

## **Report from TWGRR Annual Meeting 2008**

The Technical Working Group on Research Reactors (TWGRR) held its first annual meeting 5-7 February 2008, with 22 working group members and observers attending. This report contains the summary of the meeting presentations and discussions and includes conclusions on IAEA activities that may be considered by SAGNE in future meetings.

This first meeting focused on the initial development of the TWGRR, in particular

1. Clearly defining TWGRR's functions and scope
2. Determining a framework and agenda for the current and future meetings
3. Selection of a Chairperson
4. Briefings by staff on Agency programmes and budgets concerning research reactors under subprogramme D.2
5. Briefing by staff on Agency activities in research reactor decommissioning
6. Briefing by staff on current and proposed technical cooperation activities
7. Briefing by staff on the format of the Nuclear Energy document series
8. Review of draft questionnaire to be used prior to future meetings to determine agenda and topical presentations
9. Selection of five subgroups to gather information and prepare topical reports at the next annual meeting

### **TWGRR Functions**

The functions of the TWG on Research Reactors are:

1. To provide informal advice and guidance to the IAEA and to coordinate support in their countries for implementation of the Agency's programmatic activities concerning research reactor operation, utilization, nuclear fuel cycle (to include only fuel fabrication, use, storage, and shipping), maintenance, refurbishment, modernization, quality assurance, new designs and decommissioning;
2. To provide a forum for information and knowledge sharing on international and national research reactor programmes;
3. To disseminate information between the Agency activities and specific area and national scientific communities to deliver information between the groups;
4. To provide advice on preparatory actions (such as identifying interested or specific individuals) in Member States and the Agency's activities in planning and implementing coordinated research projects, collaborative assessments and other activities and to review the results of research reactor activities;
5. To develop and/or review selected documents in the Nuclear Energy Series, assess existing gaps and advise on preparation of new ones;
6. To identify important topics for discussion at SAGNE and contribute to status reports, technical meetings and topical conferences in the field of research reactors;
7. To provide support to Member States in order to improve and optimize the utilization of research reactors, in national, regional and extra regional contexts. When appropriate, to provide guidance in order to define actions for research reactors that have been placed in shutdown condition;
8. To identify relevant issues and topics which might increase cooperation among different research reactor centres, particularly in various regions of the world;

9. To encourage and facilitate regional and international collaborative programmes in the construction and utilization of research reactors and their nuclear fuel cycles, and to be a forum for discussion of issues related to impediments and challenges that can be faced by the concept of a regional research reactor park;
10. To propose the realization of events that will work as a forum for the exchange of information such as technical meetings, workshops, international symposiums and conferences;
11. To review and discuss the projected needs for research reactors on a global and regional basis with a long-term time horizon; and
12. To encourage participation of young professionals, as appropriate, in Agency activities.

TWGRR understands that research reactor safety and decommissioning activities are not specifically included within the scope and function of the TWGRR. Decommissioning is addressed by the International Radioactive Waste Technical Committee (WATEC) and Nuclear Safety is outside of NE Department. However, it is recommended that TWGRR be annually briefed on IAEA activities in these areas as they pertain to research reactors and be allowed to make recommendations and comments on these programmes .

### **Planning for next annual meeting of TWGRR**

Members of TWGRR have tentatively set the second week of February 2009 for the next scheduled meeting. A meeting of four days will be scheduled with an agenda that could allow early departure or conclusion.

The meeting will include one session on main developments in the field of research reactors and 4-5 topical sessions on specific topics.

Each session will be prepared by a rapporteur in cooperation with an IAEA technical officer. The IAEA recommended the use of a questionnaire to gather topical information prior to the next meeting and noted that the questionnaires are informal information gathering devices and would not be input into a database or published. The information will be presented in a short topical report. The individual topical reports will be no more than five pages in a MS PowerPoint format using bullet list for extraction into meeting minutes or submission as an overview document. In addition the IAEA will present its activities in the topical field.

Some members of TWGRR were concerned that TWGRR represented less than half of the Member States with research reactors and it was concluded that the members needed to be regionally proactive and obtain questionnaire input from non-represented facilities as necessary.

TWGRR chose to maintain the broad topical areas recommended by the Agency as being generic enough to cover all aspects of research reactor operations with the specificity coming from high interest topics identified by the questionnaire. A TWGRR member was assigned to each topical area to receive the annual questionnaires and prepare (with assistance from the subgroup members) a presentation for the annual TWGRR meeting. The five subgroups included individuals with interest and expertise in the following topics concerning research reactors:

1. Applications
2. Innovations (e.g. new reactors, modernization and refurbishment of old reactors)

3. Fuel cycle issues (e.g. non-proliferation, core conversions, fuel storage)
4. Operational issues (e.g. availability, reliability, maintenance)
5. Sustainability (coalitions, networks, regional centres of excellence)

An additional subgroup 6, called Other Topics, was assigned to P. Adelfang to address areas such as decommissioning that are not under the scope of TWGRR but may require a presentation during the annual meeting to update the members on current activities and high interest topics.

### **IAEA Current Activities on research reactor (RR) decommissioning**

TWGRR was given a presentation on current activities in support of RR decommissioning. TWGRR is concerned that long term fuel storage at reactors in extended shutdown under less than ideal conditions poses a significant radiological risk. This area should continue to be addressed by the IAEA by strongly encouraging facilities in abnormally long extended shutdown periods to decommission while experienced individuals are still available at the facilities to manage this activity. For many facilities, TWGRR recognizes that decommissioning is a one-time project and there is a significant need for knowledge transfer from facilities in advanced decommissioning status or from individuals experienced in the area of research reactor decommissioning. TWGRR supports the Agency activities via TC projects, workshops and technical reports to disseminate this valuable information to a wide audience but suggests that the individuals making the decision to decommission are not getting sufficient information on the long-term risk in remaining in a shutdown condition with poor control of the stored fuel and the social and economic benefits of decommissioning an under-utilized research reactor facility. Moreover, it was suggested that the Agency will establish a “high profile” permanent training program on decommissioning procedures, flexible enough to support various types of RR.

### **Technical Cooperation Programmes**

Members of TWGRR were given a briefing on Agency Technical Cooperation (TC) activities. The TC projects provide staff training through fellowships and scientific visits, expert services and equipment acquisition to recipient Member States. The TWGRR feels the TC programmes provide significant support to developing Member States and are important to the development of infrastructure and national programmes that have a foundation in safe and effective management systems. The TWGRR recognizes that the IAEA is a facilitator in establishing regional and extra-regional cooperative coalitions and the objectives of TC projects are primarily to transfer knowledge and not technical equipment. TWGRR was concerned that TC projects in some cases were not supporting a facility properly or implemented with good Member State oversight but Agency staff provided the clarification that a facility must have a strategic plan and strong government support before receiving a TC project. As a final comment, the TWGRR recommends that the so-called Zero Power critical facilities are included in future TC training programmes as useful facilities to benchmark existing and future neutronics codes.

### **Nuclear Energy Series Presentation**

The TWGRR received a detailed briefing on the concept and need for the Nuclear Energy series. TWGRR believes the Nuclear Energy series is an improvement in the preparation of a technical series but recommends the Agency investigate methods or procedures to improve the timelines from the initial data collection to the final published document. TWGRR is

aware of one document in the Management Systems covering quality assurance systems at research reactors that has not been issued over two years after the draft was submitted. TWGRR strongly believes the usefulness of technical documents addressing current issues is a function of the time it takes to get to the intended audience. TWGRR requests access to the nuclear energy and technical report draft documents and proposed documents to be aware of their status and scope.

### **IAEA Activities on Research Reactor Safety**

TWGRR received a presentation on the status of Agency projects supporting safety at research reactors. The members of TWGRR are very interested in the Agency support of safety and safety culture at Member States because an incident or poor performance indicators at one facility may reflect poorly on the individual facility as well as the entire research reactor community. TWGRR supports the current programme to regionally disseminate and discuss the Research Reactor Code of Conduct and the plans for the Agency to host an international meeting on the Code of Conduct in October of 2008. TWGRR is aware that there is a need for more training of regulators in Member States who may not be comfortable or qualified to perform safety reviews of research reactor modifications, experiments and decommissioning plans. Although research reactor safety is not currently within the direct scope of the TWGRR, the members recommend future regulatory workshops and TC projects that will strengthen the role and responsibilities of Member State regulatory bodies and facility safety committees.

### **Presentation of IAEA Subprogramme D.2, P&B 2008-2009**

The Agency Scientific Secretaries made several presentations to TWGRR on the 2008-2009 Programme and Budget for subprogramme D.2 on the first day of the meeting with a discussion by TWGRR occurring on the second and third day of the meeting. Specific comments and recommendations from TWGRR are included here for clarity and reference to the original P&B presentations.

#### **Project D.2.0.1 Enhancement of utilization and application of research reactors**

TWGRR recognizes the importance of Agency support for developing member states (MS) to increase the utilization of their research reactor facilities by developing networks that encourage collaboration with facilities in larger developed member states. The difficulty in obtaining input from MS for the Research Reactor Database (RRDB) seriously reduces the utility of the database and TWGRR supports the ongoing project to simplify the database input forms and the use of a secure web-based input mechanism. TWGRR recommends the Agency continue to solicit input from MS on ways to make the database user-friendly and to avoid requesting input by the use of multiple questionnaires.

TWGRR discussed the Agency support for international activities such as IGORR and technical meetings as a necessary means to receive input on Agency activities and programmes. TWGRR recommends a complementary meeting (to the planned technical meeting on high neutron fluence applications supporting the energy sector) to explore involvement in low and medium flux facilities in support of the energy sector in the 2010-2011 budget cycle. TWGRR recommends the activity to coordinate a CRP on the testing of materials using neutrons and complementary techniques be slightly rewritten to be more specific and to exclude theoretical applications and techniques not involving a research reactor. TWGRR recommends the Agency develop a workshop or meeting in the current

budgetary cycle to define the role of small research reactors in supporting the nuclear energy renaissance and the development of the infrastructure necessary to support a new or developing nuclear energy programme in a Member State.

#### **D.2.0.2 Supporting Research Reactor Modernization and Innovation**

TWGRR recommends the 2010-2011 outcomes for this project separate the activities involving refurbishment and modernization from those involving only construction of new research reactors. TWGRR supports the continuing development of regional research reactor networks and centres of excellence as a means of promoting the modernization and refurbishment of the existing research reactors and collaborative efforts to build new research reactors that support regions and not a single Member State.

TWGRR recognizes that there are limits to how quickly proceedings and technical documents may be published and it appreciates the time necessary to fully review the documents but it should be reiterated that the timelines should be limited. The proceedings of the 2006 workshop on Modernization and Refurbishment are expected to be published by mid-2008 with another meeting planned at the end of 2009. Many research reactors are currently considering modernization projects so these proceedings and the introductory material would be very timely for a facility or manager making strategic plans.

TWGRR recommends the CRP on innovative methods in research reactor analysis include Thermal hydraulic analysis during 2009, or include this activity in the 2010-2011 budget cycle. TWGRR members are concerned that a CRP involving safety analysis is listed in the budget as an unfunded item.

TWGRR recommends the Agency consider establishing guidance for member state regulatory bodies concerning requests for major refurbishment from regulatory bodies to facilities during safety assessments that are not risk based changes (such as seismic reinforcement or changes to existing emergency cooling systems) as these refurbishment projects may not significantly enhance safety but the compliance costs may cause premature shutdown and decommissioning of a facility.

TWGRR supports a future CRP on aqueous, homogeneous reactors (AHR) for the production of radioisotopes. It is recommended that the information available on AHR be explored in the 2008-2009 budget cycle with a CRP scheduled in 2010-2011.

#### **D.2.0.3 Addressing Research Reactor Fuel Cycle Issues**

TWGRR supports the continuing preparation of a database on spent fuel from research and test reactor as a means of identifying facilities with limited storage or the need to fully decommission. TWGRR feels the Agency must explore incentives to encourage facilities storing spent fuel in degraded or corroded conditions to return the fuel to the country of origin to reduce the current radiological risk and future decommissioning costs.

TWGRR members feel the updating of the core conversion guidebook to include high-density U-Mo fuels is premature due to recent fuel element failures in elements using this fuel. TWGRR was assured by P. Adelfang that the document would support a proposed training workshop for research reactor operators and regulators who may need to review proposed use of these fuels and understand the failure data. TWGRR feels this activity may move forward to another year naturally as the information on high density fuel performance is changing too rapidly to develop a guidebook chapter.

TWGRR supports the preparation of a technical document on good practice for the management and storage of research reactor spent fuel. TWGRR members feel the workshop information from presentations on Russian Research Reactor Fuel Return Programme should be captured and placed on a secure website for access by TWGRR members. The creation of a technical document on the use of LEU in accelerator driven subcritical assemblies is supported by TWGRR. TWGRR supports the coordination of a CRP on the production of Mo-99 using LEU or neutron activation to provide small-scale radioisotopes to member states and to support increased utilization of small and medium research reactors. The CRP covering conversion of the miniature neutron research reactors is also supported. Similar to comments made above, TWGRR feels an activity providing a training course on U-Mo core conversion is premature and should be moved to the 2010-2011 budget cycle.

TWGRR members make the comment that “fuel cladding” in Activity 12 of D.2.0.3 is unnecessary because fuel fabrication implies fuel cladding is involved. TWGRR understands the first CS for the activity to provide research reactor support for innovative nuclear power reactors and fuel cycles is scheduled for May 2008 and supports this activity.

#### **D.2.0.4 Facilitating transfer of know-how on decommissioning of research reactors and irradiated core materials**

TWGRR supports the projects to develop a technical report on decommissioning research reactors under constrained resources and the use of samples from the cores of decommissioning or refurbished reactors to improve the understanding of the ageing of core materials. TWGRR recommends the activity covering pool side fuel inspection include those inspections necessary for spent fuel shipping. TWGRR notes that there are extensive databases available now for the power reactor industry with information on many reactor core materials. TWGRR recommends a review of these databases to look for informational gaps and then a more directed CRP on ageing of irradiated core materials could be developed. TWGRR members recommended the Agency consider methods to directly fund the decommissioning of research reactors in developing countries

#### **D.2.0.5 Research reactor operation, maintenance, availability and reliability**

TWGRR recommends a second meeting on research reactor availability and reliability in the 2010-2011 budget cycle. TWGRR also feels that it is important to have a meeting that considers resource management (financial and personnel) in 2008-2009 to assist facilities to begin project management as early as possible but recognizes that this activity may need to move to 2010-2011 if the budget does not allow it. In addition to the planned CS meeting on research reactor quality management system development, TWGRR strongly recommends a workshop on this topic occur in the 2008-2009 budget cycle.

TWGRR members noted the activity to perform a CRP for on-line monitoring systems for research reactors emphasizes the reactor mechanical and electrical system and not operations or experiments. TWGRR recommends this activity be moved to D.2.0.2 or changed to emphasize the potential improvement in research reactor availability and reliability by using on-line, real-time monitoring systems such as wire-less vibration sensors. This scope should be defined by a CS sometime in 2008.

#### **Additional Comments by TWGRR**

TWGRR members suggested and the Agency staff agreed that a dedicated webpage for TWGRR members could be hosted on the IAEA website for minutes, presentations and agenda for all TWGRR activities. Several TWGRR members made the recommendation during the meeting that the Agency should compile a database of research reactor physics and thermal-hydraulic experimental data via a CRP that could be used to test new computational methods and codes.

## **Conclusion**

TWGRR commends the IAEA for recognizing that there was a need for more direct feedback from Member States on the Agency research reactor programmes and long-term activities. TWGRR members feel it is a clear responsibility of TWGRR to solicit input from those Member States without representation on the TWGRR and to remain highly involved in research reactor activities nationally and internationally in order to act as an effective advisory group to the Agency. Enhanced and effective utilization, safe and secure decommissioning, age management and spent fuel disposition are just some of the areas that TWGRR and the IAEA see as important over the next year but the role of research reactors in the support of infrastructure and technological development for the nuclear renaissance is a serious concern for research reactor facilities and one that has not, in TWGRR's opinion, been sufficiently addressed.