

***2<sup>nd</sup> Meeting of the Mediterranean Research Reactor Network***  
***(under regional TC projects RER4032 & RAF4022)***

***22 – 24 June 2011***

**Vienna, Austria**

NOTE

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## Table of Contents

1.	BACKGROUND .....	3
2.	OBJECTIVES OF THE MEETING .....	3
3.	WORK DONE .....	4
4.	SUMMARY AND CONCLUSIONS .....	5
ANNEX I.	MEETING AGENDA .....	7
ANNEX II.	LIST OF PARTICIPANTS .....	8
ANNEX III.	WORKPLAN FOR E&T .....	12
ANNEX IV.	WORKPLAN FOR NAA .....	13
ANNEX V.	WORKPLAN FOR N-IMAGING.....	14

## 1. BACKGROUND

The IAEA promotes networking, coalitions and regional collaboration to improve the efficient and sustainable utilization of RR. A number of RR coalitions and networks have developed with IAEA support as a new model to better utilise RR and facilitate access for the Member States without such facilities. The coalition/network concept involves putting in place cooperative arrangements among RR operators, user entities and other stakeholders. Ideally, a strong partnership is formed leading to increased utilization of individual RRs through collective efforts, including improved self-sustainability and self-reliability.

In this context, the Mediterranean Research Reactor Network (MRRN) was created during the meeting held at the IAEA headquarters in Vienna (Austria) on September 28 – October 1 2010. As of today, full members of the network are: Algeria, Azerbaijan, Bulgaria, Egypt, France, Greece, Italy, Montenegro, Morocco, Portugal, Slovenia, Syria, Tunisia, and Turkey.

This 2<sup>nd</sup> coordination meeting aimed to strengthen the cooperative efforts of the member institutions of the MRRN and examine the current status and future trends of RR needs and capabilities in the Mediterranean region. Joint projects and publications were expected to be developed, notably through strategic planning for the coming year. The coordination meeting also intended to provide a forum for sharing of information and good practices among the Member States in the region.

The main topics that were discussed concerned the three focus areas of MRRN, namely, (1) education and training, (2) neutron activation analysis, and (3) neutron imaging. The complete programme of the meeting included member lectures and working sessions during which the participants were expected to take an active participation in terms of presentations, discussions and drafting of strategic plans for collaboration and networking that will satisfy stakeholder needs and balance RR capabilities.

## 2. OBJECTIVES OF THE MEETING

The main objectives of the meeting were:

- Present a status report on the goals set forth in the work-plan during the previous meeting in September 2010, and address any outstanding action items
- Develop a long range plan and evaluation measures for cooperation in the MRRN's three focus areas, namely, (1) education and training, (2) neutron activation analysis, and (3) neutron imaging
- Discuss the organization of the regional research reactor training course ensured by the MRRN and supported by the IAEA
- Review suggested means for publicizing the MRRN and its capabilities, and identify further cooperative efforts that could allow the MRRN reaching more broadly potential stakeholders, particularly those in regional Member States without RRs
- Establish the work-plan and action matrix of the MRRN for the next 12 months

### *Expected input from all meeting participants*

Specific tasks are highlighted in the meeting agenda, given in Annex I.

### 3. WORK DONE

This meeting was organized under the IAEA regional Technical Cooperation projects RER4032 “Enhancing the Sustainability of Research Reactors and Their Safe Operation through Regional Cooperation, Networking and Coalitions” and RAF4022 “Enhancing Research Reactor Utilization and Safety (AFRA)”. The meeting was attended by 20 participants from 15 countries in the Mediterranean Sea region.

The official opening remarks were given by Ms M. Venkatesh (DIR-NAPC), Mr I. Videnovic (PMO of RER 4032) and Mr M. Putineanu (PMO of RAF 4022). Introductory remarks were given by Mr D. Ridikas, (Scientific Secretary, Physics Section - NAPC) and the participants were self-introduced. Mr M. Shaat (ERC, AEA, Egypt) was nominated as a chair person and Mr I. Stamatelatos (NCSR “D”, Greece) was appointed as a *rapporteur* of the meeting.

Mr. D. Ridikas (Scientific Secretary NAPC/Physics Section IAEA) gave a presentation on the IAEA activities in support of enhanced utilization and applications of RRs. In particular, Mr. Ridikas discussed IAEA related activities on RR Networks and Coalitions, Coordinated Research Projects, Technical Cooperation Projects, the Research Reactor Data Base and forthcoming Meetings and Workshops. He then introduced the main objectives of this Meeting.

The meeting continued with a presentation by Mr H. Abou Yehia (Research Reactor Safety Section, NSNI) on the Safety of Research Reactor Experiments. Mr. Abou Yehia drew the attention of the participants on the related IAEA publications on RR safe utilization, categorization of utilization projects and approval routes and gave emphasis on Neutron Activation Analysis and Beam Tube Experiments from the safety point of view.

Then Mr. M. Shaat (chair person of the meeting) reminded on the work-plan and activities scheduled during the Workshop on Research Reactor Coalitions and Networks: Concerted Actions in the Mediterranean Region held in Vienna, on 28 September – 1 October 2010. The chair person’s presentation was followed by summary reports from specific task conveners on the previously identified three topics of common scientific interest and collaboration between MRRN partners:

- (a) Education & Training (Mr. B. Smodis, JSI, Slovenia),
- (b) Neutron Activation Analysis (I. Stamatelatos, NCSR “D”, Greece), and
- (c) Neutron Imaging (Mr. Barradas, ITN, Portugal).

A summary of the results obtained from the response to circulated Questionnaires on the MRRN capabilities on the above selected fields was presented and compared with the current situation worldwide.

The meeting was continued with a special session on dedicated topics. Mrs M. Cagnazzo (LENA, Italy) presented the Integrated Management System (IMS) successfully implemented at Pavia Research Reactor facility and Mr. Foulon (INSTN, France) presented the E&T activities using ISIS training Research Reactor at CEA Saclay.

Then the participants presented reports on the current status of their facilities and the MRRN related activities in their respective Institutions. Mr. M. Kuneshka (NNA, Albania), representing a new country in the MRRN meetings, described the capabilities and scientific potential of NNA institute in Tirana. Mr. M. Abbaci (COMENA, Algeria) presented the capabilities of Es Salam and Nur research reactors, with emphasis given on NAA and neutron imaging capabilities. Moreover, Mr. Abbaci discussed the E&T training program in COMENA. Mr. K. Krezhov (INR&NE, Bulgaria) presented the history, current status and future plans of the IRT-200 (Sofia Research Reactor) refurbishment project. Mr. M. Shaat (AEA, Egypt) presented the activities at ETTR-2 regarding E&T, NAA, Neutron

Imaging and commercial production of radio-isotopes. Mr. I. Stamatelatos (NCSR “D”, Greece) presented the current status and planned activities of the GRR-1 refurbishment program and, moreover, the future prospects in neutron beam experiments, NAA, material irradiations and characterization. Mr. S. Jovanovic (UCNC, Montenegro) presented the gamma spectrometry facilities capabilities in Montenegro and moreover the development of computational models for gamma ray detectors that lead to successful commercialization of ANGLE™ software.

The 1<sup>st</sup> day of the meeting was closed by the useful remarks by P. Adelfang (SH-RR, NEFW) on good practice experiences for the successful implementation of the MRRN work program. The day ended by a hospitality event generously provided by the Agency.

The 2<sup>nd</sup> day of the meeting started with the continuation of the participants activity reports. Mr. A. Santagata (ENEA, Italy) presented the capabilities of RC-1 and TAPIRO reactor facilities at ENEA. Mr. Santagata highlighted the E&T activities, NAA capabilities and achievements and existing and under development neutron radiography systems. Mr. M. Bounakhla (CNESTEN, Morocco) presented the capabilities and plans of the Moroccan 2 MW TRIGA II reactor with respect to I-131 production, NAA and PGNA, neutron diffraction, fission track dating and neutron radiography, as well as the applications and E&T programmes at CNESTEN. Mr. N. Barradas (ITN, Portugal) provided a status report on the PRI reactor program. Mr. Barradas focused his presentation on the neutron imaging systems installed at RPI and the most useful application of the technique on examining tiles for conservation and heritage studies. Then, Mr. B. Smodis (JSI, Slovenia) presented the NAA capabilities and activities, sample irradiations, E&T activities, nuclear data and computational codes verification and validation at the 250 kW TRIGA reactor at JSI. Mr. K. Khattab (AECS, Syria) presented the Syrian MNR capabilities and recent activities with respect to NAA, short-lived radioisotopes production and E&T. Ms. S. Baccouche (CNSTN, Tunisia) presented the capabilities of CNSTN and the programs for installation of a new RR facility and the recent plan to install a sub-critical assembly in Tunisia. Moreover, Ms. Baccouche presented the newly installed D-D neutron generator capabilities and identified the needs of her country with respect to basic and applied research, NAA and E&T. Mr. M. Mercimek (ITU, Turkey) presented the current status of ITU-TRR TRIGA II facility. Reactor characteristics, E&T, NAA, health physics capabilities and applications in environmental studies activities were discussed. Mr. O. Kutlu (CNAEM/TAEK, Turkey) presented a status update on TR-2. Mr. Kutlu described the history of TR-2 reactor, the current status and project for strengthening the reactor building, as well as future plans in E&T and NAA systems modification. The country reports were closed with the presentation by Mr. M. El-Koliel (EAEA, Egypt) who discussed the current status and future prospects of ETRR-1 reactor facility. The existing ETRR-1 refurbishment and upgrade options were discussed.

The meeting was continued by sessions dedicated to E&T, NAA and Neutron Imaging. The activities of the MRRN in these fields were thoroughly discussed and a pragmatic work plan for the next year was proposed (see below).

#### 4. SUMMARY AND CONCLUSIONS

- Participants acknowledged IAEA’s support through RAF4022 and RER4032
- Participation, contribution and in-kind support from developed countries, namely France and Italy, was acknowledged
- Meeting agenda has been followed in detail without major deviations; all items scheduled have been discussed/clarified
- Thanks to pro-activity of all members, MRNN has achieved most of scheduled activities since the last meeting (Sept. 2010)

- Algeria and France have requested to become full members of MRRN. This request was endorsed by the network. Now MRRN includes 14 MS (11 with RRs and 3 without RRs)
- Albania will confirm its full membership in the near future
- Work-plan for the next 12 months was discussed in detailed and agreed by all partners. The following resumes the main activities of the network:
  - Organize the 1<sup>st</sup> MRRN educational demonstration workshop on train-the-trainers on RR experiments in support of nuclear engineering programme in Q2 2012. Draft prospectus of this workshop was prepared (see Annex III).
  - Organize the NAA proficiency tests in Q4 2011 and Q1 2012
  - Organize the n-imaging Round Robin experiments as soon as standard samples become available (through the IAEA CRP); Portugal, Algeria, Slovenia, Italy and Turkey agreed to participate.
  - Finalise and document questionnaires on a) NAA, b) E&T, and c) n-imaging. N-imaging facilities under modernization or scheduled in the future will provide their respective data as well.
  - Initiate and collect detailed information regarding educational curricula on Nuclear Engineering (existing or under the development)
  - Organize the NAA proficiency test follow up workshop in Turkey in Q3 2012.
  - Organize the 3<sup>rd</sup> MRRN meeting in Q3 2012 in Turkey (Vienna as an alternative), possibly in combination with the NAA proficiency test follow up workshop
- At the very end of the meeting participants discussed and formulated the following recommendations:
  - IAEA was requested to continue support of MRRN activities through RER4032 and RAF4022; added value in involving Europe & other regions was clearly seen/appreciated
  - The members of MRRN agreed on rotation policy approach for the venues of the meetings (Europe-Africa), and therefore the rotation of venues is the request of the Member States. In this regard, African representatives will seek for approval from AFRA Programme Management Committee through their AFRA NCs to attend the MRRN meetings in Europe
  - All countries expressed their disappointment for non-approval of the dedicated INT TC project 2012-2013. Formulation and submission of the MRRN INT TC project in the new TC cycle (2014-2016) was recommended
  - The Members of Steering Committee were encouraged to manifest more pro-activity, permanent contacts, exchange of information, and play more important role in follow up of network's activities; interaction of MRRN with other RR Networks and Coalitions should be promoted
  - Other Mediterranean countries like *Lebanon, Jordan, Libya, Spain, Serbia, Malta, Croatia, BH, etc.* should be encouraged to join the network
  - When necessary and justified, network members should seek to establish bilateral agreements as a formal procedure to enhance cooperation and joint activities
  - RR under long shut-down should consider preserving user community, user programmes and strategies; preserve existing experience while working at the same time on returning the facilities to operation

## ANNEX I. MEETING AGENDA

## Wednesday, 22 June 2011

08:30-09:30	<b>Registration, Gate 1</b>
<b>09:30</b> -10:00	<b>Welcome &amp; Opening Remarks</b> <b>Ms M. Venkatesh</b> (Director, NAPC) & <b>Mr P. Adelfang</b> (SH-Research Reactors, NEFW) <b>Mr I. Videnovic</b> (PMO of RER4032) & <b>Mr M. Putineanu</b> (PMO of RAF4022) <b>Mr D. Ridikas</b> (Scientific Secretary, NAPC / Physics Section) Self-introduction of the participants; Selection of the Chairperson & Rapporteur Approval of the Agenda, Discussion & Administrative Arrangements
10:00-10:30	<b>Mr D. Ridikas</b> , IAEA: Introduction & Objectives of the Meeting
10:30-11:00	<b>Mr H. Abou Yehia &amp; Mr A. Shokr</b> , IAEA: Safety of experiments at research reactors
11:00-11:30	<i>Coffee break</i>
11:30-13:00	<b>Summary Report from the Chair &amp; Steering Committee (20 min)</b> <b>(Egypt, Greece, Portugal, Slovenia and Tunisia)</b>  <b>Summary reports from task conveners:</b> <ul style="list-style-type: none"> <li>• E&amp;T – Slovenia, 20min</li> <li>• NAA – Greece, 20min</li> <li>• Neutron imaging – Portugal, 20min</li> </ul> <b>Discussion</b>
13:00-14:00	<i>Lunch break</i>
14:00-16:00	<b>Summary reports from new participants or status update from members (~10min each):</b> <ul style="list-style-type: none"> <li>• Albania, Algeria, Azerbaijan, Bulgaria, Egypt, France, Greece, Italy, Montenegro, Morocco, Portugal, Slovenia, Syria, Tunisia, Turkey</li> </ul> <b>Discussion; acceptance of new members (on request)</b>
16:00-16:30	<i>Coffee break</i>
16:30-17:30	<b>Session on dedicated topics:</b> <ul style="list-style-type: none"> <li>• Integrated Management System (IMS) at Pavia RR by <b>Ms Cagnazzo (Italy)</b></li> <li>• E&amp;T activities using ISIS training RR at CEA Saclay by <b>Mr Foulon (France)</b></li> </ul> <b>Discussion</b>
18:00	<b>Hospitality Event</b>

## Thursday, 23 June 2011

<b>09:00</b> -10:30	<b>E&amp;T session:</b> discussion on the organization of the regional RR training course ensured by the MRRN and supported by the IAEA; other possible joint activities
10:30-11:00	<i>Coffee break</i>
11:00-12:30	<b>NAA session:</b> discussion on the organization of the NAA proficiency tests; analysis of samples for MS without RRs; participation in the new IAEA CRP; other possible joint activities
12:30-14:00	<i>Lunch break</i>
14:00-15:30	<b>Neutron imaging session:</b> discussion on the organization of the Round Robin exercise; share of facilities for common projects; participation in the new IAEA CRP; other possible joint activities
15:30-16:00	<i>Coffee break</i>
16:00-17:30	<b>Discussion:</b> <ul style="list-style-type: none"> <li>• Development of a long range plan and evaluation measures for cooperation in the MRRN's three focus areas, namely, (1) E&amp;T, (2) NAA, and (3) neutron imaging</li> <li>• Establishment of the work-plan and action matrix of the MRRN for the next 12 months</li> </ul>
17:30	End of the 2 <sup>nd</sup> day

## Friday, 24 June 2011

<b>09:00</b> -10:30	<b>Discussion:</b> <ul style="list-style-type: none"> <li>• Finalizing work-plan and action matrix of the MRRN for the next 12 months</li> <li>• Drafting of conclusions &amp; recommendations</li> </ul>
10:30-11:00	<i>Coffee break</i>
11:00-12:30	<b>Discussion: Finalizing of workshop conclusions &amp; recommendations</b>
12:30-14:00	<i>Lunch break, end of the Workshop</i>

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### ANNEX III. WORKPLAN FOR E&T

- 1) E&T questionnaires to be finalised and documented
- 2) Collection of information of curricula in nuclear engineering (available or under development)
- 3) 1<sup>st</sup> MRRN educational demonstration workshop on train-the-trainers on RR experiments in support of nuclear engineering programmes

**Q2 2012 (France, alternative: Algeria, Slovenia, Italy, Egypt)**

**Participants:** future trainers/lecturers of the nuclear engineering programme

**Duration:** 2 weeks

**Qualification requirements:** university degree with professional background in reactor physics or nuclear engineering

#### Proposed programme

##### Theory

1. Definition of the pedagogical scheme/strategy/culture, curricula review process
2. Utilization and applications of RRs versus power
3. Safety in utilization of RRs
4. Concept/requirements of radiation protection
5. Description of the experimental RR facility (including I&C)
6. Theoretical lectures related to experiments to be carried out
7. Procedures and methodology related to experiments to be carried out (including safety requirements, post-experimental analysis)
8. Supporting modelling tools, including simulations of experiments

##### Experiments (6 experiments minimum, to be selected by the host institution)

1. Radiation protection (facility + staff) + on-site visit
2. Start-up of the reactor, critical experiments, power change, shut-down, poisoning effects, decay heat monitoring
3. Control rod calibration (reactor period, doubling time, and other approaches)
4. Thermal/void effects
5. Neutron flux characterization/determination (passive, e.g. Au foils/wires)
6. Neutron/gamma instrumentation (dynamic; e.g. fission chamber)
7. Influence of experimental set up on core reactivity
8. Reactor power determination

Note: QA/QC aspects should be considered as a cross cutting for above programme

##### Output:

- Prepare and document workshop material for future similar/related workshops
- Final evaluation of participants & issue of certificates

#### **ANNEX IV. WORKPLAN FOR NAA**

- 1) Finalise and document NAA questionnaire; expand it on areas of applications
- 2) NAA proficiency tests with soil and plant samples (service provided by WEPAL); follow up workshop to be combined with 3<sup>rd</sup> meeting of the network
- 3) Sub-group on large sample NAA: protocol for efficiency characterization; bigger than 1 litre (e.g. silicon ingot, experimental data from Egypt or other non-standard volume geometry)
- 4) Agreement to analyse ~50 samples (environment, pollution, ceramics, ...) for countries without such capabilities (cost free but subject to common interest and resulting in joint project/publication), more samples – based on bilateral contract agreement
- 5) Encourage to participate in new CRP on NAA automation

## **ANNEX V. WORKPLAN FOR N-IMAGING**

- 1) Finalise and document the questionnaire; include future projects
- 2) Neutron radiography proficiency tests (similar to the ones for the CRP); share the sample geometry and protocols; start measurements when it is possible
- 3) Limited number of samples to be examined subject for countries without such capabilities (cost free but subject to common interest and resulting in joint project/publication)