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ANNETTE PROJECT

Advanced Networking for Nuclear Education and Training and Transfer of Expertise

DELIVERABLE D 1.2

Sustainable Advanced Networking in Nuclear E&T

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ABSTRACT

Advanced Networking is not an occasional part of the acronym of the ANNETTE Project, since at the time in which the proposal was conceived the issue of networking with different actors in nuclear E&T was really a quite relevant one. Later on, other priorities emerged that suggested greater attention to be devted to other aspects. The present report summarises the actions made and the results obtained to achieve the goals initially envisaged in relation to networking. It is shown that ENEN is implementing networking mechanisms that are suggested to be effective by most of the involved Stakeholders. These mechanisms are presently in place and routinely operating.

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LIST OF ABBREVIATIONS

ANNETTE	Advanced Networking for Nuclear Education and Training and Transfer of Expertise
CPD	Continuous Professional Development
ENEN	European Nuclear Education Network Association
ECTS	European Credit Transfer System
ECVET	European Credit System for Vocational Education and Training
E&T	Education and Training
MoU	Memorandum of Understanding
WP	Work Package

1 INTRODUCTION AND BACKGROUND

Task 1.2 of the ANNETTE project is devoted to investigate mechanisms of advanced networking in nuclear Education and Training. The inclusion of this task in the ANNETTE Proposal was suggested by the reading of the SET Plan Roadmap for Nuclear E&T issued in 2014 [1], which, together with the specific requests of the responded Euratom Call, inspired many of the ideas at the basis of the proposal.

In that remarkable document [1], in addition to suggest the preparation of Masters of 60 ECTS for Continuous Professional Development (CPD), being one of the key actions of ANNETTE in WP2, WP5 and WP6, it was considered necessary to devote attention to the setting up of an advanced networking described as in the snapshot below (Figure 1), drawn from page 32 of the document:

Action 1.1.8 Advanced Network(s) for Nuclear Fission Education and Training

The *Advanced Network(s) for Nuclear Fission Education and Training* builds on or develops further the European Nuclear Education Network (ENEN)[27], the European Network for Education and Training in Radiation Protection (ENETRAP)[28] or other relevant networks.

The target public of this EU-wide action consists primarily of research and industry workers at the higher education level, i.e. levels 6 to 8 of the EQF.

Within this network(s), new profiles linking the nuclear sector (including all applications of ionising radiations) to the other energy sectors and society should be developed. Proposals at the level of MSc and/or PhD networks should be based on Private-Public Partnerships and could be taken up e.g. by a group of universities having both nuclear and social sciences in their programmes in association with private stakeholders of the nuclear value chain.

Support for lifelong learning and borderless mobility should be encouraged, in particular, to ensure multilateral exchanges and a close link with the existing research infrastructures, including large facilities. Obstacles preventing the mobility of qualified nuclear experts should be removed (e.g. national regulations regarding specific nuclear job qualifications, cultural or linguistic barriers, or different technological cultures).

The strategy and end user needs should be discussed with the *European Human Resources Observatory - Nuclear Energy* (EHRO-N)[16].

One pilot activity is proposed to kick-start the operation of this advanced network(s):

Figure 1. Description of Advanced Networking in [1] page 32.

So, both ENEN (http://www.enen.eu/) and ENETRAP (https://enetrap.sckcen.be/en) networks were explicitly called into play to cooperate in setting up broader networking mechanisms. It is also interesting to note the stress on lifelong learning and borderless mobility, something for which efforts have been spent in different Work Packages of ANNETTE.

It must be anyway recognised that at the time in which the ANNETTE proposal was conceived (from spring to autumn 2014) networking was intended with a broader meaning than suggested by the SET Plan Roadmap for Nuclear E&T issued in 2014 [1]. In fact, ENEN and ENETRAP have had already common interfaces and cooperation, e.g. in advertising each-other initiatives (see e.g., https://enetrap3.sckcen.be/en/Searchresult?searchText=enen) and in the participation of members of the two Networks to both of them.

The accent in ANNETTE was therefore shifted to reaching the different actors in the world of nuclear Education and Training, not only limiting to Nuclear Reactor Technology / Safety and

Radiation Protection, the two fields of action typical of ENEN and ENETRAP, but to stimulate cooperation in a broader sense, setting up mechanisms for sustainable networking.

As a consequence, the objectives of T1.2 in the DoA of ANNETTE were identified as follows:

T1.2 EXPLORE THE POSSIBILITY FOR THE IMPLEMENTATION OF SUSTAINABLE ADVANCED NETWORKING MECHANISMS IN NUCLEAR EDUCATION, TRAINING AND TRANSFER OF EXPERTISE
Mechanisms for effective and sustainable interaction with existing networks, groups, platforms, etc. dealing with E&T in nuclear areas will be studied. The E&T landscape for communication with will be the outcome of T1.1. It will be investigated to which extent the establishment creation of an advanced networking mechanisms, bringing together all nuclear E&T initiatives, can give an added value to effective nuclear knowledge transfer, competence building, and can facilitate information exchange on relevant E&T issues such as organisation of specific courses, and also policy related matters, cross border mobility, European certification and endorsement of courses and/or learning pathways, etc.. Depending on the outcome of this investigation, a methodology for the functioning of this advanced networking scheme will be set up and first steps towards an effective implementation will possibly be taken.
Task leader: CIRTEN, Task partners: UL, SCK-CEN, UPPSALA, UNIPV, BfS

Figure 2. Description of the task T1.2 from the DoA of ANNETTE.

It must be said that ENEN had at the time already a considerable number of Members (around 60) and that the initial stress of the "European Nuclear *Engineering* Network" (being the first denomination of ENEN) on the aspects related to nuclear engineering had shifted to more general "nuclear fields". This allowed including also Radiation Protection and Waste Management and Geological Disposal in the considered areas, leading to the present denomination of European Nuclear *Education* Network, which appears more meaningful in this respect. This was accompanied by the definition of the main mission of ENEN as "*the preservation and further development of expertise in the nuclear fields (NOTE!) by higher Education and Training*."

Attempts to join the three mentioned sectors of nuclear E&T had been made at the time of the ENEN-II project, which combined actions from the three fields by explicit request of EC at the time of proposal preparation:

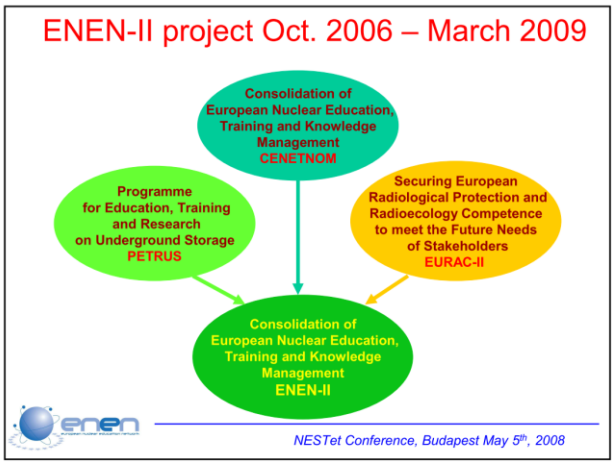

Figure 3. The merging of three different proposals in the ENEN-II Project
(from a presentation by the past-President Prof. Joseph Safieh at a NESTet Conference in 2008).

However, this attempt was not completely successful, since subsequent projects were carried out in which E&T was dealt with separately for the three areas (e.g., ENETRAP-III, PETRUS-III and ENEN-III).

Nevertheless, signs of possible willingness of merging actions in nuclear E&T came from a Meeting of MELODI (the Multidisciplinary Low-Dose Initiative, http://www.melodi-online.eu/). In the Meeting of the MELODI Education and Training Forum in 2013 the former ENEN President was invited to present scope and strategy of ENEN and to contribute to the internal discussion of MELODI on the issue of cooperation with the Association (see Figure 4).

Figure 4. Front-page of the ENEN Presentation at the MELODI E&T Forum 2013 and related agenda

This represented a stimulus to further consider the institutions involved in E&T in the field of Radiation Protection for a deeper cooperation, managing the related interfaces.

A further stimulus to join was received from the group of institutions involved in Waste Management and Geological Disposal. In particular, in the PETRUS-III project (http://www.enen.eu/en/projects/petrus-iii.html) Work Package 5 included provisions for the long term sustainability of the PETRUS consortium by entering the ENEN Association. This initiative was welcomed by ENEN that, in March 2015 at its General Assembly celebrated at Aalto University in Finland, accepted as new members the Université de Lorraine, historical leader of the Waste Management and Geological Disposal projects (PETRUS), and the Istituto Técnico Lisboa, partner in PETRUS-II and III and in ENETRAP-II and III projects.

Finally, ENEN achieved awareness of a possible new role attributed to it by developments in the field of the establishment of ECVET, the European system of Credits for Vocational Education and Training. During the 3rd ECVET Seminar for the Nuclear Energy Sector (Hotel Nord Nuova Roma, Rome, Italy, 12-14 November 2014) it was clear the need of identifying a supra-national institution capable of supporting the ECVET implementation in the European Member States. This role could be actually played by ENEN, provided that enough trust could be achieved by the Association as a provider of certifications. This consideration, being matter of reflection for the ANNETTE and the ENEN+ Projects and, recently, in the frame of just submitted AI ENEN+ proposal, suggests to gain trust also by involving a greater number of Stakeholders in the Association. This is possibly the further frontier of the process of networking with respect to what ENEN has been considering in the frame of ANNETTE.

2 ELABORATING ON NETWORKING IN THE FRAME OF ANNETTE

2.1 The ANNETTE Consortium

A first aspect to be considered in relation to the contribution that ANNETTE has provided to Advanced Networking is the composition of its Consortium. Since the start of proposal conception, attention was explicitly paid to involve members of the Communities involved in the three fields of Nuclear Technology / Safety, Radiation Protection and Waste Management and Geological Disposal. The role of "coordination" embedded into WP1 was actually conceived for putting together "again" these three communities, restarting an environment of strict cooperation that, since the times of the ENEN-II project, had not yet taken place. The favouring aspects mentioned in the previous chapter invited to do so and this result was explicitly sought for in the selection of participants and in the planning of the activities.

In addition to this result obtained "by design", two fortunate unforeseen events occurred during the proposal preparation, represented by the request of joining by two additional groups:

- the ESARDA Group (https://esarda.jrc.ec.europa.eu/), in particular, asked to participate in the endeavour, bringing their specific expertise in the field of nuclear safeguards; the joining of this group, whose constituting Institutions are represented in the logo of Figure 5, enriched the offer of courses for the master and the summer school;
- FuseNet (https://www.fusenet.eu/), the sister network of ENEN for Higher Education in the field of nuclear fusion, also asked to adhere to the proposal, bringing as linked third parties the University of Ghent, the Technical University of Eindhoven and the Schoenfelder.Training Company; the specific subject proposed to be addressed in the project was the "nuclearisation" of fusion, i.e., the process by which it is intended that nuclear fusion should change from a discipline to be developed in qualified research laboratories into a mature engineering and commercial reality.

Therefore, partly by design and partly because of the interest created by the proposal, the group of participants grew **constituting by itself a result of "advanced networking"**. This way, the proposed initiatives were going to benefit from an unprecedented multidisciplinary character and from the variety of subjects that could be addressed by the different groups.

Figure 5. Logo of the ESARDA Group adopted to advertise the related courses

2.2 Work made for Milestone MS5

The roadmap established for WP1 in terms of results to be step-by-step reached during the progress of the project envisaged a first milestone at month 12 (i.e., end of December 2016) consisting in the elaboration of a written proposal for an effective interaction between relevant E&T networks. The milestone was fulfilled by issuing on December 19th 2016 a report of the Institution to which the Task Leader belongs (CIRTEN) [2], which is reported at the end of this document as ANNEX I.

The document, starting from the articles of the Statutes of the ENEN Association (at the time under the French law) and recalling the history of the Association (mostly as done in the previous chapter) suggested two possible mechanisms for allowing ENEN to achieve a considerable networking potential:

- the **"integration route",** similar to what experienced in the case of the PETRUS Consortium, with the joining of ENEN as Members of some of its participants;
- the **"coordination route",** similar to the one followed with FuseNet, with which a MoU for cooperation was signed by the former-President of ENEN at Culham (UK) in February 2015.

These two routes were proposed as model, realistic procedures, already implemented within ENEN and therefore fully feasible to make ENEN reach out the various organisations operating for E&T in the nuclear fields and achieve an advanced networking.

The report also indicated possible actions to be performed during the project for reaching advanced networking. The actions were:

1. connection with groups of course providers, to propose sustainable interactions;
2. interactions with Stakeholders, to identify needs in networking and involving them in committees for releasing ENEN certifications;
3. organising special events on networking;
4. possibly, reconsidering the internal structure of ENEN for easing a sufficient independence to groups joining ENEN by the "integration route".

Concerning item no. 1 in the above list, the GENTLE Consortium was repeatedly contacted in order to involve this previous EFTS project in the delivery of Courses for ANNETTE. This was envisaged in the DoA of the ANNETTE project also on the basis of promising contacts had before the start of the ANNETTE project, enthusiastically confirmed during its first phases. However, notwithstanding the effort spent in contacting the members of the Consortium, it resulted finally impossible to overcome some intervened difficulties during the time span of the project. Indeed, networking is not always feasible in a straightforward way, whenever problems of economical sustainability and intellectual property may arise.

Item no. 2 will be matter for the following section, where it will be dealt with in detail.

In relation to Item no. 3, networking events were envisaged in the project roadmap and actually were organised as follows.

- **A first event was the ANNETTE Project Open Workshop @ NESTet 2016**, Berlin, May 25, 2016, 13:40-15:30, in which a round table was organised having as Moderator, Mr. Jean-Pol Poncelet, Secretary General of FORATOM and ENS and the following Panelists:
    - Prof. Walter Ambrosini, University of Pisa, Italy, Past President of ENEN, coordinator of the ANNETTE project proposal
    - Ms. Satu Helynen, Vice President, Operations, VTT, Smart Industry and Energy Systems, Finland, Vice president of the NUGENIA Association
    - Mr. Robert Geisser, Manager Training Department Germany and Talent Sourcing at AREVA, Germany
    - Dr. Michèle Coeck, Head of SCK•CEN's Academy for Nuclear Science and Technology, Belgium
    - Prof. John Roberts, University of Manchester, UK, Chairman of the SNETP ETKM working group
    - Prof. Pascal Anzieu, Directeur, Direction des programmes et formations CEA/INSTN, France

- Mr. Keith Allen, Manager, New Plant Training; Operating Plants Business, Westinghouse, USA
- Mr. Massimo Flore, Scientific Project Officer, JRC EHRO-N, European Commission
- Mr. Roger Garbil, Research Scientific & Technical Project Officer, Euratom Fission, European Commission
- Prof. Leon Cizelj, Head, Reactor Engineering, Jožef Stefan Institute, Slovenia, President of ENEN Association

The workshop represented and interesting occasion to present the ANNETTE project and its objectives, including the advanced networking. It was anyway too early to get conclusions or receive suggestions for better networking practices.

- **A second and a third event were held in 2019**, respectively as a **Special Event before the General Assembly of ENEN** on March 28, 2019 (see ANNEX II) and at the **FISA Meeting**, held in Pitesti, RO, in June 2019 (see ANNEX III). Though both the meetings were absolutely interesting in providing reflections and prospective solutions for the problems encountered by nuclear education nowadays, they were less rich in terms of indications about the problems of networking. This is probably a sign that, also tanks to the actions already performed by ENEN before and during ANNETTE, the problem of networking is considered less relevant in the present scenario, in comparison to the considerable worries raised by the difficult attempts to keep a sufficiently numerous and qualified nuclear workforce. This justifies also the shift of the interest from the problems of coordination and networking in the current ENEN+ project and in the submitted AI ENEN+ proposal; definitely the actions to attract and retain students in the nuclear fields at all the levels (from secondary school to PhD) are felt more urgent.

In relation to Item no. 4, the issue is believed to be under experimentation. The part of the PETRUS Consortium included as a working group within ENEN is certainly benefitting of the existence of the Association, as a legal structure providing sustainability to it, and enjoying a sufficient freedom to organise future E&T actions, also under the aegis of ENEN. No specific issue can be reported at the moment in regard and it is believed that this experiment represents a successful win-win action for both PETRUS and ENEN.

2.3 Work made for Milestone MS6

This milestone was actually foreseen for month 24 in the project (i.e., within December 2017), probably too early for the actual dynamics by which the ANNETTE project developed. The actions envisaged was a consultation of Stakeholders about the different routes proposed for networking. Completing this action within the scheduled time resulted impossible, also because it was found too difficult to attract the attention of the Advisory Board and of the End-User Group of ANNETTE on this aspect in an effective way within the prescribed time.

So, an appropriate occasion was waited for in order to raise the problem and discuss it. A first such occasion was the celebration of the 15th Anniversary of the ENEN Association, held in Brussels in the day before the General Assembly of 2018. Questionnaires were prepared and were disseminated. However, they were not distributed as effectively as it should be done because of last minute organisational reasons.

In order to repair to this problem, the issue was addressed in two ways:

- questionnaires and a .ppt presentation were sent by e-mail to the two groups of Stakeholders, asking for filling the questionnaires and returning them to the sender with useful suggestions; the questionnaires are described in a CIRTEN report [3] to be mentioned again;

- in the same e-mail message, a link was included to a videoclip more generally addressing the structure of the “master” proposed under ANNETTE, also proposing the problem of networking within ENEN; the video, containing quizzes, was conceived to send to the organisation that prepared it (the University of Pisa) the answers related to questions on the structure of the “master” and to the networking problems; the videoclip is still available at the link:

  http://www.dimnp.unipi.it/walter-ambrosini/For%20Stakeholders/For%20Stakeholders.html

Thanks to the combination of these two means, it was possible to achieve enough material (11 answers) to draw conclusions about the opinions of Stakeholders on networking mechanisms within ENEN, notwithstanding the fact that the questions had to be put in a very simple way in order to have an hope to get answers.

The resulting material is reported in the mentioned CIRTEN report [3], entirely made available to the reader in ANNEX IV. Though the reader is referred to its direct reading for a detailed description of the work, the Conclusions of this report are reported in a next chapter for the purpose of shortly discussing them.

3 PRESENT NETWORKING PRACTICES IN ENEN

According to its home page, ENEN has nowadays 77 Members, subdivided as in the following list (extracted from the ENEN website on October 18th, 2019):

FULL MEMBERS:

1	Atominstitut der Oesterreichischen Universitaeten	ATI	Vienna
2	Belgian Nuclear Research Centre	SCK•CEN	Mol
3	Ghent University	UG	Ghent
4	Katholieke Universiteit Leuven	KUL	Leuven
5	Université Catholique de Louvain	UCL	Louvain-la-Neuve
6	Université de Liège	ULG	Liege
7	Université Libre de Bruxelles	ULB	Brussels
8	Vrije Universiteit Brussel	VUB	Brussels
9	Westinghouse Electric Company	WEC	Brussels
10	Risk Engineering Ltd.	REL	Sofia
11	CV Rez	CVRez	Prague
12	Czech Technical University in Prague	CTU	Prague
13	University of West Bohemia	UWB	Pilsen
14	Aalto University	AALTO	Helsinki
15	Fennovoima Oy	FENNOVOIMA	Helsinki
16	Lappeenranta University of Technology	LUT	Lappeenranta
17	AREVA	AREVA	Paris
18	CEA/INSTN Centre d'Etudes de Saclay	CEA/INSTN	Saclay
19	European Nuclear Safety Training and Tutoring Institute	ENSTTI	Fontenay-aux-Roses
20	Institute Mines-Télécom Atlantique	IMTA	Nantes
21	Institute for Radiation Protection and Nuclear Safety	IRSN	Fontenay-aux-Roses
22	Institut National Polytechnique de Grenoble	INPG	Grenoble
23	Institut Régional Universitaire Polytechnique	IRUP	Saint Etienne
24	Institut Supérieur des Techniques de la Performance	ISTP	Saint Etienne
25	Université de Lorraine	ULR	Nancy
26	Institute of Nuclear Fuel Cycle, RWT Aachen University	INBK	Aachen
27	Karlsruhe Institute of Technology	KIT	Karlsruhe
28	Ruhr Universität Bochum	RUB	Bochum
29	Schoenfelder.Training	ST	Köln
30	Technische Universitaet Muenchen	TUM	Munchen
31	Universitaet Stuttgart	IKE	Stuttgart
32	Aristoteles University of Thessaloniki	AUTH	Thessaloniki
33	Budapest University of Technology and Economics	BME	Budapest
34	Consorzio Interuniversitario per la Ricerca Tecnologica Nucleare	CIRTEN	Pisa
34	Polytechnic of Milan	CIRTEN	Milan
34	Polytechnic of Turin	CIRTEN	Turin
34	University of Bologna	CIRTEN	Bologna
34	University of Padova	CIRTEN	Padova
34	University of Palermo	CIRTEN	Palermo
34	University of Pisa	CIRTEN	Pisa
34	University of Roma1 “La Sapienza”	CIRTEN	Roma
35	ENEA	ENEA	Rome
36	AGH University of Science and Technology	AGH	Cracow
37	Instituto Superior Tecnico	IST	Lisbon
38	National Institute "Horia Hulubei"	IFIN-HH	Bucharest
39	University Politechnica Bucharest	UPB	Bucharest
40	Slovak University of Technology in Bratislava	STU	Bratislava
41	ARAO Agency for Radwaste Management	ARAO	Ljubljana
42	Jozef Stefan Institute	JSI	Ljubljana
43	University of Ljubljana	UL	Ljubljana
44	CIEMAT	CIEMAT	Madrid
45	Technical University of Catalonia - Barcelona Tech	UPC	Barcelona
46	TECNATOM	TECNATOM	San Sebastián de los Reyes
47	Universidad Nacional de Educacion a Distancia	UNED	Madrid
48	Universidad Politecnica de Madrid	UPM	Madrid
49	Universidad Politecnica de Valencia	UPV	Valencia
50	Chalmers University of Technology	CUT	Goteborg
51	INBEx	INBEX	Bälinge
52	Royal Institute of Technology	KTH	Stockholm
53	Uppsala University	UU	Uppsala
54	Swiss Federal Institute of Technology Lausanne	EPFL	Lausanne
55	Swiss Federal Institute of Technology Zürich	ETH	Zurich
56	Delft University of Technology	DUT	Delft
57	Imperial College London	ICL	London
58	University of Birmingham	UB	Birmingham
59	University of Central Lancashire	UCLAN	Preston
60	University of Manchester	UM	Manchester
61	Cardiff University	CAR	Cardiff

INTERNATIONAL MEMBERS:

62	Tokyo Institute of Technology	TokyoTech	Tokyo
63	University of Fukui	FUKUI	Fukui
64	RosatomTech	RosatomTech	Obninsk
65	National Research Nuclear University "MEPhI"	MEPhI	Moscow
66	Tomsk Polytechnic University	TOMSK	Tomsk
67	Odessa National Polytechnic University	ONPU	Odessa
68	V. N. Karazin Kharkiv National University	KKNU	Kharkiv

PARTNERS - INTERNATIONAL INSTITUTIONS:

69	International Atomic Energy Agency	IAEA	Vienna
70	European Nuclear Society	ENS	Brussels
71	International Institute for Nuclear Energy	I2EN	Saclay
72	University Network of Excellence in Nuclear Engineering	UNENE	Ontario
73	World Nuclear University	WNU	London
74	Fusenet	FUS	Europe
75	World Federation of Science Journalists	WFSJ	Montréal
76	Nugenia	NUG	Brussels
77	Nuclear Energy Agency of the Organisation for Economic Cooperation and Development	OECD-NEA	Paris

Some of these members have a MoU, some others decided to join the Association by an explicit request of membership that can be proposed as described at

http://www.enen.eu/en/about/enen-membership.html

As it can be seen by the increased number of Members with respect to time at the start of the ANNETTE Project, the actions of the Association continue to involve in different ways new Members and touch new fields of action. Two recent examples of coordination of ENEN actions with international bodies and Institutions are presently visible on the landing page of the Association, being the recently signed MoUs with OECD-NEA (Figure 6) and the one with Rosatomtech (Figure 7).

Figure 6. Picture of the signature of the MoU with OECD NEA from the ENEN website

Figure 7. Picture of the signature of the MoU with Rosatomtech from the ENEN website

4 ENEN PRACTICES AND SUGGESTIONS BY STAKEHOLDERS

The text of the Conclusions of the report in reference [3] are here used (in Italics) to list the main suggestions received from the 11 answers proposed by the Stakeholders who sent their questionnaires.

1. *"Answer #1 approves the two different routes, warning about **keeping lively contacts** with the Bodies with which ENEN has MoUs;"*

This recommendation has obvious practical implications. It must be noted that with the present huge number of Members keeping lively contacts with each one of them may be challenging. So, this suggestions is a reminder about the need to actively involve MoU Members in ongoing actions. It must be noted that in recent ENEN projects and proposals a clear capability of the Association to reach out to several organisations and involving them in its action is apparent.

2. *Answer #2 suggests **a "cooperation route"** owing to the richness of the ENEN Association in providing the service to identify the most competent persons or groups for some needs; in this case, it seems to be suggested that **ENEN should enhance is attractiveness** as a partner in E&T actions, also through the use of its database and, in case, of a repository of course material;*

This suggestion is precious. ENEN can be seen as a provider of different kinds of nuclear expertise pooled from Europe to be routed to those needing it. This suggests possibly a new role that may be included into the routine missions of the Association.

3. *Answer #3 proposes the **possible difficulties in integration** and suggests that both routes should be used;*

This suggestion substantially agrees with the two proposed routes (with a warning about integration) and supports the present practices within ENEN.

4. *Answer #4 recommends that, **on top of the two routes, a strong link with the industry, platforms and end-users should be kept;***

This answer actually reminds the privileged contacts that ENEN should have with platforms. In this regard, it must be mentioned that NUGENIA is in the list of ENEN international partners. We can also remind a recent common initiative held in cooperation with NUGENIA in relation to PhD (see at the site http://www.nuclearenergy.polimi.it/enen-nugenia-phd-award/).

5. *Answer #5 just approves both the proposed routes;*

This approval means support for the business as usual practice of ENEN.

6. *Answer #6 details the particular cases of cooperation with different bodies, considering the two routes instrumental in different cases; it is anyway explicitly mentioned the **extra-European cooperation with the regional networks AFRANEST, ANENT, LANENT and STARNET**.*

The cooperation with IAEA and its regional networks is certainly very important and is kept clearly in mind. A single regret can be expressed in this regard recalling that during the Grant Agreement preparation of the ANNETTE project the opportunity to join an IAEA action, in the form of a Coordinated Research Project closely related to the work envisaged in ANNETTE (though not compromising the independence of the work made for EU), was denied by EC. That denial certainly deprived the project of an additional and very powerful opportunity to enhance networking at a worldwide level, though it did not deter the two organisations from continuing their long lasting cooperation, formally started in 2009 and several times renewed by ENEN Presidents.

7. *Answer #7 provides a very useful indication in relation to a sector that may strongly benefit of the services of ENEN, being the one of the **small and medium enterprises**: discussions on this aspect are not new in ENEN and it is important to resume them, considering the **needs of this important part of the nuclear industry, needing qualified persons**.*

The recent revision of the level of membership fees for small Companies in ENEN can partly ease this aspect. By the way, ENEN, already addressing several sectors of nuclear E&T (from Secondary School to PhD levels and Continuous Professional Development) should open a new internal front to cope with the needs of SME. This may be seen possible, but it is certainly to be considered as a challenging effort.

8. *Answer #8 stresses the point of the **economical sustainability** of ENEN in its action, being certainly a major issue, calling for adequate and continuing support from the EC side; the observation ends with a question, whose answer is that, of course, **the offer should be aligned to the demand** and, if possible, it should be also visionary enough to forecast the future needs;*

The economical sustainability of ENEN and of its actions is an issue related to its capability to attract funding for E&T. In this regard, it is important that decision makers in the nuclear sector value this aspect enough. The two mentioned events organised in 2019 in the frame of ANNETTE were actually trying to stimulate in the different stakeholders the interest for maintaining in Europe enough capabilities for deploying a sufficiently numerous and qualified workforce in the next decades. Aligning the offer with the demand is also important, though the organisation of E&T must be sufficiently longsighted to forecast future needs, beyond the immediate needs of industry at the present moment.

9. *Answer #9 finds **difficult the route of integration in some cases** and again stresses the aspect of the alignment between offer and demand.*

This answer stresses again a point already discussed above. It pointed out the need to have plans for E&T in line with present and future needs (see the report for the exact wording in this answer).

10. *Answer #10 **suggests a mapping of the different groups** operating in the field of nuclear education and training, recalling a work started years ago in cooperation between ENEN and other existing groups, trying to understand the galaxy of entities formed in different fields for nuclear E&T, which could better cooperate once their respective mandates are clarified.*

This systematic approach would certainly be of interest and specific projects could deal with its deployment in order to better rationalise the effort being spent in the nuclear E&T field. This is an aspect to be borne in mind for future actions related to networking.

11. *Answer #11 detaches from the other answers received so far, seemingly suggesting unavailability of the XXXXX community to cooperate in advanced networking, reserving to them only the responsibility to lead E&T initiatives in the field. A subsequent question asking if the meaning of the sentence was a door closed for future cooperation did not get any answer.*

Though it is easy to convince that cooperating is a win-win strategy, we must also respect those enclaves of research and education that feel to be enough well organised for their purposes and do not need any further contribution.

As a whole, the previously reported conclusions from the answers detailed in Report [3] seem to support the mechanisms of networking envisaged in the frame of ANNETTE. The suggestions received are therefore presented to the ENEN Presidency and to the Board of Governors for elaborating future strategies of collaboration.

5 CONCLUSIONS

The ANNETTE project contributed to the capabilities of networking of the ENEN Association since the diffusion of the notice of proposal submission. The interest raised by the declared aims in terms of coordination, networking and revival of interest for nuclear courses generated a positive dynamics around ENEN and its missions in the service to EU that already repaid of the effort spent in preparing this endeavour and in taking care of the very challenging aspects involved in it.

The mechanisms of “advanced” networking proposed during the development of Task 1.2 were clearly drawn from the knowledge of the modus operandi of the Association in the past decades, which qualified it as a major catalyser of efforts in the field of nuclear E&T. It can be now observed that the consultation of the Stakeholders of ANNETTE provided additional suggestions in regard, though they substantially confirmed the routes that the Association is routinely using to reach out.

Considering the additional suggestions received from Stakeholders and even considering some denial of willingness to cooperate, the ENEN AISBL seems therefore in a very good position to continue catalysing E&T efforts in an effective progression towards advanced networking, fully matching ideas and practices suggested in this document.

REFERENCES

[1] Strategic Energy Technology (SET) Plan Roadmap on Education and Training, Availability and mobilisation of appropriately skilled human resources, JRC Science and Policy Reports, EHRO-N, Coordinated for JRC by A. Georgakaki, U. von Estorff, S.D. Peteves, 2014, EUR 26558 EN

https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/strategic-energy-technology-set-plan-roadmap-education-and-training

[2] Walter Ambrosini and Rosa Lo Frano, Networking mechanisms to be activated in the frame of the ANNETTE Project – Written proposal for MS5 of the ANNETTE Project, CIRTEN Report No. MR/ANH2020/022016, Pisa, December 19th, 2016

[3] Walter Ambrosini and Rosa Lo Frano, Investigation of the added value of a sustainable advanced network: Summary of discussions with stakeholders – Written proposal for MS6 of the ANNETTE Project, CIRTEN Report No. MR/ANH2020/022018, Pisa, September 7th, 2018. Version 1, released on October 8th, 2018.

ANNEX I – CIRTEN DOCUMENT FOR MILESTONE MS5

CIRTEN

Consorzio **I**nteruniversitario per la **R**icerca **TE**cnologica **N**ucleare

Networking mechanisms to be activated in the frame of the ANNETTE Project

Written proposal for MS5 of the ANNETTE Project

Walter Ambrosini and Rosa Lo Frano

Pisa, December 19th, 2016

CIRTEN Report No. MR/ANH2020/022016

ABSTRACT

The present short document summarises the proposals prepared as envisaged in milestone MS5 of the ANNETTE project. The proposal concerns an effective methodology for interacting between relevant E&T networks as specified in the related milestone table, whose relevant row is reported below.

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS5	M1.2.1	7 - CIRTEN	12	Methodology for effective interaction between relevant E&T networks, Means of verification: Written proposal of networking mechanisms

The proposal accounts for the context developed up to the time of writing in terms of connections that the European Nuclear Education Network has established in the last years.

ACKNOWLEDGEMENTS

The President and the Secretary General of ENEN were involved in revising and contributing to the text of this proposal, owing to the interest of the matter dealt with for the policy of the Association.

TABLE OF CONTENTS

1. THE MISSION OF ENEN AND THE PRESENT CONTEXT

Article 2 of the Statutes of the European Nuclear Education Network is reported hereafter for due reference, in view of the comments reported below.

"ARTICLE 2 - AIMS AND STRATEGIES

2.1 - The main objective of the ENEN Association is ***the preservation and the further development of expertise in the nuclear fields by higher education and training****. This objective should be realized through the* ***co-operation between universities, research organisations, regulatory bodies, the industry and any other organisations involved in the application of nuclear science and ionising radiation.***

To meet with this objective, the ENEN Association has to:

- Promote and further develop the collaboration in nuclear education and training of students, researchers and professionals,

- Ensure the quality of nuclear education and training,

- Increase the attractiveness for engagement in the nuclear fields for students, researchers and professionals.

- Promote life-long learning and career development at post-graduate or equivalent level. The

basic objectives of the ENEN Association shall be to:

- ***Harmonise European Master of Science curricula in nuclear disciplines and promote PhD studies,***
- *Promote exchange of students and teachers participating in the frame of this network,*
- *Increase the number of students by providing incentives,*
- ***Establish a framework for mutual recognition,***
- *Foster and strengthen the relationship between universities, research organisations, regulatory bodies, the industry and any other organisations involved in the application of nuclear science and ionising radiation by facilitating their participation in (or associating them with) nuclear academic education and by offering continuous training.*

2.2 - The aims of the ENEN Association shall be achieved by:

- ***Discussion on educational objectives, methods and course contents among the members and with external partners, particularly national and European industries.***
- *Organisation of internal audits on the quality of nuclear education curricula.*
- ***Awarding the European Master of Science certificates in nuclear disciplines to the curricula satisfying the criteria set up by the ENEN Association.***
- ***Cooperation between the ENEN Members, and with universities, research organisations, regulatory bodies, the industry and any other organisations involved in the application of nuclear science and ionising radiation*** *for enhancement of mobility of teachers and students, organisation of training and advanced courses, use of large research and teaching facilities or infrastructures.*
- ***Cooperation with international and national governmental institutions, agencies and universities.***
- *Synergy with European Union initiatives in nuclear science and technology*
- *Identification and development of solutions to specific problems and deficiencies which hinder the attainment of the aims of the Network.*
- *Facilitating the exchange of information between the Members of the ENEN Association - on course objectives, content, modes of presentation and other matters."*

5

In reporting the above Article 2 of the Statutes, some sentences having a key role for our discussion have been highlighted in boldface character. It is clearly noted from the content of the article that:

- ENEN has had since the very beginning (22 September 2003) the ambition and the commitment to provide a major service of coordination in E&T in the nuclear fields in Europe;
- since the very beginning the Statutes of the Association were longsighted enough to include in the range of operation the Association not only the engineering / safety field, from which it was initially springing, but all the relevant sectors in nuclear E&T;
- the objective of harmonising the MSc curricula and promoting PhD studies in the relevant nuclear fields by establishing a framework for mutual recognition qualifies ENEN as a center of gravity in Europe for elaborating E&T strategies aimed at maintaining and developing the nuclear workforce;
- finally, the means for achieving these objectives (discussing curricula, awarding certifications, cooperation between major actors in E&T, cooperation with international and national governmental institutions) evidently qualify ENEN as "the network" for nuclear E&T in Europe, set up to catalyse, coordinate and make sustainable the different efforts appearing in Europe in this frame.

On the other hand, the Advanced Network(s) mentioned in the SET Plan Roadmap [1] which inspired the setting up of the ANNETTE Proposal are described as follows:

> *"Action 1.1.8 Advanced Network(s) for Nuclear Fission Education and Training*
>
> *The Advanced Network(s) for Nuclear Fission Education and Training builds on or develops further the European Nuclear Education Network (ENEN) , the European Network for Education and Training in Radiation Protection (ENETRAP) or other relevant networks.*
>
> *The target public of this EU-wide action consists primarily of research and industry workers at the higher education level, i.e. levels 6 to 8 of the EQF. Within this network(s), new profiles linking the nuclear sector (including all applications of ionising radiations) to the other energy sectors and society should be developed. Proposals at the level of MSc and/or PhD networks should be based on Private-Public Partnerships and could be taken up e.g. by a group of universities having both nuclear and social sciences in their programmes in association with private stakeholders of the nuclear value chain.*
>
> *Support for lifelong learning and borderless mobility should be encouraged, in particular, to ensure multilateral exchanges and a close link with the existing research infrastructures, including large facilities. Obstacles preventing the mobility of qualified nuclear experts should be removed (e.g. national regulations regarding specific nuclear job qualifications, cultural or linguistic barriers, or different technological cultures).*
>
> *The strategy and end user needs should be discussed with the European Human Resources Observatory Nuclear Energy (EHRO-N) 16. "*

The ANNETTE proposal (now project) caught this explicit invitation to make ENEN become a broader "advanced" network, building on its own experience, on the one of ENETRAP and of other relevant groups. Moreover, ENEN through ANNETTE also accepted the further invitation of the SET Plan Roadmap to set up a Master for CPD:

"One pilot activity is proposed to kick-start the operation of this advanced network(s):

Activity 1: Development of Professional Master Courses in Nuclear Technologies at the Frontier of Knowledge

Within this activity, professional master courses should be developed for (young) researchers and engineers working in, among others, industry, consultancy companies or regulatory bodies, to enhance their Knowledge, Skills and Competences (KSC) in nuclear technologies, with emphasis on issues agreed upon with the main stakeholders. This means in particular, for nuclear fission, that the content of the courses is in alignment with the vision of the various European Forums and Technology Platforms (e.g. SNE-TP, IGD-TP and ENEF) and with the strategic objectives of other authoritative groups, associations and forums concerned (e.g. MELODI, ENSREG, HERCA). They should include learning content related to scientific-technological as well as socio-economic issues, such as: advanced safety systems; technological improvements in components and structures; radiation protection; waste management; decommissioning and dismantling; nuclear system engineering; global analyses of the energy market; market entrepreneurship; participation of industry in public engagement processes (aiming among others at developing Corporate Social, Environmental and Financial Responsibility)."

In this respect it can be recognised that the ANNETTE project strictly adhered to at least two of the key recommendations of the SET Plan Roadmap, which were partly echoed in the subsequent Euratom call at the topic NFRP 10.

On this basis, given the status of legal entity of ENEN and its missions, as described in the above Article 2 of its Statutes, it is straightforward to envisage the proposed "Advanced Network" in the nuclear fields as ENEN itself, proposer and Coordinator of the project purposely named "Advanced Networking for Nuclear Education and Training and Transfer of Expertise" (ANNETTE).

However, ENEN, in order to become fully qualified to undertake successfully this new role assigned to it, has to more effectively catalyse the ongoing efforts in the field, by generating a better involvement. This better involvement may be achieved by different means, including the adhesion to the Association of some groups born independently and/or the implementation of agreements and MoUs for stricter and better coordinated cooperation with others.

In this regard, two recent examples can be considered as study cases for the advancement in networking envisaged in the SET Plan Roadmap for E&T:

- a first example is the step recently completed in the PETRUS-III Project which, in Work Package 5, included as a project objective the integration of its Consortium into ENEN; this step was made real by the creation of a specific PETRUS Working Group within the Association and by the election in the Board of Governors of the historical leader of the PETRUS projects; we will call this route to the creation of an Advanced Network as the **"integration route"**;
- on the other hand, the ANNETTE project includes the Work Package 6, led by the sister network for higher education in fusion science and technology, namely FuseNet; at the present time coordination of the actions between ENEN and FuseNet is not aiming at an integration of any of them into the other, but a Memorandum of Understanding was signed instead in February 2015 in Culham (UK) defining the lines of a strict cooperation; we will call this second route to an Advanced Network as the **"coordination route".**

Which one of the two routes should prevail in the present process of "advancement" in networking depends on the specific cases. However, it must be recognised that:

- nuclear fields having very many interfaces among each other, as the nuclear engineering/safety, the radiation protection and the waste management and geological disposal ones, should strive for integration, as it happened for PETRUS and as discussed in recent times during the ENEN interactions with the technological platforms (SNE-TP, MELODI, IGD-TP);
- in particular, in its Governing Board meeting on September 29th, 2015, the SNE-TP Chairman expressed "trust" in the role of coordination of E&T of ENEN, indicating in this endorsement the intention of making more effective the organisation of activities in this field;
- the present context of lack of attractiveness of the nuclear careers for young generations, owing to the oscillations in nuclear risk perception consequent to occurred accidents, suggests to join efforts at the highest possible level (integration), aiming at proposing to young STEM students a well organised pattern of career opportunities in the nuclear fields;
- ENEN itself, in order to better accomplish with its missions, needs to have on board more industrial bodies and also regulators, to directly involve them, e.g., in the release of international certifications that may ease the process of cross border mobility of professionals in the nuclear fields.

Therefore, at present time "integration" seems to be the best route for advanced networking, as one of the main targets of ANNETTE, leaving to the route of "coordination" a specific role in those cases in which the interfaces of ENEN with groups active in nuclear E&T are important but, for various reasons, keeping separate organisations may result in a better functional interaction.

2. THE PROPOSED ACTIONS TOWARDS ADVANCED NETWORKING

Basing on the above considerations and taking into account the actions already planned in the ANNETTE Project in relation to advanced networking, the following actions can be suggested in the course of the project, whose results will be reported in the deliverable D1.2 in month 48, with an interim report in month 24.

- **Interaction with groups of course providers.** Course providers in the nuclear fields not belonging to ENEN will be approached in order to propose a sustainable interaction either by integration or coordination. Relevant interfaces and possible synergies will be particularly discussed. In this regard, the interaction with stakeholders will be an essential means to highlight specific needs in the field of E&T and to identify the groups who are mostly active in this regard.
- **Interaction with Stakeholders.** Stakeholders should be involved in the actions of ENEN, as "advanced" network, in order to take active part in its life and to support it by their specific suggestions about the real needs in nuclear E&T. Especially industrial bodies and regulators should be better involved in the life of the network, e.g., by inviting them to take part in ENEN committees for awarding international certifications released by the Association as a "supra-national" network, thus reflecting the agreement among relevant stakeholders on the levels of knowledge, skills and responsibility and autonomy to be achieved in learning processes useful for end-users.
- **Organising special events on advanced networking.** The Task T7.4 of the ANNETTE project envisages the organisation of two special events on networking. These events will be important occasions to verify the feasibility of the advanced networking and to discuss with groups of course providers and stakeholders the best strategies to provide coordination to E&T actions. It must be recalled in this regard that coordination, as one of the primary objectives of ANNETTE, received large support by the stakeholders contacted since the time of setting up the proposal; it is therefore expected that stakeholders will eagerly participate in such events, underlining their agreement on the undertaken actions. The special events on advanced networking will be therefore essential steps to confirm and carry on the strategies of networking that will be shaped during the course of the project.
- **Possibly reconsidering the internal structure of ENEN.** The present organisation of ENEN in working groups already offers a flexible structure for hosting activities born independently from the Association, which may find long term sustainability and sufficient independence within coordination inside ENEN. This is the scheme adopted for the PETRUS Consortium which is presently being experimented since the end of the PETRUS-III project (August 2016). However, it may be the case that the structure of the Association should be retouched in order to be adapted to the needs encountered in the integration of several working groups. This aspect needs to be considered in due time.

REFERENCES

[1] Strategic Energy Technology (SET) Plan Roadmap on Education and Training, Availability and mobilisation of appropriately skilled human resources, JRC Science and Policy Reports, EHRO-N, Coordinated for JRC by A. Georgakaki, U. von Estorff, S.D. Peteves, 2014, EUR 26558 EN

https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/strategic-energy-technology-set-plan-roadmap-education-and-training

ANNEX II – AGENDA OF THE SECOND ANNETTE EVENT

Announcement as of 20 February 2019

ANNEX I

Nuclear Education: A Cause for Concern?

(ENEN & ANNETTE Stakeholder Event)
14:00-18:00, February 28, 2018**, Stanhope Hotel, Rue du Commerce 9, Brussels,** Belgium
Draft Feb 19, 2019

Background

The dwindling education, training and knowledge management in many nuclear disciplines was interpreted as "A cause for concern?" in 2000 by the OECD/NEA report entitled "Nuclear Education and Training: A Cause for Concern?"
Many bottom-up initiatives have been started since then, resulting among others in preserving and further development of nuclear education and training. Nonetheless, the long term sustainability of nuclear education and training seems to be exposed to larger risks than two decades ago.

The challenges to be discussed

How did this happen? What are possible bottom-up ad top down strategies to preserve and further develop the nuclear education and training for the future generations of nuclear workforce and reactors in Europe? How can we engage all nuclear stakeholders (including general public) to jointly promote the necessity of and support for nuclear education and training?

Panelists

Mr. Jacques Repussard, former director of IRSN, France, former chair of MELODI
Mr. Yves Desbazeille, director general, FORATOM
Mr. Petros Papandopoulos, vice chair ENS YGN, ETH Zürich
Mr. Patrick Child, Deputy Director General DG RTD
Ms. Kirsty Gogan Alexander, Founder and CEO, Energy for Humanity, UK
Ms. Satu Helynen, Vice-president, NUGENIA, Vice president VTT
Mr. Leon Cizelj, President, ENEN, Head of Reactor Engineering Division, Jožef Stefan Institute

Moderator

Prof. Joerg Starflinger, Director IKE, Universitaet Stuttgart, Germany

Format

14:00 – 15:45 Opening statements by panelists
15:45 – 16:15 Coffee break
16:15 – 18:00 Moderated discussion.

Acknowledgement

ANNETTE project is co-funded by the European Commission under the Euratom Research and Training Programme on Nuclear Energy within the H2020 Programme, Call NRFP 2014-2015, Grant agreement 661910.

Dinner

After the event a social dinner will be offered by ENEN in the dining rooms of the Stanhope Hotel.

European Nuclear Education Network
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ANNEX III – INTRODUCTORY PRESENTATION AT THE THIRD ANNETTE EVENT HELDU DURING THE FISA 2019 CONFERENCE

E&T Networking Event

Nuclear Education: A Cause for Concern?

Panelists:
Prof Dr **Javier DIES LLOVERA** (Commissioner, Consejo de Seguridad Nuclear, ES),
Prof Dr **Joerg STARFLINGER** (Vice-President of ENEN, Uni Stuttgart Germany, DE),
Dr **Nathan PATERSON**, President (ENS YGN, BE), Dr **Pavel ZHURAVLEV** (ROSATOMTECH, RU)

Co-Chairs:
Panagiotis MANOLATOS (DG RTD, EC),
Walter AMBROSINI (Univ. of Pisa, IT), **Teodora RETEGAN** (CHALMERS, SE)

FISA 2019 Technical workshop n.3
Tuesday 4 June, 14:00 – 17:00

Objective

The dwindling education, training and knowledge management in many nuclear disciplines was interpreted as **"A cause for concern?"** in 2000 by the OECD/NEA report entitled "Nuclear Education and Training: A Cause for Concern?". Many bottom-up initiatives have been launched since then, resulting among others in preserving and further development of nuclear education and training. Nonetheless, the long-term sustainability of nuclear education and training seems to be exposed to larger risks than two decades ago.

The challenges to be addressed: How did this happen? What are possible bottom-up ad top down strategies to preserve and further develop the nuclear education and training for the future generations of nuclear workforce in Europe? How can we engage all nuclear stakeholders (including general public) to jointly promote the necessity of and support for nuclear education and training?

Practical key recommendations on the paramount importance of guaranteeing an adequate supply of experts and trained cross-sectorial workers will be the main objective of this workshop.

The Role of Networking

In this period of adverse conditions and scarce attractiveness for nuclear careers, the European Nuclear Education Network and other actors in the field of nuclear E&T tried to coordinate their actions, in order to harmonise efforts and avoid duplication

The **ANNETTE project** (Advanced Networking for Nuclear Education and Training and Transfer of Expertise) made of **coordination** and **networking** the objective of a whole work package. The project is mainly aimed to catalyze education for **Continuous Professional Development** with "master after master" courses

The **ENEN+ project** (Attract, Retain and Develop New Nuclear Talents Beyond Academic Curricula) is also making use of networking for addressing the levels of education starting from **Secondary School, to BSc, MSc, PhD and "nuclearisation" of professionals**

Networking is therefore a magic word in this field, meaning that we should act as far as possible together in order to preserve nuclear competences in the nuclear fields: this is a specific mandate of ENEN

Networking actions by ENEN

In this regard, two recent examples can be considered as study cases for the advancement in networking envisaged in the SET Plan Roadmap for E&T:

- a first example is the step recently completed in the PETRUS-III Project which, in Work Package 5, included as a project objective the integration of its Consortium into ENEN; this step was made real by the creation of a specific PETRUS Working Group within the Association and by the election in the Board of Governors of the historical leader of the PETRUS projects; we will call this route to the creation of an Advanced Network as the **"integration route"**;
- on the other hand, the ANNETTE project includes the Work Package 6, led by the sister network for higher education in fusion science and technology, namely FuseNet; at the present time coordination of the actions between ENEN and FuseNet is not aiming at an integration of any of them into the other, but a Memorandum of Understanding was signed instead in February 2015 in Culham (UK) defining the lines of a strict cooperation; we will call this second route to an Advanced Network as the **"coordination route".**

Questions and items for reflection in this Workshop

- How is nuclear education a "cause of concern"?
- What are the bottom up and top down strategies to preserve nuclear education ?
- How we can engage stakeholders in the common **networking effort** for nuclear E&T, e.g. as catalyzed by ENEN?
- How to involve **the general public** (as a major stakeholder) in this process?
- Let us know from the panel and the audience about these important issues

Thank you in advance for your thoughts and suggestions !

ANNEX IV – CIRTEN DOCUMENT FOR MILESTONE MS6

CIRTEN

Consorzio **I**nteruniversitario per la **R**icerca **TE**cnologica **N**ucleare

Investigation on the added value of a sustainable advanced network: Summary of discussions with stakeholders

Written note for MS6 of the ANNETTE Project

Walter Ambrosini and Rosa Lo Frano

Pisa, September 7th, 2018

CIRTEN Report No. MR/ANH2020/022018

Version 1, revised on October 8th, 2018

ABSTRACT

The present short document summarises the considerations collected as envisaged in milestone MS6 of the ANNETTE project. The considerations concern an effective methodology for interacting between relevant nuclear E&T networks as specified in the related milestone table, whose concerned row is reported hereafter:

MS6	M1.2.2	WP1	7 - CIRTEN	24	Investigation for the added value of a sustainable advanced network, Means of verification: Summary of discussions with stakeholders

The considerations reported herein draw conclusions from the answers received in regard by some members of the Advisory Board and the End-User Group of ANNETTE who responded to a specific questionnaire based on the proposals reported in the document issued for MS5.

ACKNOWLEDGEMENTS

The President and the Secretary General of ENEN were involved in revising and contributing to the text of this proposal, owing to the interest of the matter dealt with for the policy of the Association.

Regrettably, the document is issued with delay with respect to the planned deadline (month 24th, i.e., December 2017), since the interaction with Stakeholders was not at all easy and some of the planned actions to favour it (e.g., the distribution of a questionnaire during the celebration of the 15th Anniversary) of ENEN did not receive the expected success.

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1. THE PROPOSALS OF MS5 AND THE QUESTIONNAIRE FOR THE STAKEHOLDERS

In a previous document issued on a similar subject in fulfilment to MS5 [1], after a discussion of the missions of the European Nuclear Education Network (ENEN) and of the actions needed to promote coordination in Education and Training (E&T) in the nuclear sectors, a possible strategy for directing the future developments of the actions of ENEN to promote and catalyse efforts was proposed. The proposal, reported verbatim hereafter, was basing on two recent successful examples of coordination by ENEN of efforts being spent in the nuclear fields.

> *In this regard, two recent examples can be considered as study cases for the advancement in networking envisaged in the SET Plan Roadmap for E&T:*
>
> - *a first example is the step recently completed in the PETRUS-III Project which, in Work Package 5, included as a project objective the integration of its Consortium into ENEN; this step was made real by the creation of a specific PETRUS Working Group within the Association and by the election in the Board of Governors of the historical leader of the PETRUS projects; we will call this route to the creation of an Advanced Network as the **"integration route"**;*
> - *on the other hand, the ANNETTE project includes the Work Package 6, led by the sister network for higher education in fusion science and technology, namely FuseNet; at the present time coordination of the actions between ENEN and FuseNet is not aiming at an integration of any of them into the other, but a Memorandum of Understanding was signed instead in February 2015 in Culham (UK) defining the lines of a strict cooperation; we will call this second route to an Advanced Network as the **"coordination route".***
>
> *Which one of the two routes should prevail in the present process of "advancement" in networking depends on the specific cases. However, it must be recognised that:*
>
> - *nuclear fields having very many interfaces among each other, as the nuclear engineering/safety, the radiation protection and the waste management and geological disposal ones, should strive for integration, as it happened for PETRUS and as discussed in recent times during the ENEN interactions with the technological platforms (SNE-TP, MELODI, IGD-TP);*
> - *in particular, in its Governing Board meeting on September 29th, 2015, the SNE-TP Chairman expressed "trust" in the role of coordination of E&T of ENEN, indicating in this endorsement the intention of making more effective the organisation of activities in this field;*
> - *the present context of lack of attractiveness of the nuclear careers for young generations, owing to the oscillations in nuclear risk perception consequent to occurred accidents, suggests to join efforts at the highest possible level (integration), aiming at proposing to young STEM students a well organised pattern of career opportunities in the nuclear fields;*
> - *ENEN itself, in order to better accomplish with its missions, needs to have on board more industrial bodies and also regulators, to directly involve them, e.g., in the release of international certifications that may ease the process of cross border mobility of professionals in the nuclear fields.*
>
> *Therefore, at present time "integration" seems to be the best route for advanced networking, as one of the main targets of ANNETTE, leaving to the route of "coordination" a specific role in those cases in which the interfaces of ENEN with groups active in nuclear E&T are important but, for various reasons, keeping separate organisations may result in a better functional interaction.*

As it can be noted, instead of searching improbable networking mechanisms that would possibly replace the present ones, the mentioned report tried to draw, from the positive experience of ENEN, the lesson learned in view of future actions, with a simple and down-to-the-earth perspective about the role of the Association in the panorama of E&T in the nuclear fields in Europe.

Of course, it must be considered that, in a European Union of independent Member States and with different traditions in higher education, joining ENEN in advanced networking by either one of the mentioned routes is not mandatory for any organisation. However, it is believed that the missions of ENEN involve actions for catalysing efforts in nuclear E&T that can turn out to be win-win situations, especially in front of the serious problems of sustainability that the nuclear workforce is facing nowadays.

On the basis of the above considerations, a simple questionnaire was set up in order to receive the needed feedback from the Stakeholders; this questionnaire is reported in ANNEX I. The question proposed may look very minimal, conceived to take the shortest possible time of Stakeholders. This questionnaire was distributed during the celebration of the 15th Anniversary of ENEN (March 1st, 2018), but the logistics of the event did not allow the expected results in terms of Stakeholders' involvement.

A further attempt of involvement of Stakeholders (namely, the members of the Advisory Board and of the End-User Group) on these issues was made in mid May 2018, taking the chance of presenting to them the ideas at the basis of the conception of the modular Courses of the ANNETTE Master for Continuous Professional Development. A PowerPoint presentation was then prepared and it was firstly submitted to the Steering Board of the ANNETTE Courses, limited to the components involved in the ANNETTE Project as participants; this phase allowed to receive comments which were given a feedback on the presentation before releasing it. A video clip for its asynchronous attendance was also prepared and made available at the website

https://www.dropbox.com/sh/29ddw2gd3q7ev2b/AACL6ydwXjFyvxV5V3z6FJFla?dl=0

with the aim to avoid to Stakeholders the boredom of reading the written material, attending instead a short presentation of it. The video-clip embeds a few questions about the presented material, in the form of "quizzes", often adopted in e-learning videos as "pop-up" features; the questions included those appearing in the previously proposed questionnaire on networking. The (few) answers to these quizzes were sent automatically to the e-mail address of the WP2 Leader.

However, also this means resulted not completely effective in stimulating the attention of the contacted Stakeholders, even adding in the transmission the simple questionnaire on networking for those having not enough time to go through the full presentation. In fact, only a few answers to the questionnaires were received at the time; this might be due also to the fact that Stakeholders were contacted in June 2018, a month in the year traditionally full of engagements and mid term deadlines. Therefore, it was later tried to address singularly the Stakeholders asking for answering only the questionnaire on networking.

The difficulties encountered in contacting the Stakeholders by the WP2 Leader point out the difficulty experienced also in other work packages when needing a direct feedback from them on project actions. On one side, in fact, E&T are universally recognised among the most important priorities for keeping in Europe the competences in the nuclear fields, while on the other hand the daily life of people who could provide useful suggestions to those acting in order to achieve this goal is often directed towards immediate actions needed for research and development.

As a lesson learned from this experience, it can be inferred that better planned actions should be set up, possibly in the frame of the specifically developed Work Package (WP7), aimed at involving platforms and end-users in ANNETTE and ENEN actions in general.

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2. ANSWERS TO THE QUESTIONNAIRE ON NETWORKING

As in previous reports describing the results of the interaction with Stakeholders, it is here chosen to list in anonymous form the answers received from them in response to the questionnaire on networking, trying to draw conclusions from their suggestions.

Answer #1

I think both routes can be effective for developing networking. It will depend on the individual body which would be more effective. For some it may not be appropriate or necessary to integrate with ENEN and join the Board of Governors. The important thing is to ensure regular communication, and that the parties do not forget about each other. This can be achieved through an MoU.

Answer #2

Both routes are reasonable approaches about how to formalize the cooperation between ENEN and the other project providing nuclear education. However, I think another important question for ENEN to think about is how it can make itself attractive to parties, such that they automatically want to connect with ENEN. This could lead to a third route, namely the "cooperation route". Imagine ENEN would have a large database with names and expertise (topics and level) of lecturers in the nuclear domain. It seems logical that a certain partner/project wishing to develop some kind of E&T activity (course, summer school, online education, syllabus or book, etc) would contact ENEN first to find the most suitable persons to cooperate with. Another way ENEN could give added value to a partner/project is that advertising via ENEN would lead to many more students interested in the specific E&T activity. Maybe ENEN can develop new activities (via ANNETTE?) that would make ENEN the preferred partner for projects willing to develop a certain E&T activity. ENEN could also setup an archival database for storage of E&T materials beyond the end date of the project. Each of these activities could have its preferred route, either via the "integration", "coordination", "cooperation" or even another one. I hope this helps! Good luck, …

Answer #3

I assume it is adequate, but I have little experience in that field. I could see that both routes could work depending on the case. Maybe the coordination is easier in more cases as some E&T activities may have long histories and integration would be difficult. Maybe we can learn from the two cases what are the drivers in the choice of the route. It is not clear to me, are the routes both options in the future for the long run, or is it necessary to focus on one of them?

Answer #4

Both routes can be appreciated and valuable in the development and improvement of ENEN. Integration and coordination are considered both important to provide unique opportunities to students without duplication. As a suggestion ENEN may consider to have an exchange of information with nuclear stakeholders such that represented by NUGENIA, ESNII etc. in order to receive feedbacks about initiatives, effectiveness etc. In other words keep a strong link between ENEN and Industrial/research organizations.

Answer #5

The two routes (integration and coordination) make sense to me.

Answer #6

Coordination in Nuclear Education and Training is at the heart of ANNETTE mandate, and the two cases described above are considered exemplar mechanisms for its pursuit. Integration and coordination are both important vehicles to foster synergies, pool resources and reduce overlap.
These should both be promoted, particularly at the European level, where the integration route could be considered for strictly linked or highly complementary EU projects; while the cooperation route could also be considered for groups, organisations and networks beyond the European boundaries. In particular, within the broader ENEN framework, concrete cooperation leads could be further pursued with the IAEA-fostered educational networks: AFRANEST, ANENT, LANENT and STARNET.

Answer #7

In my opinion, there is a missing link between course providers and potential employers and especially small and medium enterprises (more than 5000 in Europe). The question is how to reach these stakeholders? and how to help them accessing the offers.

Answer #8

The approach looks sound. I still have however some doubt about the economy of the system.
I am not sure I understand "advanced networking". Would it mean coordination among the E&T actors leading to an offer actually aligns to the demand?

Answer #9

Routes for integration seems difficult because of the difficulties of joining of some type of institutions. In addition, it would be nice to know what the work market asks for in the future, where there will be lack of personnel, etc. to be able to drive the interest of courses on such subjects.

Answer #10

I understand the objective of the ANNETTE is to coordinate better the European E&T initiatives. I understand the proposal of having ENEN as "catalyser" of the projects. Many initiatives are created, but the objectives are different, therefore it would be difficult to merge them under one hub of ENEN. I am not aware what PETRUS-III project result was, so I cannot answer to this proposal. MoUs with different existing nuclear E&T network would be indeed important. Even more important would be a matrix of different organisations, similar to that one what we have started in Vienna with the NKM division and ENEN at one of the meeting, back in 2014. An example attached. This kind of overview would not only help to understand us what exists, but let the external stakeholders understand the objectives of different networks.

	ENS	ENEN	EHRO-N	(ETKM) SNETP
profile	is the federation of 21 nuclear societies, representing nuclear science, research and industry in Europe	Network of universities with nuclear studies, big support of the EC	DG JRC' s Institute for Energy and Transport together with SAG	platform of 120 public and private members covering most of the EU fission R&D community
members	15.000 nuclear professionals, 50 corporate members	67 members - universities offering the MSc in Nuclear Engineering, research institutes and 4 companies offering the nuclear training	31 members from industry, universities and research centers	research, industry, safety organisations, education networks
objectives	fostering engineering E&T, organising scientific conf, platfom between MS - corporate members - European Institutions	Promote and further develop the collaboration in nuclear e&t of students, researchers and professionals,	producing database on the short-, medium-, and long-term needs for HR for the different nuclear stakeholders, identify gaps and deficiencies in the European nuclear (E&T) infrastructure and elaborate recommendations for remedial actions and optimization	identify education and training gaps and recommend actions at appropriate levels, take account of the knowledge that was accumulated in companies, research centres or regulators and recommend actions for transferring it to younger generations,
project involved	SPRINT, ET&C Platform, NUSHARE, GENTLE	NUSHARE, GENTLE, ANNETTE, ENEN III,	ECVET, Job Taxonomy, Platform with training opportunities	NUGENIA, ESNII, NC2I, SPRINT
connections	ENS - YGN, FORATOM, IAEA, DG RTD, JRC, ENEN, SNETP	EC, IAEA	ENEN, SNETP, ENEF, IAEA, OECD-NEA, ENS	ENEN, FORATOM, EC, ENS
strenghts	high number of visitors, ENS-YGN, conf	Strong closed community	mandate of the EC and ENEF, opinion leader	close to industry and research institutes - able to recommend a framework for E&T

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Answer #11

It is the opinion of the [redacted] that going forward, co-ordination of European level education and training in the arena of radioactive waste management would most appropriately be the responsibility of the proposed European Joint Programme (EURAD).

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3. CONCLUSIONS

Though the difficulties in the interaction with the Stakeholders and the consequent delays in the present action have been openly declared, it must be recognised that the 11 answers received by the interviewed Stakeholders underline quite interesting aspects. Hopefully, they will be duly taken into account in planning the further actions of ANNETTE and of the European Nuclear Education Network in promoting E&T in the different nuclear fields. In particular:

- Answer #1 approves the two different routes, warning about **keeping lively contacts** with the Bodies with which ENEN has MoUs;
- Answer #2 suggests **a "cooperation route"** owing to the richness of the ENEN Association in providing the service to identify the most competent persons or groups for some needs; in this case, it seems to be suggested that **ENEN should enhance is attractiveness** as a partner in E&T actions, also through the use of its database and, in case, of a repository of course material;
- Answer #3 proposes the **possible difficulties in integration** and suggests that both routes should be used;
- Answer #4 recommends that, **on top of the two routes, a strong link with the industry, platforms and end-users should be kept;**
- Answer #5 just approves both the proposed routes;
- Answer #6 details the particular cases of cooperation with different bodies, considering the two routes instrumental in different cases; it is anyway explicitly mentioned the **extra-European cooperation with the regional networks AFRANEST, ANENT, LANENT and STARNET**.
- Answer #7 provides a very useful indication in relation to a sector that may strongly benefit of the services of ENEN, being the one of the **small and medium enterprises**: discussions on this aspect are not new in ENEN and it is important to resume them, considering the **needs of this important part of the nuclear industry, needing qualified persons**.
- Answer #8 stresses the point of the **economical sustainability** of ENEN in its action, being certainly a major issue, calling for adequate and continuing support from the EC side; the observation ends with a question, whose answer is that, of course, **the offer should be aligned to the demand** and, if possible, it should be also visionary enough to forecast the future needs;
- Answer #9 finds **difficult the route of integration in some cases** and again stresses the aspect of the alignment between offer and demand.
- Answer #10 **suggests a mapping of the different groups** operating in the field of nuclear education and training, recalling a work started years ago in cooperation between ENEN and other existing groups, trying to understand the galaxy of entities formed in different fields for nuclear E&T, which could better cooperate once their respective mandates are clarified.
- Answer #11 detaches from the other answers received so far, seeming suggesting unavailability of the [redacted] community to cooperate in advanced networking, reserving to their only the responsibility to lead E&T initiatives in the field. A subsequent question asking if the meaning of the sentence was a door closed for future cooperation did not get any answer.

It seems that the above mentioned aspects, though excerpted from just 11 answers to the proposed questionnaire, provide already a good basis to reflect and elaborate the future strategies of "advanced networking" to be undertaken by the European Nuclear Education Network Association.

REFERENCES

[1] W. Ambrosini and R. Lo Frano, Networking mechanisms to be activated in the frame of the ANNETTE Project - Written proposal for MS5 of the ANNETTE Project, CIRTEN Report No. MR/ANH2020/022016, Pisa, December 19th, 2016

ANNEX I – QUESTIONNAIRE FOR STAKEHOLDERS

Questionnaire on the mechanisms for Advanced Networking for Education and Training in the nuclear fields

Dear Stakeholder, Dear Member of ENEN,

the ANNETTE project (Advanced Networking for Nuclear Education and Training and Transfer of Expertise) lead by ENEN is aiming at a major coordination for E&T in the nuclear fields. Responding to a specific request of the SET Plan Roadmap for E&T published in 2014, the project is investigating the best mechanism to join efforts by different organisations in the nuclear E&T in order to make real the dream of a pan-European coordination of efforts born by different networks.

While ENEN, with its actions, is collecting more and more members, CIRTEN, as responsible of milestones related to these aspects, proposed **possible routes for making ENEN an effective catalyser of this process**. These routes are described hereafter, by a text taken from a document issued as a milestone of WP1, lead by SCK•CEN, fully devoted to coordination.

In order to understand how much these mechanisms are agreed by major stakeholders and ENEN Members, we are now asking you to briefly read this text and then shortly comment and suggest,

THANKS IN ADVANCE !

---------- Text from the milestone document by CIRTEN ----------

"(...) ENEN, in order to become fully qualified to undertake successfully this new role assigned to it, has to more effectively catalyse the ongoing efforts in the field, by generating a better involvement. This better involvement may be achieved by different means, including the adhesion to the Association of some groups born independently and/or the implementation of agreements and MoUs for stricter and better coordinated cooperation with others.

In this regard, two recent examples can be considered as study cases for the advancement in networking envisaged in the SET Plan Roadmap for E&T:

- *a first example is the step recently completed in the PETRUS-III Project which, in Work Package 5, included as a project objective the integration of its Consortium into ENEN; this step was made real by the creation of a specific PETRUS Working Group within the Association and by the election in the Board of Governors of the historical leader of the PETRUS projects; we will call this route to the creation of an Advanced Network as **the "integration route";***
- *on the other hand, the ANNETTE project includes the Work Package 6, led by the sister network for higher education in fusion science and technology, namely FuseNet; at the present time coordination of the actions between ENEN and FuseNet is not aiming at an integration of any of them into the other, but a Memorandum of Understanding was signed instead in February 2015 in Culham (UK) defining the lines of a strict cooperation; we will call this second route to an Advanced Network as **the "coordination route". "***

Name _____ Surname _____

Institution _____

Please, comment on the above described routes for coordination. Do you agree? What do you suggest in regard? Which groups should be addressed for establishing better links ?

_____

_____

_____

_____

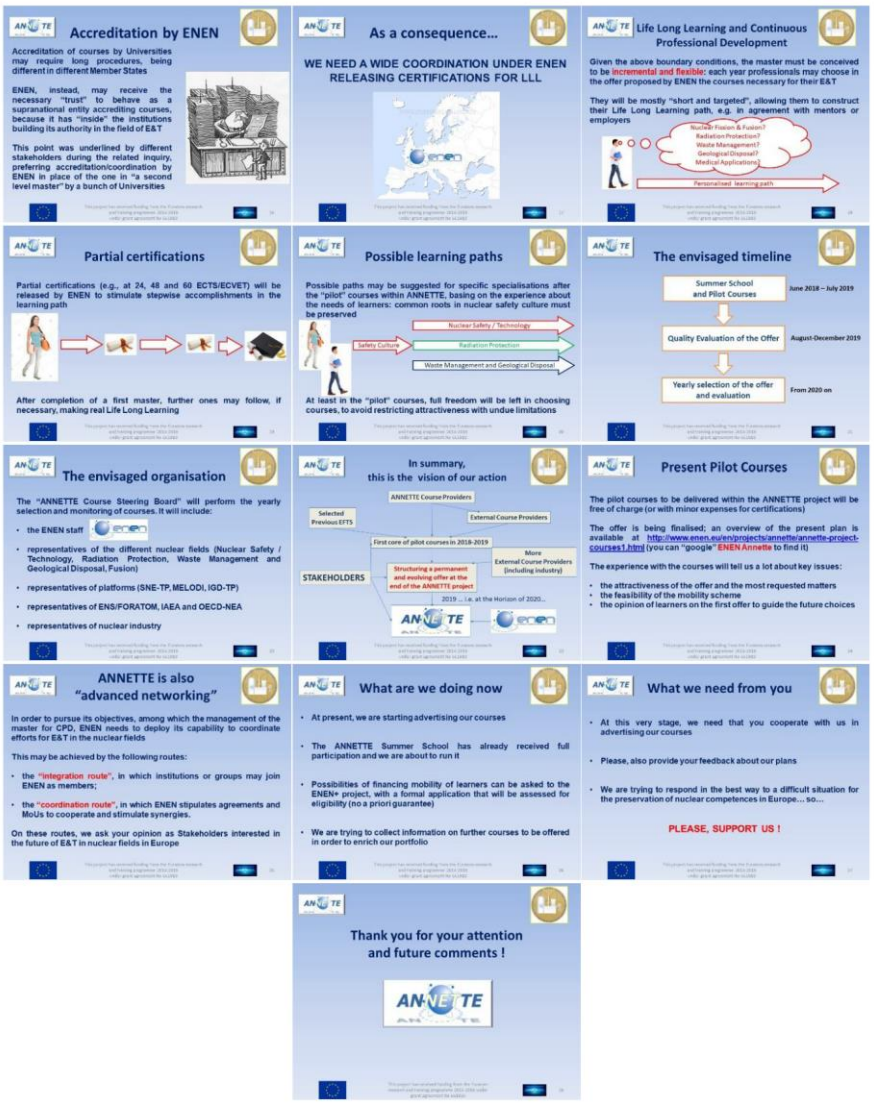
_____

_____

I agree that the information I provided in this questionnaire is freely used in the frame of the ANNETTE Project, in the purpose of analysing and selecting the best advance networking mechanisms.

Signature _____ **Date** _____

ANNEX II – PRESENTATION ON THE MASTER FOR CPD ADDRESSED TO STAKEHOLDERS


Accreditation by ENEN
Accreditation of courses by Universities may require long procedures, being different in different Member States
ENEN, instead, may receive the necessary "trust" to behave as a supranational entity accrediting courses, because it has "inside" the institutions building its authority in the field of E&T
This point was underlined by different stakeholders during the related inquiry, preferring accreditation/coordination by ENEN in place of the one in "a second level master" by a bunch of Universities
As a consequence...
WE NEED A WIDE COORDINATION UNDER ENEN RELEASING CERTIFICATIONS FOR LLL
Life Long Learning and Continuous Professional Development
Given the above boundary conditions, the master must be conceived to be incremental and flexible: each year professionals may choose in the offer proposed by ENEN the courses necessary for their E&T
They will be mostly "short and targeted", allowing them to construct their Life Long Learning path, e.g. in agreement with mentors or employers
Nuclear Fission & Fusion?
Radiation Protection?
Waste Management?
Geological Disposal?
Medical Applications?
Personalised learning path
Partial certifications
Partial certifications (e.g., at 24, 48 and 60 ECTS/ECVET) will be released by ENEN to stimulate stepwise accomplishments in the learning path
After completion of a first master, further ones may follow, if necessary, making real Life Long Learning
Possible learning paths
Possible paths may be suggested for specific specialisations after the "pilot" courses within ANNETTE, basing on the experience about the needs of learners: common roots in nuclear safety culture must be preserved
Safety Culture
Nuclear Safety / Technology
Radiation Protection
Waste Management and Geological Disposal
At least in the "pilot" courses, full freedom will be left in choosing courses, to avoid restricting attractiveness with undue limitations
The envisaged timeline
Summer School and Pilot Courses
June 2018 – July 2019
Quality Evaluation of the Offer
August-December 2019
Yearly selection of the offer and evaluation
From 2020 on
The envisaged organisation
The "ANNETTE Course Steering Board" will perform the yearly selection and monitoring of courses. It will include:
the ENEN staff
representatives of the different nuclear fields (Nuclear Safety / Technology, Radiation Protection, Waste Management and Geological Disposal, Fusion)
representatives of platforms (SNE-TP, MELODI, IGD-TP)
representatives of ENS/FORATOM, IAEA and OECD-NEA
representatives of nuclear industry
In summary, this is the vision of our action
ANNETTE Course Providers
Selected Previous EFTS
External Course Providers
First core of pilot courses in 2018-2019
STAKEHOLDERS
Structuring a permanent and evolving offer at the end of the ANNETTE project
More External Course Providers (including industry)
2019 ... i.e. at the Horizon of 2020...
Present Pilot Courses
The pilot courses to be delivered within the ANNETTE project will be free of charge (or with minor expenses for certifications)
The offer is being finalised; an overview of the present plan is available at http://www.enen.eu/en/projects/annette/annette-project-courses1.html (you can "google" ENEN Annette to find it)
The experience with the courses will tell us a lot about key issues:
the attractiveness of the offer and the most requested matters
the feasibility of the mobility scheme
the opinion of learners on the first offer to guide the future choices
ANNETTE is also "advanced networking"
In order to pursue its objectives, among which the management of the master for CPD, ENEN needs to deploy its capability to coordinate efforts for E&T in the nuclear fields
This may be achieved by the following routes:
the "integration route", in which institutions or groups may join ENEN as members;
the "coordination route", in which ENEN stipulates agreements and MoUs to cooperate and stimulate synergies.
On these routes, we ask your opinion as Stakeholders interested in the future of E&T in nuclear fields in Europe
What are we doing now
At present, we are starting advertising our courses
The ANNETTE Summer School has already received full participation and we are about to run it
Possibilities of financing mobility of learners can be asked to the ENEN+ project, with a formal application that will be assessed for eligibility (no a priori guarantee)
We are trying to collect information on further courses to be offered in order to enrich our portfolio
What we need from you
At this very stage, we need that you cooperate with us in advertising our courses
Please, also provide your feedback about our plans
We are trying to respond in the best way to a difficult situation for the preservation of nuclear competences in Europe... so...
PLEASE, SUPPORT US !
Thank you for your attention and future comments !

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