Asian Network for Education in Nuclear Technology (ANENT)

Report

of the

1st Coordination Committee meeting

including the

ANENT Terms of Reference
and the
Action Plan

23-27 February 2004, Kuala Lumpur, Malaysia

organized by the
International Atomic Energy Agency

in co-operation with and hosted by
MINT, Malaysia

Contents

1 Background

Like any highly technical endeavour, the use of nuclear technology relies heavily on the accumulation of knowledge. This includes technical information in the form of scientific research, engineering analysis, design documentation, operational data, maintenance records, regulatory reviews and other documents and data. And it includes knowledge embodied in people – e.g., scientists, engineers and technicians. Effective management of nuclear knowledge thus involves ensuring the continued availability of essential reservoirs of both technical information and qualified people. This is critical to ensuring safety and security, encouraging innovation, and assuring the future availability of the benefits of nuclear technologies in the fields of human health, food and agriculture, water management, industrial applications and electricity generation.

In some of the countries, it became apparent that the nuclear workforce is aging as more nuclear workers approach retirement age without a compensating influx of appropriately qualified younger personnel to replace them. Fewer young people are studying nuclear science, nuclear engineering and related fields at the university level, and a growing number of universities have given up their nuclear education programmes altogether. At the same time, in particular in countries where a nuclear infrastructure and a nuclear power programme are foreseen to be expanded or built up, the transfer of knowledge and expertise to the young generation of these countries and the sharing of knowledge with more developed countries are essential.

In 2002, the IAEA General Conference has adopted a new resolution on "Nuclear Knowledge" (GC(46)/RES/11B), reiterated in 2003 (GC(47)/RES/10B), emphasizing the importance of nuclear knowledge management, calling for increased awareness and inviting both the Agency and Member States to strengthen their activities and efforts. In the Agency's Programme for 2002-2003, a dedicated programme on "Maintenance of Knowledge in Nuclear Science and Technology" (subprogramme D4) was established, continued in 2004-05 as subprogramme C3.

In response to General Conference resolutions, the Agency has convened a consultancy meeting in July 2003 to prepare the establishment of a new *Asian Network for Education in Nuclear Technology* (ANENT). The consultancy prepared a preliminary assessment of the status of education and training in the region and a terms of reference for ANENT. In February 2004, the Agency convened a Technical Meeting (TM) as *1st Coordination Committee* meeting on ANENT, inviting all IAEA Member States in Asia to participate and to work out and approve an Action Plan for ANENT implementation.

This report was prepared by the Technical Meeting in February 2004 and summarizes results from both meetings.

2 Meeting Details

2.1 Preparatory meeting

The preparatory meeting for ANENT was held as an IAEA consultancy meeting, 30 June-4 July 2003, hosted by KAREI, Daejon, Republic of Korea.

The objective of the meeting was to initiate preparations for the establishment of a regional Asian network for higher education in nuclear technology, as proposed by KAERI, Republic of Korea.

The following detailed objectives had been set for the meeting:

- to compile information on the status of higher education in nuclear technology in the area [presentations by participants],
- to discuss and clarify the needs for and benefits of a network on higher education in nuclear technology [discussion];
- to prepare a joint document that describes the proposed network and its operation [key outcome; draft document provided by IAEA/KAERI];
- to prepare an Action Plan covering steps leading to the establishment of the network and contact points in each potential Member State to be invited to participate.

Welcoming remarks were given by Mr. I.S. Chang, President, KAERI. The meeting was chaired by Mr. K.W. Han, KAERI; Mr. P.J. Gowin, IAEA, served as Scientific Secretary of the meeting.

2.2 1st Coordination Committee meeting

The first Coordination Committee meeting was held as an IAEA Technical Meeting, 23-27 February 2004, hosted by the Malaysian Institute for Nuclear Technology Research (MINT), Malaysia.

The objective of the meeting was to specify the needs for networking in nuclear education in Asia and to adopt, based on stated needs by Member States, an Action Plan for ANENT.

The following detailed objectives had been set for the meeting:

1. to compile information on the status of education and training in nuclear technology in the area (presentations by participants), and to further discuss and clarify the needs for and benefits of a network on education covering both nuclear energy and non-energy technology (discussion);
2. (as key outcome) to agree on an extended "Action Plan" for the implementation of ANENT;

3. to identify and allocate work packages to be implemented by (teams of) participating institutions (under the leadership of one *Co-ordinating Member State*), as outlined in the ANENT terms of reference, and

4. to discuss the need for establishing ANENT as a new IAEA TC Regional Project, based on stated needs in the region (see point 1) and make related recommendations.

Opening statements were given by Mr. Ahmad Sobri B. Haji Hashim, Director General of MINT and by Mr. Gowin, IAEA. The meeting was chaired by Mr. Nahrul Khair Alang Md. Rashid, DDG of MINT and Mr. Fatimah Mohd Amin, MINT. Mr. Gowin served as Scientific Secretary of the meeting. Mr. Gowin gave an introductory presentation on *Asian Network of Education in Nuclear Technology – Background and Objectives*. Mr. P. Danesi represented the IAEA departments of Nuclear Applications and of Technical Cooperation; Mr. Danesi gave presentations on TC mechanisms and on nuclear applications.

3 Status of Nuclear Education in Asia

3.1 Introduction

Participants representing India, Japan, Pakistan, Indonesia, Thailand, the Asian School of Nuclear Medicine, Mongolia, Sri Lanka, the Philippines, Viet Nam, Malaysia, the Republic of Korea, the European Nuclear Engineering Network and the World Nuclear University gave presentations, covering:

- National approach toward (nuclear) education and training
- Status of higher education and training in nuclear technology (student enrolment figures, institutions, national networks and future human resource demand projections, wherever available)
- Needs for regional cooperation in nuclear education and training

Additional presentations were given on related collaborative initiatives in nuclear education and training. The table below lists several of those initiatives.

	Target region	**Technical scope**	**Organizer**
ANENT	Asia	Nuclear technology	IAEA
ANSN	Asia	Nuclear safety	IAEA
ASNM	Asia	Nuclear medicine	ARCCNM
ARCCNM	Asia	Nuclear medicine	ARCCNM
HRD/FNCA	Asia	Nuclear (general)	Japan
ENEN/ NEPTUNO	Europe	Nuclear engineering	European Union
ENEN Association	Europe	Nuclear engineering	ENEN Association
RCA	Asia	Nuclear (general)	IAEA
WNU	global	Nuclear (general)	WNU

3.2 India

3.2.1 BARC Training School

In the beginning of the atomic energy programme in India, it was realized that the programmes of higher education, because of their focus on specialization, have to be followed by assured placement. There has to be a direct link between the ‘user’ and the ‘programme’ -

both in terms of course content and the number of students. Therefore, for recruitment to the Department of Atomic Energy (DAE), a methodology based on the principle of 'hire and train' was devised and is still being followed. This programme has been running since 1957. Over 6000 students have graduated from this Training School and currently it runs the programmes in the following disciplines:

- Chemical, computer, electrical, electronics, metallurgy and mechanical engineering.
- Physics, chemistry and biology.
- Radiation protection and environment sciences.

The course includes 450 lecture hours including laboratory work. The course content includes subjects such as Nuclear Physics, Reactor Physics, Health Physics intended to provide an orientation towards nuclear sciences and special subjects consistent with the basic qualification of the student. Intake to this school in the recent past has been about 120 every year.

To cater to the requirement of manpower for expanding nuclear power programme, we have opened additional schools as affiliates of BARC Training School. One such school is at the Centre for Advanced Technology, Indore, which concentrates on training students in the area of lasers and accelerators. Three batches have already graduated from this school and annual intake is about 20.

Another school is at Nuclear Fuel Complex, Hyderabad, which concentrates on training manpower for manning heavy water plants, fuel fabrication plants and fuel reprocessing plants and waste management facilities. Two batches has already graduated from this school and annual intake is about 25.

NPCIL needs a large number of engineers for operation and maintenance of nuclear power plants and it runs its own training centres at some of its power plant sites. About 1000 students have graduated from the centers comprising NPCIL training school.

From the year 2002, India has started DAE Graduate Fellowship Scheme (DGFS). Students, who have been selected for admission to the masters programme in engineering at select institutes, can apply for this scheme in the beginning of the programme and if selected, have to take up electives and project work in an area of interest to DAE. After completion of the masters programme, they join BARC Training School for one semester to study nuclear engineering. This scheme has twin objectives viz., human resource development and involving the faculty at the select institutes in the programmes of the DAE.

3.2.2 Other Programmes at BARC

BARC also runs other training programmes, but these are not followed by assured placement. These are the following.

- Diploma in Radiological Physics (DipRP). Annual intake is 25.
- Diploma in Radiation Medicine (DRM). Annual intake is 10.

- Diploma in Medical Radioisotope Techniques (DMRIT). Annual intake is 10.

BARC also runs a one year programme to equip science graduates to work as health physics professionals in nuclear power plants and fuel cycle facilities.

BARC also runs several short term courses such as Radioimmunoassay and its clinical applications, industrial radiography, isotope hydrology. BARC also offers training in various fields to the trainees sponsored by IAEA under its fellowship programmes.

3.2.3 Doctoral Programmes at R&D Centres and Aided Institutions

Research centres and autonomous institutions of the Department of Atomic Energy also run doctoral programmes and 100 students get Ph.D. every year from the R&D centers and aided institutions.

India offered to train nationals of other countries on a large enough scale under the aegis of Asian Network of Higher Education in Nuclear Technology.

3.3 Indonesia

Nuclear technology was officially recognized in 1958 through the founding of Dewan Tenaga Atom Nasional (National Atomic Energy Board), which was reorganized and named BATAN in 1964. Since the construction of the first reactor in 1965, BATAN (National Nuclear Energy Agency) has been operating 3 research reactors. The application of nuclear technology in research, which was started in 1960's , was followed by application in industries, agriculture, food and utilization of radiation and radioisotopes in medical therapy and diagnostic.

3.3.1 Nuclear Education and Training in Indonesia

To meet the need of manpower, BATAN through ETC (BATAN Education and Training Center) has set up a national network of nuclear education and training which involves some universities, such as University of Indonesia, University of Gadjah Mada, University of Pajajaran, School of Medical Instrumentation, and STTN (Polytechnic Institute of Nuclear). This network has contributed to the education of 911 S1-graduates, 24 masters, 21 doctors (Ph. D.), and approximately 400 technicians holding D-3 or D-4 diploma. While, overseas education programs under the framework of government-financed, and bilateral, regional, as well as international cooperations, has contributed to the education and trainning of 46 bachelors degree, 201 masters and 98 doctors. In addition, major efforts have been carried out towards attracting talented youth to nuclear science and technology in order to avoid supply shortage for higher education intake.

Training courses are implemented as BATAN-organized trainnings or cooperation trainnings. The former are managed by BATAN-ETC and conducted with support from various research units within BATAN, while the later are organized conducted by other trainning institutions in Indonesia or abroad. The BATAN-ETC provides also trainning courses in Radiation Protection and Radiography to support licensing requirement stipulated by the regulatory body in Indonesia.

The development of human resources in nuclear science and techology in Indonesia in the last few years has been challenged by several issues such as economic crisis, brain drain, zero-growth policy of the government, the aging of manpower, and the declining interest of the youth in the nuclear field.

3.3.2 Needs for Regional Cooperation in Nuclear Education and Trainning

At present, formal education in nuclear science and technology in Indonesia is limited to only a few institutions of higher education. Indonesia would require many more scientists and engineers with graduate and post-graduate qualifications to intesity its efforts in nuclear R & D. Through ANENT, Indonesia students would have the oppurtunity to obtain graduate and post-graduate degrees in ANENT member organizations. The establishment of a reference curricula as well as the mutual recognition of degree may offer students especially who are already employedin nuclear or related orgaizations the flexibility to conduct part of the course in their home countries and not have to spend the full course time in another country.

The exchange of academic staff among ANENT member organizations would also benefit countries with less-established nuclear education and trainning. Academic staff from member organizations with established nuclear educational and training courses could assist in curricula design and trainning.

3.4 Japan

3.4.1 Nuclear Education and Training in Japan

In Japan, many of the experienced nuclear engineers and scientists who have constructed nuclear power plants and developed the application methodology of RI and radiation, are aging and retiring. Also with the decrease in the construction of nuclear power plants and decrease in the nuclear energy research expenditures, it is becoming more difficult to maintain the present level of capability in designing and manufacturing of nuclear facilities.

There are 14 universities providing nuclear and nuclear related education in BS, MS and Ph.D courses. Total number of graduates from BS courses in 2000 is 370, MS 280, Ph.D 70. The total number is slightly increasing. However, the ratios of the graduates with these degrees obtaining nuclear related jobs are quite low, 10% for BS, 25% for MS and 28% for Ph.D in 2000. There is a big gap between supply and demand.

On the other hand, the educational infrastructures in the universities such as nuclear research reactors and the facilities where handling of radioactive materials are permitted, are deteriorating due to the difficulties to meet the more stringent regulatory requirements. With the decrease in the popularity of nuclear energy and maturing of nuclear technology it is becoming more difficult to attract sufficient number of promising young individuals to nuclear field. There is a strong concern in the future supply of capable human resources in the nuclear field. It is feared that the knowledge and expertise necessary for securing safety of nuclear power plants and radiation application could not be sufficiently preserved and transferred to the next generation.

In order to cope with the above situation, several proposals are being considered and some new systems are already being worked out. The joint establishment of a graduate school

to educate the core members of nuclear engineers and regulatory officers are being considered with close cooperation between some universities and the new unified corporation to be formed by JAERI and JNC in FY2005. There are several similar plans to jointly establish graduate schools for the nuclear technology and sciences in the regions having various nuclear installations and universities. One of such plans is to establish a graduate school aiming to utilize strong neutron beams generated by the intense proton accelerator, J-PARC which is being constructed in Tokai-mura jointly with JAERI and KEK. Furthermore, there is also a plan to establish a *Nuclear Education System Network* (NesNET) to serve as the focal organization to enhance better cooperation and coordination of maintenance teams for nuclear power plants, nuclear education and training centers and infrastructures in the industries, universities and national research institutions. In addition, a new qualification system for Professional Engineers in the Nuclear and Radiation Field has been established. This will become effective in 2004 as a national qualification system to certify and to continuously enhance the professional level of nuclear and radiation engineers.

3.4.2 Contribution and significance of ANENT to Japan

Socio-economic development of Asian countries is very desirable for better harmonization of the region. The ANENT contributes to the development, peace and security of the region. ANENT may contribute to stimulate young students to major nuclear science and technology. ANENT enhances international training of Japanese students and scientists in nuclear field. ANENT enhances international mobility and network of students, scientists and engineers. ANENT enhances international cooperation in R&D as well as Japanese HRD programme. ANENT enhances the contribution of Japanese scientists and engineers to international nuclear community.

3.5 Republic of Korea

Korea is operating 18 NPPs and a 30MW research reactor (HANARO). In addition, the country is focusing on the development of emerging technologies in the field of nuclear power and non-power. For this, about 21,000 people are engaged in the nuclear field. However, the first generation of nuclear work force is getting older and retired, and less of the youth are studying nuclear science and engineering. Thus, timely supply of highly qualified human resources to the field is essential. The Korean Government has established a promotion program for the nuclear human resources development

Nuclear education and training institutions include universities, R&D institutes, industries, associations, and medical centers. Six universities offer BS, MS and Ph. D courses in nuclear engineering. In addition, the University of Science and Technology (UST) opened in 2004 will provide students with emerging advanced nuclear technology linked with 5Ts. KAERI will provide 3 advanced engineering courses in M.S, Ph. D under the framework of UST, and various specialized training programs for the Korean nuclear community. While, Korea Institute of Nuclear Safety (KINS) provides training courses for the field of safety and regulation. The Korea Cancer Center Hospital (KCCH) provides training courses on radiation emergency treatment.

For the promotion of international cooperation, the RCA Regional Office is providing RCA post-doctorial fellowship training programs, RCA/KAIST master’s degree courses, and RCA/KOICA nuclear medicine internship training programs. In addition, Korea International

Cooperation Agency (KOICA) and Korea Nuclear International Cooperation Foundation (KONICOF) financially support training activities.

The Korean Network of Nuclear Education and Training (KN-NET) is being developed linking domestic institutions related to nuclear education and training. Potential international education and training programs available from KN-NET will be: 1) Nuclear policy, 2) Advanced reactor technology, 3) Nuclear fuel technology, 4) Radioactive waste management technology, 5) Nuclear safety improvement, 6) Radiation protection, 7) Radioisotope production and radiation application technology, 8) Nuclear medicine and radio-therapy, 9) Basic nuclear science such as accelerator technology.

The Korean nuclear community feels that the regional cooperation would address the following national needs to:

- attract the young generation by broadening their vision of the nuclear field to the regional level;
- facilitate the accessibility of nuclear personnel to the regional forum where they can learn more about emerging technologies;
- develope careers of nuclear personnel through their involvement in regional education and training activities;
- upgrade its education and training capabilities to international level by effectively making use of available resources from the region; and
- increase mutual benefit at regional level by sharing its expertise and experience with other communities of neighboring countries.

3.6 Malaysia

Malaysia's transition from a production-based economy to a knowledge-based economy is a vital step towards achieving a developed nation status by the year 2020. A large pool of skilled labor force including those with tertiary level education is critical for Malaysia's transition to a knowledge-based economy. Malaysia's policies related to education and training emphasize the need to address the shortage and to enhance the quality of human resources, in particular human resources in science and technology. In this regard, a target has been set for a ratio of 60:40 science to arts students at the secondary school and tertiary level education institutions. The total number of post-graduate enrollment in universities will be increased to 25 per cent of total enrollment by the year 2010. Human resource with tertiary level education, especially at the post-graduate level is essential for upgrading capability in research and development (R&D). The target is to enlarge the pool of researchers from 15.6 researchers per 10,000 labor force in the year 2000 to 60 researchers per 10,000 labor force by the year 2010.

The Malaysian Institute for Nuclear Technology Research (MINT), previously known as the Tun Ismail Atomic Research Centre (PUSPATI) was established in 1972 to promote nuclear science and technology development and application. Since nuclear energy is not included as one of Malaysia's energy options, MINT's programs focus on the development and application of nuclear science and technology in medicine, agriculture, industry and

environment. MINT operates a 1 MW TRIGA MKII research reactor and several radiation facilities.

As the largest employer of nuclear science and technology graduates, MINT has a major role in ensuring the sustainable supply of nuclear workforce and the preservation of nuclear knowledge. In this connection, MINT collaborates with institutions of higher education in the development of human resource in nuclear science and technology through providing assistance in the design of curriculum, providing facilities and supervisors for students' training and post-graduate research, and implementing joint research and development (R&D) projects.

To date, there has been only one university that offers a full course in nuclear science at the undergraduate level. For a long time this course was not the course of choice for students in the science faculty but has gained in popularity since the last three years with an average annual enrollment of about 40 students. Two universities offer courses in Medical Physics at the post-graduate level and one university a health physics course at the undergraduate level.

While universities offer formal education, MINT leads in the provision of training in nuclear science and technology. MINT offers a wide range of training courses including those in support of the licensing requirements of the regulatory authority and those related to the application of nuclear science and technology.

In Malaysia, the declining interest in science and technology, further worsened by the lack of interest among the young to take up courses in nuclear science and technology partly due to the limited career prospects in the nuclear field, are some of the challenges for Malaysia in the development of human resource in nuclear science and technology. These challenges would have to be addressed through an expanded effort to create awareness among the young, creating job opportunities and intensifying efforts to introduce more courses in nuclear science and technology in institutions of higher education. In this connection, Malaysia's efforts to intensify its nuclear education and training programmes in nuclear science and technology could be greatly facilitated through participation in ANENT.

3.7 Mongolia

The National University of Mongolia (NUM) is the country's oldest, the only comprehensive university, and a leading center of science, education and culture. The NUM offers the widest range of undergraduate and graduate programs in natural and social sciences and humanities. Nuclear Research Centre, NUM is only research and educational institution of nuclear science & technology in Mongolia (Website: www.num.edu.mn/nrc).

Higher Education Degree Structure. Students who have successfully completed secondary education and passed the entrance examinations are admitted to the University. The Bachelor degree is awarded to students who have obtained 120-128 credits. The duration of undergraduate study is four years of full-time study. Master programs consist of coursework (core subjects and electives) and research. Master's students should obtain at least 30 credit points in courses and write theses for the M.Sc. degree. The duration of the Master's program is three to four semesters of full time study. Doctor programs consist of coursework and research. Students who have obtained 60 credit points and successfully defended their research dissertations will be awarded with a Ph.D. The duration of the PhD programs is three years of full-time study or six semesters.

Bachelor's education aims to develop students' knowledge and skills so that they are professionally capable of working in industry and service. The objective of Program Majored in Nuclear Technology is to provide knowledge and skills to use nuclear physics' methodology & nuclear radiation for education, science, health protection, agriculture, geology, mining, nature protection, energy and etc industries.

Content classification	Credits[1]	Remarks
General Education Courses	37	1st and 2nd year
Basic Core Courses (Physics)	28	1st to 3rd year
Major Core Courses (Nuclear Physics)	26	2nd to 4th year
Elective Courses	31	3rd and 4th year
Course Work	4	3rd and 4th year
Probation Work	2	4th year
Total	128	

Table 1: Curriculum Structure of the Bachelor of Science Program

Since the selection of nuclear physics students from physics major students and their first graduation in 1970 the school created over 170 nuclear physicists. Beginning 1997 the university started the acceptance and teaching of students majored in nuclear technology. During this period there were 166 students accepted to nuclear technology bachelor degree and from this we have 35 graduates and currently 110 students are in their study process. In nuclear science and technology master's degree programs since 1993, 32 students were accepted and 19 people obtained their master's degrees. In the Ph.D degree program since 1999 there were 8 students accepted and are in the process of obtaining their degrees.

The graduates in nuclear science and nuclear technology are working as physics teachers in all levels of schools, as scientists, and analysts, engineers and physicist in radiation control, nuclear treatment, geological research laboratories, mining production control, power stations, crimimalistic laboratories etc.

3.8 Pakistan

To harness the benefits of nuclear energy and the applications of radiations and radio nuclides in various disciplines a broad and deeply rooted nuclear education in essential. To cater and its needs of trained manpower, Pakistan Atomic Energy Commission (PAEC) has established 5 centers/ Institutes. These institute offer degree courses (Post-graduate and Ph.D Level), as well as and host courses for Technicians, Scientists and Engineers. This paper describes the courses offered by these institutes.

3.9 The Philippines

Education and training in nuclear science and technology in the Philippines are obtained from higher education institutions, and from courses offered by the Philippine Nuclear Research Institute. The Philippine Nuclear Research Institute (PNRI), an institute under the Department of Science and Technology (DOST), is the sole government agency in charge of matters pertaining to nuclear science and technology, and the regulation of nuclear energy.

[1] The course unit is credit hour. One credit point is deemed to be equivalent to 48 academic hours of student work whether taught faculty or independent study.

In the college or university level in the Philippines, not all curricula for a Bachelor's degree in Science or Engineering incorporate nuclear science/technology as a one-semester course (consisting of 3 units), or as topics in a one-semester course. It is not a requirement but the option of a particular school to include nuclear science and technology topics.

An M.S. degree program in Medical Physics is offered by one university in the Philippines. Other graduate degree programs, i.e. M.S. in Power Engineering, Chemical Engineering, Electrical Engineering or Mechanical Engineering do not incorporate nuclear S&T topics or nuclear engineering, because of lack of professors or faculty to teach these topics. The Ph.D. program in Energy Engineering which is offered by only one university does not include nuclear power, for the same reason – lack of faculty to teach the subject.

The Philippine Nuclear Research Institute (PNRI) regularly conducts training courses in nuclear science and technology, and radiation protection to users of radioisotopes in academic and research institutions, hospitals and medical institutions, and different industrial companies. Except for those who take the Radiographic Testing (Nondestructive Testing) Courses, the minimum requirement for trainees is a Bachelor of Science degree in the sciences or engineering.

In the event that the Philippines will again implement a nuclear power program, there will be a great need for M.S. and Ph.D. holders in nuclear engineering. There are less than five nuclear engineers in the country today. At present, there is no university in the Philippines offering this graduate degree, and linkages have to be made with other countries that offer this program. If the PNRI will go in the direction of acquiring electron beams and accelerators, there are no technical personnel knowledgeable or trained in this technology. There is a need for professors and faculty with appropriate background and training to teach nuclear S&T, nuclear engineering topics in higher education institutions.

3.10 Sri Lanka

There are two major levels of obtaining radiation or nuclear education and training in Sri Lanka: the University and the Atomic Energy Authority of the Ministry of Economic Reforms, Science and Technology.

3.10.1 University Education

Subjects related to nuclear science /technology are only offered at the University of Colombo. All other university degree programmes as and when required request the courses from University of Colombo. Introduction to Nuclear Science offered at the third year is a compulsory credit for any student to register for any of the other nuclear science related studies. Students reading for a Biological Science Degree has the opportunity to study Radiobiology and Nuclear Techniques where as the Physical Science Degree programme allows the student to read Health Physics, Medical Physics, Nuclear Physics and Applied Nuclear Science during the third year of the study programme. All these courses are optional.

The student numbers during the last five years reading the above are as follows. 25-30 students from the Biology stream, 100 students from the physical science stream. Some B.Sc. curricular has special topics as one or two credit courses. For example B.Sc. Pharmacy includes Nuclear Pharmacy lectures and has hospital training (in a nuclear medicine unit) for

two full weeks. B.Sc Chemistry and Biochemistry has molecular radiobiology as an optional topic. . B.Sc Environmental Science has one credit on Radiation in the living environment.

University of Colombo offers a M Sc. in Nuclear Science . As of 2003, 42 students have followed this course and 33 have completed. University of Peradeniya offers a M.Sc. in Medical Physics.

3.10.2 Training at Atomic Energy Authority

The AEA conducts the following training courses: Radiation Safety in using Radioisotopes for Research and Industrial Applications (one week duration); Radiation Protection & Quality Assurance in Diagnostic Radiology for users of General Radiography & Fluoroscopic Equipment (one week duration); Nuclear Electronic Instrumentation for users / operators, repair and maintenance personnel (three weeks duration); Microprocessors/micro controllers three weeks duration; NDT Training courses in Radiography, Ultrasonic, Eddy current Testing Dye Penetrant Testing and Magnetic Particle at all three levels (duration varies from one to three weeks). This Training is conducted according to ISO standards. On an average around 75 are trained each year in radiation protection and 100 in NDT.

3.10.3 Other activities

School of Radiography in the National Hospital Colombo is the focal point to train radiographers.

3.11 Thailand

Medical application, Industrial applications and Research applications are the three main groups using radiation are radioisotope in Thailand. Since nuclear power is not planned in near future, human resource in these applications were limited.

Nuclear Science has been included in curriculum of science study in every university and college. In some universities the special subjects in nuclear are included and graduate courses are offered, for example Physics, Chemistry, Medical Physics, Nuclear Technology, Environmental Science, Radiation Technology, etc. However, more intensive survey must be conducted in order to achieve valuable data for human resource development plan. For the higher education, at present there are only 2 universities offering the PhD degrees and 4 universities for the Masters, with the students of 24 and 156 respectively.

In addition, office of Atoms for Peace (OAP), Ministry of Science and Technology (MOST), also carries out many national training programs in nuclear field, for example, Radiation Protection and Safety, Nuclear/Radioisotope and Radiation Application, Non-destructive testing, which number of Trainees are about 800 annually.

It is expected that ANENT will be very beneficial for Thailand and other countries. Due to the vast different in nuclear application from country to country, developed countries and developing countries, only Education may not fully serve the needs for all countries. It is proposed that some selected professional Training courses such as, Non-destructive level 3, should be also added to ANENT.

3.12 Viet Nam

Vietnam began to be interested in education and training on nuclear sciences and related subjects since the early 1960's. A department of Nuclear Physics and Engineering was established in 1970 at the Hanoi University of Technology (HUT), which is the biggest interdisciplinary technological education centre of the country. In Vietnam there are several institutions where exist programmes of education on nuclear sciences and nuclear engineering. But HUT has been being since 1970 the only institution that has underway programme of education on nuclear engineer degree. Although the Department was renamed and its education programme was adjusted, but the objectives of its education programme have been being followed without changes. These objectives are as follows: 1) - To develop peaceful applications of atomic energy in Vietnam; 2) - To train up engineers on nuclear instrumentation for supporting the first objective; and 3) - To prepare initial manpower for introduction of Nuclear Power in Vietnam.

Nuclear community of Vietnam is still not so large. Total number of its members increased until 1986, and then decreases up to now. Present average age of members of the community is of 45. In 15 coming years at least 500-700 young people must be educated on programmes on nuclear engineer degree and on nuclear bachelor degree. This is a very difficult task for a developing country such as Vietnam. From a point of view of development, the above-mentioned number is too small, and it must be much more. This makes the task much more difficult. In addition, education on nuclear engineering in the country at present is in a hard situation because of lacking in experienced people, as well as in teaching material and equipment, and, because of weakness of the education programme. So, it may be impossible to achieve success in realization of the task without a large and effective international co-operation in education on nuclear science and engineering. That is why the Asian Network for Education on Nuclear Technology (ANENT) together with the other suitable forms of international cooperation is of high importance for development of nuclear manpower in Vietnam.

3.13 Asian School of Nuclear Medicine

3.13.1 Aims of ASNM

The aims of the ANSM are: to foster Education in Nuclear Medicine among the Asian countries, particularly the less developed regions; to promote training of Nuclear Medicine Physicians in cooperation with government agencies, IAEA and universities and societies; to assist in national and regional training courses, award continuing medical education(CME) points and provide regional experts for advanced educational programmes; and to work towards awarding of diplomas or degrees in association with recognised universities by distance learning and practical attachment, with examinations.

3.13.2 Organisation of ASNM

Dean – Dr. Felix X Sundram; Vice Deans - Dr. Shuji Tanada(Japan), Dr. Sang-Moo Lim(Korea), Dr. Theo San Luis (Philippines), Dr. S. Boonyaprapa (Thailand), Dr. Y N I Anand (India), Dr. Zuo-Xiang He/ Dr. Chen(China), Dr. Ren-Shyan Liu(Taiwan).

3.13.3 Finances

Grant from ARCCNM; Donations requested from Siemens and Nycomed-Amersham; some IAEA funding. A distance learning project for Nuclear Medicine Physicians would cost about 80,000/- USD for the first two years.

3.13.4 Activities

October 2003 - CME points and Certificate awarded by ASNM for KOICA/KIRAMS course in PET and Nuclear Medicine. December 2003 – ASNM Certificate and CME points for IAEA/ASNM workshop on liver cancer treatment with radionuclides, Manila. February 2004 - Certificate and CME points for ASNM training course in PET Cyclotron, Singapore (paticipants from Thailand, Pakistan and Bangladesh). June/November – Planned ASNM Nuclear Medicine Symposium in Colombo, Sri Lanka.

3.14 ENEN

The need to preserve, enhance or strengthen nuclear knowledge is worldwide recognized since a couple of years. Within the 5th framework program the European Commission supports the European nuclear higher education network. The ENEN contract started on Jan 1, 2002 and lasts for 24 months. The Commission support for this "accompanying measure" amounts to €197716.

Based upon a year-long extensive exchange of views between the partners of ENEN, consisting of a representative cross section of nuclear academic institutions and research laboratories of the EU-25, a coherent and practicable concept for a European Master of Science in Nuclear Engineering has emerged. The concept is compatible with the Bologna philosophy of higher education for academic education in Europe. Pursuing the sustainability of the concept, the ENEN partners organized themselves in a non-profit-making association.

Within the 6th framework program, the Commission services favourably evaluated the proposal: "Nuclear European Platform of Training and University Organisations". The objectives of the NEPTUNO co-ordination action are to establish a fair dialogue and a strong interaction between the academic and the industrial world and to bring all nuclear education and training activities under a common strategy of the ENEN type. The present proposal schedules for 18 months and the Commission earmarked a financial contribution of €830619.

3.15 World Nuclear University

The World Nuclear University (WNU) is a global partnership of educational, commercial and inter-governmental institutions, dedicated to preparing the nuclear professions for an expanding role throughout the 21st century. Its mission is to strengthen nuclear education and training worldwide, thereby to build the foundations of professional excellence in all aspects of peaceful nuclear technology, and to enhance the appeal of nuclear studies to the young generation.

It was founded at a ceremony held in London in September 2003. The Founding Supporters (FS) are key multinational organisations: the World Nuclear Association (WNA) and the World Association of Nuclear Operators (WANO) in the private sector and the

International Atomic Energy Agency (IAEA) and Nuclear Energy Agency of the OECD (OECD-NEA) in the public sector.

As distinct from a traditional university, the WNU will not engage in classroom teaching of standard academic courses or degrees. Rather, the WNU will be a vehicle for co-operation among nuclear educators and other nuclear experts, in order to improve the content and delivery of education and training at institutions which already provide such instruction.

The basis for the WNU partnership is a network of leading centres of nuclear education and research, known as Participating Institutions (PI), in 30 countries throughout the world. In addition the European Nuclear Engineering Network (ENEN) is a PI, while it is hoped that the new Asian Network for Education in Nuclear Technology (ANENT) will be likewise. The partnership will also include and depend upon the active leadership of the FSs. All interested educational and research institutions may join the WNU network; it carries no further obligation than to engage actively in fulfilment of the WNU mission.

Operationally, WNU activity will occur primarily through ten Working Groups, which will stimulate interaction between individual educators and other nuclear experts from the FSs and PIs. This model is typical of the traditional way the FIs have promoted co-operation amongst governments and companies. It is the objective of WNU to broaden the current framework of global co-operation to encompass the institutions of learning, which are the wellsprings of nuclear science and technology.

Three of the working groups will focus on the systems required to preserve, organise and deliver nuclear knowledge to future generations, for example curriculum design. Another five will cover key nuclear disciplines, developing strong “globalised” courses suitable for adoption by PIs as part of a “WNU-certified” curriculum. Finally, two will develop authoritative thinking on the future of nuclear technology, to help place educational needs into context.

The Working Groups and other WNU activities will be co-ordinated by a small London-based Secretariat, staffed by the institutional participants (both FSs and PIs). An Academic Council, with representatives of both FSs and PIs, will consider and validate the recommendations of the Working Groups. The modest budget for this will come from the companies and governments amongst the FSs. It is, however, an essential characteristic of WNU that there will be no separate stand-alone entity. Its “product” will be the collaborative process which its co-operative mechanism inspires and facilitates.

In terms of “start up” activities, the Working Groups are the prime “engines of action” within the WNU partnership. However, there will be special activities to generate awareness of the new co-operative mechanism and stimulate participation. Key amongst these will be Summer Schools, week-long courses led by travelling expert teams to key institutions around the world in the WNU network. In addition, the IAEA is assembling a comprehensive array of Agency-originated educational and training materials. This exercise will provide a starting point from which the Working Groups can evaluate courses and develop recommendations on standards.

For further information on WNU, visit http://www.world-nuclear-university.org

4 Need for and Benefit of ANENT

4.1 Overall motivation for ANENT in Asia

The availability of nuclear technology is essential for meeting growing energy demands, but also in the areas of health, industrial and agricultural development and protection of the environment. In many countries of the region, nuclear technology can be a catalyst for ushering a culture of science and technology, while at present, the penetration of various applications of nuclear technology is below optimum in most countries in the region.

Using nuclear technology requires highly qualified human resources. Many nuclear education and training resources are available within the Asian region, while differences in the level of knowledge and resources are observed, depending on the national level and usage of nuclear technology. On the other side, shortage of human resources is a serious concern in some Member States, while other Member States have developed educational systems and can supply education and training as well as trained human resources. The shortage is likely to be magnified by migration of trained human resources from Asia to developed countries and aging of experienced human resources.

There is a strong need of systematic integration of available resources for nuclear education and training in Asia. An information & resources sharing scheme through networking could contribute quick spreading of the benefits of atomic energy. A number of on-going activities in the countries of the region could potentially be linked under the ANENT umbrella.

4.2 Rationale for ANENT in Member States

Most Asian Member States consider education and training of the next generation to be of key importance, while the individual reasons for that importance may well be different. In some Member States, like Japan, the need to educate human resources for the operation of existing facilities with high safety standards while facing declining student enrolment numbers is dominating. In India, while part of the trained nuclear human resources in certain specializations would leave to work abroad, education and training is a high priority as part of national development.

In some Member States with significant on-going R&D activities, human resource development is considered key for future innovations in R&D. Member States like Viet Nam, with intentions to introduce nuclear power state a need to establish new educational infrastructures and develop new nuclear human resources. In addition, in almost all developing Member States nuclear technology at present plays it’s most important role for nuclear applications (health and medicine, agriculture, industrial applications), e.g. in Sri Lanka, and those Member States wish to strengthen nuclear human resources as part of sustainable national development.

Increased co-operation and networking and intensified sharing of nuclear knowledge, both for nuclear power and for other nuclear applications could overcome major obstacles to the sustainable use of nuclear technology and will further stimulate progress. Significant development and innovation might become possible through increased co-operation,

networking and sharing of resources in the Asian region, at present being one of the most dynamic regions for nuclear development and utilization of nuclear technology.

4.3 Collaboration in the region and with the IAEA

4.3.1 Common needs

It was noted that several Member States stated similar needs to be addressed, both in nuclear power and in non-power applications of nuclear technology. Member States with developed nuclear infrastructure expressed needs to secure human resources for safe operation of existing facilities, for future expansion of nuclear power and for future R&D. They wish to co-operate among themselves to pool expertise and share facilities.

On the other side, Member States with a less developed nuclear programme wish to co-operate with each other and with more Member States with more developed nuclear programmes to jointly benefit from knowledge transfer to the region for sustainable development and capacity building.

4.3.2 The possibility of knowledge transfer within the region

While some Member States in Asia would qualify as potential donors of knowledge and resources, other, less developed Member States would be in a receiving position. Co-operation between those two types of Member States in Asia can be achieved through ANENT. Regional transfer of knowledge through education and training might become an important pillar for human resource development of the receiving Member States.

For co-operation under ANENT in education and training, the techniques of networking, distance learning and sharing of facilities will be central and key pillars. It is expected that such joint activities will further enhance national development objectives in education and training for capacity building in several Member States.

4.3.3 Addressing needs through the IAEA

When looking at the relation of individual Member States and the IAEA, in particular via TC projects, it appeared that common problems were identified that could be addressed by the Agency on a common basis with several Member States at a time, thus also triggering co-operation among developing countries in the region.

ANENT is complementary to existing IAEA initiatives in focussing on education and would fit into existing IAEA frameworks. ANENT will be open to all interested Member States, and will address common problems related to education and training on a cross-cutting basis as part of the IAEA’s cross-cutting programme on nuclear knowledge. ANENT might be a very flexible and effective mechanism to address education and training needs in areas not covered by thematic networks.

4.4 Public Awareness

Public awareness (directed towards potential students) about the desirability of using nuclear technology and its applications should be enhanced. Accordingly, a regional level motivation is required by identifying challenges in nuclear technology and its applications that would attract talented youth.

4.5 ANENT and other international initiatives

A number of initiatives exist in the Asian region as well as outside. Linkage with these initiatives could be useful for the countries in the Asian region.

The ENEN Association is recognized as a strong partner in Europe in nuclear power technology education, and ANENT can benefit from experience gained in Europe. WNU and ANENT are complimentary initiatives with potential synergy in the future.

Established regional initiatives in nuclear medicine such as the ASNM are recognized as individual and on-going separate projects which could form a part of ANENT and benefit from ANENT as an overall framework. Existing organizations for co-operation in Asia, such as the FNCA and RCA, can be considered as support mechanisms for ANENT.

When looking at the Asian region alone, ANENT is a comprehensive initiative in education and training in that it will be giving equal importance to energy and non-energy technologies and in that it can have members from Asian countries at present not participating in other initiatives.

5 ANENT Terms of Reference

The following terms of reference for ANENT was prepared by the consultancy meeting in June 2003 and has been adopted for ANENT, with minor modifications, by the Technical Meeting in February 2004.

5.1 Objective

ANENT is set up to promote, manage and preserve nuclear knowledge and to ensure the continued availability of talented and qualified human resources in the nuclear field in the Asian region and to enhance the quality of the human resources for the sustainability of nuclear technology.

The objective of ANENT is to facilitate co-operation in education, related research and training in nuclear technology in the Asian region through:

- sharing of information and materials of nuclear education and training;
- exchange of students, teachers and researchers;
- establishment of reference curricula and facilitating mutual recognition of degrees; and
- serve as facilitator for communication between ANENT member organizations and other regional and global networks

5.2 Strategy

ANENT will strive to integrate available resources for education and training in synergy with existing IAEA and other mechanisms, to create public awareness about the benefits of nuclear technology and its applications, to attract talented youth in view of alternate competing career options, to encourage senior nuclear professionals to share their experience and knowledge with the young generation and will use information technology, in particular web based training and education to a maximum possible extent. Bilateral co-operation might be the starting point for multilateral networking.

5.3 Scope

5.3.1 Institutional

ANENT is a network of institutions active in nuclear education and training in the Asian region. Membership is open to universities, research centres, governmental entities and other institutions.

Other organizations, e.g. from outside the region or other international organizations, may contribute to ANENT as collaborating members.

5.3.2 Technical

The scientific and technical content covers education (higher, tertiary education, post-graduate education and associated research) and training (training courses of various duration) in all subjects in the area of nuclear science and technology.

5.4 Activities

5.4.1 Exchange of information and materials for education & training

- Identification of existing information and material;
- Establishment of a web based network, including it's operation, amendments and additions.

5.4.2 Exchange of students, teachers and researchers

- Establishment of a working mechanism to support the exchange of students, teachers and researchers;
- Facilitation of bilateral co-operation as a starting point for multilateral networking.

5.4.3 Distance learning

- Compilation of existing learning material;
- Making the material available to ANENT-web and other electronic media;
- Setting up new ANENT distance learning courses.

5.4.4 Establishment of reference curricula and facilitating credit transfer and mutual recognition of degrees

- Exchange and analysis of existing curricula;
- Establishment of recommended requirements for reference curricula;
- Facilitate mutual recognition of degrees and transfer of credits.

5.4.5 Liaise with other networks and organizations

- Identification and development of mechanisms to link ANENT with other networks such as RCA, ANSN, ENEN, FNCA, ASNM, ARCCNM and WNU;
- Serve as facilitator for communication between ANENT member organizations and other regional and global networks.

5.5 Organization

5.5.1 Membership

An individual institution becomes a member of ANENT through an authorized country representative's statement at a Coordination Committee meeting or through a direct confirmation by the representative who attended the last Coordination Committee meeting.

An individual international institution network becomes a collaborating member of ANENT through a direct expression of a representative of that institution to the IAEA.

5.5.2 Coordination Committee and ANENT spokesperson

ANENT will be guided by a *Coordination Committee*, in which IAEA Member States from which institutions are participating in ANENT are represented as members and collaborating members are represented as observers. Coordination Committee meetings should be held once per year.

The chair of the Coordination Committee will also have the role of a spokesperson of ANENT as a whole until the next Coordination Committee meeting.

5.5.3 ANENT Scientific Secretary

An ANENT *Scientific Secretary* will serve as focal point to convene Coordination Committee meetings and to report on the overall implementation of ANENT.

5.5.4 Co-ordinating Member States - Work Packages

On the operational level, ANENT activities will be divided into *Work Packages* by the Coordination Committee.

Work Packages will be implemented by (teams of) participating institutions under the leadership of a co-ordinator, who will report results to the Coordination Committee.

6 ANENT Action Plan

6.1 Milestones

ANENT is expected to be implemented in phases and is expected to grow in the future. Milestones from 2004 to 2006 are summarized below.

Milestone	**Implementing Institutions**	**Timeframe**	**Remarks**
Project initiation meeting	IAEA	held in 2003	✓
Establishment of a web based network, including it's operation, amendments and additions	KAERI	Started in 2003, continuing	✓
1st ANENT Coordination Committee meeting	IAEA	Feb. 2004	✓
Implementation of ANENT Activities 1 to 5	Participating Member Institutions	2004-2005	IAEA support
Optional: Preparation of a new IAEA TC Regional Project through established TC mechanisms			In parallel with other activities
2nd ANENT Coordination Committee meeting	IAEA	2005	to review progress achieved
Full operation of ANENT	Participating Member Institutions	beginning of 2006	IAEA support, but not in central role

6.2 Activity 1: Exchange of information and materials for education & training

Work Package/Deliverable	Lead/Implementing Institutions	Timeframe	Remarks
KAERI to provide a format for the compilation of information on the following: 1. existing institutions in nuclear engineering and nuclear-power related subjects 2. existing courses in nuclear engineering and nuclear-power related subjects 3. existing courses and training materials in nuclear engineering and nuclear-power related subjects 4. existing institutions in non-nuclear power subjects 5. existing courses in non-nuclear power subjects 6. existing course and training material in non-nuclear power subjects Designated representatives to the 1st Coordination Committee meeting to provide the above information to KAERI.	KAERI/national representatives to the 1st Coordination Committee meeting	mid 2004	Input for Web
Institutions willing to share training material to provide their training material to KAERI to be placed on the ANENT website.	Member institutions	end 2004	Input for Web
Agreement with INIS to provide access to ANENT participants	INIS Secretariat	end 2004	Offer from ROK to host INIS2
Establishment of INIS gate on the ANENT website	KAERI and INIS	2005	
Operation of a preliminary website	KAERI	mid 2004	in parallel with other work packages
Feedback from ANENT member institutions on the design of the ANENT website	KAERI and Member Institutions	mid to 3rd quarter of 2004	
Establishment of a fully operational ANENT website	KAERI	end 2004	

Work Package/Deliverable	Lead/Implementing Institutions	Timeframe	Remarks
Operation and improvement of the website with permanent updating of information regarding existing institutions, courses and course and training material	KAERI	from 2005	Input needed continuously

Contact for Activity 1:

Name: Mr. Kyong-Won HAN

Address: Director, Nuclear Training Center, Korea Atomic Energy Research Institute, P.O Box 105, Yuseong 305-600 Daejon, The Republic of Korea

Email: kwhan@kaeri.re.kr

6.3 Activity 2: Exchange of students, teachers and researchers

Work Package/Deliverable	Lead/Implementing Institutions	Timeframe	Remarks
MINT to provide a format for the compilation of information on teaching and research staff in nuclear science, technology and engineering. Member institutions to provide these information to MINT and MINT to transmit this compilation to KAERI to be placed on the ANENT website.	MINT	mid 2004	
Member institutions to provide information on exchange needs (bilateral/multilateral basis) to MINT.	MINT	end 2004	Based on previous
MINT to compile information on financial support options for exchange mechanisms (eg. TC fellowship, cost-shared basis, etc)	MINT	end 2004	
Member institutions to implement exchange of teaching and research staff on bilateral or multilateral basis	Member institutions	2005 onwards	ENEN models to be considered TC national projects for funding
Agreement on selected financial options to support exchange of students and staff	Member Institutions	end 2005	
Establishment of an operational system for student and staff exchange	Member Institutions	mid 2005 onwards	Co-ordination with IAEA/TC

Contact for Activity 2:

Name: Ms. FATIMAH Mohd Amin

Address: Manager, Research Management Centre (RMC), Malaysian Institute For Nuclear Technology Research (MINT), Bangi 43000 KAJANG, Malaysia

Email: fatimah@mint.gov.my

6.4 Activity 3: Distance learning

Work Package/Deliverable	Lead/Implementing Institutions	Timeframe	Remarks
PNRI to compile existing course and training material available on electronic form (eg. training material produced by RCA, ASNM, ANSN, etc)	PNRI	mid 2004	Refer Activity 1
PNRI to seek agreement from owners of the training material that are to be made available on the ANENT website. KAERI to place the training material on the ANENT website.	PNRI and KAERI	end 2004	Refer Activity 1
Formulate a mechanism for distance learning.	PNRI	2004-2005	In cooperation with INIS
Identify the needs for new courses and training materials for distance learning	PNRI and member Institutions	End 2005	

Contact for Activity 3:

Name: Ms. Corazon Casenas BERNIDO

Address: Philippine Nuclear Research Institute, P.O Box 213, U.P.1101 Quezon City, Philippines

Email: cber@info.com.ph

6.5 Activity 4: Establishment of reference curricula and facilitating credit transfer and mutual recognition of degrees

Work Package/Deliverable	Lead/Implementing Institutions	Timeframe	Remarks
HUT to compile existing curricula on nuclear science, technology and engineering in ANENT member institutions; a format for information collection will be provided by HUT. HUT to transmit this compilation to KAERI who will place it on the ANENT website.	HUT and KAERI	mid 2004	Refer Activity 1
Compilation of information on mechanisms for transfer of credits and mutual recognition of degree used by member institutions.	HUT	end 2004	
Member institutions to implement transfer of credits.	Member institutions	mid 2005 onwards	
Member institutions to implement mutual recognition of degrees	Member institutions	mid 2006 onwards	
Establishment of recommended requirements for “reference curricula”	Member Institutions	end 2005	or later

Contact for Activity 4:

Name: Mr. Phung Van DUAN

Address: Hanoi University of Technology, 1 Dai Co Viet Roadm Hanoi, Vietnam

Email: pvduan@mail.hut.edu.vn

6.6 Activity 5: Liaise with other networks and organizations

Work Package/Deliverable	Lead/Implementing Institutions	Timeframe	Remarks
UC to compile information on the activities of other networks/organizations such as RCA, ANSN, ENEN, FNCA, WNU, etc. related to education and training in nuclear science, technology and engineering. UC to transmit this compilation to KAERI to be placed on the ANENT website.	UC and KAERI	mid 2004	Refer Activity 1
Formulate mechanisms for regular information exchange between ANENT and other related networks/organizations	UC	end 2004	
Identification of possibilities for joint projects or activities (e.g. joint studies, joint courses) with other related networks/organizations	UC and Member Institutions	2004-2005	

Contact for Activity 5:

Name: Ms. Rohini HEWAMANNA

Address: Commissioner, Atomic Energy Authority, 60/460 Baseline Road, Orugodawatta, Wellampitiya, Sri Lanka

Email: srlaea@slt.lk

7 Institutions participating in ANENT

The following institutions are participating in ANENT, as of February 2004, through participation in the 1st Coordination Committee meeting:

ANENT Members		
Country	**Participating institution**	**Contact**
China	*Beijing Institute of Nuclear Engineering*	*Mr. Junming Zheng [could not attend]*
India	Bhabha Atomic Research Centre (BARC) (others to be listed later)	Mr. R. Grover
Indonesia	National Nuclear Energy Agency Education and Training Center (BATAN)	Mr. M. Karsono
Japan	(under consideration)	Mr. Y. Seki
Malaysia	Malaysian Institute for Nuclear Technology (MINT)	Ms. Fatimah Amin
Malaysia	University Kebangsaan Malaysia	Mr. Sukiman Sarmani
Malaysia	University Putra Malaysia	Ms. Aini Ideris
Mongolia	National University of Mongolia	Mr. S. Davaa
Pakistan	KANUPP Institute of Nuclear Power Engineering (KINPOE)	Mr. Nasir Ahmad
Pakistan	Pakistan Institute of Engineering and Applied Sciences (PIEAS)	Mr. Nasir Ahmad
Pakistan	Centre for Non-distructive Testing	Mr. Nasir Ahmad
Republic of Korea	KAERI, Nuclear Training Centre	Mr. K.W. Han
Republic of Korea	Department of Nuclear Medicine Seoul National University	Mr. J.K. Chung
Sri Lanka	Atomic Energy Authority	Ms. R. Hewamanna
Sri Lanka	University of Colombo	Ms. R. Hewamanna
Thailand	Office of Atoms for Peace (OAP) (list of institutions to be added)	Mr. P. Pongpat

The Philippines	Philippine Nuclear Research Institute (PNRI)	Ms. Corazon Casenas Bernido
Viet Nam	Hanoi University of Technology	Mr. Ph.V. Duan

ANENT Collaborating Institutions	
Asian School of Nuclear Medicine (ASNM)	Mr. F. Sundram
European Nuclear Education Network (ENEN)	Mr. F. Moons
World Nuclear University (WNU)	Mr. S. Kidd

8 Recommendations

It was noted that ANENT activities have started and ANENT is operational. The following recommendations are made:

1. Full operation of ANENT should be supported through a new Regional TC Project, and the IAEA is invited to examine this possibility.

2. Member States representatives are encouraged to contact IAEA TC through their respective official channels to request support for ANENT as a Regional TC Project.

3. Member States are invited to consider hosting one of the next Coordination Committee meetings.

4. Nuclear energy and nuclear applications play equally important roles in Asia, and the related IAEA departments should be involved in further ANENT work.

5. Nuclear safety plays a very important role and is being addressed through the ANSN. The meeting recommended that ANSN and ANENT work together for synergistic effects.

9 Spokesperson

It was agreed that a representative from MINT would take the role of spokesperson of ANENT until the next Coordination Committee meeting.

10 Next Meeting

The next Coordination Committee meeting is scheduled to be held in 2005.

11 Glossary

Acronym	Full name
ANENT	Asian Network of Education in Nuclear Technology
ANSN	Asian Nuclear Safety Network
ARCCNM	Asian Regional Cooperative Council for Nuclear Medicine
ASNM	Asian School of Nuclear Medicine
FNCA/HRD	Forum for Nuclear Cooperation in Asia – Human Resource Development (Group)
ENEN	European Nuclear Engineering Network (EC project)
NEPTUNO	Nuclear European Platform of Training and University Organizations (EC project, follow-up to ENEN)
RCA (- RO)	Regional Cooperative Agreement (- Regional Office)
WNU	World Nuclear University

12 Annexes

Annex 1: Terms of Reference of the ANENT Consultancy, July 2003

Annex 2: List of participants of the ANENT Consultancy, July 2003

Annex 3: Terms of Reference (information sheet) of the ANENT Technical Meeting (1st Coordination Committee meeting), February 2004

Annex 4: List of participants of the ANENT Technical Meeting (1st Coordination Committee meeting), February 2004

Annex 5: General Conference resolutions are available from the IAEA knowledge management website: http://www.iaea.org/km

Annex 6: Background papers and presentation material on national activities and ANENT related activities

a. China

b. India

c. Indonesia

d. Japan

e. Republic of Korea

f. Malaysia

g. Mongolia

h. Pakistan

i. The Philippines

j. Sri Lanka

k. Thailand

l. Viet Nam

m. ASNM

n. ENEN

o. WNU

p. RCA-RO

q. FNCA-HRD

r. IAEA Presentations