

Impact of the ENEN2plus Project After One Year of Implementation

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ABSTRACT

Nuclear power and non-power technologies are technically very complex facilities that operate in increasingly challenging regulatory frameworks and market conditions. Development, construction, operation, decommissioning, waste management, and oversight of these facilities require personnel with excellent education, skills and motivation: nuclear specialists, that are equipped to work in multidisciplinary, multicultural and competitive environments. The project "Building European Nuclear Competence through continuous Advanced and Structured Education and Training Actions" or, in short, ENEN# aims to be the largest and most integrative nuclear Education and Training (E&T) action up to date. Assessing the nuclear (or related) industry needs in terms of human resources (HR) would be the first step in approaching this challenge. A detailed insight into the EU supply and demand of nuclear human resources for power and non-power applications will be developed. This will include industries, academia, technical safety organizations, and regulators. The attraction of excellent new talents followed by outstanding development through E&, cross-cultural, and cross-disciplinary activities are the overarching objectives that will represent the following challenges. A highly qualified workforce should remain the basic enabler of safe long-term operation of existing nuclear power plants and it is the enabler of future developments in the field and for the creation of advanced facilities.

A higher number of nuclear talents can be achieved through dedicated career-related events and competitions for high school pupils and teachers, students (BSc, MSC, Ph.D.), postdocs, and lifelong learners. ENEN# is looking into developing such activities and more. We are implementing a so-called "mobility" program which allocated a 2.5million EUR for the increase in knowledge, skills and competencies of future generations regardless if you are or you are not part of the project. One could access the necessary funds as support for his or her travel to a specific location that provides the necessary upgrades for developing a new career of for improving the existing one.

After one year of project implementation the results are impressive. One of the most important aspect it is the support the project offered to the nuclear industry and the impact it had in such a short period.

1 INTRODUCTION

The project “Building European Nuclear Competence through continuous Advanced and Structured Education and Training Actions” or, in short “ENEN2plus” is the latest and the biggest project under the coordination of the European Nuclear Education Network – ENEN. ENEN is an association of 91 Members among which one can find Universities, Research Centers, Technical Support organizations, Companies with implemented education and training programs, European and International organizations and sister organizations across the Globe. Today we can say that the actions of ENEN are spread across the whole European continent and go even beyond that with clear contributions and influences on Asia, Africa and America. In the ENEN2plus project 51 partners from Europe, Asia, United States and Canada together with partner organizations such as OECD-NEA, nucleareurope European Nuclear Society and the Sustainable Nuclear Energy Technology Platform-SNETP are looking into designing a common approach in Education and Training for nuclear sciences. The project ENEN2plus launched in June 2022 and it aims at supporting the nuclear education as a whole, with a fair distribution among nuclear topics.

The ENEN2plus project is having a focus point in creating a highly educated workforce and also for attracting youngsters to the nuclear field. We believe that in order to achieve this goal, persons must first be made aware of the multiple benefits of the nuclear field brings and also the variety of uses of nuclear education. Also, the nuclear talents must be engaged and for them we have created a set of actions and rewards to recognize their merits and involvement in this field.

.After a few months of its debut, the ENEN2plus managed to take over from where ENENplus project left when it comes to educational mobility support for the nuclear scientists and newcomers and with good results. Its approach and outcomes are described below.

2 PROJECT PURPOSE AND STRUCTURE

The main purpose of of the project, is to offer to the industry the right person in terms of qualification and timing. These purposes are to be achieved through various means:

- **analyzing the needs of human resources (HRs) in the nuclear sector.** This is conceived to be the absolute first step of the project. In the same time, it is a very complex task since we need to consider specific conditions that will make possible the support of nuclear energy to the energy transition, for power applications, and to the continuous development of the non-power applications and of nuclear research; this step will be needed to tailor the actions to be developed within and beyond the project .

Our aim is to include as many domains that relate to ionizing radiation as possible. We focus at analyzing the needs of industry, research centers, technical safety organisations (TSO) and academia, and we aim to duly identify gaps and critical resources, thus supporting the development of a consistent and feasible EU strategy for reinforcing HRs in the nuclear sector;

- **informing and attracting new talents.** Since for several years a decline in the number of scientists and university level students has been noticed, the attractiveness of nuclear studies and careers needs to be revived. When it comes to information sharing, we intend to make more easily available information on study and career opportunities via a single information entry point, thus updating and better developing previous initiatives undertaken by

ENEN into one HUB; the organization of career events and of the establishment of recognitions for outstanding works made by students and researchers in the nuclear field will further promote the attractiveness of the nuclear field and will provide greater visibility to its fascinating achievements; reaching out to pupils and teachers, to make them know about nuclear energy and its opportunities of professional development, will be another important action for enhancing attractiveness; attention to transdisciplinary approaches will be given in order to make better known the opportunities in power and non-power applications of nuclear energy;

- **enhancing nuclear competences by continuous E&T programmes.** In order to provide what knowledge is needed, a strong correlation with the industry needs is foreseen. We are aware that some of the know-how already exists and some needs to be developed. After reviewing the industry needs we will analyze the existing educational programmes and promote existing and new courses for innovative applications (new technologies in power applications, space, medical applications, etc.) We have also foreseen an easier access to nuclear infrastructures, by organizing attractive nuclear events (webinars, summer schools, competitions, etc.), by promoting and reinforcing actions for young generation networks and cross-professionals organisations;

- **developing sustainable vocational training programs and networks.** In order to bring education closer to industry needs a dedicated section of the project was assigned to the creation of dedicated Vocational Education and Training (VET) actions. Finding an adequate number of specific professionals may become in the future the bottleneck for new builds and long term operation; actions as the analysis of the existing VET offer, the further organization of communities of VET learners and the study and the creation of a dedicated platform for VET constitute the work to be performed in regard in the frame of the project;

- **establishing a successful mobility scheme for nuclear talents.** This mobility scheme stays at the forefront of our efforts. We are totally aware that we cannot provide education and training actions for all nuclear fields. We target as many nuclear disciplines as possible but indeed, know-how can reside also outside project consortium. In this idea, we have created a strong educational mobility scheme in order to support students and young researchers and specialists to pursue their career path regardless they are part of the current project or not. This mobility fund is based on the previous successful experience of ENENplus. With this educational mobility scheme we intend to obtain a strong European and international dimension of their studies and researches

This will be one of the actions deserving the greatest effort, in order to favour the most effective ways the attraction of new talents to the nuclear field;

- **internationalization and stakeholders' involvement:** It is important to consider the international environment since new technologies are developed across the world and this particular know how redised outside Europe. The experience of ENEN in cooperating with IAEA and OECD/NEA and in running projects in cooperation with non-European countries (e.g., Japan, Canada, etc.) will find its expression in a renewed and systematic cooperation with these important actors, as well as with the European technological platforms active in the nuclear fields

On the basis of the long-term experience of ENEN and thanks to the considerable diversity of the Consortium of qualified institutions involved in the project, all these objectives will have a strong and durable impact in the nuclear E&T fields, leading to clearly measurable and verifiable results, as proved below.

The project, as it can be seen in the Figure 1, is structured into seven technical Working Packages and one management Work Package.

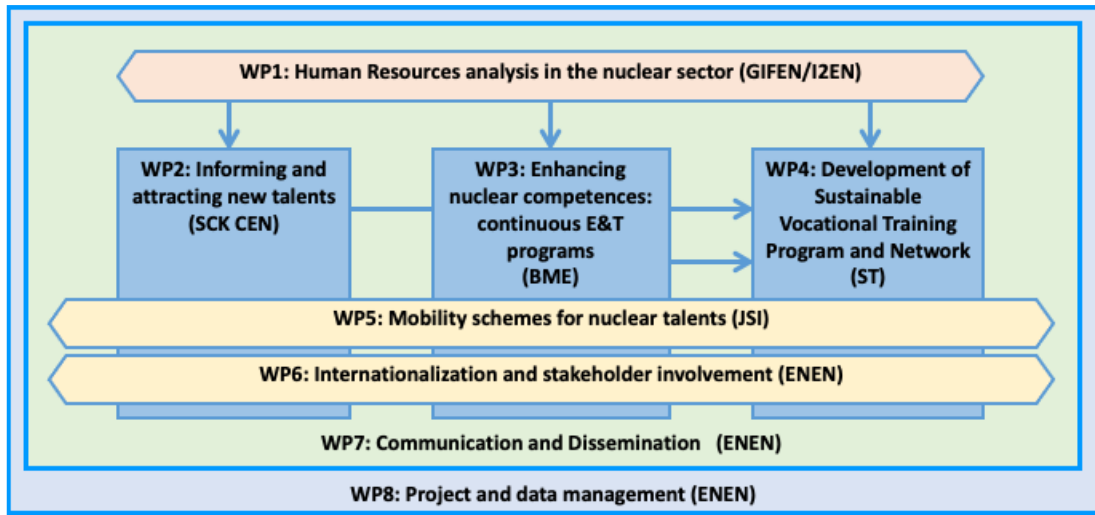


Figure 1. ENEN2 plus project structure

The first Work Package, **WP 1** is dedicated to the evaluation of workforce necessary in the nuclear sector and in the sectors which ionizing radiation is used, in Europe. This is done in order to identify gaps in terms of nuclear Education & Training to match the needs. Several domains are targeted:

- HR needs of the European nuclear industry;
- HR needs of research centres, waste management and safety operators. Nuclear research centres, waste management agencies and Technical Safety Organisations (TSO) in support of national safety authorities rely on high skills in many domains and contribute to training of nuclear engineers even in countries having no nuclear power. Research reactors are facilities readily available for students, PhDs, postdocs and teachers
- HR needs in non-power applications. There is a variety of non-power applications using radioactive elements or radiation rays. The most important one is the use of radioisotopes for medical use either for therapy (e.g irradiation of cancers) or diagnosis (e.g scintigraphy). All these application need specific competences and some generic nuclear competences such as for example radiation protection and handling of radioactive materials

The Work Package two (**WP2**) deals with informing people and attracting new talents to the nuclear field. This should be done by concentrating all the information into one single point, the ENEN educational HUB. This is targeting to be a single entry point for finding information related to: nuclear education, training, job opportunities, and access to facilities. The target of this WP is to be achieved by the organization of career events where information on education, training and careers in nuclear is given and opportunities for networking between students, young professionals and employers; dedicated competitions and summer schools for pupils and teachers promoting transdisciplinary approaches to create awareness on the broad applications of ionising radiation in nuclear as well as non-nuclear industry and healthcare.

The Work Package three (**WP3**), Enhancing nuclear competences through continuous E&T programs aims at provide a broad spectrum of education and training initiatives for the enhancement of competence profile. This should be done firstly by analysing and benchmarking the existing E&T programs provided by other European projects and the development of E&T materials for new themes according to the needs. For encouraging nuclear talents, a series of events for BSc/MSc/PhD level students are foreseen. An important

role in knowledge spread is communication. Thus we planned to support the networking cross-YG and cross-professional organizations as stimulating collaboration in the different nuclear fields. A final goal of the WP is to revise the existing EU strategy for E&T in nuclear and propose enhancements.

The Work Package four (**WP4**). Deals with the creation of a Sustainable Vocational Training Program and Network. Within this WP we intend to understand and analyze the existing Vocational Education and Training (VET) offer in the nuclear field. We intend to identify critical jobs in the nuclear domain and specify vocational training that will contribute to resolve the criticality need. Last but not least, we aim to contribute to resolving the current fragmentation of the relevant nuclear vocational training opportunities in the EU.

The Work Package five (**WP5**). aims at enhancing EURATOM competences through mobility opportunities, including access to world-class infrastructures and job perspectives.

In particular, the WP 5 objectives are:

- Develop, implement and manage a comprehensive mobility scheme
- Establish and implement links with project(s) supporting access to infrastructures
- Identify and follow-up opportunities for sustainable funding

The Work Package six (**WP6**), Internationalization and stakeholder involvement intends to engage international organizations with the scope to provide the necessary set of Educational and Training actions to nuclear domains that are missing the expertise at the level of EU. This should be done by assessing the gaps through finding from WP1 and matching them with identification of suppliers from extra EU countries and then through regional cooperation (US, Asia, other international organizations), providing adequate E&T actions with support of extra EU actors.

The Work Package seven (**WP7**) Communication and Dissemination. This is a very important WP in which we disseminate the E&T actions in order to attract the targeted audience to them We use this WP also to promote the results of our activities and to communicate with relevant stakeholders and decision makers.

3 IMPACT ON THE NUCLEAR COMMUNITY

After one year of project implementation the actions started to have effects. One of the most important effect was on the nuclear community at large which started to benefit from the mobility scheme. The mobility scheme is designed in such way to support an attendee regardless the action was designed by ENEN2plus members or other members from the nuclear community. In the figures presented below there is no distinction between participants who benefitted from actions developed within ENEN2 plus or other organizations.

3.1 Overview of the scientific mobility requirements

Support for the scientific community is based on a set of rule created and gathered under one comprehensive document that can be found in [1]. In Figure number 2 below are graphically described the essential condition for a mobility to be considered: they must involve cross-border travel; an EU citizen can travel to another EU country or to a non-EU country; a non-EU citizen must travel only to an EU country. There are also some limits when it comes to level of funding per period of travelling but also other useful information on the types of mobilities that can be supported. There is also a clear distinction between individual applications (made by individuals per se) and by group applications (made by events organizers in which funds still go directly to the attendee).

Mobilities
Not mobilities

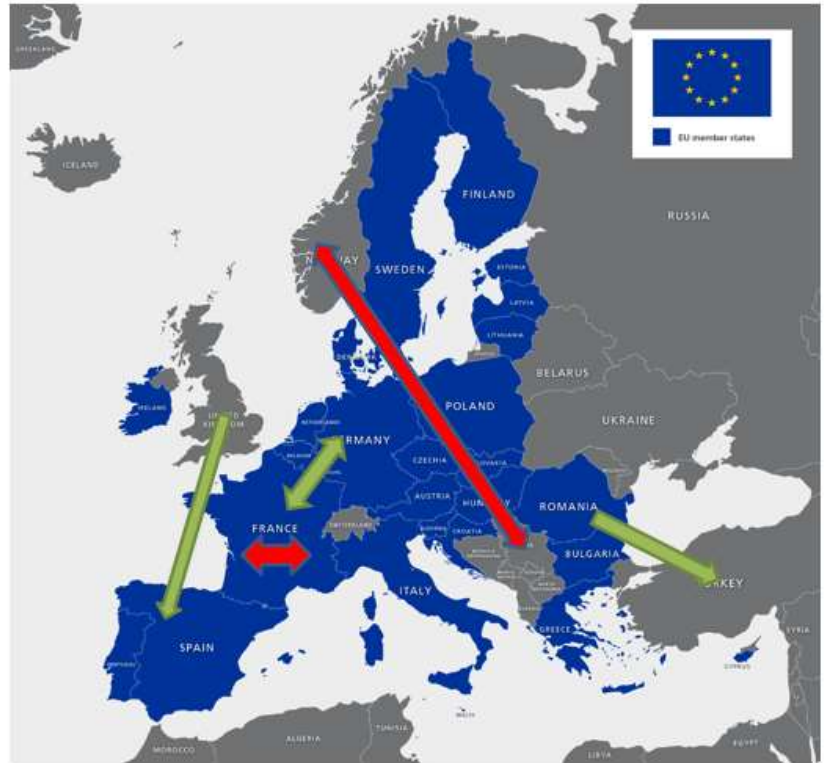


Figure 2. Definition of mobilities under ENEN2plus

3.2 Scientific mobility results

After one year of implementation some notable results can be mentioned. As it can be seen in [2] the group applications showed a large variety of nuclear topics that were supported. Among these E&T actions we can mention:

- Nuclear data for depletion calculations
- Nuclear Days, University of West Bohemia
- Workshop on Criticality Safety Calculations
- Fundamentals of Neutron Detection
- Course on “Deterministic modelling of nuclear system multi-physics”
- GRE@T-PIONEER course on “Reactor transients, nuclear safety and uncertainty and sensitivity analysis”
- Scientific dating, SCK CEN Academy, SCK CEN
- GRE@T-PIONEER course on “Core modelling for core design”
- Advanced Reactor Physics Course (ENEPP)
- Fundamentals of Isotope Production (ENEPP)
- GRE@T-PIONEER course on “Radiation protection in nuclear environment”
- GRE@T-PIONEER course on “Core modelling for transients”

Figure number 3 represents a summary of all the outputs to date. As it can be noticed up to now we got 34 group applications submitted and 26 are in progress. We received request for 388 individual applications and 486 are currently in progress.

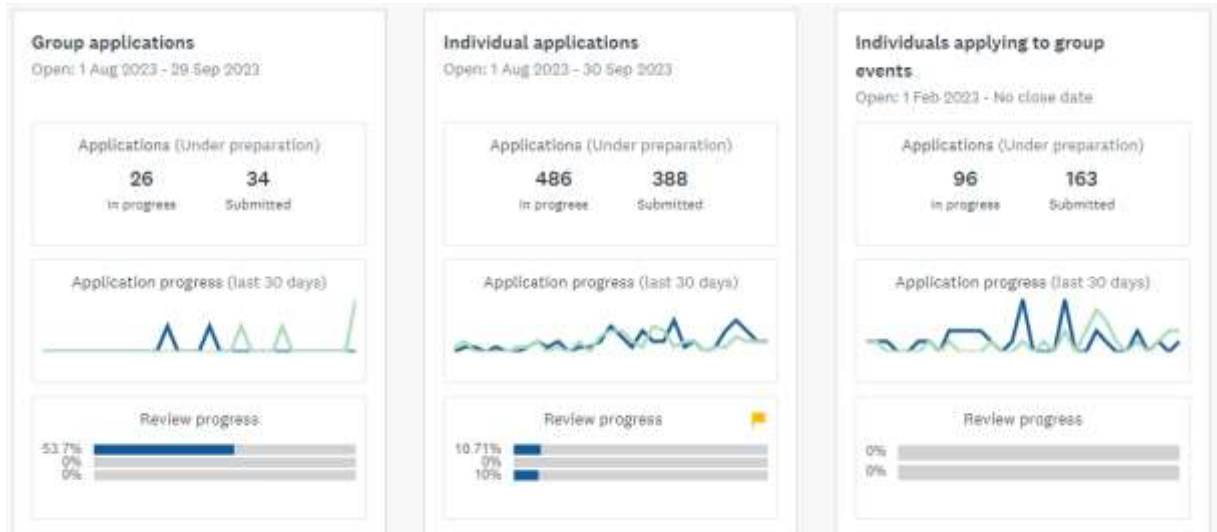


Figure 3. Summary of support offered under the ENEN2plus project

4 CONCLUSIONS.

Although the project is in its first year of implementation the impact that the previous ENENplus project had on the nuclear community was very important. This statement is sustained by the unexpected high numbers of supported mobilities which already occurred in the first part of the project implementation.

The initial estimation was that the project will support about 1.000 learners and after one year and a half we already received 388 applications. A certain percentage of those were not eligible for funding but the large majority is already in the situation of receiving the requested support. We do estimate that the impact on the nuclear community will be positive and we do strive to maintain and further develop high quality education and training actions.

ACKNOWLEDGMENTS

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