

## Newsletter #3

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## What is PETRUS?

PETRUS III is a Euratom programme for nuclear research and training. The Consortium includes representatives from twelve different countries all over Europe who work in the nuclear domain at universities and different education and training institutions as well as established companies and agencies in the nuclear sector.

The essential objectives of the project are:

- the practical implementation of an accredited training programme following ECVET principals, leading to a recognised qualification in geological disposal
- the creation and design of a multidisciplinary training and research framework for PhD students
- the development of strategies and frameworks for maintaining the PETRUS initiative long-term.

# Introduction



## Welcome to our third edition!

*A warm welcome to our third edition of the PETRUS III Newsletter.*

Isabel Paiva  
IST



**L**isbon, Portugal, was the location of the third PETRUS III progress meeting. Members of the project and its End-User Council met at an extended meeting at the Instituto Superior Técnico (IST), Alameda Campus on 22<sup>nd</sup> and 23<sup>rd</sup> April.

The strength of links with other institutions and organizations with responsibilities in E&T in radwaste was pursued in this meeting with the IAEA being invited (Helen Rycraft and Stefan Mayer) to present the Agency's approach to learning programs, leadership, and safety culture in radwaste management. All members participated actively including the international labs and private companies (JRC-ITU from EC, Nidiatec, Micans, etc.) and radwaste management organizations (ANDRA, SURAO, ARAO, Posiva Oy, etc., with REC as a chairman of this extended EUC meeting (Nadja Zeleznik) and the Universities (Mines Nancy Lorraine, Cardiff, UPM, Aalto, TUDelft, UNipi, Inu, CTU, IST, etc.) during the first days of the meeting.

All WP leaders made their presentations during the meeting, which was the first occasion the IST had been present as a new ENEN member. Pedro Dieguez welcomed us into the organization, which now comprises 66 members, while describing the evolution in the sustainability and external links with ENEN.

The ECVET model for the elaboration of a PD training programme by École des Mines de Nantes (Abdesselam Abdelouas) and its current

implementation by Aalto University (Jussi Leveinem) were also discussed. The important challenge of multi-disciplinary skills at PhD level was further presented by UPM (Francisco Elorza) and ARAO (Borjan Hertl), who described the think-thank activities and the fundamental link to the IGD-TP. CTU (Radek Vasicek) described the evolution related to the technical aspects of maintenance of PETRUS III docs and website development. The Coordinator of PETRUS III, Université de Lorraine (Behrooz Bazargan-Sabet) referred this year's PETRUS PhD Conference, which was successfully held in Nancy in June.

Links between CMET and PETRUS III are still being strengthened and members of PETRUS III participated in the CMET meeting in the two days before PETRUS III (also at IST, Alameda Campus), as well as in the training session organized by Cheryl Contee from Fission Strategy about the different social media tools that can be used to communicate E&T.

A dinner offered by both PETRUS III (Behrooz Bazargan-Sabet) and CMET WG (Marjatta Palmu) brought together all participants at The Pastorinha, a Portuguese restaurant with a view over the sea and it was a pleasure to have everybody in Lisbon.

The next meeting is scheduled for Madrid in October 2015. It will be hosted by UPM and we are all looking forward to it!



## Petrus III project in the context of setting up an ecvet pilot project



*Rodica Elena Ceclan  
University Politehnica of Bucharest*

**T**he ECVET implementation in the nuclear energy sector started in October 2009, when the Joint Research Center (JRC) - Institute for Energy and Transport (IET) was assigned for the implementation and the management of the European Human Resources Observatory for the Nuclear Energy Sector (EHRO-N)<sup>1</sup>.

In December 2010, several Euratom Fission Training Schemes (EFTS) projects were funded by the EC and some of them developed qualifications based on the ECVET approach:

Project	Qualification developed
ENEN III	<i>Fluid system Construction and Commissioning Engineer</i>
ENETRAP II	<i>Radiation Protection Expert</i>
PETRUS II	<i>Safety Analysis Expert for Deep Geological Disposal</i>
EUTEMPE-RX	<i>Medical Physics Expert</i>
TRASNUSAFE	<i>Compliance of Contractors with Safety Systems</i>
CINCH II	<i>Euro Masters in nuclear and radiochemistry</i>
GENTLE	<i>Executive Euro Masters in nuclear reactors and fuel cycles</i>

A sectorial approach<sup>2</sup> and a road map for ECVET implementation have been developed by JRC-IET. According to the JRC-IET road map, the ECVET system has five major components that would be assembled or tested through a pilot project.

The first three components of ECVET were developed through the following direct actions, driven by JRC:

- C1: Human Resources Demand-Supply analysis;
- C2: Shift from Knowledge Based Qualification System (KB-QS) to Competence Based Qualification System (CB-QS);
- C3: Developing CB-QS.
- The next two components of ECVET were developed through indirect actions (EFTS projects, driven by DG RTD):
- C4: The development of mobility tools;
- C5: The qualification achievement process.

After developing the fifth ECVET component, and before implementing the ECVET system into a particular sector (including the Deep Geological Disposal sector), there is a need to assemble all ECVET components and to test how the system works, on a small scale, within a pilot project in the context of mobility.



When a sector decides to test ECVET by a pilot project some preconditions must be met:

- a) the project consortium should be in place;
- b) each project partner should have a deep understanding and mastering of all ECVET innovations;
- c) the pilot project should have a reliable source of funding.

One of the most important innovations brought by ECVET in the nuclear sector is the development of the CB-QS. Developing CB-QS means to structure a nuclear qualification (in particular Safety Analysis Expert for Deep Geological Disposal) in Units of Learning Outcomes (LOs).

In ECVET, a Unit of LOs is the smallest part of a qualification, that can be assessed, transferred, validated, and possibly independently certified. It can be specific to a single qualification, or common to several qualifications. Moreover, the name of a Unit of LOs should be linked to the role, or functions of the job. In this way, that qualification becomes more transparent and understandable for someone without a nuclear background.

The next step in designing a qualification according to the ECVET approach is to furnish the Unit of LOs with competences or LOs needed to exercise that specific role or function. A competence, or LO, is a set of knowledge (K), skills (S) and/or competences (C) an individual has acquired and/or is able to demonstrate after completion of a learning process, either formal, non-formal or informal.

A standard ECVET pilot project is focused on international mobility of learners, and is set out in four phases:

- 1) Preliminary phase: selecting one or more professions to be tested, individuating national or international partners

according to the qualifications taken into account, elaborating a shared competence framework, drawing up an agreement among partners. Also, the elaboration of a competence framework is crucial for the evaluation of workers' qualifications;

- 2) Preparation phase: organizing the stay abroad of learners, elaborating a competence profile (CP), and agreeing on the specific LOs to be gained during the learning period abroad. The shaping of a competence profile is crucial as well, as it will replace the current curriculum format and it will keep track of what a worker can do and how well;

- 3) Implementation phase: learning period abroad. The shaping of training programs according to the LOs model; it is also important in the long run, in order to give to workers the possibility of lifelong learning.

- 4) Final phase: assessment and recognition of the learning outcomes achieved abroad. the assessment of workers' competences is the pivotal point of a pilot project. It should offer the possibility of determining the competences of workers outside their learning background (formal, non-formal, informal), in order to accredit them for the regional labor market and prevent black-market work.

Considering the leading role of Petrus III project is promoting ECVET, setting up a pilot project for ECVET testing within the Deep Geological Disposal sector could be a new challenge for the project consortium.

#### References:

- 1. European Human Resources Observatory-Nuclear (EHRO-N); <http://ehron.jrc.ec.europa.eu>.
- 2. Ceclan, M., Von Estorff, U., The road map for ECVET implementation in the nuclear energy sector, ECVET MAGazine (20); 2014, p. 18-21. JRC90189.



# PhD conference



*Behrooz Bazargan-Sabet*  
*Petrus project coordinator*

**A**t the end of June 2015 in Nancy under the bright sun of early summer the first PETRUS PhD conference was held. Around 60 people, mostly students, came from all over Europe and even further afield to attend this event. It is true that the food is famous in this region of France and the people are particularly welcoming, but what motivated these (young) scientists was above all the opportunity to participate in a unique event of its kind **bringing together PhD students and young researchers, along with professionals and academics in radioactive waste disposal.**



As might be expected, it was a successful week of friendly and intense exchange. 15 PhD students presented the results of their current research to a panel of four professors and responded to questions from their counterparts present in the room. Afternoons were devoted to outstanding lectures given by professors and professionals. The themes selected were deliberately heterogeneous combining a wide variety of subjects ranging from mathematical modeling to social issues. At the end of the event, special prizes were awarded by the jury to the two best students during a festive ceremony.



We hope that the success of this first event will be confirmed by the PETRUS 2016 PhD Conference, which will be held in June 2016 in Delft, Netherlands. Stay tuned...

# WP summaries

## WP #1

### WP 1 Elaboration of the PD training programme using ECVET model

*Abdesselam Abdelouas  
Mines de Nantes*



**T**he deliverable documents of WP 1 comprise the key inputs of the Petrus III project. They include the description of the planned program for professional training in accordance with the strategic planning of different end-users, the selection of thematic areas, as well as the learner profiles including the criteria for accepting students. This also includes The Memorandum of Understanding between the participating universities and stakeholder companies, as well as a learning agreement.

The mobility of individual learners can be defined within a learning agreement (LA) between the learner, the sending organization, and the host institution. The main aspects of a LA include the assignments, the related course objectives, the evaluation process, and the validation and recognition mechanisms. The learning agreement is a formal contract developed by the student, the field instructor, and the faculty supervisor. It consists of a framework for the three parties to design the outlines during the learning period. It describes the learning activities the learner is expected to accomplish, the content, the time, and the role of supervision. In parallel with the work in progress for defining the first job profile, a prototype of the learning agreement has been prepared in the frame of WP1.

# WP summaries



## WP 2 Actual implementation of the PD training programme

*Jussi Leveiner  
Aalto University, Finland*



**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, who can represent competent institutes, training providers, and end-user organizations.**

Achievement of the mutual recognition of the qualifications and learning outcomes of the Petrus Professional Development Program including the nuclear industry/the end-users, as well as national education authorities, will also require the development of an accreditation process to ensure that the program provides the education base for the entry route to professional practice. Regulations concerning the validation and recognition of the professional qualification vary substantially between countries and currently there are no European standard procedures and requirements for ECVET programs. Different nuclear waste management programs vary at the present stage of implementation and geological conditions also make accreditation challenging.

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 a training program that can provide a specific set of KCS needed in nuclear waste management.

# WP summaries



## WP 3 Addressing the challenge of multidisciplinary skills at PhD level

*Francisco Javier  
Elorza Tenreiro  
Universidad  
Politecnica de Madrid*



**O**ne of the objectives of WP3 is the elaboration of a multidisciplinary training and research framework for PhD students. This new educational challenge is addressed through a set of lectures that target broadening the scientific vision of PhD students. The organization of this summer's PETRUS PhD Conference was an ideal opportunity to launch this set of lectures. During this event that lasted a full week (from 22 to 26 June), forty participants had the opportunity to follow seven high quality lectures in various fields of study relating to radioactive waste disposal, including:

- Microbiology in nuclear waste disposal, by Professor Karsten Pedersen (Chalmers University / Microbial Analytics AB, Sweden)
- Radiation Protection and the impact of the new EU BSS on Waste Management, by Dr. Danyl Pérez Sánchez (CIEMAT, Spain)
- Radioactive waste management and social issues, by Jenny Rees, Head of Public Relations and Added Values (SKB Oskarshamn, Swedish Nuclear Fuel and Waste Management, Sweden)
- Modelling the coupled physical and chemical processes in engineered barrier systems in relation to safety analysis/assessment, by Dr. Snehasis Tripathy (Cardiff University, UK)

- Natural analogue studies in the geological disposal of radioactive wastes by Professor Jean-Marc Montel (Université de Lorraine, France)
- Radioactive waste forms in the context of geological disposal by Professor Abdesselam Abdelouas (École des Mines de Nantes, France)
- Hydro-mechanical and transport processes in radioactive waste disposal by Professor FCO Javier Elorza (Mining School of Madrid, Spain)

All of these lectures have been recorded and are accessible through the conference website.

 [www.petrus2015.eu](http://www.petrus2015.eu)



# WP summaries



## WP 4 Think-Tank activities and link with the IGD-TP

*Bojan Hertl  
Arao*



**S**ince 2005, the PETRUS initiative has been coordinating universities, RW management organizations, training providers and research institutes in efforts to develop a cooperative approach to E&T in the specific field of radioactive waste management (geological disposal). The objective is to ensure the continuation, renewal, and improvement of professional skills by filling the gap between growing demands for structured E&T. As RW management organizations try to find new types of approaches to meet their human resources demands and to maintain the competence and availability of skilled personnel, PETRUS proposes an innovative strategy for sharing resources from both academia and industries.

PETRUS III took the initiative through WP4 to organize stakeholder round table discussions addressing interesting questions such as: What kinds of profiles are needed to provide the required knowledge, skills, and competences? How can we create, maintain, transfer, and manage the knowledge needed? How can we ensure the skills and competences include the required safety culture? Short presentations and round table discussions were organised during the extended end-user council meeting in Lisbon attended by PETRUS III members, CMET working group members, and IAEA representatives.

During the regular PETRUS III meeting, it was suggested that the End-User Council needed to remain

an important crossroads between end-users, program providers, and IGD-TP's CMET working group. To enrich the interaction between PETRUS III and IGD-TP CMET, ENEN, as PETRUSIII WP5 leader and as a member of CMET, may be encouraged to support common meetings with EU nuclear initiatives such as ENS, ENSREG, SNETP, and FORATOM (end-users and program providers) to exchange results from EFTS (Euratom Fission Training Schemes).

# WP summaries



## WP 5 Sustainability, external collaborations and link with ENEN

*Pedro Dieguez Porras*  
ENEN



**T**he 13th ENEN General Assembly in Helsinki, was hosted by Aalto University in March 2015 with the ENEN Special Event fully dedicated to “Nuclear Waste Management & Geological Disposal”. The presentations from the event can be downloaded from the secure area of the ENEN website.

This event allowed the PETRUS community to be fully presented and its outcomes disseminated to all the members of ENEN raising the interest and awareness of its work in Nuclear Waste Management & Geological Disposal among the ENEN members. More initiatives will be launched to integrate these fields among the different areas of interest and expertise of ENEN members.

The further actions to be performed within the framework of WP5 involve the integration of the PETRUS Consortium into ENEN, exploring how to set up a certification similar to the European Master of Science in Nuclear Engineering (EMSNE) for the Geological Disposal sector, agreements for student exchanges, international cooperation, and finally the definition of a roadmap for PETRUS Consortium sustainability.

The European Master of Science in Nuclear Engineering (EMSNE) certification was established under the European Commission in 2005. It establishes common reference curricula and mutual recognition among ENEN members in Nuclear Engineering. The requirements for the EMSNE certification have been analyzed for the needs of the PETRUS III project and

comparison and/or the future establishment of a similar certification in Waste Mg. and Geological Disposal. As a reminder we can see that a candidate to the EMSNE must have been a holder of a Masters level degree with at least 5 years university education (3+2, 4+1, or 5), and a final Masters thesis, at least 60 ECTS must be “purely nuclear” and 20 ECTS must be obtained from a “foreign” institution that is a member of the ENEN Association. The list of topics that must be included in the student curricula are: Reactor engineering, Reactor physics, Nuclear thermal hydraulics, Safety and reliability of nuclear facilities, Reactor engineering materials, Radiology and radiation protection, Nuclear fuel cycle, and applied radiochemistry. The work in WP1 is elaborating a Professional Development program in three units, which will be practically implemented during the works of WP2. This work is currently being completed. When finished it will be possible to estimate the size of the three training/educational units in ECTS and/or ECVET and assess the feasibility of a possible PETRUS certification or the integration into the EMSNE certification scheme.

# EVENTS



## Training course in radiation protection

November 16 - 20, 2015  
SCK-CEN Mol , Belgium 

Target audience:  
Master or PhD students, or professionals working with radioactive materials or managing nuclear activities and requiring insight in fundamental and practical aspects of radiological protection.

[academy.sckcen.be](http://academy.sckcen.be) 

## ENETRAP III specialised training modules for Radiation Protection Experts

In the framework of the European Network on Education and Training in Radiation Protection (ENETRAP III), several training modules were developed for the Radiation Protection Expert (RPE) following the European Reference Training Scheme. These will be organised by the ENETRAP III partners at different locations in Europe.

The modules are linked to specific competences and activities that a Radiation Protection Expert (RPE) requires in compliance with Council Directive 2013/59/Euratom (BSS).

June 27- July 1, 2016  
Karlsruhe, Germany 

**ENETRAP Module 4** is a specialised training course designed for Radiation Protection Experts working in **nuclear power plants & research reactors**.


Course announcement   
Background document

 July 4-8, 2016  
Budapest, Hungary

**ENETRAP Module 7** is a specialised training course designed for Radiation Protection Experts (RPEs) working in the **medical field**.  
Online phase as from September 2015

 Course announcement  
Background document

Fully booked – should you be interested in this course you can put your name on the waiting list (mail to [mcoeck@sckcen.be](mailto:mcoeck@sckcen.be))

 July 18-22, 2016  
Karlsruhe, Germany

**ENETRAP Module 9** is a specialised training course designed for Radiation Protection Experts (RPEs) working in **geological nuclear disposal**. This course was developed in collaboration with PETRUS III.

 Course announcement  
Background document

Further information on the ENETRAP training courses is available on the website of ENETRAP III:  
<http://enetrap3.sckcen.be/>

## DOPAS 2016 Plugging and Sealing Seminar

 May 25-27, 2016  
Turku, Finland

This seminar is open for anyone who is working now or in the future with repository to define better closure or operation and related development and research items specific but not limited for the radioactive waste management and spent fuel disposal in geological formations.

Plenary, oral presentations and poster sessions will be organized. An optional technical tour to Finland's repository location at Olkiluoto will be arranged.

 [www.posiva.fi/en/dopas](http://www.posiva.fi/en/dopas)



# Partners

## PETRUS



### Partners:

Université de Lorraine (FR) | POSIVA Oy (FI) | ENEN (FR) | Ecole des Mines de Nantes (FR) | Cardiff University (UK) | Linnaeus University (SE) | MICANS (SE) | SÚRAO (CZ) | ARAO (SI) | ENRESA (ES) | Aalto University (FI) | Universidad Politécnica de Madrid (ES) | Czech Technical University (CZ) | Universitatea Politehnica Din Bucuresti (RO) | CEA (FR) | IST-ID (PT) | Delft University of Technology (NL) | SCK·CEN (BE) | CIRTEC (IT) | REC (SI) | Nidia (IT) |

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