STRENGTHENING ENERGY SECTOR COMPETENCES
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A WORD FROM THE DIRECTOR

Éric Gadet
Interim Director of INSTN

3 QUESTIONS FOR...

The nuclear industry is facing key challenges. What are the main issues?

In a period of rapid change worldwide, the nuclear industry is now facing major challenges. The first, and most important of which, is developing and maintaining competences. Following its restructuring, the French nuclear industry is now actively recruiting. Our role, as a Higher and Continuing Education institution, is to provide support by developing competences that meet the current and future needs of industry. The integrated approach to energy, covering both nuclear energy and renewable energies, is another issue. In this area we must, together with all institutional and industrial players, strengthen the image and attractiveness of the sector by providing an extended offer incorporating energy systems. Accompanying the development of nuclear medicine around the world is another equally important challenge. As is the creation of an industrial sector in nuclear decommissioning, cleanup and waste management.

How has INSTN supported the nuclear industry through 2018’s challenges?

With our commitment to the CEA and in line with our new strategic orientations, INSTN has continued to provide an offer focused on three key areas. For each of these, ambitious actions have been implemented. Examples include the development of decommissioning-cleanup project management training, a continuing professional training offer in the field of Energy Storage for Low Carbon Energy Systems, and support of the IAEA1 in their Nuclear Applications in Human Health programme for fighting cancer, notably in French-speaking Africa.

In 2018, we also implemented “return-to-work” support actions with Nuvia, by designing a training programme in Radiation Protection. We also participated in the creation of an international teaching-research chair in the field of Innovative Processes for Materials Development, and signed strategic partnerships with Orano, TechnicAtome and EDF ITech. Finally, we continued our educational and digital transformation with key innovations: further development of our educational approach focused on competences and launch of the EVOC and INSTART LEARNING EXPERIENCE platforms.

INSTN has gained strong recognition over the years, especially in 2018. What stands out for you?

- In 2018, INSTN became a member of the Conference of Grandes Ecoles, an association for French Science and Engineering Schools, obtained the European Union’s label for decommissioning training (ELINDER) offered at our Marcoule Training Centre, and gained European Horizon 2020 funding for the Numerics programme (welcoming doctoral students). These are key achievements that strengthen our objectives of continuing to support the performance of the nuclear and energy sector and to meet current and future skills needs.

**INSTN provides training for 16 experts from Africa on behalf of the IAEA**

— The 16 trainees, from Algeria, Ethiopia, Ghana, Kenya, Mauritania, Tunisia, Morocco and Zimbabwe, followed an advanced course in nuclear technologies for environmental industrial processes. On the programme: theory classes and intensive hands-on practical work designed for training specialists to carry out measurements, using the properties of radioactive radiation, while following international standards of safety and radiation protection. INSTN delivered the training as an IAEA Collaborating Centre.

**25 JUNE-13 JULY**

French and British collaborate on skills in nuclear

— How to promote skills in the nuclear field, capitalise on experience, attract young people, and encourage mobility into the sector, are all issues shared by the French and British nuclear sectors and discussed during a seminar organised in Paris by INSTN, on ‘Innovative Approaches to Nuclear Skills’. In partnership with the British Embassy, the seminar brought together the key players in the French and British civil nuclear sectors, with the aim of defining areas of collaboration between the two countries. It was followed by a seminar in London in November.

**28 JUNE**

*First INSTN Hallmark for Assystem*

— Looking to demonstrate the quality of their professional training course on the ‘Operation of Nuclear Facilities’ for employees of the company, Assystem Nuclear Institute asked INSTN for advice on their educational approach and technical content. At the end of the review process, focusing on the educational objectives, the relevance of the content and the delivery of the training, we awarded Assystem INSTN’s ‘Gold Hallmark’, which attests to the high standards of the course.

**20 SEPTEMBER**

*INSTN role in Franco-Indian partnership agreement on Nuclear*

— As part of the partnership agreement between the CEA and the Indian Department of Atomic Energy, INSTN and HBNI (Homi Bhabha National Institute) signed a collaboration agreement. Objectives: joint development of teaching and student exchanges, as well as joint preparation of scientific publications.
Strengthening Energy Sector Competences

26-28 JUNE

World Nuclear Exhibition: highlights for INSTN

— Bringing together key players in the French and international nuclear industry, the 3rd Edition of the World Nuclear Exhibition (WNE) represented a key opportunity for INSTN. Among the highlights of this meeting: the launch of our EVOC virtual education platform, a world first, the signing of two highly strategic partnerships with Orano and TechnicAtome for training and joint development in France and internationally, as well as the signing of a collaboration agreement between INSTN Foundation, sheltered by Fondation de France, and the Franco-British student association ‘Spark! Contest’.

28 JUNE

Marcoule Training Centre awarded European Union label

— Faced with an increased need for competences in the field of decommissioning due to the aging of nuclear facilities, the European Commission launched the ELINDER project (European nuclear decommissioning training programme). Its objective is to promote high quality training and increase the attractiveness of jobs in decommissioning. Specialising in this field, with over a dozen programmes offered, our Marcoule Training Centre is the first training organisation to receive the ELINDER label for the ‘Introduction to Decommissioning of Nuclear Facilities’ training course. A key demonstration of quality for INSTN.

13 NOVEMBER

INSTN becomes member of Conference of Grandes Écoles

— Following a full audit of our Institute’s education activities in 2018, the Conference of Grandes Écoles (CGE), an association for French Science and Engineering Schools, endorsed INSTN membership. The CGE accreditation demonstrates the quality of higher education provided by our Institute, particularly that of our Nuclear Engineering Masters Degree for specialised engineers, and provides new opportunities for our Institute as INSTN will now be able to offer Specialised Masters, specially adapted to the needs of the energy sector.

11-15 NOVEMBER

INSTN and Emirati Safety Authority strengthen collaboration

— In 2016, INSTN and the United Arab Emirates’ Federal Authority for Nuclear Regulation (FANR) signed a three-year cooperation agreement for the training of their nuclear safety inspectors, in light of the construction of four Korean technology reactors. In 2018, FANR staff in Abu Dhabi received training on nuclear fundamentals and on the APR1400 reactor, a Korean technology chosen by the United Arab Emirates. INSTN also organised two weeks of visits to French nuclear sites. Collaboration between the two countries will be further developed in 2019.
INSTN is a National Higher and Continuing Education which specialises in the field of energy. For over 60 years, INSTN has been delivering highly specialised professional Education and Training courses, from operator to engineer. INSTN has been a member of the Conference of Grandes Ecoles since 2018. Our role as an IAEA Collaborating Centre, since 2016 in France, has further established our international recognition. INSTN is administered by the CEA and has close links to all of its areas of research.

**ABOUT INSTN**

**The French Education and Training Institute for Nuclear Applications**

- LIFE-LONG LEARNING OPPORTUNITIES
- INNOVATIVE TEACHING TOOLS
- KEY AREAS OF COMPETENCE AND EXPERTISE
  - Industrial Applications of Nuclear Energy
  - Nuclear Applications in Human Health
  - Low Carbon Energy Systems

**LOCATED ACROSS 5 SITES IN FRANCE, WITH 114 STAFF MEMBERS**

**A LARGE NETWORK OF French and international industrial and academic PARTNERS**

**INTERNATIONAL RECOGNITION**
An International Atomic Energy Agency (IAEA) Collaborating Centre

**A SOCIAL AND ETHICAL COMMITMENT**
The INSTN Foundation sheltered by the Fondation de France

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**1,100 students per year, including 300 apprentices and 30% international students**

**7,900 trainees per year, in continuing professional training programmes**

**1,600 PhD students conducting research with the CEA**

**1,300 teachers, trainers and experts**

**46 certifications, diplomas and degrees from High School leaving level to 7 years’ Higher Education**

**9 ATC Partner apprentice training centres**

**95% pass rate for degrees, diplomas and professional certifications**

**85% of graduates find employment within 6 months**
INSTN has been supporting the French nuclear industry for over 60 years, and continues to do so by listening to our partners and clients in order to continually adapt to their needs. Today’s nuclear industry must address several key challenges: maintaining competences at a time when many current members of the workforce are approaching retirement, integration into a broader energy mix, and continuing the trend of previous years, a rise in the nuclear applications in human health. This is why our Institute is now focusing on three key areas: industrial applications of nuclear energy, nuclear applications in human health and low carbon energy systems.
AN OFFER FOCUSED ON THREE KEY AREAS

INDUSTRIAL APPLICATIONS OF NUCLEAR ENERGY

Graduates increasingly adapted to the needs of industry, new training courses integrating digital developments and new research practices, ongoing modernising of education and training... In 2018, INSTN has been working on all these fronts to meet the needs of the nuclear industry.

CADARACHE

ITER Project: integrating Beryllium risk

As one of the world’s most ambitious science projects in the field of energy, the ITER project is paving the way for future fusion power plants. As Beryllium is used in the plant, ITER Organization asked INSTN to develop and provide specific training for their employees.

What are the challenges of developing a Beryllium risk training course for ITER Organization?

René Raffray: We use several Beryllium-based components in the ITER project, including the manufacture of the 440 panels which will cover the walls of our machine. These panels, which are currently manufactured in Europe, Russia and China, will be delivered to the site from the end of 2024. As of now, this calls for specific training for those of our staff who will be visiting our suppliers’ facilities in order to ensure proper monitoring of their manufacturing process.

Why did you choose INSTN to develop this training programme? What was their role?

R. R.: The original training, delivered in England, needed updating in terms of format and focus in order to achieve a turnkey training programme, both for theory and hands-on practice, as well as providing a professional certification, covering Health, Safety and Environment (HSE) regulations and the specificities of the ITER project. We wanted to collaborate with a local organisation in order to deliver this training closer to our site. Considering experience and ability to develop training, INSTN seemed the most appropriate partner to respond to our requirements. INSTN’s involvement on the international scene has also strongly contributed to our choice. Since June 2018, we have trained about fifteen people through two sessions.

Has the training met your expectations?

R. R.: The responsiveness and professionalism demonstrated by INSTN has been particularly appreciated. The practical module, in particular, has been particularly valued. Allowing trainees to become familiar with the protective equipment, and to practice entry and exit of a Beryllium risk zone whilst avoiding contamination, simulated by phosphorescent dust, has greatly increased their awareness of the risks. This positive collaboration has resulted in training that is also of interest to our international partners.

THE RESPONSIVENESS AND PROFESSIONALISM demonstrated by INSTN has been particularly appreciated.

René Raffray
Section Leader / Blanket Section
ITER Beryllium Management Committee Chair – ITER Organization
The nuclear industry confirms their commitment

In 2018 INSTN’s flagship degree course, the Nuclear Engineering Masters Degree for specialised engineers (Génie atomique-GA), continue to received strong commitment from the nuclear industry. Focus on key events.

Designed to update job role descriptions and competences reference frameworks, in order to ensure that training is adapted to the needs of industry, the first Development Committee for Nuclear Engineering Training was organised by INSTN in March 2018. There was a strong presence and involvement of industry operators who have highlighted the importance of this training for the sector.

Inauguration of 64th intake by Framatome

On the 23rd of October 2018, Bernard Fontana, Chairman of the Executive Board and CEO of Framatome, gave the inaugural lecture for our Nuclear Engineering Masters Degree for specialised engineers. A speech in which Bernard Fontana emphasised the key place occupied by nuclear safety and security, as well as the challenges of competitiveness for the French nuclear industry in an international setting. “In order for the nuclear power sector to thrive requires us to carry out our job as industrialists and nuclear experts, with a motivated workforce”, he said.

Round table sponsored by Orano

Led by EDF, Framatome, Naval Group, and Orano, and sponsored by Orano, as part of the Graduation Ceremony for the 2017/2018 intake, the round table ‘Significant challenges for future engineers specialised in Nuclear Engineering’ brought together Jean-Paul Combemorel (EDF), Gilles Griesmar (Framatome), Thomas Paya (Naval Group) and Nathalie Hubert (Orano), sponsor of the intake. “The Nuclear Engineering Masters is unique in France, perhaps even the world; it provides in-depth understanding and awareness of nuclear safety,” said Jean-Paul Combemorel, EDF Center Val-de-Loire Regional Delegate.

FIVE INTERNATIONAL RESEARCH INSTITUTIONS TRAINED IN SODIUM RISK

In March 2018, as part of the partnership between the Sodium School and our Cadarache Training Centre, INSTN organised a specialised training course on the technology and operation of sodium R&D facilities. A total of 12 participants from research institutions including, CNEA (Argentina), ININ (Mexico), INL-DOE (USA), HZDR and KIT (Germany) followed theory courses, visited the facilities of the research platform for liquid metals, PAPIRUS, and did practical work on the SUPERFENNEC School test loop, as well as completing a practical drill on a sodium fire.

TRANSFERRING NUCLEAR CULTURE TO UAE INSPECTORS

In 2016, INSTN and the United Arab Emirates’ Federal Authority for Nuclear Regulation (FANR) signed a cooperation agreement for the training of their nuclear safety inspectors. After two successful initial training courses in 2017, in November 2018 INSTN organised, the training course ‘APR 1400 - Operation and Safety Principles’, in Abu Dhabi. Objective: to transfer fundamental knowledge on these Korean technology reactors, of which four units are currently under construction in the United Arab Emirates. A new demonstration of the scope of our offer and international reach.
NUCLEAR APPLICATIONS IN HUMAN HEALTH

Nuclear Medicine is a growing sector. Practices are developing rapidly requiring ongoing updating of practitioner competences. The field is developing worldwide, especially with support from the IAEA\(^1\). In 2018, INSTN also contributed to this development, in particular as an IAEA Collaborating Centre. \(^{[1]}\) International Atomic Energy Agency.

MEDICAL PHYSICS

DQPRM: a high quality professional training course

Created in 1997, the Radiological and Medical Physics Diploma (DQPRM) trains future professionals, at INSTN, specialising in medical radiophysics for radiotherapy, nuclear medicine and imaging services in the public and private hospitals sector. Brian Baron is one of the students from the 2019 intake of this unique training programme in France.

Why did you choose INSTN’s DQPRM programme?  
Brian Baron: After completing a Bachelors followed by a Masters Degree in Applied Physics, specialising in Medical Physics, the Radiological and Medical Physics Diploma was a logical next step in my career. So I came to INSTN, which is the only institution delivering this degree. I started the advanced diploma in September 2017.

What do you think the strengths of this training are?  
B. B.: Firstly, its professional focus. Students are quickly placed in a professional working environment. As the course alternates theory classes and long internship placements, it allows students to acquire hands-on practice in the work place. Another strength is the diversity of its teaching staff: research lecturers, health professionals and medical physicists from all over France. It is an excellent opportunity for us to have direct contact with these professionals and learn from their experience.

What are your future career plans?  
B. B.: I am currently finishing my internship at Institut Curie, after which I will be looking for a job in the Paris region. I am optimistic about the rest of my career as this qualification is highly sought after by the hospital sector.

MEDICAL PHYSICISTS TRAIN ON DOSEO

Cutting Edge Training — In 2018, Doseo, CEA’s radiotherapy and medical imaging technology platform, launched a training programme for medical physicists. Managed by INSTN, it has trained some forty professionals in new areas related to medical imaging and radiotherapy. The programme: one-to-two-day training courses which replicate professional practices as closely as possible, providing opportunities to interact with CEA experts and update knowledge, through practical work carried out on the platform’s equipment.

Doseo, a unique platform in Europe — Located in Saclay, Doseo is a 1000m\(^2\) technology platform at the forefront of innovation. At the centre of key societal issues, radiotherapy, which is becoming increasingly personalised and targeted, is an integral part of medicine for the future, aiming for improved patient care. Doseo provides an excellent opportunity to combine research and training.
Strengthening Energy Sector Competences

Signed on the 18th of September 2017, at the IAEA General Conference in Vienna, the partnership between INSTN and CNESTEN focuses on the joint development, over three years, of training in the fields of radiation protection, dosimetry, metrology, non-destructive testing, medical physics and radiopharmacy. Located in Rabat, CNESTEN is a public scientific and technical research institution.

Joint development of training, particularly in the field of Nuclear Applications in Human Health, is the objective of the agreement signed between CNESTEN and INSTN. Since then, INSTN has developed specific Radiation Protection training for CNESTEN, focused on the Dosimex code.

Looking to develop the competences of their trainers in the field of radiation protection and, more specifically, calculations of the doses generated by ionising radiation and radiological risk, CNESTEN asked INSTN experts for an initial training programme covering the Dosimex training pack tools. These codes cover a wide range of radiological exposure situations and enable estimation of gamma, X-ray, beta and neutron dose rates with optimum reliability depending on the nature and activity of the sources and materials present. Taking place over five days in Rabat in September 2018, the session trained 12 CNESTEN experts. It is the first project under the cooperation programme between the two institutions.

French Healthcare, which INSTN joined in 2018, brings together companies, health institutions, and research and training institutes in France, looking to promote their activities internationally. Created by the French Ministry of Europe and Foreign Affairs, the role of this new organisation is to develop the influence of French expertise and technologies in the health sector. INSTN has chosen to become more involved in the specialty of ‘cancer’, and we are looking to develop specific training projects in this area.

As part of INSTN’s collaboration with the IAEA, in 2018 we welcomed four African students, for a period of nine months, onto our Radiological and Medical Physics Diploma (DQPRM) and Radiopharmacy and Radiobiology Diploma (DESC). These students from Benin and Ivory Coast then completed practical internships at the SHFJS or at French Comprehensive Cancer Centres (FCCCs). They are now contributing to the development of Benin’s first nuclear medicine service and the opening of the Abidjan Oncology Centre.


[3] Frédéric Joliot Hospital – Service hospitalier Frédéric Joliot – CEA-JOLIOT.
LOW CARBON ENERGY SYSTEMS

The French energy sector is set to transform itself in the coming years. INSTN is supporting this transformation by training new graduates who are able to adapt in this rapidly developing sector. Our Institute’s close relations with CEA laboratories also allow us to offer training courses in the field of new energies.

ENERGY TRANSITION

EEET Masters: a double technical and economic qualification

As part of the energy transition, INSTN supports the CEA in its commitment to developing future sectors related to low carbon energy systems. Our Masters in Environmental, Energy and Transport Economics (EEET – M2 Energy Economics), allows students to cover the technical and economic aspects. A double qualification which is highly sought after by companies.

What are the objectives of this degree course?
Sanaa Sirven: The significant energy and environmental changes of recent decades, and their impact on the global economy, require training of analysts, economist engineers and expert researchers, who can develop strategies and respond directly to the research and development needs of the energy sector’s industries.

Who is involved in this course?
S. S.: This degree course is delivered by several institutions of Université Paris-Saclay – INSTN, CentraleSupélec, AgroParisTech – in partnership with Université Paris Nanterre, IFP School, École des Ponts ParisTech, ENSTA ParisTech, Mines ParisTech, and École Polytechnique.

What competences do students acquire by the end of the course?
S. S.: They are multiple and aim to enable students to be operational as soon as they graduate: techno-economic analysis of energy sectors, integration of energy systems, conducting and interpreting prospective studies, evaluation of costs, benefits and strategic choices of an energy policy, project management and low carbon energy risk management, management of energy production, consumption and distribution activities.

And what are the jobs and sectors that graduates can work in?
S. S.: Project manager in the various energy sectors, strategic and financial advisor within a company, energy management at the local level, engineer/economist in a consulting company or a government agency, expert in environmental and energy issues with national or international institutions...there are many career opportunities.

3 programmes are offered:
A specific curriculum is also offered to apprenticeship students.
MTI Masters: Number 1 Masters in Innovation Management

With the growth of new technologies and increasing international competition, innovation management is becoming a strategic focus for companies and a key issue for their competitiveness. Delivered jointly by INSTN, Université Paris Dauphine and Mines ParisTech, the Technology and Innovation Management (MTI) Masters trains future key professionals in the intersection between research and industry.

For the sixth year running, the MTI Masters has been ranked number one in France in the Innovation Management category, by Eduniversal, ahead of other top institutions. It is distinct in terms of who takes the course, half of whom are scientists – science and engineering students, professional scientists and engineers, doctors – and the other half of whom are graduates from finance, management, marketing, legal, HR or political science sectors.

Real operational projects for companies

Another strength of the course: completion of strategic consulting student projects in laboratories, organisations, start-ups and companies. Among the projects carried out as part of the MTI: technological prospective analyses for the CEA on SMR (Small Modular Reactors), smart grids and photovoltaic house-car coupling, development of business plans for start-ups based on the Plateau de Saclay, in Paris or within the Génopôle, as well as innovative design projects for the RATP and SNCF.

Learning expedition to Brazil

As part of the course, and with agreement from the supervising organisations, students organise an annual study trip to analyse innovations in an international setting. In 2018, they chose Brazil. On the programme: numerous visits of companies in Rio and Sao Paulo.

PROVIDING THE KEYS TO ENERGY POLICY

Specifically designed by INSTN for CEA managers, the training course, ‘Sustainable Energies’ aims to cover all areas on the topic of energy, from technical, economic, and geopolitical to scientific aspects. A highly appreciated multidisciplinary approach allowing trainees to understand a rapidly developing sector, as well as the more specific strategic orientations of the CEA.

MOBILITY USING HYDROGEN, A PROMISING OPPORTUNITY

As part of INSTN’s integrated vision of energy systems, we offer training on the entire value chain related to the use of hydrogen as a source of energy. Thanks to its close links with CEA-Liten, a key player with solid expertise in applications such as transport and construction, our Grenoble Training Centre offers training ranging from hydrogen production, to storage and use (fuel cells), as well as its limitations and associated risks. The Grenoble Training Centre has responded to specific requests for training sessions for individual companies in France and internationally, and also offers inter-company training.
SUPPORTING THE ENERGY SECTOR

Supporting the energy sector, supporting its employment strategies and maintaining its competences, are the focus of INSTN’s projects. With this in mind, we continually update our Institute’s Education and Training offer, as well as offering an extended range of business services, both in France and internationally. These projects are supported by strategic partnerships with key players in the sector.

Education and Training adapted to competences

In order to ensure that INSTN’s Education and Training courses correspond to the needs of the sector, and following educational methods focused on competences, we now involve industry and employers in the development of our training programmes. In 2018, this was the case for the updating of our job role descriptions and competences reference frameworks for our Nuclear Engineering Masters for specialised engineers, for which the leading professionals in the sector were brought together on a Development Committee.

Another key project for our Institute was the update of our Radiation Protection programmes. Similarly, INSTN is strongly committed to supporting recruitment by providing training for jobseekers. This commitment has been put into action in 2018 through projects with Nuvia, AFPA, APAVE and the French Job Centre (Pôle Emploi).

An extended range of services

In order to respond to the sector’s competence needs and recruitment issues and to ensure ever increasing efficiency and performance, INSTN offers a wide range of business services in addition to our Education and Training activities. This mainly comprises support identifying job developments, defining the competences required and in developing adapted training. Other approaches are also offered: support for maintenance and transfer of knowledge following a knowledge management approach, training of trainers, as well as hallmarking of partner training programmes, as was the case for Assystem in 2018.

Extending our international support

Consistent with INSTN’s support for the CEA and the sector, we provide services outside of France. A recent example is the cooperation agreement signed with Senegal in 2018, as part of the creation of a Centre of Excellence for Nuclear Science and Technology. INSTN is contributing to the definition of competences, the development of training and the training of future professionals for research activities and nuclear applications in human health. Our Institute is also active in India, the United Kingdom, the United Arab Emirates, Africa (Maghreb and South Africa) and Southeast Asia.

By XAVIER PERRETTE
Head of Development and Partnerships Department – INSTN

5 new partners in 2018
Orano, Framatome, TechnicAtome, Kedge Business School, HYLIAD Distribution

A TOTAL OF 30 partnerships with energy sector companies
What are the key objectives of the Foundation? Bruno Lancia: INSTN Foundation, sheltered by Fondation de France, focuses its projects and funding on four aims: to contribute to the creation of Teaching Chairs, to contribute to improving life conditions for students, to finance the development of educational tools and facilities, and to participate in transferring knowledge about energy issues to students, professionals and the general public. It is essential that lessons be innovative and adapted to the digital environment, and that competences be maintained at the highest level. This is INSTN’s role and the Foundation is here to support them in this process.

What are your objectives for the Foundation? B. L.: Set up by INSTN and three industrial partners – Nuvia, Apave and Assystem – the Foundation has been up and running for over two years now. It is time to integrate new partners in order to provide more funding and allow us to develop our objectives and extend our outreach. Another subject that is important to me is supporting the attractiveness of our Education and Training programmes for international students. It is through spreading French culture, the French nuclear approach and model, that we will contribute to the deployment of French nuclear technologies internationally. It is the future of the nuclear industry that is at stake.
SUPPORTING THE ENERGY SECTOR

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RADIATION PROTECTION TRAINING PROGRAMMES

Nuvia and INSTN team up for jobseekers

The Marcoule Training Centre now offers a training course in Radiation Protection for Nuvia Group, focused on supporting people who have been out of employment for some time in their return to work. Specifically designed for jobseekers, in 2018 this certification course supported around twenty people in their conversion to the radiation protection profession.

What are the aims of this partnership between INSTN and Nuvia Group?

Jérôme Videcoq: The main need for Nuvia Group, and the reason for this training course, is to better equip two of its business divisions, Nuvia Process and Nuvia Prévention, in Human Resources in order to respond to requests from different industry operators, in particular EDF, Orano and the CEA. For INSTN, the aim is also to support the professionals of the sector, to focus on professional insertion of jobseekers and to participate in the creation of wealth and jobs in the region.

What are the stages of this training course?

J. V.: The first step for Nuvia is the recruitment of future trainees from the region’s Job Centres. We then developed an eight-month certificate course together, alternating training periods within our Training Centre and periods of practice within the different business divisions of the Nuvia Group. This course includes the First Level in Radiation Protection (PNR), Competent Person in Radiation Protection (PCR) training programmes, and a fast track training programme for workers required to carry out specific projects for the Group’s industrial partners. Eleven people were supported during a first session organised in the first semester of 2018, and a further twelve people during a second session at the end of the year.

Can this type of course be of use to other partners?

J. V.: For eight years now, we have been organising a First Level in Radiation Protection certificate course for jobseekers at the request of the Gard Employers’ Group for Employability and Qualification (GEIQ). This is done in partnership with Orano, who contribute to the programme by receiving trainees on-site for one year. Our aim is to encourage the return to work of people with disabilities or social difficulties. We also have requests from Orano DS and will be renewing our partnership with Nuvia in 2020. These projects are part of a more comprehensive approach to supporting the return to work in the local industrial regions of each INSTN Training Centre.

For INSTN, the aim is also to SUPPORT THE PROFESSIONALS OF THE SECTOR, to focus on professional employability of jobseekers and to participate in the creation of wealth and jobs in the region.*

Jérôme Videcoq
Centre Deputy Head/Course Manager – Marcoule Training Centre
Focused on new generations of processes for synthesising and integrating advanced materials for industry, the IMPACT Chair aims to promote research on non-polluting processes for manufacturing 2D and 3D materials. Its innovative nature lies in the development of a set of technological components enabling the use of autonomous and robotic synthesis machines integrating artificial intelligence approaches, in order to optimise complex processes, as well as the use of development and characterisation tools, to enable rapid screening of new materials.

A synergy between teaching, research and industrial applications

Designed as a partnership between professionals from research, education and training and industry groups, IMPACT aims to develop joint research programmes at CEA laboratories, academic partners and industry teams, and organise seminars and International Schools bringing together international experts from the discipline.

A project supported by INSTN Foundation

As part of its philanthropic activities, INSTN Foundation, sheltered by Fondation de France, supports this Chair by funding the exchange programme for second-year Masters (M2) and PhD students whose professional project matches the Chair’s research topics. These scholarships are awarded following specific criteria, with priority given to programme applicants with an excellent academic performance record and a relevant professional project.

MATERIALS MANUFACTURING

IMPACT: international Chair for development of innovative processes

International Research-Teaching Chair, IMPACT, for ‘Innovative Materials and Processes Accelerated through Computing Technologies’ was established in 2018 as part of a scientific partnership between INSTN, the Mecachrome Group and the Dephis start-up, with the support of Framatome, Safran and NTU Singapore.

FOCUS ON COMPETENCES IN NEW RADIATION PROTECTION COURSE

In 2018 we continued to redesign INSTN’s Radiation Protection training programmes following a competences-based approach. As such, our Institute has set up a project group bringing together professionals from the sector to develop new competences reference frameworks for the first three levels of training:
- First Level in Radiation Protection (PNR),
- Radiation Protection Technician (TR),
- Advanced Technician (BTS) in ‘Ionising Radiation Control and Applying Protection Techniques’ (CRIATP). This overhaul was implemented for the Radiation Protection Technician training offered at our Cadarache and Cherbourg Training Centres.

CONCRETE DURABILITY: A SAFETY ISSUE FOR NUCLEAR POWER PLANTS

The safety of nuclear power plants, their operating life and performance, are closely related to the behaviour of the materials used in their construction. In order to anticipate the effects of aging, INSTN and ITech, EDF Group’s training institute, have developed training on the ‘Durability of concrete structures in Pressurised Water Reactors’. On the programme: the different conditions, means of detection and visit of the VeRCoRs ² facility on the EDF Lab site, a 1/3 scale reactor building, unique in the world.

[1] Institute for Technology Transfer – Institut de transfert des technologies
**What is the framework for collaboration between INSTN and these two Indian educational institutes?**

**Paul Livolsi:** As part of the partnership agreement between CEA and the Indian Department of Atomic Energy, INSTN has been, since 2017, in discussions with the main academic and professional training institutions in the country, including HBNI, specialised in degree courses, and GCNEP, focused on continuing professional training. This collaboration with two key institutions that provide training for technicians, scientists and engineers, and PhD researchers for the country’s research centres and industry, is part of a strategic nuclear programme, including the construction of new nuclear power plants in India, such as the Jaitapur Project. The challenge for India, which has a very strong nuclear culture, is the development of new competences for French technology with safe and sustainable integration of nuclear energy.

**What are the first projects undertaken with HBNI?**

**P. L.:** Following the collaboration agreement signed for three years between INSTN and HBNI on the 20th of September 2018, a first training course on the topic of severe accidents was developed. This project, developed as part of the Sarnet network, will be delivered in Cadarache by Indian, French and European experts, for a fortnight in September 2019. This is the first project undertaken as part of this new partnership. It will enable us to get to know each other’s Institute better, before jointly developing education and training on the identified topics: nuclear safety, materials, medical physics, radiobiology, radiation protection, medical imaging and nuclear medicine.

**At what stage is the partnership with GCNEP?**

**P. L.:** The collaboration agreement between INSTN and GCNEP will be signed in 2019. It will cover a dozen topics, including nuclear safety culture, safety of sources and transport of radioactive materials. The aim of this partnership is also development of common training actions, as well as the sharing of our experience and expertise in Education and Training.

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INSTN SUPPORTS ALGERIA IN MEDICAL PHYSICS

It is within the framework of a cooperation agreement between COMENA\(^1\) and CEA that the Algerian Institute for Nuclear Engineering Training (IAGN) asked INSTN to develop a national reference database of training in medical physics. Experts visited IAGN in February 2018, with the support of the IAEA\(^2\). A training course, in the form of an Autumn School, was also organised in Algiers in November. Aimed at Algerian, Tunisian and Moroccan professionals, it focused on developing competences in Monte Carlo calculation codes. A productive collaboration that will lead to other projects of this type in the coming months.

\(^1\) Algerian Atomic Energy Commission. 
\(^2\) International Atomic Energy Agency.

HACKADEM: FIRST DIGITAL HACKATHON FOR DECOMMISSIONING

On the 21st of September 2018, 90 science students in their final year at the Albert Einstein High School in Bagnols-sur-Cèze (Gard) came together for the first digital hackathon for decommissioning in Marcoule. A creative process used in digital innovation, this tool allowed these students, coached by five regional start-ups and CEA experts, to learn about the problems, professionals and innovative solutions in the cleanup-decommissioning sector. An educational innovation helping students to discover the depth of these jobs and a success paving the way for many future editions.

FRANCO-BRITISH AGREEMENT

Cooperation focused on nuclear skills development

World leaders in nuclear energy, France and the United Kingdom require advanced skills for their respective nuclear programmes. The authorities of the two countries, met at the Franco-British Summit in January 2018, making the topic of skills a priority for their cooperation.

Following on from the agreement signed with NSAN\(^1\) in 2017, INSTN’s counterpart in the field of Education and Training in the United Kingdom, we were asked by the NSSG\(^2\), an organisation which brings together the main employers in the nuclear sector, government bodies in charge of skills development and representatives of the nuclear industry’s social partners, to collaborate on development of strategic skills in the UK and France.

Two seminars in Paris and London

In 2018 two seminars were jointly organised by the NSSG and INSTN, one in May at the British Embassy in Paris, then another in November at the French Embassy in London. Focused on innovative approaches to nuclear skills and bringing together the key players in French and British civil nuclear power, their objectives were to identify key issues and outline the lines of cooperation between the two countries. Joint actions in terms of attractiveness of the sector to young people, developing skills and maintaining expertise, reciprocal recognition of training and certification courses, and promotion of diversity have been planned.

Strengthening collaboration in 2019

These initiatives will continue into 2019, as part of the Strategic Contract for the nuclear sector, the result of the work of the CSFN\(^3\) and GIFEN\(^4\). Particular attention will be paid to achievement of concrete results and real progress for skills and cooperation between the United Kingdom and France in the field of nuclear energy.

\(^1\) National Skills Academy for Nuclear. 
\(^2\) Nuclear Skills Strategy Group. 
\(^3\) French Nuclear Sector Strategy Committee – Comité de pilotage stratégique de la filière nucléaire. 
DEVELOPING DIGITAL AND EDUCATIONAL INNOVATION

In order to respond to the transformation taking place in the nuclear sector and resulting competences needs, and to support developments in society’s knowledge and use of energy, in 2018 we continued with INSTN’s ambitious educational and digital innovation programme. Our main focus has been to adopt a competences-based approach and move forward with digitalisation of our Education and Training.

Competences-based educational approach

Initiated in 2017, this educational transformation, concerning both degree and continuing professional training, aims to develop a range of services and training programmes focused on the acquisition of competences by learners, in order to improve their employability. Based on the analysis of professional needs, this approach consists of defining learning outcomes and associated training objectives, and then developing the methodology for implementing and evaluating training. At the centre of this approach: competences needs of industry, as well as learners, to improve the performance of offered courses. This development was strongly supported internally by an expert in Education and Training who, in conjunction with the training, quality and digitalisation managers, coordinated the process by ensuring, in particular, the coherence of all of the degree programmes and continuing professional training provided by our Institute.

Digital support for acquiring competences

In order to promote this new educational approach, and in particular the transfer of training course content and

FOCUS

TE(A)CH LAB: AN OPEN SPACE FOR EDUCATIONAL CREATIVITY

A blackboard for expressing and drafting ideas in colour, a video projector and telepresence and videoconferencing equipment to facilitate meetings, continuous access to the Instart Learning Experience platform, tablets and virtual reality headsets available for role play... welcome to the Te(a)ch Lab, a new educational innovation space, developed at our Saclay site, specifically to encourage the creativity of our educational teams. «Its goal is to bring education and training and digital technicians together in a single place, where they can develop courses following the competences-based approach and incorporating new digital uses,» explains Vincent Minier, Chief Digital Officer at INSTN. This space will soon host an audiovisual editing station and educational scenario.
assessments of acquired skills. INSTN has been investing in innovative digital tools. There are multiple objectives: to make the learner responsible for their own learning, to personalise their training and to facilitate the collaborative experience between learners, to provide a variety of learning experiences and to adapt to new mobile uses.

With this in mind, INSTN offers distance learning and e-learning for basic or procedural knowledge, as well as offering face-to-face and virtual, via serious games, case studies and role plays for acquiring more specific competences. Key innovations developed in 2018 include: development of MOOCs¹ and SPOCs², launch of the EVOC (Enhanced Virtual Open Core) multimodal education platform, and launch of the Instant Learning Experience platform, a Learning Management System (LMS) designed to deliver the educational materials of INSTN degree and training courses in all their forms – videos, online tests, virtual classroom, adaptive learning – for distance use, face-to-face and flipped classrooms.

¹ Massive Open Online Course.
² Small Private Online Course.

nuclear reactor simulators
C-PWR
SOFIA
SIRENa

Site Training Schools (chantiers-ecoles)
Cadarache
Cherbourg-Octeville
Marcoule
Saclay

1 multimodal education platform
EVOC

1 3D immersive room
VERT

1 LMS platform
INSTANT LEARNING EXPERIENCE
DEVELOPING DIGITAL AND EDUCATIONAL INNOVATION

EVOC: launch of multimodal platform a world first

Launched in June 2018 at the 3rd World Nuclear Exhibition (WNE), the EVOC (Enhanced Virtual Open Core) virtual education platform focuses on nuclear reactor physics training. The result of collaboration between INSTN and CEA, this innovation is an ambitious project that brings our Institute into the digital age.

How does the EVOC multimodal platform work?

Isabelle Bailly: It has several tools: a physics simulator, a virtual reality immersion system, a control room and a classroom equipped with the latest educational innovations. The first students to have used it were separated into two groups. The first group worked on the practical work hall, working together to carry out real manipulations inside the virtual reactor. The second group observed and operated the reactor from the control room. The two groups were reunited in the classroom to compare their calculations and share feedback on their practical experience.

What are its key advantages?

I. B.: It provides our learners’ with an excellent opportunity to develop their competences in a safe and secure environment. The facility replicates the nuclear environment without associated constraints. They can learn about physics phenomena through carrying out standard operations (putting in place reactor core components, reactor operation). The simulator manages changes to the parameters corresponding to the manipulations in real-time. The students can practice in a setting where they are allowed to make mistakes. Instructors can then validate attainment of key competences.

And what future developments are envisaged?

I. B.: Although this platform was originally intended primarily for our students, we quickly realised its potential for use in continuing professional training programmes. We also plan to offer it internationally.

INSTART LEARNING EXPERIENCE: INSTN’S NEW ONLINE PLATFORM

An online training platform — Designed from a software solution provided by FUN – France’s Online University – the Instant Learning Experience platform is a key element of our Institute’s digital transformation. Put online in 2018, it hosts the educational material of INSTN’s and our partners’ degree and training courses. All types of content are hosted: videos, documents, course materials, online tests, virtual classroom or adaptive learning. It can be used in distance learning, in the classroom or the flipped classroom.

For life-long learning — By offering initial education modules for INSTN degrees, continuing professional training modules, short-course training modules, and permanent training modules, the Instant Learning Experience platform answers to the need for life-long learning.

Go to
The competences-based approach for training of Plant Safety Officers

Promoting long-term employability in a time of continual change is the main objective of the competences-based approach. In order to achieve this, it strengthens learners’ ability to combine knowledge and competences in solving complex problems in professional situations. It relies, in particular, on active learning in practical situations, supported by innovative digital media.

Redesign of the ISI course
At CEA’s request, the redesign of the ‘Plant Safety Officers’ course was based on this approach, with the aim of reinforcing learning, certifying competences and responding to the range of learner profiles. As such, INSTN developed a multimodal course with personalised blended learning, combining face-to-face training on the prevention of risks, CEA procedures and equipment and e-learning training on the sources of danger and risk. The new training modules will be completed by INSTN, working with the CEA, in 2019.

E-LEARNING: NEW SPOCS

As part of INSTN’s digital transformation, in 2018 we continued to run two SPOC projects. The first SPOC, ‘Recycling Chemistry’, launched in 2017 with the CheMISyst LabEx, has been expanded with three new modules. Open to PhD students and taught by professors from the universities of Montpellier and Regensburg (Germany), ICSM² and CEA, it is available on Instant Learning Experience, our Institute’s new online platform. The second SPOC, for Nuclear Engineering students, is focused on the fundamentals of thermohydraulics. Developed in 2018, it was put online and successfully tested by students during the summer.

Tell us more about the Numerics programme.
Jean-Luc Zimmermann: Numerics is a new funding programme, in addition to existing PhD financing programmes. It focuses on PhD work with a significant research component in the fields of numerical simulation and artificial intelligence, cross-cutting areas of interest to many CEA laboratories. As part of the European 'Marie Sklodowska Curie Actions', it also requires a high mobility of selected PhD students, who must not have lived in France for more than twelve months in the last three years. It has significant support from the European Union having secured €3.9 million in funding over five years from the Horizon 2020 programme.

Why is this European Union accreditation important?
J.-L. Z.: The Horizon 2020 programme is very selective and very prestigious. The awarding of this funding demonstrates the recognition, by European bodies, of the quality of training through research carried out by CEA laboratories, with support from INSTN, and their support towards professional employment. It also gives us a strong presence internationally, allowing us to recruit PhD students worldwide. As part of this programme, four PhD students were recruited in 2018 for three years of research. We expect to recruit twenty in 2019 and twenty-five in 2020, most of whom will be foreigners.

What is the role of INSTN in this programme?
J.-L. Z.: Recruited PhD students work within CEA laboratories. INSTN coordinates the selection of candidates, as well as the implementation of the doctoral training programme. Numerics provides cross-cutting services required for welcoming young researchers to the CEA, which were originally set up by INSTN with the Eurotalents (2009-2013) and Enhanced Eurotalents (2014-2018) programmes. This coordination also allows PhD students to benefit from the professional training developed by our Institute. Among the proposed topics: how to build a bibliography, write scientific articles, train for your oral defense and manage your PhD as a project.
Strengthening Energy Sector Competences

Following a complete audit of activities carried out throughout the 2018, this accreditation marks a turning point for INSTN, in particular as it allows us to offer Specialised Masters, professional post-Masters level training particularly adapted to the needs of the energy industry.

A prestigious recognition

“Joining the Conference of Grandes Écoles is a great collective success as it means that all of our practices and our model have been viewed positively by the auditors,” says Eric Gadet, Interim Director of INSTN. Our professional teaching, significant use of digital technologies, and our openness to business and internationally have been key. “Our goal is to support the performance of the nuclear and energy sector in the wider sense, to meet its competences needs, and to support our students in their long-term employability. Joining the Conference of Grandes Écoles is an important step.”

Founded in 1973, the Conference of Grandes Écoles is a leading French Think Tank, which is actively involved in discussions on Higher Education. It is also an accrediting body for training – Specialised Masters, Masters of Science, BADGE, CQC – for its members, it attests the quality of the programmes and ensures that its fundamental principles are adhered to, which comprise excellence, employability and international openness.

Approved on the 13th of November 2018, INSTN’s membership of the Conference of Grandes Écoles (CGE), an association for French Science and Engineering Schools, attests to the quality of higher education offered by our Institute, particularly for our science and engineering degree training in Nuclear Engineering, as well as opening up new perspectives.

ELINDER PROJECT: INSTN ACCREDITED BY EUROPEAN UNION

Developed by the European Commission to promote high quality training and the attractiveness of decommissioning professions, the ELINDER project is part of the response to a major need in terms of competences due to the aging of nuclear facilities. In June 2018 our Marcoule Training Centre, which specialises in this field with over a dozen training programmes offered, is the first training organisation to receive the ELINDER label for the ‘Introduction to Decommissioning’ training for professionals in the sector. A guarantee of quality and a prestigious recognition.

(1) European nuclear decommissioning training program.

MARCOULE TRAINING CENTRE IN THE SPOTLIGHT ON JAPANESE TELEVISION

On the 13th of June 2018, our Marcoule Training Centre was honed by the Japanese TV Channel NHK, as part of a report on the decommissioning of French nuclear sites. Highlighting the importance of training in decommissioning, the increased use of digital tools in this field and the role of France as a leading player, this report showcased the nuclear facilities located on the CEA Marcoule site, in particular, the Présage immersive room, as well as the practical work carried out at INSTN’s Site Training Schools (chantiers-écoles).

You find the full report on INSTN’s YouTube channel.
OUTLOOK 2019

MAKE
INSTN a key player in the development of competences in the energy sector

BUILD ON
INSTN Foundation’s role in supporting the energy sector

COMMIT TO
international development in line with needs

STRENGTHEN
an offer for safe and secure operation of facilities

SUPPORT
the use of low carbon energy with an extended training offer

DEVELOP
educational methods focused on the competences-based approach

CONTINUE
with digital and education innovation

FURTHER DEPLOY
training in Project Management
INSTN would like to thank all those who have kindly contributed to our Annual Report 2018.

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