures, which they found interesting and innovative - especially those focused on IAEA safety standards and the nuclear fuel cycle. A very good response was also received for the SOGIN presentation, as some participants were already familiar with Dr. Mariani from online interviews about SOGIN's activities. In addition, many positive impressions were gathered about the "Particle Detectors Exhibition" session, during which participants had the opportunity to visit the ENEA laboratory and learn about the application of various instruments and laboratory procedures in the field of radioisotope detection, monitoring, and analysis. Overall, they expressed appreciation for the organization of the entire event.

Some participants were slightly disappointed with the training session on the AMBER code, mainly because it was challenging for them to explore the topic in depth due to limited time for hands-on use of the software. Nevertheless, they appreciated the initiative and found the session useful. The group exercise on the 4th day, received very positive feedback, particularly regarding the case study inspired by the story of the *Ray Cat Solution*, which greatly engaged and inspired the participants. They were also very pleased to have the opportunity to present the results of their group work.

In general, the group was satisfied with the Winter School, although a few participants mentioned that they would have preferred to include more laboratory activities or replace some theoretical lectures with site visits.

4.5 ENEN2plus Nuclear Summer School Hands-on exercises at the BME training reactor

The Training Reactor of the Budapest University of Technology and Economics (BME) is a 100kW maximum power, pool type, light water moderated research reactor used regularly for education and training. A set of measurements is offered to learn and experience the fundamental principles of reactor physics and apply the acquired theoretical knowledge in practice.

After the course, the participants were able to:

- understand the principles of experimental reactor physics, nuclear measurements, and radiation protection;
- understand the behavior of nuclear reactors and their operation;
- evaluate measurement data and draw conclusions from the results.

Course format: The pedagogical format of the course is based on a flipped classroom. In this format, you must complete some preparatory work online (representing about 40 hours) before attending the on-site hands-on exercises. The course page for these online activities will open one month before the course (4 August 2025).

The measurement sessions, which occur every morning (ca. 08:30-12:30, CEST) from 1 – 5 September, are followed by the measurement data evaluation sessions in the afternoon (ca. 13:30-17:30, CEST).

4.5.1 Registration to ENEN2plus Nuclear Summer School

Registrations for the ENEN2plus BSc and MSc Nuclear Summer School were submitted by filling in the registration form. A CV (curriculum vitae), a recommendation letter and a clear motivation were important for the selection procedure.

The registration was open until 27th July 2025.

- Participation is recommended for all BSc or MSc students with basic reactor physics knowledge.
- 10 participants will be accepted to the course, and a waiting list of max. 5 persons will be created. Waiting list participants will have access to the course page for the online preparatory activities.
- Upon successful completion of the course, a certificate will be issued. It will briefly describe the course contents, the number of hours the different course elements represent, and the number of equivalent ECTS credits (European Credit Transfer and Accumulation System). Waiting list participants will receive a separate certificate upon completion of the online part, if they are not selected for onsite participation.

Requirements for the registration:

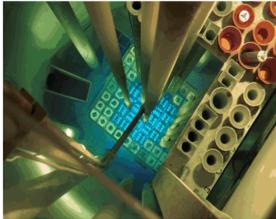
- Completed registration form.
- Motivation letter listing the nuclear-related subjects completed.
- Providing the name, position, affiliation and email address of a professional recommender (supervisor, professor, etc.).
- Some document about the academic results of the last two semesters (does not have to be certified).



**BUILDING EUROPEAN
NUCLEAR COMPETENCE**
THROUGH CONTINUOUS ADVANCED
AND STRUCTURED EDUCATION
AND TRAINING ACTIONS

Nuclear Summer School
1 – 5 September 2025

**Budapest University of Technology and Economics (BME)
Institute of Nuclear Techniques
Budapest, Hungary**



- A set of measurements is offered to learn and experience the fundamental principles of reactor physics and apply the acquired theoretical knowledge in practice.
- Participation is recommended for all BSc or MSc students with basic reactor physics knowledge.
- Selected applicants will receive financial support for their travel expenses, and they can participate on the summer school organized by the ENEN2plus

<https://nuclearsummerschool2025.enen.bme.hu/>
Deadline for submitting your application:
27 July 2025



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 **Funded by
the European Union**

Figure 47 – Poster of the Nuclear Summer School at BME

4.5.2 Participants

Advertisement of the summer school started mid July 2025 on several social media platforms (Facebook, LinkedIn, etc.) and by circulating the poster is the summer school (Fig. 46.). The [information and registration website](#) was opened at the same time. Despite the very close application deadline 16 applications arrived (see table 2 below). Four applications were rejected due to incomplete data and ineligibility (lack of student status). All the other applications were of very high quality, but due to the limitation in the number of students because of the

laboratory exercises two applications had to be put on the waiting list. The waiting list was closed a week before the course when all selected participants confirmed their participation.

Table 2. List of applicants.

	Name of the university	Number of the person
1	University Politecnico di Milano	1
2	University of Bucharest	1
3	Uppsala University	2
4	Lund University	1
5	IMT Atlantique/Universidad Politécnica de Madrid	2
6	Technical University of Munich	2
7	University of Debrecen	1

The online preparatory phase in the SOUL Learning Management System (LMS) started already on 4 August. It contained the reading of handbooks, watching short summarizing videos and answering quizzes about the measurements. All participants have successfully completed this phase ensuring that they could efficiently participate in the laboratory exercises.

4.5.3 Agenda of the event

The course was implemented according to the draft schedule in Table 3. The students performed laboratory exercises every morning in two groups (except the first day when the criticality experiment was performed in one group). Before starting the measurement, they had to complete quizzes in the LMS. During the measurements they also had to complete some tasks individually and upload a measurement log as a group, which contains all data required for the evaluation of the measurements.

The measurement evaluation sessions took place in the afternoons. The student has to perform the evaluation task individually on the LMS and submit a presentation of a few slides as a group summarizing the measurements and their findings. One of the groups presented at the end of every day (except Friday).

A social evening was organised during the course on Tuesday evening to help the students and teachers get to know each other.

Table 3. Daily program of the course

	Monday (1 September)	Tuesday (2 September)	Wednesday (3 September)	Thursday (4 September)	Friday (5 September)
Group A	Welcome, introduction (30 min)	Measurement 2 Absorbent and void reactivity worth measurement. <i>J. Kópházi</i>	Measurement 3 Diffusion length. <i>Sz. Czifrus</i>	Measurement 4 Thermal neutron flux distribution. <i>G. Klujber</i>	Measurement 5 Reactor operation and control rod calibration. <i>A. Horváth</i>
Group B	Measurement 1 Criticality experiment. <i>J. Kópházi</i>	Measurement 3 Diffusion length. <i>Sz. Czifrus</i>	Measurement 2 Absorbent and void reactivity worth measurement. <i>J. Kópházi</i>	Measurement 5 Reactor operation and control rod calibration. <i>A. Horváth</i>	Measurement 4 Thermal neutron flux distribution. <i>G. Klujber</i>

4.5.4 Feedback from the participants

The last activity in the LMS was a feedback survey for which separate time was allocated in the schedule. All participating students answered the survey.

A ranking on the scale: strongly disagree (1), disagree (2), neutral (3), agree (4), strongly agree (5), was possible for the following four questions in two categories:

Course Satisfaction:

Question 1: The teaching methods used were effective in facilitating my learning.

Question 2: The course content was well-organized and easy to follow.

Student Learning Outcomes:

Question 3: I developed practical skills relevant to the nuclear field.

Question 4: I gained a deeper understanding of the theoretical concepts.

Detailed results can be seen in Fig 47. The high average ranks (4.3) showed a high general satisfaction with the course. The students especially valued the practical skill obtained (4.7) while they were less satisfied with the understanding of the theoretical concepts (4.2).

Free text answers were possible for the following questions:

1. What challenges, if any, did you face during the training?
2. What aspects of the training do you feel were best?
3. What aspects of the training do you think could be improved?

In the challenges the data evaluation tasks with MATLAB Grader were mentioned most frequently. Most students mentioned as the best part the participation in practical laboratory exercises, while the explanation of the theoretical concepts was most often mentioned as the aspect to be improved. The feedback will be considered during the later editions of the course.

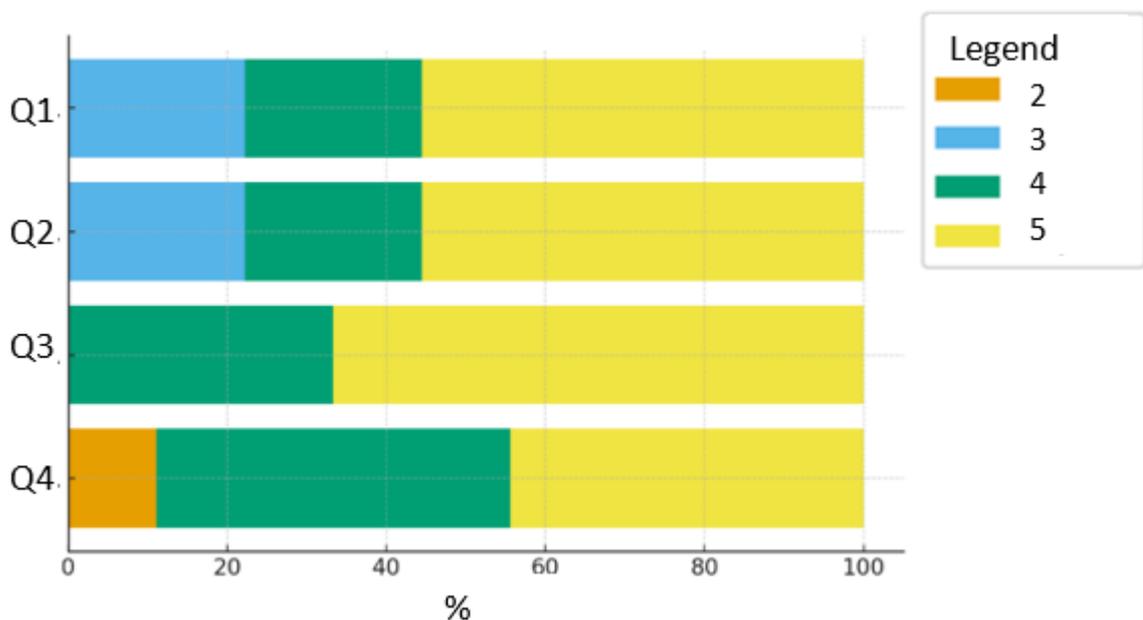


Figure 48 – Feedback from the Nuclear Summer School at BME

4.5.5 Photos taken during the course



Figure 49 – Collection of photos from the Nuclear Summer School at BME

4.6 Nuclear Science & Technology School - University of Leeds

The University of Leeds organized a Nuclear Science & Technology School for Masters & Bachelors students over 16th-18th September 2025. The overall aim of the school was to enhance the nuclear knowledge of students and to prepare them for advanced studies and careers in the nuclear sector.

4.6.1 Registration to ENEN2plus summer School



BUILDING EUROPEAN NUCLEAR COMPETENCE THROUGH CONTINUOUS ADVANCED AND STRUCTURED EDUCATION AND TRAINING ACTIONS

Nuclear Science & Technology School
16th – 18th September 2025
University of Leeds

Aim
To enhance the nuclear knowledge of Bachelors and Masters students to prepare them for advanced studies and careers in the nuclear sector.

Content
The school will consist of a series of lectures, career presentations and laboratory tours delivered by experts from academia and industry. Areas covered will include nuclear reactors, nuclear fuel cycle, nuclear waste and decommissioning, nuclear forensics, nuclear fusion, nuclear medicine and radiation safety.

Who Should Apply
Bachelors and Masters students who are interested in exploring opportunities within the nuclear sector.

Funding and support
There are no registration fees.
Successful applicants from within the EU can apply for travel, accommodation and subsistence support from the ENEN2+ mobility fund after the event.

Applications
Applicants should send an email to nuclear.school@leeds.ac.uk with the following attachments:

- Motivation letter – including why you want to attend, how you will benefit, etc. (max 1 page)
- Recommendation letter from academic tutor/supervisor
- Curriculum Vitae

Applications will be evaluated by academic staff at the University of Leeds with successful applicants being informed by 1st August 2025.

Closing date: 15th July 2025

This nuclear school is being offered as part of the [ENEN2+ project](#).

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 **Funded by the European Union**

Figure 50 – Flyer of the Nuclear Science & Technology School

4.6.2 Participants

Forty students from different universities across the UK, EU and USA attended. The breakdown is shown in Figure 51 below.

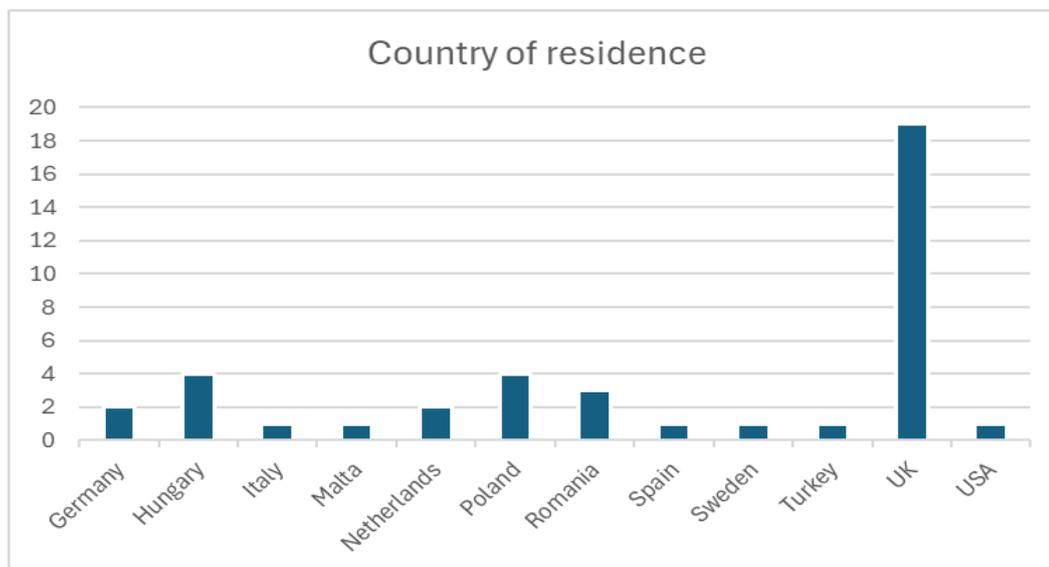


Figure 51 – Distribution of participants in the Nuclear Science & Technology School

Table 4 – Universities in the Nuclear Science & Technology School

Budapest University of Technology and Economics	Hungary
Cranfield University; University of Lancashire; University of Leeds; University of Liverpool	UK
Eindhoven University of Technology	Netherlands
Friedrich-Alexander-University Erlangen-Nuremberg; Heidelberg University	Germany
Institut Barcelona d'Estudis Internacionals	Spain
Istanbul Technical University	Turkey
Middlebury Institute of International Studies at Monterey	USA
National University of Science and Technology Politehnica Bucharest	Romania
Royal Institute of Technology	Sweden
University of Camerino	Italy
University of Malta	Malta
Warsaw University of Technology; Wroclaw University of Science and Technology	Poland

The school comprised a series of lectures, career presentations and laboratory tours delivered by experts from academia and industry. Areas covered included nuclear reactors, nuclear fuel cycle, nuclear waste and decommissioning, nuclear forensics, nuclear fusion, nuclear medicine and radiation safety. The detailed agenda is presented in 4.6.3 Agenda.

The school was promoted via a variety of channels - including the project website, LinkedIn, social media, and existing networks.

Very positive feedback was received from the students. The summarised feedback is discussed in 4.6.4 Feedback from participants.

4.6.3 Agenda

Tuesday 16th September		
8:30	Registration	
Session 1 Chair: <i>Dominic Rhodes</i>		
9:00	Welcome	David Harbottle University of Leeds
9:15	Radioactivity and its Measurement	Nick Evans Nottingham Trent University
10:15 Break		
10:45	Introduction to Targeted Alpha Therapy	Samantha Ree UK National Nuclear Laboratory
11:30	Ionising Radiation Protection, Safety, and Regulation	Yannick Verbelen University of Bristol
12:15 Lunch		
Session 2 Chair: <i>Jacob Rumney</i>		
13:30	Nuclear Forensics	Matthew Higginson AWE
14:15	Particle Technology in the Nuclear Industry	Alex Lockwood Sellafield
15:00 Break		
15:30	Managing the UKs Civil Plutonium Inventory	Robert Harrison The University of Manchester
16:15	Modelling of Precipitation Reactors in Reprocessing of Spent Nuclear Fuel	Abdul Samad Rana University of Leeds
17:00 End of Session		

Figure 52a – Agenda of the Nuclear Science & Technology School (1)

Wednesday 17th September		
08:30 Registration		
Session 3 Chair: Alex Lockwood		
09:00	Fuel Cycles and Fast Reactor MOX Manufacture	Dominic Rhodes Independent Consultant
09:45	Thermal and Fast Reactors	Dominic Rhodes Independent Consultant
10:30 Break		
11:00	Global Challenges in Nuclear Decommissioning: Strategies, Case Studies, and Future Directions	Ian Burke University of Leeds
11:45	Radioactive waste management	Gareth Law University of Helsinki
12:45 Lunch		
Session 4 Careers Chair: TBC		
14:00	Gareth Law	University of Helsinki
14:20	Michelle Baxter	UKAEA
14:40	Elanor Murray	Cyclife UK
15:00	Ian Burke	University of Leeds
15:20	Samantha Ree	UK NNL
15:40 Break		
16:00	Alastair Baker	University of Leeds
16:20	Yannick Verbelen	University of Bristol
16:40	Dominic Rhodes	Independent Consultant
17:00	Alex Lockwood	Sellafield Ltd
17:20 End of Session		
19:00 School Drinks Reception & BBQ - The Faversham (1-5 Springfield Mount, Leeds, LS2 9NG)		
Thursday 18th September		
08:30 Registration		
Session 5 Chair: TBC		
09:00	Is it possible to build a star on earth?	Kate Lancaster University of York
09:45	STEP Fusion - Powering the future?	Jordan d'Arras UKAEA
10:30 Break		
11:00	Industrial Radiological Accidents	Yannick Verbelen University of Bristol
11:45	MULTiform - Multiphase Fluid Flow in Nuclear Systems - AB	Alastair Baker University of Leeds
12:30 Lunch		
Session 6 Laboratory Tours		
13:45 - 16:00		Alastair Baker Dragan Matijevic Jacob Rumney Harinder Nizzer
16:00 Closing remarks – David Harbottle		

Figure 52b – Agenda of the Nuclear Science & Technology School (2)

4.6.4 Feedback from the participants

What did you like best about the school?

- Excellent Lab tours
- I most appreciated the diversity of topics covered, ranging from fundamental nuclear science to applied technologies and policy challenges. The combination of lectures, career insights, and practical lab tours made the programme both comprehensive and inspiring.
- I enjoyed the range of speakers and their confidence presenting, whether it was an overview or technical insight. It was similar to listening to a big nuclear physics podcast every day, where you get coffee and food breaks (really helpful in refreshing yourself in between talks)
- Introduction to Radioactivity and its Measurement and Careers Section
- Definitely talking to experts, it was so eye opening. Their experience is so much valuable for us students
- What I liked best about the entire Summer School was the unique combination of cutting-edge scientific lectures and personal career insights from the speakers. The fusion-related sessions (by Dr Kate Lancaster and Jordan d'Arras) were particularly inspiring, as they presented a forward-looking vision of clean energy, while the talks on radiology, radiation protection, and targeted alpha therapy demonstrated the direct impact of nuclear science on society and healthcare.

Equally valuable were the career presentations, which gave an honest and motivating view of the many possible professional paths in the nuclear sector. Hearing lecturers share their own experiences — from academia, industry, and research organizations — was both inspiring and reassuring.

This blend of scientific depth, real-world applications, and career-oriented guidance, together with the excellent organization and the opportunity to connect with peers from different backgrounds, was what I appreciated the most about the Summer School.

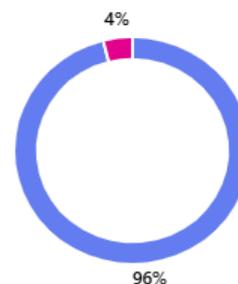
- I most enjoyed getting to know people from different countries' universities, and sharing our knowledge and experiences with each other. From the lectures I liked those about fast reactors and nuclear safety the best.
- How interactive the presenters were
- careers sessions and stories of other people. It was very motivating to hear that we can change our topic of research in any moment and not be afraid of it.

- make me learn about the nuclear application on real world
- The lectures were well structured and easy to understand, good organization of the program and the practical activities were interesting
- The best things, and most interesting for me were the presentations of Yannick Verbelen and Dominic Rhodes. for me, the continuous integration of vital info and some humoristic remarks, made me maintain focused.
- Personally, I really enjoyed the targeted alpha therapy session as it was directly linked to medical applications of nuclear applications, which is the field that I am most interested in. I also enjoyed the radiation protection session and the nuclear accidents lectures, as they were highly engaging and informative.
- Getting to meet people from all over the world with a common interest in nuclear energy
- As a non-UK citizen, I found it super interesting to get to know the British view on nuclear. I specifically enjoyed getting to know so many people working in the area and to get to network with them and hear from them how they ended up in their jobs. I also really liked that there were women as lecturers present.
- Samantha Ree's lecture on nuclear industry in medicine and Kate Lancaster's lecture on nuclear fusion.
- I really enjoyed the depth and breadth of the course content, which gave me new perspectives on potential career paths in nuclear science. I particularly valued the passion of the speakers and their personal stories, which highlighted that career shifts are exciting opportunities rather than setbacks. I also appreciated the chance to mentor undergraduates and connect with a diverse group of participants, which broadened my perspective and reinforced my enthusiasm for the field.
- Each speaker could introduce us to their topic with outstanding educational and rhetorical skills, which is - in my opinion - unique in our field, as not all researchers tend to be good teachers too. I also liked the location, the social dinner, the welcoming environment and the generous hospitality.
- approach to listeners, a really nice atmosphere and very interesting and inspiring career sessions
- I most enjoyed the balance between academic and industry perspectives. The lectures from professors gave a strong grounding in current research, while the talks from employers provided valuable insight into real-world applications and future opportunities in the nuclear sector. This combination made the programme both informative and inspiring.
- I loved the careers presentations. I took note of every company mentioned and have been looking to available internships/jobs. I have already had an interview for a

position at a company I learned about at the summer school! I also liked engaging with other people who are excited to be in the field. I would recommend this program to anyone interested in the more technology side of the nuclear sphere.

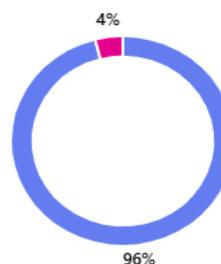
26. Has the Summer School increased your awareness of the nuclear and radiochemistry field?

● Yes	24
● Slightly	1
● No	0



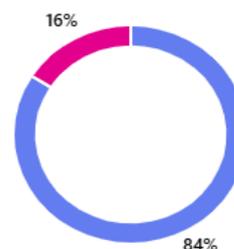
27. Has the Summer School increased your awareness of careers available in the nuclear and radiochemistry field?

● Yes	24
● Slightly	1
● No	0



28. Has the Summer School persuaded you to follow a career in nuclear and radiochemistry field?

● Yes	21
● Slightly	4
● No	0



29. Has the Summer School persuaded you to advance your level of study? (e.g. BSc to MSc, and MSc to PhD)

● Yes	20
● Slightly	4
● No	1

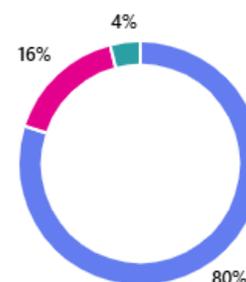


Figure 53 – Feedback from the Nuclear Science & Technology School

4.6.5 Photos from the event



Figure 54 –Collection of photos from Nuclear Science & Technology School



Figure 55 – Collection of photos from Nuclear Science & Technology School

5 SUMMARY

Student competitions and summer schools in the nuclear field are significant tools of education and development for many reasons. They play an essential role in building future nuclear workforce and they also strengthen national and international nuclear competencies while promoting safety and innovation. In order to maximize the beneficial effects of these events, it is crucial to ensure their stable, predictable funding and enable them to be organized annually or biennially. Two BSc, MSc and four PhD competition and sixth summer school were organized from 2022 until today under the ENEN2plus project. Over 200 students applied for the various competitions, and usually two or three times more students applied for the summer schools than we could fund. Based on our three years of experience, we can state the following regarding the importance and usefulness of nuclear competitions and summer schools:

a. Ensuring workforce development

The nuclear industry has to address and manage the constantly increasing shortage of skilled professionals worldwide. Nuclear events such as competitions and summer schools can help to:

- Motivate students to select nuclear-related careers (in the fields of nuclear energy, medical applications, safety and safeguards, radiochemistry, nuclear materials, radiation protection, nuclear waste management and others),
- Identify talented individuals early in their academic path,
- Facilitate entry into graduate and postgraduate programs,
- Encourage long-term engagement in the nuclear sector.

b. Promoting nuclear safety culture

Safety culture is a key element in the nuclear field. Competitions and summer schools help students develop fundamental skills regarding safety, for instance:

- Understanding and following regulations,
- Implementing control and verification mechanisms,
- Making responsible and informed decisions,
- Assessing and mitigating risks.

c. Stimulating innovation and research

Nuclear competitions and summer schools provide a platform for students that is suitable for exploring innovative solutions, such as:

- New reactor designs and concepts,
- Advances in radiation protection,
- Digital simulation and modelling approaches,

- Robotics and automation applications in nuclear contexts
- New technological procedures in medical applications.

d. Strengthening institutional and international collaboration

Competitions and summer schools generally foster cooperation between several universities, research centres, and industry partners. These collaborations can:

- Facilitate knowledge exchange,
- Improve the quality of education and training,
- Introduce students to international scientific networks.

e. Ensuring operational sustainability

Even though nuclear competitions and summer schools do not involve hazardous activities, they require significant resources to ensure their efficiency.

These resources include for example:

- Laboratory and simulation infrastructure,
- Software licenses and technical tools,
- Expert mentoring and evaluation,
- Equipment, materials, and logistics,
- Prizes, scholarships, and recognition for participants.

f. Contributing to public awareness and acceptance

Competitions and summer schools help bring up professionals who can communicate effectively about nuclear sciences and technologies, their benefits, and safety aspects. By engaging students early, these programs:

- Increase technical literacy and professional awareness,
- Reduce misconceptions and public fears regarding nuclear,
- Build a community of credible nuclear experts.

g. Supporting national strategic interests

Maintaining nuclear competence is critical for:

- National and international energy security,
- Medical and industrial applications of nuclear technology,
- Compliance with international treaties and obligations.

h. Ensuring participation through regular scheduling

The frequency of competitions has a direct effect on students' engagement. Without organising the events regularly:

- Students may not have sufficient time to learn about the opportunities,
- Participation rates may remain low,
- The program may lose visibility, limiting its long-term effectiveness.

When competitions take place consistently:

- Students can plan their preparation in advance,
- Engagement and interest build over time,
- Participation increases with each successive event,
- The program gains recognition and attracts wider institutional support.

Regular funding can ensure that these programs operate sustainably, establishing a continuous talent pipeline for the peaceful application of nuclear science and ensuring high-quality events and predictable organization. Competitions can guarantee that the educational experiences are consistently delivered which helps to educate a future workforce that values and supports safety principles. Ongoing coordination enables that these initiatives grow into continuous cycles of innovation, contributing to research, industrial development, and the global competitiveness of the national nuclear sector. Stable conditions allow these partnerships to remain consistent, which promotes long-term relationships and collaborative opportunities between the institutions. Competitions strengthen the competence and human resources that are necessary for a safe, reliable, and strategically independent nuclear sector and the positive societal impact.

More information about the organization of nuclear awards can be found in the ENEN2plus Deliverable D2.3. [6]

6 CONCLUSIONS

Providing stable funding for nuclear competitions and summer schools is a **strategic investment** since only regular support can ensure:

- Sustainable development of nuclear workforce,
- Strengthening of nuclear safety culture,
- Promotion of nuclear science, innovation and research,
- Stable institutional and international collaborations,
- Increased student participation through predictable scheduling,
- Enhanced public awareness and trust,
- Preservation and growth of national and international nuclear competencies.

These benefits can only be entirely realized if competitions and summer schools are supported with **long-term, predictable, and reliable funding**. Ensuring this financial foundation is crucial to maintain the quality, impact, and continuity of nuclear education and workforce development programs.

7 REFERENCES

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