TRAINING IN NUCLEAR TECHNOLOGY IN AN ANTI-NUCLEAR ENVIRONMENT

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ABSTRACT

The 250 kW TRIGA Mark II reactor operated by the Atomic Institute is now the only nuclear facility in Austria. Although Austria follows a dedicated anti-nuclear policy the Atomic Institute enjoys a relative undisturbed nuclear freedom in its nuclear activities. This allows to use the research reactor not only for academic training but also for international training course especially in nuclear technology. Typical examples of periodic training courses are

- Courses for junior IAEA safeguards trainees
- Courses for staff of the NPP Bohunice and NPP Mochovce (Slovak Republic)
- Courses in cooperation with the University of Manchester for NTEC students and junior professionals

The presentation will outline typical training programmes and summarize the experience with international training courses.

2. National Activities

Since its initial operation the Atomic Institute of the Austrian Universities was founded as an inter-university institute where students from all Austrian universities may carry out their post-bachelor specialisation in the fields of

- Neutron- and Solid State Physics
- Nuclear Technology
- Radiochemistry
- Low Temperature Physics
- Radiation Protection
- Nuclear- and Astrophysics
- X-Ray Physics

According to the university curricula students have to enrol a certain number of practical and theoretical courses to be completed with a practical Masters Thesis. Since that time the Atomic Institute of the Austrian Universities offers about 80 theoretical and 10 practical courses within the above fields. Especially two courses on "Reactor Physics and Kinetics" and on "Reactor Instrumentation and Control" attracted many students as they were trained directly at the TRIGA Mark II reactor. The students work in a group of 4-5 students, they have to summarize their results and a written test completes the course which is valued with 3 ECTS. A list of the exercises of the "Reactor Physics and Kinetics" is given below:

- Measurement of the thermal neutron flux density in the reactor core
- Measurement of the epithermal and fast neutron flux density in the reactor core
- Determination of the importance function and the void-coefficient
- Determination of the neutron absorption cross section according to the danger coefficient method
- Measurement of the reactor period
- Radiation protection around a research reactor
- Critical experiment
- Control rod calibration and determination of the core excess reactivity

- Sub-critical safety rod calibration
- Determination of the reactivity value of uranium fuel and graphite elements in different core positions
- Reactor power calibration and determination of the temperature coefficient of the reactivity
- Demonstration of a reactor pulse with different reactivity insertion

A list of the exercises of the "Reactor Instrumentation and Control" follows:

- Introduction into a typical reactor instrumentation
- Reactor safety principles
- Calibration of the nuclear channels
- Measurement of control rod drop times
- Neutron flux measurement with compensated ionisation chambers
- Fission chambers
- Self-powered neutron detectors
- Simulator program for PWR

Further practical courses offered at the Atomic Institute is "Radiation Protection" and "Radiochemistry".

In the years between 1972 and 1978 part of these courses plus some theoretical courses were integrated in the program of a Technical School to train technicians as future staff of the NPP Zwentendorf. After the negative referendum on 5.11.1978 this training was stopped but the regular students training at the Atomic Institute was not influenced.

However the strong Austrian anti-nuclear policy and the Chernobyl accident reduced the number of MS and PHD students in the nuclear field up to about 1995. Since the mid-90ties the number of students in nuclear technology is again increasing due to two facts:

- An increased cooperation with the IAEA
- The decommissioning of the 10 MW ASTRA reactor at Seibersdorf in July 1999

Also during that period bilateral cooperation with Czech Republic and Slovak Republic increased at an university level by student exchange and student group excursions, this fact will be important later in view of trans-national cooperation and knowledge exchange. Since the mid-90ties the Atomic Institute was also heavily involved in public discussions on Eastern European WWEER NPP's as the Austrian Government created a "Nuclear Forum" to support it's anti-nuclear policies against neighbouring countries. The Atomic Institute remained a scientific and technical centre of nuclear competence (1) which was strongly ignored by the Austrian media but highly appreciated as a discussion partner for New EU Member countries.

The strong ties between the Atomic Institute and the IAEA is reflected in many cooperation activities especially in soft- and hardware development for safeguards and security instrument development (2-11). In many projects the IAEA received high quality academic work and the students were supported financially by the IAEA. Some of the students were later employed by the IAEA due to their excellent scientific and technical knowledge.

3. International Activities

As first large international activity in nuclear education the Atomic Institute took part in the ENEN and NEPTUNO projects (12,13). In this context the Atomic Institute produced an extensive catalogue on all nuclear educational activities at European universities (14) which acts still as a very valuable document for follow up projects. Out of these cooperation

contacts with other European universities initiated and resulted typically in an international course between four universities (Bratislava, Budapest, Prague and Vienna) called the Eugene Wigner Course which is carried out since 2005. At this course about 15 students and young professionals rotate in groups of 5 between 4 universities carrying out practical exercises at 3 different research reactors. This course is also credited according to the Bologna agreement by the home universities of the students with 3 ECTS.

Another co-operation started in 2007 by signing a contract with the Dalton Institute/University of Manchester. Within the Nuclear Technological Education Centre (NTEC) two groups with maximum 6 students spend a week of practical training in reactor physics and kinetics and in reactor instrumentation and control at the TRIGA reactor of the Atomic Institute.

Further since a few years the Atomic Institute also cooperates with the TU Bratislava in the Slovak retraining program of staff members of the NPP Bohunice and NPP Mochovce. Groups of 4 staff members carry out a selected group of exercises from the above list during 3 days, in addition selected ppt presentation on subjects of interest are included. Another international co-operation is the participation at an EU project called Integrated Infrastructure Initiative for Material Testing Reactors Innovations (MTR+I3) (15) which is concentrated in the preparation of the operation and utilization of the Jules Horowitz reactor. The Atomic Institute has taken over the Work Package Leadership 2 on training of reactor staff in cooperation with Belgium, Czech Republic, France, Greece and Portugal. The program is subdivided into three task which deals with

- Define target groups for training and needs in the MTR field and potential candidates per year
- Training programs within the European Unions, strengths and weaknesses, information from European training programs in nuclear field (academic and practical) such as ENEN, NEPTUNO and Eugene Wigner course (multinational training course between Austria, Czech Republic, Hungary and Slovak Republic supported also by the IAEA)
- Define training programs adapted to the particular needs of the various target groups Integration of the MTR programs in the European training programs. Training program could be delivered in two complementary sites, new sessions dedicated to MTR in existing programs in order to attract young persons in the MTR field.

4. Conclusions

Although the Atomic Institute is located in a strict anti-nuclear environment both politically and supported by continuous negative media information, the Atomic Institute manages to carry out it's international contacts successfully even with an obvious increase during the past decade. It further helps to improve the international relations in the nuclear field by active co-operation even in spite of lack of national support.

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