



EUROPEAN
COMMISSION

Community Research

PETRUS-III PROJECT

(Grant agreement no: 605265)

Deliverable n° 2.21

Accreditation procedures report

Nature of the deliverable		
R	Report	X
P	Prototype	
D	Demonstrator	
O	Other	

Author(s): Jussi LEVEINEN

Date of issue of this report: 28/06/2015

Project co-funded by the European Commission under the Euratom Research and Training Programme on Nuclear Energy within the Seventh Framework Programme		
Dissemination Level		
PU	Public	*
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the partners of the PETRUS II project	
CO	Confidential, only for partners of the PETRUS II project	

Scope	WP2 deliverable n° D2.21	Version:	1
Type/No.	Report	Total pages	17
Title:		Chapters:	11
Filename:		Suppl. pages:	
Internet		Phase	

ABSTRACT:

The PETRUS professional development training program aims to bring together vocational training on nuclear waste management and formal academic training provided by the partner higher educational institutes. Vocational training programs that follow the ECVET-system are based on mutual trust and recognition of the reached learning outcomes between the partners which can represent competent institutes, training providers and end user organizations. Achievement of the mutual recognition of the qualifications and learning outcomes of Petrus Professional Development Program including the nuclear industry/the end users as well as national education authorities will require also the development of an accreditation process to ensure that the programme provides the education base for the entry route to professional practice. Regulations concerning the validation and recognition of the professional qualification vary substantially among the countries and currently there are no European standard procedures and requirements for ECVET-programs. Also different nuclear waste management programs represent diversity in present stage of implementation as well as geological conditions making accreditation challenging. The academic educational and exchange programs share several key principles as ECVET-programs. The accreditation processes in which universities are committed today in Europe will introduce to their everyday practices quality assurance procedures which can provide the basis for mutual trust and validation and recognition of the learning outcomes and qualifications achieved in the planned PD program. The internal and external accreditation procedures that still need to be implemented concerning the PD-program can be focused on the assessment of training programme against a specific set of KCS needed in nuclear waste management.

The deliverable documents of WP 1 of Petrus III-project will comprise the key inputs to the accreditation documents. They will include the description of the planned program and the role different of end-user in the planning of its contents and selection thematic areas as well as the learner profiles including the criteria for accepting the students. The key documents for the accreditation of the program include also The Memorandum of Understanding between the participating universities and stakeholder companies of PETRUS III-consortium. MoU should confirm the basis for mutual trust as well as the special arrangements for credit transfer or learners, identify actors and competent institutions possibly related to the procedure in question as well as their duties. Instead of developing and maintaining resource-demanding and overlapping procedures for an ECVET-program specific QA/QC-procedures, the educational institutes should commit themselves in the MOU to the implementation to the Standards and Guidelines for Quality Assurance in the European Higher Education Area including the country and institute specific external and internal procedures for quality assessment. Attachments of MoU can give the list of courses provided by different universities and training organizers that should be included as. Also the learning agreement produced as a deliverable of WP1 will be an important document to be submitted for accreditation. As part of the accreditation procedures, a self-assessment of the program and the objectives, procedures and outcomes should be prepared and provided as a Deliverable of WP2.

Signatures

	Name	Signature	Date
Prepared by	Jussi Leveinen		28/06/2015
Revised by			
Approved by:	Behrooz BAZARGAN SABET		07/07/2015

Document revision history

Identifier	Date	Short description
Version n°1	28/06/2015	
Version n°		

Abbreviations

PD	Professional development
KSC	Knowledge, skills and competences (attitudes)
ECTS	European Credit Transfer and Accumulation System
ECVET	European Credit system for Vocational Education and Training
VAE	Awarding academic credit for experience
MoU	memoranda of understanding
ENQA	European Network for Quality Assurance in Higher Education
IAEA	International Atomic Energy Association
IGD-TP	The European Technology Platform for Implementing Geological Disposal .
CMET	Working Group on the Competence Management, Educational and

Table of Contents

Name	3
Signature.....	3
Program Design	5
Background.....	5
End-user inputs to the development of the approach.....	6
Theme selection for the competence-based Petrus PD program	6
Resources from different partners	7
Accreditation approach	8
Basis of mutual trust and qualification.....	9
Internal quality assurance procedures of partner Universities.....	10
External quality assurance procedures by Universities.....	11
Accreditation documentation preparation	12
Summary and conclusions.....	13

Accreditation procedures report

Program Design

Background

The PETRUS professional development training program aims to bring together vocational training on nuclear waste management and formal academic training provided by the partner higher educational institutes. Planning of the structure of the programme and the accreditation system have been a subjects of the EU FP7 financed Petrus II-project. After comparisons of the existing national accreditation systems for non-formal training the conclusion of this project was that the most consensual model for the purpose of the PETRUS programme accreditation would be an approach that applies ECVET-principles as instruments for mutual recognition and the French VAE system as framework for qualification of the PETRUS training programme.

In addition to comparisons of accreditation systems for non-formal training, the planning of the Petrus programme has been based on inputs of the End-users participants in the Petrus II and III –projects representing implementers of nuclear waste management in different European countries. The project has maintained a close link to the Working Group on the Competence Management, Educational and Training (CMET) of the European Technology Platform for Implementing Geological Disposal (IGD-TP). The information on the available PD-training courses as well as on the training and education needs taken into consideration include the questionnaire send in 2008 by International Atomic Energy Association (IAEA) to the Underground Research Facilities Network Participants. The respondents to this survey expressed almost unanimously requests for support in geological disposal through training in a form of courses, seminars, workshops and networks of experts. The list of different training course obtained through the IAEA questionnaire was made available to the preceding Petrus II-project.

End-user inputs to the development of the approach

Although the Petrus II-project was able to identify the training course needs, it also confirmed the fragmented nature of the education and vocational training available, and consequently confirmed the findings of the CETRAD-project. The inputs of different stakeholders and end-users of the project also verified that the demand of the current and future needs of professionals varies depending on the country's situation in their radioactive waste management programs. The qualification time frames that would meet the future needs of the waste management programmes in the participant countries also include both short-term and long-term competence requirements. Accordingly, also the end-user prerequisites for new employees and on entry level requirements for personnel working in geological disposal varied in different countries. The main conclusions of the project were that the training programs to be developed should be based on the competences fitting to the current and future employee job profiles and preferred educational profiles of personnel entering the job markets. In other words, in order to best serve the competence management needs of nuclear waste management companies as end-users, the educational programs to be developed should be designed based on comprehensive analysis of knowledge, skills and competences rather than listed course topics. It should also support life-long learning enabling entrance and selection of different career paths of different experts in the field of geological disposal. On the other hand, the programme should be also sustainable in terms of educational resources which means that it would be best achieved by implementing it through existing institutes of higher education. However, the disciplines and areas of expertise are too diverse so that a joint degree or a fully inclusive curriculum on geological disposal would be possible. On the other hand, the courses and training activities provided by the Petrus partner universities in the existing Master's programs would cover substantially or complement many of the educational and training needs distinguished in the sector of geological disposal. Therefore, integration of the formal academic courses and vocational training can provide a set of learning outcomes enabling the achievement of the knowledge, skills and competences (KSC) required in geological disposal.

Theme selection for the competence-based Petrus PD program

The objective of Petrus III-project is the development of competence-based curriculum for the elaboration of the radioactive waste disposal Professional Development training programme. The development of the program carried out in WP1, will yield the professional profiles with key occupational tasks and also the trainee profiles with selected core competences required. The work

already started in Petrus II has be taken further by determination of the learning outcomes related to the general and domain specific competences and outlining the applicable teaching and learning methods and assessment methods of knowledge, skills and attitudes. In the delineation of the core competences for professional profiles the job descriptions and E&T-needs that have compiled in previous projects and by IAEA have been taken into account.

The previous analyses made by the IAEA and the end-user organisations is that key tasks of nuclear waste management experts and consequently, their key competencies or attitudes in general, are based the assurance of nuclear safety whatever their job functions are. Therefore, knowledge, skills and attitudes required to build up and maintain nuclear safety and safety culture will comprise the underlying theme of the PD-program. The model for the competence-based job description produced is for *“the safety engineer specialized in integrating and analysing site specific geochemical and hydrogeological data as an input data for carrying out numerical modelling and calculations for dose estimation under various likely scenarios for the [future] repository”*.

Also other examples of competence-based job descriptions can be included to the program. The comparisons in the previous Petrus II-project of the courses available and the available information on the job context titles suggested that at least three job contexts could have been covered with the available courses at that time. These were Site Investigation Management, Underground Construction and Repository and Engineered Systems Design, respectively. However, such comparisons focused mainly on professional profile and present key occupational tasks of the personnel. Continuation the description of nuclear waste management professional profiles in terms of the core KSCs would help would allow linking between the course learning outcomes and these KSC, which enables also elaboration of alternative study plans for students with different background. It would also provide means to persons with existing degrees and diplomas and work career to plan vocational programs enabling their “nuclearization” to meet competence requirements by the end-users.

Resources from different partners

The universities that will participate to the Petrus PD-program on radioactive waste disposal represent countries that have committed themselves to so called Bologna process that has led to harmonization of the degree structures and common standards and moreover, development of common peer review

systems Quality assurance and/or accreditation for higher education (Reference). Such are currently either already implemented or being in the process of implementation in the participating universities.

The universities provide education in the relevant field of technology and sciences such as geology, geochemistry and other geosciences, mining or civil engineering in the levels 6-7 of European Qualification Framework (Master and Doctoral degrees). The Universities should point 20 –30 ECTS among Standard Courses taught in afore mentioned disciplines, which can be identified as having a direct link with the geological disposal. Institutions are planned to allocate 10 ECTS to the Common Courses so that same module carries the same number of credits. Furthermore 20 to 30 ECTS are allocated for a period of 4 to 6 months for the MSc-thesis work. The training will also utilize the over 130 hours of e-learning courses and lectures that have been already produced by the consortium.

Due to the ongoing of the organizational changes and recent development in implementation and curriculum of the participating universities (concerning particularly the Aalto University). Therefore, **the list of the courses to be allocated for Petrus- PD-program will be defined in more detail in the Memorandum of Understanding and its Appendices to be accepted by the participating organizations of the Petrus PD-program.**

Accreditation approach

The Petrus PD-program will combine formal MSc-training and standard courses following the ECTS-system to vocational training following ECVET system.

The ECVET system has been created to promote transnational mobility primarily within the European Union and to facilitate lifelong learning. The purpose of the ECVET system is to enhance mobility, utilize learning achievements acquired abroad as part of a qualification and increase the transparency of qualifications. As the tool of transnational mobility the objective of ECVET is to make credit transfer, accumulation and recognition easier through an agreed description method for learning outcomes. In evolving and restructuring labor markets ECVET system can help lifelong development of new knowledge, skills and competences while utilizing in new career routes what has been learned in the past.

The principles of an ECVET include the documentation of the qualification system that is considered to provide the KSC- base for the entry route to professional practice. This means that the KSCs needed for qualification must be linked with expected learning outcomes defined as statements of what a learner is expected to know, understand and/or be able to do at the end of a period of learning.

Qualification is described in terms of “units” of learning outcomes. Each of these units is associated with a certain number of “credit points” defined on the basis of common European standards. Learners can accumulate required units for a given qualification programme over time, in different countries, and in different learning situations (e.g. modular courses, practical training).

The ECVET program also requires that the partners have mutual consent about the learning outcomes that expected to be achieved, the associated with ECVET points, the assessment criteria and methods as well as the validation and recognition of achieved learning outcomes. The principles and general procedures applied will be agreed on the Memorandum of Understanding between the participating organization while practical terms of implementation of human mobility are described in the learning agreement between learner and training providers and the host institutes where the learner is accepted as a student.

Basis of mutual trust and qualification

ECVET-programs are based on mutual trust and recognition of the reached learning outcomes between the partners which can represent competent institutes and end user organizations. Achievement of the mutual recognition of the qualifications and learning outcomes of Petrus Professional Development Program by the nuclear industry/the end users as well as national education authorities will require also the development of an accreditation process to ensure that the programme provides the education base (expressed in terms of KSCs) for the entry route to professional practice. Furthermore, regulations concerning the validation and recognition of the professional qualification vary substantially among the countries and may e.g. require that the qualification to practice a profession will be awarded by an external regulatory body by professional associations. A key challenges for the ECVET-program include the lack of European standard procedures and requirements to be applied in ECVET-programs. Also different nuclear waste management programs represent diversity in present stage of implementation as well as geological conditions.

The conclusion made in the previous Petrus II-project was that the challenges of accreditation of the Petrus PD Program by integration of the ECVET program with existing university courses and utilizing Quality Assurance and the accreditation procedures applied in university degrees and educational programs.

European educational institutes across the European Higher Education Area that have committed to the Bologna process are also required to follow the agreed set of standards, procedures and guidelines on quality assurance' and to carrying out adequate peer reviews and accreditations of the educational programs. This means also that academic educational and exchange programs share several key principles as ECVET-programs. These corresponding requirements include e.g. that

- the proposed programme must belong to an identified thematic area and integrate fundamental knowledge relevant to the thematic area.
- The educational components and outcomes of learning processes comprising the programme must be validated through an appropriate procedure showing its compatibility with a set of standards and they must be linked and show a logical interconnection among modules/courses that constitute the programme.
- Requirements and prerequisites for applicant entrance to the programme as well as for awarding the diploma/degree after completing the programme must be defined.

Due to the similar requirements for the implementation of vocational and academic training programs, the accreditation procedures and standards set for higher educational institutes can be utilized in planned Petrus PD program combining principles of ECVET system and formal academic training.

Therefore, adherence to QA/QC-procedures and periodic assessment against accepted standards of higher education will be an essential part of the accreditation process of Petrus PD. European standards and guidelines for quality assurance in higher education consider three categories of assessments: internal and external assessments of educational institutes respectively, and finally standards and guidelines for agencies carrying out external assessments (ENQA 2009). The accreditation processes in which universities are committed today in Europe will introduce to their everyday practices quality assurance procedures which can provide the basis for mutual trust and validation and recognition of the learning outcomes and qualifications achieved in the planned PD program. However, the accreditation must be focused on the assessment of training programme against a specific set of KCS needed in nuclear waste management.

Internal quality assurance procedures of partner Universities

The **internal quality assurance procedures that the universities are required to put into action include the following:**

1. *The strategy, the policy and procedures for quality assurance* for the assurance of the quality and standards of their programmes and awards, which should have a formal status and be publicly available. These should indicate explicitly their commitment to the development of a culture which recognizes the importance of quality, and quality assurance in their work. Universities should develop and implement a strategy for the continuous enhancement of quality.
2. Formal mechanisms for the approval, periodic review and monitoring of the programmes and awards of *the institutes*.
3. *Assessment of students using* published criteria, regulations and procedures and consistent adherence to this procedures.
4. *Quality assurance of teaching staff verifying* that staff involved with the teaching of students are qualified and competent to do so. The results should be available for external reviews.
5. *Procedures for learning resources and student support should be developed to* ensure that the resources available for the student learning are adequate and appropriate for each programme offered.
6. *Information systems* should enable collection, analyses and use of relevant information for the effective management of their programmes of study and other activities.
7. Institutions should regularly publish up to date, impartial and objective information, both quantitative and qualitative, about the programmes and awards they are offering.

External quality assurance procedures by Universities

Requirement for the external quality assurance procedures required include the following

1. External quality assurance procedures should take into account the effectiveness internal quality assurance procedures
2. The aims and objectives of quality assurance processes should be determined before the processes themselves are developed. All responsible should be involved (including higher education institutions) and the aims and objectives should be published with a description of the procedures to be used.
3. Any formal decisions made as a result of an external quality assurance activity should be based on explicit published criteria that are applied consistently.
4. The external quality assurance processes should be designed to ensure their fitness to achieve the aims and objectives set for them.
5. The reporting of decisions, commendations or recommendation. Should be clear and made accessible to all intended readers.
6. Quality assurance processes which contain recommendations for action or which require a subsequent action plan, should have a predetermined follow-up procedure which is implemented consistently.

7. External quality assurance of institutions and/or programmes should be undertaken on a cyclical basis. The length of the cycle and the review procedures to be used should be clearly defined and published in advance.
8. Quality assurance agencies should produce from time to time summary reports where the general findings of their reviews, evaluations, assessments etc. are described and analyzed.

Accreditation documentation preparation

The deliverable documents of WP 1 of Petrus III-project will comprise **the key inputs to the accreditation documents**. They will include **the description of the planned program** and the role different of end-user in the planning of its contents and selection thematic areas as well as the learner profiles including the criteria for accepting the students.

The deliverables include also **The Memorandum of Understanding** between the participating universities and stakeholder companies of PETRUS III-consortium should confirming the basis for mutual trust as well as the special arrangements for credit transfer or learners. The contents of the MOU to should be finalized by updating the deliverable of WP1, if necessary, to include the following:

- state the mutual acceptance of the status of competent institutions involved,
- state the mutual acceptance of quality assurance, assessment, validation
- recognition criteria and procedures as adequate for credit transfer,
- agree upon the terms of partnership, such as objectives, duration and the revision of the Memorandum of Understanding,
- agree upon the comparability of qualifications for credit transfer and use
- the reference levels defined in the European Qualifications Framework,

In addition, MOU should identify any other actors and competent institutions possibly related to the procedure in question as well as their duties. Instead of developing and maintaining resource-demanding procedures for an ECVET-program specific QA/QC-procedures, the educational institutes should commit themselves in the MOU to the implementation to the Standards and Guidelines for Quality Assurance in the European Higher Education Area including the country and institute specific external and internal procedures for quality assessment.

The deliverable reports will be complemented with a final list of courses provided by different universities and training organizers that should be included as an attachment to the MOU. The final course list is not included here since in many partner Universities the curriculum is evolving at the

moment e.g. partly due to still ongoing changes brought by Bologna process and other organizational changes in some of the partner universities. Also the learning agreement produced as a deliverable of WP1 will be an important document to be submitted for accreditation, a self-assessment of the program and the objectives, procedures and outcomes should be documented. The aim of the self-evaluation can be set as in Petrus II project as:

- The effectiveness, quality and impact of the courses
- The effectiveness of the participants' recruitment
- The outcomes achieved by course participants
- The effectiveness of the evaluation procedures

The self-evaluation should be carried out by designated representatives of the participant organisation. Particularly, concerning evaluation against the first objective, inputs of end-users will be essential.

Summary and conclusions

The PETRUS professional development training program aims to bring together vocational training on nuclear waste management and formal academic training provided by the partner higher educational institutes. Planning of the structure of the programme and the accreditation system have been a subjects of the EU FP7 financed Petrus II-project.

The current demand and future needs of professionals varies depending on the country's situation in their radioactive waste management programs. The qualification time frames that would meet the future needs of the waste management programmes in the participant countries also include both short-term and long-term competence requirements. Accordingly, also the end-user prerequisites for new employees and on entry level requirements for personnel working in geological disposal varied in different countries. The PD-training programs to be developed should be based on the competences fitting to the current and future employee job profiles and preferred educational profiles of personnel entering the job markets. In other words, in order to best serve the competence management needs of nuclear waste management companies as end-users, the educational programs to be developed should

be designed based on comprehensive analysis of knowledge, skills and competences rather than listed course topics.

Therefore, the objective of Petrus III-project is the development of competence-based curriculum for the elaboration of the radioactive waste disposal Professional Development training programme.

Since the key competencies or attitudes of nuclear waste management professionals aim to the assurance of nuclear safety irrespective of their job functions, the knowledges, skills and attitudes required to build up and maintain nuclear safety and safety culture will comprise the underlying theme of the PD-program. Consequently, the model for the competence-based job description produced is for “the safety engineer specialized in integrating and analysing site specific geochemical and hydrogeological data as an input data for carrying out numerical modelling and calculations for dose estimation under various likely scenarios for the [future] repository” has been chosen. Also other examples of competence-based job descriptions can be included to the program.

The universities that will participate to the Petrus PD-program provide education in the relevant field of technology and sciences such as geology, geochemistry and other geosciences, mining or civil engineering in the levels 6-7 of European Qualification Framework (Master and Doctoral degrees). The Universities should point 20 –30 ECTS among Standard Courses taught in afore mentioned disciplines, which can be identified as having a direct link with the geological disposal. Institutions are planned to allocate 10 ECTS to the Common Courses so that same module carries the same number of credits. Furthermore 20 to 30 ECTS are allocated for a period of 4 to 6 months for the MSc-thesis work. The training will also utilize the over 130 hours of e-learning courses and lectures that have been already produced by the consortium. The Petrus PD-program will combine formal MSc-training and standard courses following the ECTS-system to vocational training following ECVET-system.

ECVET-programs are based on mutual trust and recognition of the reached learning outcomes between the partners which can represent competent institutes and end user organizations. Achievement of the mutual recognition of the qualifications and learning outcomes of Petrus Professional Development Program including the nuclear industry/the end users as well as national education authorities will require also the development of an accreditation process to ensure that the programme provides the education base (expressed in terms of KSCs) for the entry route to professional practice. Regulations concerning the validation and recognition of the professional qualification vary substantially among the

countries and may e.g. require that the qualification to practice a profession will be awarded by an external regulatory body by professional associations. A key challenges for the ECVET-program include the lack of European standard procedures and requirements to be applied in ECVET-programs. Also different nuclear waste management programs represent diversity in present stage of implementation as well as geological conditions.

The academic educational and exchange programs share several key principles as ECVET-programs The challenges of accreditation of the Petrus PD Program will be approached by integration of the ECVET program with existing university courses and utilizing Quality Assurance and the accreditation procedures applied in university degrees and educational programs across the European Higher Education Area by universities that have committed to the Bologna process. Therefore, adherence to QA/QC-procedures and periodic assessment against accepted standards of higher education will be an essential part of the accreditation process of Petrus PD. The accreditation processes in which universities are committed today in Europe will introduce to their everyday practices quality assurance procedures which can provide the basis for mutual trust and validation and recognition of the learning outcomes and qualifications achieved in the planned PD program. However, the internal and external accreditation procedures still need to be implemented concerning the PD-program specifically but these can be focused on the assessment of training programme against a specific set of KCS needed in nuclear waste management.

The deliverable documents of WP 1 of Petrus III-project will comprise the key inputs to the accreditation documents. They will include the description of the planned program and the role different of end-user in the planning of its contents and selection thematic areas as well as the learner profiles including the criteria for accepting the students.

The deliverables include also The Memorandum of Understanding between the participating universities and stakeholder companies of PETRUS III-consortium should confirm the basis for mutual trust as well as the special arrangements for credit transfer or learners. The contents of the MOU to should be finalized by updating the deliverable of WP1. In addition, MOU should identify any other actors and competent institutions possibly related to the procedure in question as well as their duties. Instead of developing and maintaining resource-demanding and overlapping procedures for an ECVET-program specific QA/QC-procedures, the educational institutes should commit themselves in the MOU to the implementation to the Standards and Guidelines for Quality Assurance in the European

Higher Education Area including the country and institute specific external and internal procedures for quality assessment.

The deliverable reports will be complemented with a final list of courses provided by different universities and training organizers that should be included as an attachment to the MOU. Also the learning agreement produced as a deliverable of WP1 will be an important document to be submitted for accreditation. As part of the accreditation procedures, a self-assessment of the program and the its objectives, procedures and outcomes should be prepared and provided as a Deliverable of WP2.