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ANNETTE PROJECT

Advanced Networking for Nuclear Education and Training and Transfer of Expertise

DELIVERABLE D 4.1

APPLICATION OF THE ECVET SYSTEM IN THE NUCLEAR FIELD

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ABSTRACT:

This report describes the current status of the implementation of ECVET and of its technical components in the nuclear field, focussing on good practices resulting from the different ECVET pilot projects (such as ENEN-III, ENETRAP II, PETRUS II, etc.), the work already conducted by EHRO-N (European Human Resources Observatory for the Nuclear Sector), and the survey which was launched by the ANNETTE WP1.

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List of abbreviations

AAHP	American Academy of Health Physics
ANNETTE	Advanced Networking for Nuclear Education, Training and Transfer of Expertise
Cedefop	European Centre for the Development of Vocational Training
CINCH	Coordination of education In Nuclear Chemistry
CPD	Continuous professional development
CS	(Europass) certificate supplement
CV	(Europass) curriculum vitae
CVET	continuing vocational education and training
DG RTD	Directorate-General for Research & Innovation
DS	(Europass) diploma supplement
ECTS	European Credit Transfer System
ECVET	European Credit System for Vocational Education and Training
EFOMP	European Federation of Organizations in Medical Physics
EFTS	Euratom Fission Training Schemes
EHRO-N	European Human Resources Observatory for the Nuclear Sector
EM	(Europass) mobility
ENEN	European Nuclear Education Network Association
ENETRAP	European Network for Education and Training in Radiation Protection
EQAVET	European Quality Assurance in VET
EQF	European Qualifications Framework
ESCO	European classification of skills, competences, qualifications and occupations
EUTEMPE-RX	European Training and Education for Medical Physics Experts in Radiology
GENTLE	Graduate and Executive Nuclear Training and Lifelong Education
IAEA	International Atomic Energy Agency
ISCO	International Standard Classification of Occupations
IVET	Initial vocational education and training
JRC-IET	Joint Research Centre - Institute for Energy and Transport
KSC	Knowledge, skills and competences
LO	Learning outcome
MEDRAPET	Medical Radiation Protection Education and Training
MoU	Memorandum of Understanding
MPE	Medical Physics Expert
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne
NES	Nuclear energy sector
NJT	Nuclear Job Taxonomy
NQF	National qualifications frameworks
NSAN NS4P	National Skills Academy for Nuclear Nuclear Skills Passport
PETRUS	Programme for Education, Training and Research on Underground Storage
RPE	Radiation protection expert
RPO	Radiation protection officer
TRASNUSAFE	Training Schemes on Nuclear Safety Culture
VET	Vocational education and training

WORK PACKAGE 4. CROSS BORDER TRANSFER OF EXPERTISE: PROMOTING ECVET BASED EXCHANGES IN INDUSTRY

1 Objectives of WP4

The main objective of WP4 is facilitating cross border transfer of expertise by application of ECVET (European Credit System for Vocational Education and Training) and its technical components.

A specific task group constituted by interested industrial bodies and training providers, also supported by academia and in strict cooperation with the relevant Technological Platforms as well as other stakeholders in the nuclear field, will examine the opportunities and the problems raised by the application of the ECVET system in a nuclear industrial environment. The work to be done consists of analysing the present situation in the nuclear field, and preparing, implementing and evaluating pilot cross-border exchanges of personnel working in nuclear industry, thereby providing an important basis for a widespread application of ECVET in the nuclear field.

This report describes the current status of the implementation of ECVET and of its technical components in the nuclear field, focussing on good practices resulting from the different ECVET pilot projects (such as ENEN-III, ENETRAP II, PETRUS II, etc.) and the work already conducted by EHRO-N (European Human Resources Observatory for the Nuclear Sector). By using the information provided, it is clarified how the application of ECVET fits into the specific context of nuclear themes, taking into account the feedback from the main stakeholders such as the nuclear industry, E&T providers, research centres, regulators and the Euratom platforms. The main nuclear activities are considered (engineering, radiation protection, geological disposal, safety, security and safeguards, fusion, etc.).

2 Description of the ECVET instrument and its technical components

2.1 Background of ECVET

ECVET, the European credit system for vocational education and training, is a tool designed to aid the transfer, recognition and accumulation of learning outcomes of individuals on their way to achieving a qualification. It is meant to operate in coordination with other European tools, promoting borderless mobility and lifelong learning. It creates the potential to recognise, accumulate and transfer work-related skills and knowledge acquired during a stay in another country or in different situations, so that these experiences contribute to building up recognised vocational qualifications. The implementation of ECVET will increase transparency of qualifications, support mobility and benefit professionals by providing a systematic and transparent way to present, document and validate their knowledge, skills and competence.

ECVET is one of several European tools launched the last decade as an integral part of the 'Education and training 2010-20' and Copenhagen processes. The development of ECVET began in 2002 after the Copenhagen Process emphasised the need for a credit system for VET. The system has been developed by the Member States and the social partners in cooperation with the European Commission and has been adopted through a recommendation by the European Parliament and the Council in 2009.

The timetable for ECVET implementation, which is a voluntary process, as foreseen in the ECVET recommendation, includes a preparatory period running until 2012, during which the Member States are asked to create the necessary conditions and to adopt measures with a view to introducing ECVET.

2.2 Technical components of ECVET

A well-functioning European credit system requires to be embedded in a qualifications framework. National qualifications, to follow ECVET principles, need to be described in terms of units of learning outcomes, defined as 'a coherent set of knowledge, skills and competence that can be assessed and validated with a number of associated ECVET points'. Equally important is that the learning outcomes acquired in different countries, regions or education sectors are recognised, so people can accumulate units of learning outcomes building individual career paths. This requires a well-developed process of validation, with quality assured assessment and recognition procedures (e.g. following European Quality Assurance in VET (EQAVET)). ECVET is supported by agreements and templates, such as those provided by Europass for mobility.

Generally, the technical components for ECVET can be classified in three main categories:

- Transparency of qualifications (qualifications, units of learning outcomes and credit points)
- The accumulation process (assessment, validation and recognition of learning outcomes)
- The transfer process (memorandum of understanding, learning agreement and learners' transcript of records)

These technical components are framed within an institutional and political context that shapes them. Figure 1 provides an overview of these components and categories.

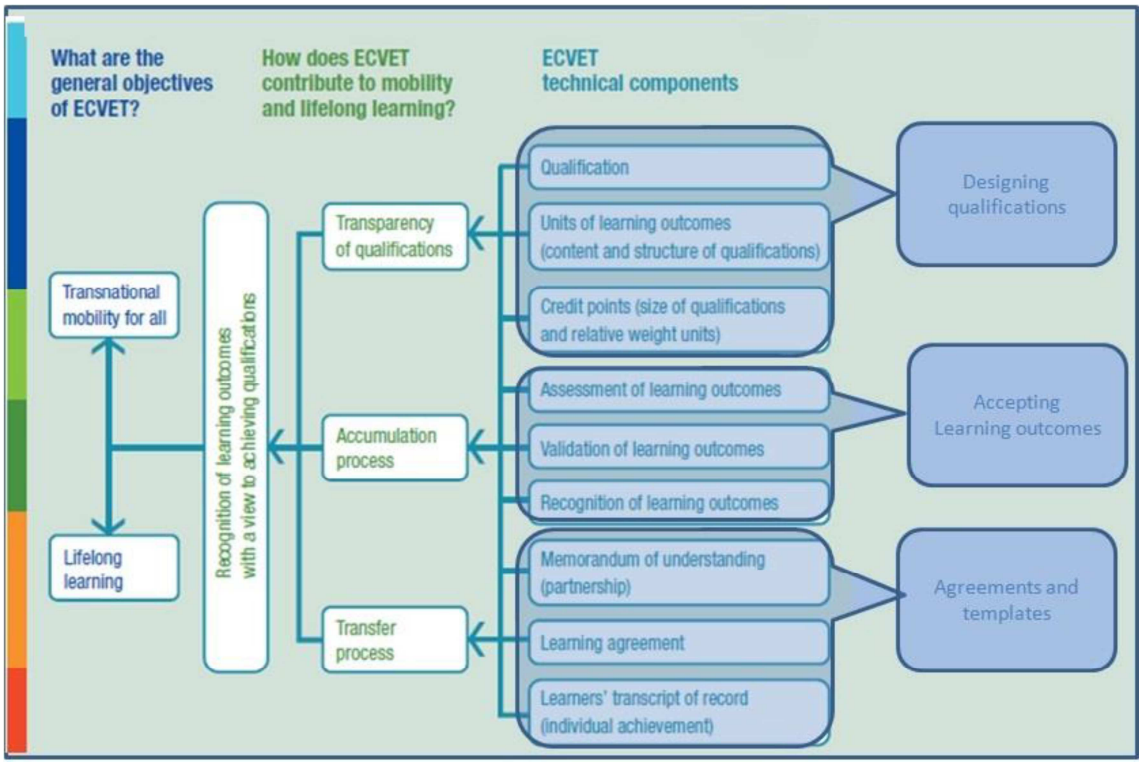


Figure 1: ECVET objectives and technical components. Adapted from Cedefop 2012a, p 11.

The first ECVET component to be tackled is learning outcomes and qualification standards. This implies developing a shared understanding of what 'learning outcomes' means, how the approach impacts on education and training systems, and how learning outcomes are developed and written. Learning outcomes are statements in terms of knowledge, skills and competence that can be achieved in a variety of learning contexts.

The description of qualifications in terms of learning outcomes has been, in many cases, triggered by the European qualifications framework (EQF), and developments in devising and implementing a national qualifications framework. In different nuclear domains, the qualifications can be described cross-border, or by using a regulatory framework (e.g. the European Basic Safety Standard 2013/59/Euratom mentions MPE, RPE, RPO).

The second component is the ECVET units. Within ECVET a unit is a component of a qualification, consisting of a coherent set of knowledge, skills and competence that can be assessed, validated and recognised. The difficulties in defining and building of units are to make the link between modules and units, and creating guidelines and framework conditions for developing ECVET units. The ECVET recommendation (European Parliament and Council of the EU, 2009) makes a clear distinction between the components of VET qualifications defined as units of learning outcomes and the components of formal learning programmes or training provision commonly known as modules.

The ECVET recommendation foresees credit points allocated in two phases: first to a qualification as a whole, and, second, to its units. According to the recommendation, 60 points are allocated to the learning outcomes expected to be achieved in one year. The relative importance of the unit within a qualification depends on the complexity and scope of the unit and the effort needed from the learner to acquire the knowledge, skills and competences described in the unit.

This translates into relative weight of ECVET points. Similar units of learning outcomes might provide different points in different countries, even though they might have exactly the same learning outcomes (i.e. content). In a similar way, if a unit has different learning outcomes but a similar weight in one country the different learning outcomes will result in a similar number of points. Because of this difficulty; the focus in the early stages of ECVET adoption will be rather only to crediting units of learning outcomes instead of ECVET points.

A credit is given for assessed and documented learning outcomes of a learner. Credits can be transferred to other contexts and accumulated to achieve a qualification on the basis of the qualifications standards and regulations existing in the participating countries.

The technical components for mutual trust and partnership among participating organisations in ECVET include memoranda of understanding (MoU) between the partners, a learning agreement and the personal transcript. The memorandum of understanding (MoU) is a framework partnership agreement between competent institutions empowered to award qualifications or units or to give credit. A learning agreement specifies the 'particular conditions for a period of mobility, such as the identity of the learner, the duration of the mobility period, the learning outcomes expected to be achieved and the associated ECVET points'. The personal transcript records the learning outcomes achieved by the learner during the mobility period and the corresponding ECVET credits gained.

The requirements for the design of a training programme based on learning outcomes are:

- The training programme should address a specific qualification/occupation;
- ECVET input consists of
    - Job Description linked to the targeted qualification;
    - Qualification structural elements (units of learning outcomes and learning outcomes);
- Training programme types:
    - Complete training programme when learners are debutants;
    - Customised training programme when learners have work experience in e.g. non-nuclear sectors

2.3 Recent update on ECVET

In the summer of 2016, the partners of the ANNETTE project received an email referencing to a new proposal for a Council recommendation (COM(2016) 383). The major change in this proposal is that the term 'competences' as used in the context of learning outcomes descriptors in the third column of the EQF descriptors of Annex II to the 2008 EQF Recommendation is limited to meaning 'autonomy and responsibility'. Therefore, the future descriptions of learning outcomes in terms of competences should be described in terms of autonomy and responsibility (Knowledge, skills and autonomy/responsibility). The survey on the current implementation of ECVET (see 5.3), which was launched in Spring 2016 could not take this into account.

3 ECVET and other common European tools and principles

3.1 ECVET and EQF (European Qualifications Framework)

The European Qualifications Framework (EQF) is a translation tool that helps communication and comparison between qualifications systems in Europe. Eight common European reference levels are included, described in terms of learning outcomes on knowledge, skills and competences (see Table 1).

Both ECVET and EQF are based on learning outcomes which make it easier to understand what the holder of a certificate or diploma knows, understands and is able to do.

Table 1: Eight EQF levels related to knowledge, skills and competences. Adapted from https://ec.europa.eu/ploteus/en/content/descriptors-page.

EQF Level	Knowledge	Skills	Competence
	In the context of EQF, knowledge is described as *theoretical and/or factual*.	**In the context of EQF, skills are described as** ***cognitive* (involving the use of logical, intuitive and creative thinking), and** ***practical* (involving manual dexterity and the use of methods, materials, tools and instruments)**	**In the context of EQF, competence is described in terms of *responsibility and autonomy*.**
Level 1	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
Level 2	Basic factual knowledge of a field of work or study	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	Work or study under supervision with some autonomy
Level 3	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	Take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems
Level 4	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
Level 5[1]	Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others
Level 6[2]	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study	Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups

EQF Level	Knowledge	Skills	Competence
	In the context of EQF, knowledge is described as *theoretical and/or factual*.	**In the context of EQF, skills are described as** ***cognitive* (involving the use of logical, intuitive and creative thinking), and** ***practical* (involving manual dexterity and the use of methods, materials, tools and instruments)**	**In the context of EQF, competence is described in terms of *responsibility and autonomy*.**
Level 7[3]	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research Critical awareness of knowledge issues in a field and at the interface between different fields	Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams
Level 8[4]	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research

The Framework for Qualifications of the European Higher Education Area provides descriptors for cycles. Each cycle descriptor offers a generic statement of typical expectations of achievements and abilities associated with qualifications that represent the end of that cycle.

1. The descriptor for the higher education short cycle (within or linked to the first cycle), developed by the Joint Quality Initiative as part of the Bologna process, corresponds to the learning outcomes for EQF level 5.
2. The descriptor for the first cycle in the Framework for Qualifications of the European Higher Education Area corresponds to the learning outcomes for EQF level 6.
3. The descriptor for the second cycle in the Framework for Qualifications of the European Higher Education Area corresponds to the learning outcomes for EQF level 7.
4. The descriptor for the third cycle in the Framework for Qualifications of the European Higher Education Area corresponds to the learning outcomes for EQF level 8.

3.2 ECVET and ECTS (European Credit Transfer System)

ECTS, the European Credit Transfer System, is a credit system and a central tool in the Bologna Process, which aims to make national systems more compatible. ECTS credits represent the workload and defined learning outcomes ("what the individual knows understands and is able to do") of a given course or programme. 60 credits are the equivalent of a full year of study or work.

Although ECTS has been part of the Bologna Process since 1999, it is still not fully implemented across all countries. ECTS credits are widely used for both credit accumulation and transfer, but there are two main challenges in fully implementing ECTS: measuring credits in terms of student workload and linking them with learning outcomes. The latest ECTS guide is focused on providing credits associated with learning outcomes. This might open up a door for further synergies between the ECVET and ECTS.

3.3 Europass

Europass aims at helping citizens to present their qualifications and knowledge. It consists of five documents. The Europass curriculum vitae (CV) and language passport are self-declaratory documents filled in by individuals. The Europass certificate supplement (CS), Europass diploma supplement (DS) and Europass mobility (EM) are completed by competent bodies (education and training providers, enterprises, etc.).

The Europass CV, Europass language passport and Europass mobility address the whole range of education and training, while the diploma supplement addresses students of higher education and the certificate supplement addresses VET trainees.

For ECVET, the most relevant Europass documents are the Europass CS and the Europass mobility. The Europass CS briefly describes the learning outcomes acquired by the holders of a VET certificate. The Europass mobility is a record of a 'European learning pathway', which is an organised period of time that a person spends in another European country for the purpose of learning (for instance, a work placement in a company or in volunteer work, or an academic term as part of an exchange programme).

3.4 ESCO - European Skills/Competences, qualifications and Occupations

ESCO is the European classification of skills, competences, qualifications and occupations and serves as a tool for the management of the supply and demand of jobs. It was developed by the European Commission, the European Centre for the Development of Vocational Training (Cedefop) and a team of stakeholders and external consultants.

ESCO identifies and categorises skills, competences, qualifications and occupations in a standard way, using standard terminology in all EU languages and an open format that can be used by third parties' software. It enables users to exchange CVs and job vacancies stored in different IT systems.

The multilingual ESCO classification is:

- composed of three inter-related pillars covering occupations; skills/competences; and qualifications;
- linked to relevant international classifications and frameworks, such as NACE (Nomenclature statistique des activités économiques dans la Communauté européenne), ISCO (International Standard Classification of Occupations) and EQF;
- available free of charge to all stakeholders through the ESCO portal: https://ec.europa.eu/esco/.

Education/training institutions – are able to describe the output of their qualifications with ESCO's skills and competences terminology, making qualifications more transparent and adapt their programmes based on feedback from the labour market.

The Nuclear Energy Sector is currently not visible in ESCO, and no nuclear sectorial reference subgroup is active to develop the content for ESCO.

4 Review of the current status of ECVET implementation in Europe

Cedefop, the European Centre for the Development of Vocational Training, monitors and analyses progress made in establishing ECVET at national, regional and project levels and points to the key challenges countries are facing.

In 2012 Cedefop identified 15 necessary conditions that create the ECVET implementation framework, grouped into six areas: argumentation, commitment, capacity-building, understanding qualifications, ensuring transfer of learning outcomes, and cross-border cooperation. One major condition was the need for ECVET to be embedded within qualifications systems and, more specifically, within national qualifications frameworks. As most countries do not (yet) have a national qualifications framework, the implementation of ECVET was one of the triggers to start developing a national approach. Figure 2 provides an overview of the necessary conditions stated in 2012.

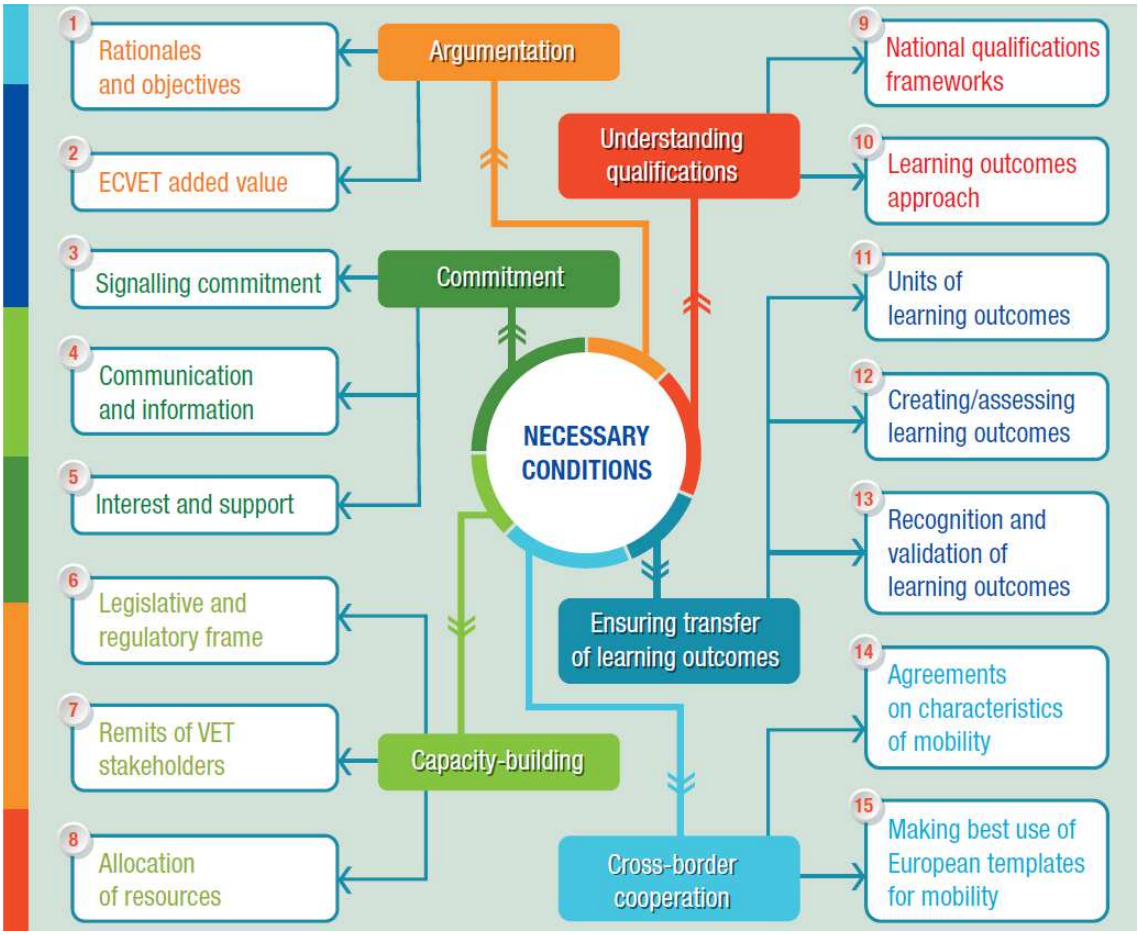


Figure 2: Necessary conditions to implement ECVET (source: Cedefop).

The Cedefop ECVET monitoring report from 2013 focused on the previously identified necessary conditions Member States should create for its implementation. The report showed that Member States are progressing and are increasingly committed to ECVET implementation, although Europe was still far from a fully operational credit system in VET and developments were heterogeneous. It is necessary to mainstream efforts and work on synergies with other European tools, especially the national qualifications frameworks (NQF) and their referencing to the European qualifications framework that are also contributing to creating those necessary conditions. Low demand from potential users and low awareness of actors about ECVET were referred to as obstacles in the 2013 monitoring.

In the Cedefop ECVET monitoring report from 2014, further progress was observed. ECVET was mainly seen by the member states as a toolbox, rather than a system, and there was no single way to implement it. The concept of implementation differs across the countries surveyed and there was mixed support from the national authorities, going from countries who keep ECVET on hold, to countries who are testing the system on VET qualifications, and even countries who have a policy commitment to apply ECVET at the level of qualifications or system level. In countries where ECVET is tested or is planned to be tested, there was no indication of whether this will lead to a formal policy commitment in the near future. While the strength of ECVET is its focus on learning outcomes, the analysis of 2014 showed its weakness is related to the use of credit points. Learning outcomes are the 'carrier' of information, both on the labour market and between education and training providers; credit points have very limited value if not associated to the learning outcomes they refer to. An important number of respondents in the

2013 Cedefop survey did not see the usefulness of credit points and several even suggested their revision or elimination. In that same survey there was a strong indication that quality assurance concerns (on assessment and certification) are among the main obstacles to transfer.

The 2016 monitoring report also looked into how countries promote ECVET and inform stakeholders. It reported separately about the implementation of ECVET principles in initial vocational education and training (IVET) and continuing vocational education and training (CVET). IVET refers to VET aimed at equipping people with knowledge, skills and competences necessary to enter a particular occupation or, more broadly, the labour market, while CVET is education and training after initial education and training or after the entry to the labour market. Results were gathered for 32 countries, whereas within some countries seperate educational systems exist.

Table 2 summarises the current situation in the countries with regard of the existence of a credit system for transfer and accumulation of learning outcomes.

In the group of countries where a credit system exists, further optimisation is needed to fully make it ECVET compatible. With respect to the implementation of the ECVET technical components, some countries do not foresee the implementation of ECVET points.

The ECVET system seems more implemented in IVET than CVET. It might be assumed that the need and potential for application of ECVET in adult learning and continuing training might be stronger. However, the survey of Cedefop in 2015 did not show that. Overall speaking, it seems that ECVET will take various national shapes that will share one common principle: the learning outcomes.

Table 2: Credit systems for transfer and accumulation of learning outcomes and ECVET development in 2015, by country. Source: Cedefop 2016

Country	Direction of ECVET development	Do the answers apply to CVET?
Countries with a credit system in IVET that allows accumulating and/or transferring learning outcomes of individuals		
Belgium-French Community	The system is ECVET-compatible.	No
Denmark	Some ECVET technical components are tested	Yes
Estonia	The system is ECVET-compatible.	Yes
Finland	The system is ECVET-compatible.	Yes
France	The system is ECVET-compatible.	Yes
Iceland	The system is ECVET-compatible.	No
Ireland	It may be possible to map elements of the well-established credit system to ECVET principles.	Yes
Luxembourg	The system is ECVET-compatible.	Yes
Malta	The system is ECVET-compatible.	Yes
Romania	Some ECVET technical components are tested.	No
Slovenia	The system is ECVET-compatible.	No
Spain	The system is ECVET-compatible.	No
Sweden	The system is ECVET-compatible.	No
UK-England	The system is ECVET-compatible.	Yes
UK-Northern Ireland	The system is ECVET-compatible.	Yes
UK-Scotland	The system is ECVET-compatible.	Yes
UK-Wales	The system is ECVET-compatible.	Yes
Countries where credits are used in some qualifications		
Austria	Some ECVET technical components are tested.	Yes
Bulgaria	A credit system compatible with ECVET is being developed.	Yes
Croatia	A credit system compatible with ECVET is being developed.	Yes
Czech Republic	A credit system compatible with ECVET is being developed.	No
Italy	Some ECVET technical components are tested.	Yes
Lithuania	Some ECVET technical components are tested.	Yes
Norway	Some ECVET technical components are tested.	Yes
Countries with no credit system		
Belgium-Flemish Community	Any initiative on ECVET implementation at system level is on hold.	Yes
Cyprus	A credit system compatible with ECVET is being developed.	No
Germany (*)	Some ECVET technical components are tested.	Yes
Greece	Any initiative on ECVET implementation at system level is on hold.	Yes
Hungary	Any initiative on ECVET implementation at system level is on hold.	Yes
Latvia	Some ECVET technical components are tested.	Yes
Liechtenstein	Any initiative on ECVET implementation at system level is on hold.	Yes
Netherlands	Some ECVET technical components are tested.	No

Country	Direction of ECVET development	Do the answers apply to CVET?
Poland	Some ECVET technical components are tested.	No
Portugal	Some ECVET technical components are tested.	Yes
Slovakia	Any initiative on ECVET implementation at system level is on hold.	Yes
Switzerland	Any initiative on ECVET implementation at system level is on hold.	Yes

(*) In Germany, there is no initiative related to ECVET at system level; however, technical components have been tested both in IVET and CVET at provider level (see also Box 4 and country summary in Annex 1).

For the promotion of ECVET in Europe, most countries disseminate information on ECVET to (potential) users, both to institutions and individuals, and provide support to main actors in the form of guidelines, networking, and peer learning. More countries do this mainly to aid transnational mobility rather than for recognition and transfer of LO in their countries. The information is usually available through various channels and in various formats. The most typical channels for ECVET-related information are websites, but also leaflets, booklets, guides and manuals, as well as newsletters were mentioned in the Cedefop survey of 2015. National experts inform stakeholders through lectures and presentations at conferences, seminars and during school visits. It is reported that, following the information and training activities, more VET institutions, and sometimes companies, express their willingness to participate in testing and application of ECVET.

EU-funded projects have so far been a significant driver for development, trial and implementation of ECVET principles and components and its promotion in the Member States, including support to national ECVET experts' teams.

5 ECVET implementation in nuclear

5.1 EHRO-Ns analysis on the needs of the nuclear market and the Nuclear Job Taxonomy

EHRO-N, the European Human Resources Observatory for the Nuclear Sector, published multiple reports on the needs of nuclear experts in the near future.

The JRC-IET (Joint Research Centre - Institute for Energy and Transport) has developed over the last years a strategy and a road map for the European Credit System for Vocational Education and Training (ECVET) implementation in the nuclear energy sector (NES).
According to the JRC-IET road map for the ECVET implementation, the nuclear ECVET system for the NES has 5 components and 2 additional activities:

- C1 – scanning the HR needs of the nuclear market
- C2 – development of the Nuclear Job Taxonomy (NJT)
- C3 – developing the Competence-Based Qualification System
- C4 – development of the mobility tools
- C5 – tools for assessment, validation, recognition and accumulation of LOs
- A1 – getting feedback from the nuclear stakeholders
- A2 – testing the nuclear ECVET at small scale (pilot project)

The JRC-IET road map for the ECVET implementation has reached the stage of Development of the Competence-Based Qualification System.

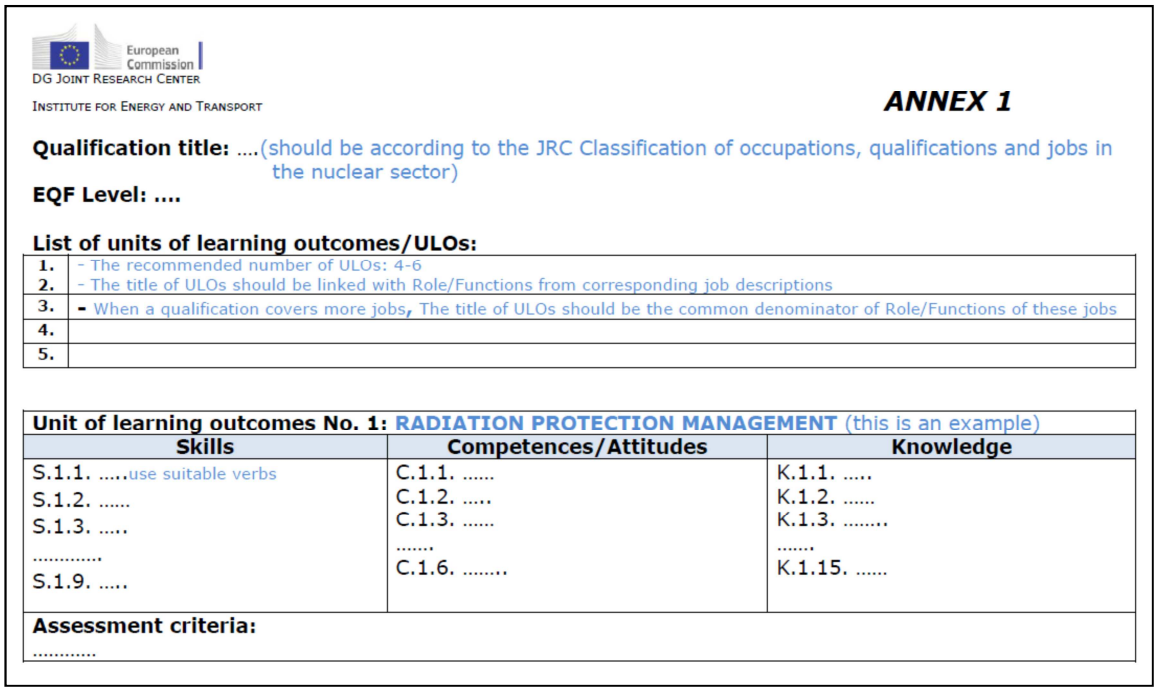
The first three components C1-C3 are in place, so the design of the Training Programmes based on LOs is possible.

In the development of the Nuclear Job Taxonomy (NJT), about 140 representative jobs were identified in the 3 phases of the NPP life cycle (New build, operation and decommissioning). It consists of a list of jobs and their profiles, focused on the required competences, and a catalogue of knowledge, skills and competence items to be used as an aid to draft the profiles.

For the qualification design, a dedicated template was developed by JRC-IET (see Figure 3).

The development of the mobility tools (in terms of memoranda of understanding, learning agreements, and learners' transcripts of records) and the tools for assessment, validation, recognition and accumulation of LOs are developed indirectly by the EFTS projects (Euratom Fission Training Schemes) supported by DG RTD (Directorate-General for Research & Innovation) (see 5.2).

Feedback from the nuclear stakeholders is collected by means of 5 ECVET workshops and 2



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ANNEX 1

Qualification title: ....(should be according to the JRC Classification of occupations, qualifications and jobs in the nuclear sector)

EQF Level: ....

List of units of learning outcomes/ULOs:

1.	- The recommended number of ULOs: 4-6
2.	- The title of ULOs should be linked with Role/Functions from corresponding job descriptions
3.	- When a qualification covers more jobs, The title of ULOs should be the common denominator of Role/Functions of these jobs
4.	
5.	

Unit of learning outcomes No. 1: RADIATION PROTECTION MANAGEMENT (this is an example)

Skills	Competences/Attitudes	Knowledge
S.1.1. .....use suitable verbs S.1.2. ..... S.1.3. .... S.1.9.	C.1.1. ..... C.1.2. ..... C.1.3. .... C.1.6.	K.1.1. ..... K.1.2. ..... K.1.3. .... K.1.15. .....
Assessment criteria:		

Figure 3: Dedicated template for qualification design by JRC-IET.

ECVET seminars, which were organised from 2011 until 2015.

5.2 Previous European projects related to ECVET

The projects of the Euratom Fission Training Schemes (EFTS) are designed to structure research training in all areas of nuclear fission and radiation protection in order to establish a common certificate for professionals throughout the EU. One of the major objectives of the schemes is to facilitate the transfer of higher-level knowledge and technology between disciplines, sectors and countries. In 2009, three EFTS projects started: ENEN-III on nuclear engineering, ENETRAP-II on radiation protection, and PETRUS-II on radioactive waste disposal.

Currently, some of these projects are continuing in a follow-up project, such as ENETRAP III, PETRUS III, CINCH II. Gradually, all of these projects started to develop, test and implement the ECVET principles.

The collaborations setup during these projects joined effort in a consortium of the GENTLE Coordination and Support Action to create a sustainable lifelong E&T programme in the field of Nuclear Fission Technology that meets the needs of the European stakeholders from industry, research and technical safety organisations. (http://gentleproject.eu/)

5.2.1 ENEN III (May 2009 – April 2012)

ENEN III is the third project in the ENEN project series in nuclear engineering (European Nuclear Education Network). This project covered the structuring, organisation, coordination and implementation of training schemes in cooperation with local, national and international training organisations, to provide training to professionals active in nuclear organisations or their contractors and subcontractors. The training schemes provide a portfolio of courses, training sessions, seminars and workshops for continuous learning, for upgrading knowledge and developing skills. One of the project deliverables was to work towards a training passport, which allowed the recognition of qualifications and the validation of training courses according to a set of commonly agreed criteria.

http://www.enen-assoc.org/en/training/for-nuclear-community/enen-iii.html

5.2.2 ENETRAP II (March 2009 - February 2012)

ENETRAP II is the second project of the ENETRAP projects series (European Network for Education and Training in Radiation Protection), focussing on the policy and implementation of education and training in radiation protection at the European and national level.

The overall objective of the ENETRAP II project was to develop European high-quality "reference standards" and good practices for education and training in radiation protection (RP), specifically with respect to the radiation protection expert (RPE) and the radiation protection officer (RPO). The definitions and requirements for RPEs and RPOs were adopted in the European Basic Safety Standard (EURATOM 2013/59). A training curriculum for the RPE was developed in terms of learning outcomes in knowledge, skills and competences following the ECVET principles. Further guidance and tools are currently developed in the ENETRAP III project, where pilot sessions of training modules are organised according to the ECVET principles.

http://enetrap2.sckcen.be/

http://enetrap3.sckcen.be/

5.2.3 PETRUS II (January 2009 – December 2011)

PETRUS II is the second project of the PETRUS project series (Programme for Education, Training and Research on Underground Storage), which aim at a cooperative approach of education and training (E&T) in geological disposal of radioactive waste between universities, waste management organisations, training organisations and research institutes.

http://www.enen-assoc.org/en/training/for-nuclear-community/petrus-ii.html

5.2.4 PETRUS III (September 2013 – September 2016)

The PETRUS II project is currently continued in the PETRUS III project whose objective is to promote E&T in geological disposal of radioactive waste. Different aspects of the ECVET system (such as the elaboration and implementation of the professional development training programme using ECVET principles) are being developed and tested in the domain of geological disposal and waste.

http://www.petrus3.eu/

5.2.5 CINCH (June 2013 – May 2016)

The CINCH-I project aimed at the Coordination of Education In Nuclear Chemistry in order to mitigate the effects of the decline of number of staff qualified in nuclear chemistry. This project is currently continued in the CINCH II project with the aim to mobilise the identified existing fragmented capabilities to form the critical mass required to implement the courses and meet the nuclear chemistry postgraduate education and training needs of the European Union. The current curricula are being developed using the ECVET guidelines.

http://cinch-project.eu/

5.2.6 TRASNUSAFE (November 2010 – October 2014)

The objective of the TRASNUSAFE (Training Schemes on Nuclear Safety Culture) project was to design, develop and test two relevant training schemes on Nuclear Safety Culture with a European environment, based on a specific evaluation of the training needs. Five different training modules were developed and tested. The LOs were described in terms of knowledge, skills and competences.

http://www.enen-assoc.org/en/training/trasnusafe-fp7.html

http://trasnusafe.eu/

5.2.7 MEDRAPET (December 2010 – February 2013)

The main aim of the MEDRAPET project (Medical Radiation Protection Education and Training) was the identification of needs in radiation protection training for various medical professionals. The results of the MEDRAPET project were the basis for the revision of the Radiation Protection 116 Guidelines on Education and Training in Radiation Protection for Medical Exposures, which was published in February 2014 as Radiation Protection 175: Guidelines on Radiation Protection Education and Training of Medical Professionals in the European Union. It consists of core learning outcomes in radiation protection, and specific learning outcomes for various categories of medical professionals, defined in knowledge, skills and competences.

http://www.medrapet.eu/

5.2.8 EUTEMPE-RX (September 2013 – September 2016)

The EUTEMPE-RX project (European Training and Education for Medical Physics Experts in Radiology) aims to provide a training scheme that allows the medical physicist in Diagnostic

and Interventional Radiology to reach EQF level 8, as it was defined by the EU funded 'Guidelines for the MPE' project. The core activity of the medical physics expert (MPE) is to ensure ionising radiations are optimally used in patient healthcare and to bring new knowledge and expertise from physics into healthcare. It will develop 12 courses at EQF level 8 following the ECVET principles.

http://www.eutempe-rx.eu/

5.3 Survey on E&T and VET in the nuclear field

The WP 1 Survey on E&T and VET in the nuclear field was launched in April 2016 to the stakeholders in the nuclear field, mainly training providers and end-users. The full results of the questionnaire are available in WD1.1.

A part of the questionnaire is dedicated to the status of the implementation of ECVET in the nuclear field. The relevant questions are to be found in annex 1, and relate to

- The level of implementation of the different technical ECVET components;
- The difficulty to implement them;
- The essentials to enable implementation;
- The added value of implementing ECVET;
- The link between ECTS and ECVET; and
- The stakeholder involvement for the ECVET implementation.

18 vocational training providers responded to these questions. Figure 4 displays the distribution of countries for these training providers.

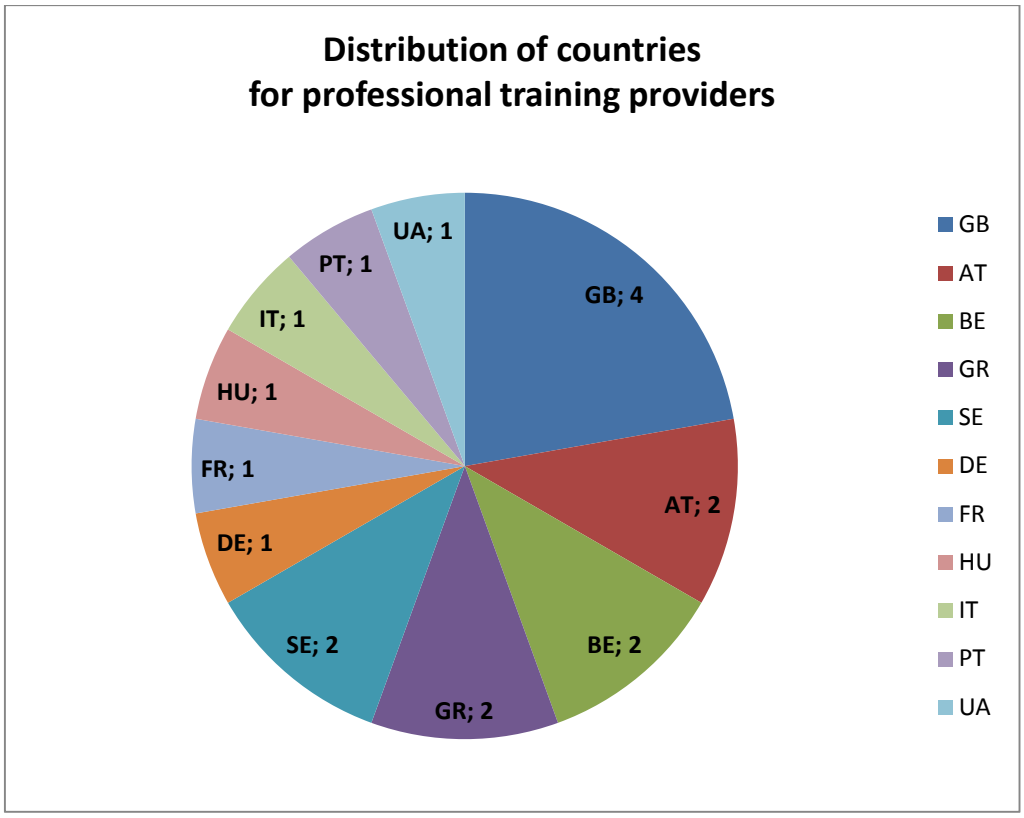

Figure 4: Distribution of countries for training providers who responded to the ANNETTE questionnaire.

None of the training providers in VET initiatives state that the ECVET system was fully implemented. Only one of the training providers state that the ECVET system was already partially implemented. 8 VET training providers (44%) state to have the ambition to implement the ECVET system, and 9 (50%) state that the implementation of ECVET is not planned.
The only training provider implemented the following technical components of the ECVET system:

Designing qualifications

- Qualification designed using the dedicated template which was developed by JRC-IET (see Figure 3)
- Units of learning outcomes (content and structure of qualifications)

Designing learning outcomes

- Definition of learning outcomes according to Knowledge, Skills and Competences
- Assessment of learning outcomes
- Validation of learning outcomes
- Recognition of learning outcomes

Agreements

- Learning agreement
- Learners' transcript of record (individual achievement)

For this training provider, the qualifications are not linked to a specific job description from the Nuclear Job Taxonomy, as this organisation was also not aware of the Nuclear Job Taxonomy as developed by JRC-IET. Also, credit points (relative weight unit relative to the size of the qualification) are not attributed to these qualifications, and a memorandum of understanding (as a partnership between the training provider and the requesting organisation) is also not (yet) implemented.

All training providers rate the technical components to be developed in the ECVET system according to the perceived level of difficulty. Figure 5 provides the average score of difficulty of each of the components to be developed in agreements (red), learning outcomes (green) and qualification design (blue). In the first category, the memorandum of understanding seems most difficult to implement. Validation and recognition of learning outcomes are perceived to be rather difficult to implement whereas defining the learning outcomes according to the knowledge, skills and competences seem rather easy.

Although the majority of components of the ECVET system is perceived to be relatively easy to implement according to the results in Figure 5, almost no effective implementation of the ECVET system is observed currently.

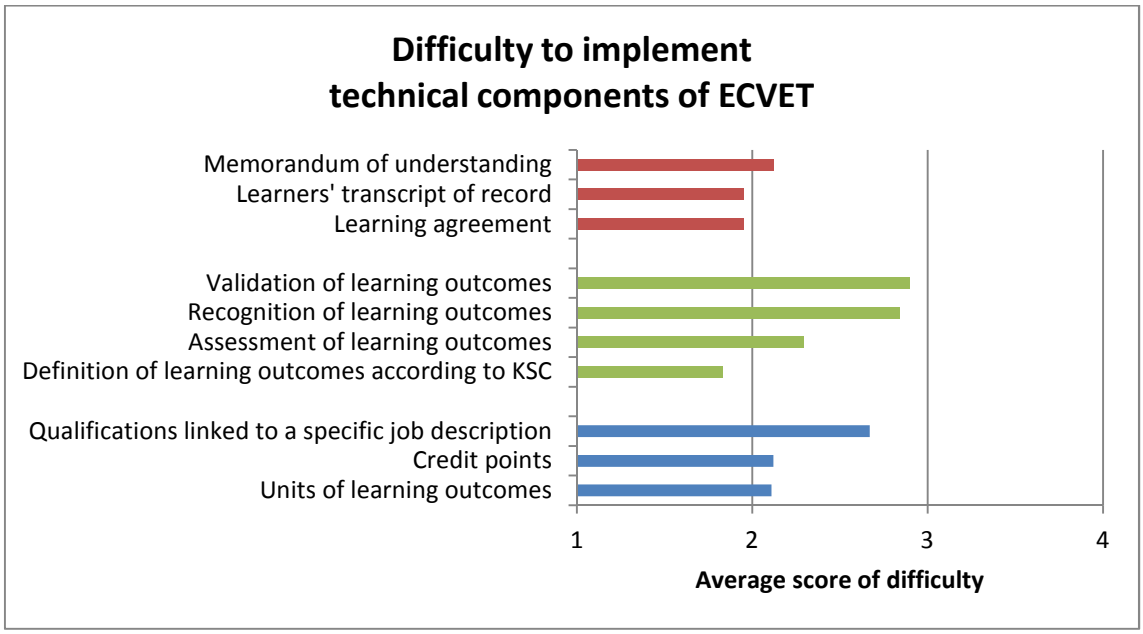

Figure 5: Difficulty to implement ECVET technical components related to agreements (red), learning outcomes (green) and qualification design (blue). The horizontal axis shows the average score of difficulty, where 1 corresponds to not difficult and 4 corresponds to very difficult.

With respect to the qualification design, EFOMP (European Federation of Organizations in Medical Physics) created a board to declare credit points for medical physics experts. It not a tradition in the medical field to use the ECVET system, according to one respondent.

The following aspects are deemed essential to implement ECVET, according to the VET training providers who did not implement ECVET (yet):

- Commitment from all parties (interest and support) (13; 33%)

- Legislative and regulatory framework (recognition) (8; 21%)
- Learning outcomes approach (assessment, validation, recognition, units) (8; 21%)
- ECVET added value (5; 13%)
- Qualification frameworks (3; 8%)

2 respondents state other reasons which are necessary to implement the ECVET system:

- *ECVET was deemed not applicable for the training for medical physics experts, since the training is performed at EQF level 8.*
- *Funding and extra administrative work.*

Figure 6 shows where the VET training providers see the most added value in implementing the ECVET system. All mentioned aspects are deemed almost equal in usefulness, where transparency of qualifications seems most useful. The transparency is also repeated in the individual comments of the respondents.

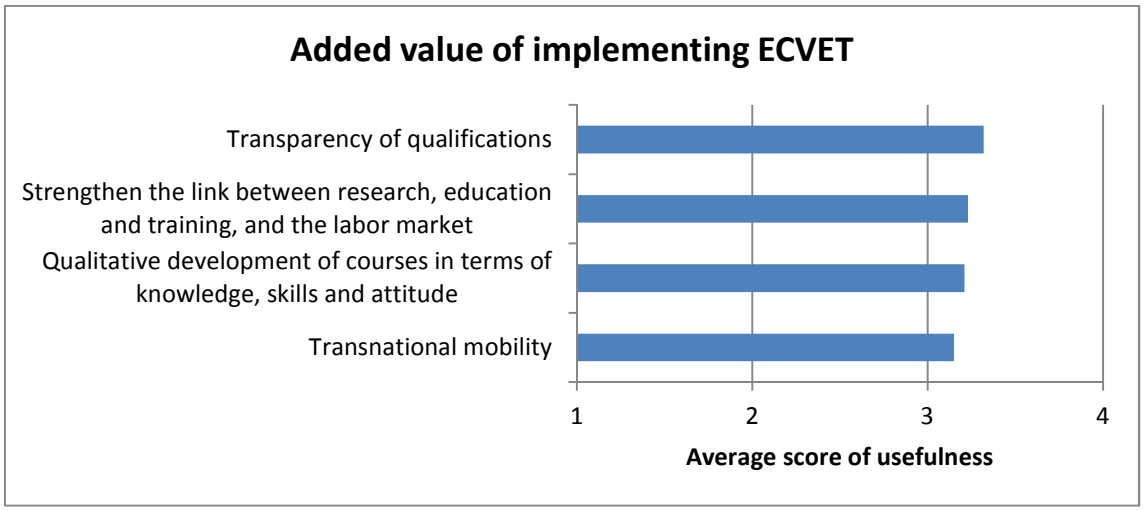

Figure 6: Added value of implementing ECVET. The horizontal axis shows the average score of usefulness, where 1 corresponds to not useful and 4 corresponds to very useful.

15 of the 18 VET training providers (83%) see benefit in linking ECTS to ECVET. The following approaches are proposed by the respondents:

- *EFOMP has a document that lists KSC (Knowledge, skills and competences). That that document could be completed with ECVET, but the medical community may not want to do so. So we would need a person convincing us.*
- *Have recognition of points relevant to both.*
- *Harmonisation of educational/training metrics*
- *As close as possible 1:1*
- *1 ECTS = ECVET*

One respondent who does not see a benefit in linking ECTS to ECVET, states that this is not currently a requirement from any of the customers.

The following suggestions are made to involve major stakeholders (in particular nuclear regulatory bodies) in the implementation of ECVET:

- Face-to-face meetings (9; 50%)
- Organizing customized seminars/workshops for interested stakeholders (7; 39%)

Two other suggestions are made:

- *An EC funded project covering radiation protection training for all people using radiation in the hospital may be of help.*
- *Presence at conference*

12 respondents (67%) state that other credit systems apply on their vocational initiatives, such as the NSAN NS4P credit system, Fit4Nuclear, AAHP Continuing Education Credits system (USA), EFOMP CPD accreditation, certifications delivered by the IAEA.

Only 3 VET training providers (16%) state that there is a certification from a governmental institute for their vocational learning initiatives. AAHP Continuing Education Credits system is mentioned, as well as IAEA and the national implementation of the ECVET program in Portugal.

6 Conclusion and approach for future cross border exchange

An implementation of the principles of ECVET, namely the modularisation of educational systems, and the description of qualifications in terms of learning outcomes, will be an important facilitator for cross border exchange and mutual recognition of knowledge, skills and competences.

Issues such as occupational standards, regulations for minimum education and training, unified qualifications and assessment methods remain a challenge in the nuclear area, as is the case in other sectors.

Although the learning outcomes approach has been grasped by numerous initiatives and projects across Europe as a fundamental aspect in the implementation of ECVET, it needs to evolve and extend towards qualification standards, education standards, assessment and recognition. Different actions were identified related to the necessary conditions to implement ECVET in nuclear.

Implementation of ECVET first requires clear and evidence based statements of the objectives and added value of implementation. Those statements must take account of all stakeholders (industry, policy- and decision-makers, researchers, sectoral organisations, etc.). In nuclear, this stakeholder involvement is already on-going by the efforts of EHRO-N and the numerous EC funded projects. Up to now, these projects worked relatively isolated in their scientific domain, such as radiation protection, geological disposal, medical physics, nuclear engineering, security and safeguards,… General benefits over all domains are clear in the context of lifelong learning such as increased transparency, quality assured learning processes and transferable competences. In some domains, some benefits seem less applicable such as, for instance, the cross-border mobility. With the ANNETTE project, efforts are made to streamline the stakeholder involvement on a larger scale. The communication about the centralised initiatives, such as the nuclear job taxonomy, could be lifted to a higher level where other domains besides nuclear engineering can follow the same approach in defining qualifications linked to competences. The link with existing standardisation initiatives such as the European

classification of skills, competences, qualifications and occupations (ESCO) could facilitate the management of the supply and demand of jobs in nuclear.

Recommendation 1: Discuss and evaluate the nuclear job taxonomy of EHRO-N, to strive for a similar approach in other nuclear domains (outside new build, operation and decommissioning) in the ANNETTE Project.

Recommendation 2: Evaluate the involvement of nuclear in ESCO (European classification of skills, competences, qualifications and occupations) through e.g. EHRO-N.

Interest in and commitment to ECVET can be increased only if its added value is clearly identified and communicated not only to the experts involved in implementing and testing ECVET but also to mobility practitioners and the wider public. Once specific objectives for ECVET implementation have been agreed on, commitment to ECVET must be formalised by e.g. competent authorities, VET providers or sectoral umbrella organisations. From the ANNETTE survey, face-to-face meetings and the organisation of workshops were estimated to be the best way to involve major stakeholders.

Recommendation 3: Organise face-to-face meetings or workshops with major stakeholders in ANNETTE WP7 to strive for a formalised commitment on the implementation of the ECVET system by e.g. voluntary self-commitment, white paper, statement document.

In the nuclear domains, the development a European qualifications frameworks could strengthen the transparency and comparability of qualifications. They could also encourage a common approach to qualifications based on learning outcomes. Different projects in various nuclear domains already took the first steps towards a harmonised qualification framework by defining job descriptions linked to qualifications. In order to improve the coherence, relevance and quality of the qualifications and to further stimulate the development, centralised structures could be setup such as ECVET contact points or ECVET committees, with exchange of experience between the domains by regular meetings.

Recommendation 4: Reflect on the added value of the creation of ECVET contact points or ECVET committees per domain in nuclear.

To ensure the transfer of learning outcomes, a differentiation is made between crediting and recognition/validation of these learning outcomes. Crediting of learning outcomes in ECVET means that a set of learning outcomes, acquired by an individual, has been assessed. Following the crediting stage, the learning outcomes or set of learning outcomes can be recognised and validated so that they count towards a qualification or can be transferred to other learning programmes or qualifications. It is in this context that questions of trust, equivalence of assessment processes and quality assurance arise. When applying ECVET to non-formal and informal learning, the award of credits and validation might be a single step. A clear methodology on the validation of learning outcomes should be created.

Recommendation 5: Describe a clear methodology in ANNETTE WP 4 for the validation of learning outcomes, once they are assessed.

In the context of transnational mobility, agreements on the learning mobility (duration, learning outcomes, quality measures, logistics and responsibilities of different stakeholders) are indispensable. In that regard, joint development and common use of European templates for memoranda of understanding, learning agreements and personal transcripts are essential. Already some elements and templates are available in the framework of Europass (Europass mobility, Europass certificate supplement, Europass CV) to document learning mobility as well as non-formal and informal learning experiences.

Recommendation 6: Joint development of templates in ANNETTE WP 4 for memoranda of understanding, learning agreements and personal transcripts, with some good examples of nuclear profiles.

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Annex 1: relevant questions in the WP1 survey on the implementation of ECVET in the nuclear sector

1. In these vocational training initiatives: is the ECVET system implemented?

- Yes, fully
- Yes, partially
- No, but it is the ambition to implement ECVET
- No, and the implementation is not planned

If yes (fully or partially), go to next question (and skip question 5).
If no, skip questions 2 and 3.

2. Which technical components are implemented?

2.1 Designing qualifications

- Qualifications linked to a specific job description from the Nuclear Job Taxonomy as developed by JRC-IET
- Qualification designed using the dedicated template (see Figure 7)
- Units of learning outcomes (content and structure of qualifications)
- Credit points (size of qualifications an relative weight units)

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ANNEX 1

Qualification title: ....(should be according to the JRC Classification of occupations, qualifications and jobs in the nuclear sector)

EQF Level: ....

List of units of learning outcomes/ULOs:

1.	- The recommended number of ULOs: 4-6
2.	- The title of ULOs should be linked with Role/Functions from corresponding job descriptions
3.	- When a qualification covers more jobs, The title of ULOs should be the common denominator of Role/Functions of these jobs
4.	
5.	

Unit of learning outcomes No. 1: RADIATION PROTECTION MANAGEMENT (this is an example)

Skills	Competences/Attitudes	Knowledge
S.1.1. .....use suitable verbs S.1.2. ..... S.1.3. .... S.1.9.	C.1.1. ..... C.1.2. ..... C.1.3. .... C.1.6.	K.1.1. ..... K.1.2. ..... K.1.3. .... K.1.15. .....
Assessment criteria:		

Figure 7: Qualification template

2.2 Designing learning outcomes

- Definition of learning outcomes according to Knowledge, Skills and Competences
- Assessment of learning outcomes
- Validation of learning outcomes
- Recognition of learning outcomes

2.3 Agreements

- Memorandum of understanding (partnership)
- Learning agreement
- Learners' transcript of record (individual achievement)

3. **Are you aware of the Nuclear Job Taxonomy as developed by JRC-IET?**
   - Yes and we are using it in the development of our training programmes
   - Yes but we are not using it in the development of our training programmes
   - No

4. **Which technical components do you think are the most difficult to implement?**

(4-point scale: very difficult, difficult, less difficult, not difficult)

- Qualifications linked to a specific job description from the Nuclear Job Taxonomy as developed by JRC-IET
- Units of learning outcomes (content and structure of qualifications)
- Credit points (size of qualifications an relative weight units)
- Definition of learning outcomes according to Knowledge, Skills and Competences
- Assessment of learning outcomes
- Validation of learning outcomes
- Recognition of learning outcomes
- Memorandum of understanding (partnership)
- Learning agreement
- Learners' transcript of record (individual achievement)

5. **Which of the following aspects are essential to you to implement ECVET in your vocational learning initiatives?**
   - ECVET added value
   - Commitment from all parties (interest and support)
   - Legislative and regulatory framework (recognition)
   - Qualification frameworks
   - Learning outcomes approach (assessment, validation, recognition, units)
   - Other

6. **Where do you see the most added value in implementing ECVET?**
   Please rate the following items.

(4-point scale: very useful, useful, less useful, not useful)

   - Transparency of qualifications
   - Transnational mobility
   - Qualitative development of courses in terms of knowledge, skills and attitude
   - Strengthen the link between research, education and training, and the labour market

7. **Do you see benefit in linking ECTS to ECVET?**
   - Yes
   - No

If yes, what would be your approach in linking these credit systems?
If no, please explain.

8. **How can we involve major nuclear stakeholders (in particular nuclear regulatory bodies) in the implementation of ECVET?**
   - By organizing customized seminars/workshops for interested stakeholders
   - By face-to-face meetings
   - Other ways. Please specify