TC project RAS4030

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Working Material

Workshop on the Elaboration of Strategic, Business and Management Plans Qatar, Doha 28-30 September 2009

Under the TC project RAS/4/030 - Developing a Regional Nuclear Training Centre for Capacity Building and Research

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Working Material

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1. IAEA INFORMATION SHEET

Workshop on the Elaboration of Strategic, Business and Management Plans

Project Code & Title:	**RAS/4/030 - Developing a Regional Nuclear Training Centre for Capacity Building and Research**
Place (City, Country):	**Doha, Qatar**
Dates:	**28-30 September 2009**
Organizers:	The Government of Qatar, through the Ministry of Environment, with the support of the International Atomic Energy Agency provided under TC Project RAS/4/030 - Developing a Regional Nuclear Training Centre for Capacity Building and Research.
Host Country Organizer:	Ms. Amal Al-Thani Head of Technical Cooperation Section Ministry of Environment, Doha-Qatar Tel: 00974 4207667, E-mail address: atalthani@moe.gov.qa
Language:	The workshop will be conducted in English (no translation will be provided).
Purpose:	The main objectives of the workshop are: • To provide information, experience and skills in the preparation and formulation of strategic, business and management plans for developing a nuclear training centre for capacity building and research; • To discuss, assess and agree on an appropriate format and specific contents of strategic, business and management plans for developing a nuclear training centre for capacity building and research; • To elaborate and agree on information sharing mechanism, roadmaps and timeframe to finalise the strategic, business and management plans (national and regional).
Expected Output(s):	• Enhanced experience and skills in the preparation and formulation of strategic, business and management plans for developing a nuclear training centre for capacity building and research; • Agreed format and specific contents of strategic, business and management plans for developing a regional nuclear training centre for capacity building and research; • Agreed information sharing mechanism, roadmaps and timeframe to prepare and finalize the strategic, business and management plans (national and regional).
Scope and Nature:	The main topics that will be discussed are relevant for the preparation and formulation of strategic, business and management plans for developing a nuclear training centre for capacity building and research with the following particular components: i) research reactor, ii) particle accelerator, and iii) nuclear education and training centre. The complete programme of the meeting will include expert lectures and working sessions during which the participants are expected to take an active participation in terms of presentations, discussions, and reporting.

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Background Information:

The Declaration of the 27th Session of the GCC Summit, held in Riyadh on 9 December 2006, directed that a GCC-wide study be conducted to formulate a joint programme in the field of nuclear technology for peaceful purposes. In this context, the GCC has been seeking the assistance and expertise of the Agency with regard to both the feasibility of introducing nuclear power for electricity generation and seawater desalination, and also the development of other non-power nuclear applications for peaceful purposes. Sustainability of the outcomes of this project is expected to be ensured by the continuous support of the GCC Member States.

As part of the Agency's package of support to the GCC Member States during 2009/2011, TC project RAS/4/030 aims at supporting the project counterparts in developing a regional nuclear training centre for capacity building and research. Under project RAS/4/030, it has been agreed by the GCC Member States and the Agency that a workshop on the elaboration of strategic, business and management plans for developing a regional nuclear training centre should be organized.

Participation:

GCC Countries

Participants' Qualifications & Contributions:

The meeting is designed for senior representatives in charge of human resources development in the area of nuclear science and technology, present/future accelerator/reactor facility managers, stakeholders from the GCC Member States. To ensure the working environment of the meeting, not more than 3 representatives per Member State will be accepted, preferably with different background.

Participants are expected to present a brief summary of an actual status and future plans on nuclear education and training, including research reactor and particle accelerator facilities. Both national and regional contexts should be elaborated.

Administrative and Financial Arrangements:

The academic and professional profile of the designated participants will be shared with the TC Department (IAEA) and the Qatari Host (see above) by **3 August 2009**, at the latest. Nominations should be submitted using the standard IAEA application form for TC workshops. Completed forms should be endorsed by and returned through the established official channels. The nominations should reach the Agency through facsimile (+43-1-26007) or e-mail (Official@iaea.org).

As agreed at the Vienna meeting with the GCC Member States on 25 February 2009, the nominating authorities shall bear the full cost of the participation of their nationals and any expenses arising during the workshop. Furthermore, it is clearly understood that each Government, in nominating participants, accepts liability for the payment of any cost or compensation that may arise from damage to or loss of personal property, or from illness, injury, disability or death of a participant while he/she is travelling to and from or attending the meeting, and undertakes responsibility for such coverage. Governments would be well advised to take out insurance against these risks.

The Agency shall provide the required experts' support to the workshop under RAS/4/030 and shall make the necessary arrangements with the hosting authorities for the adequate and timely provision of such expert services.

2. OBJECTIVES OF THE MEETING

The main objectives of the workshop were:

- To provide information, experience and skills in the preparation and formulation of strategic, business and management plans for developing a nuclear training centre for capacity building and research with two major components, namely a research reactor and particle accelerator;

- To discuss, assess and agree on an appropriate format and specific contents of strategic, business and management plans for developing a nuclear training centre for capacity building and research;

- To elaborate and agree on information sharing mechanism, roadmaps and timeframe to finalize the strategic, business and management plans (both national and regional).

3. WORK DONE AND RESULTS ACHIEVED

The workshop was attended by 5 international experts, from Belgium, France, South Africa, United Kingdom and USA. The 6 GCC countries were represented by 17 officially nominated participants. After the official host opening remarks by Mr Mohamad H. Al-Qubasi, Director of Scientific & Technological Cooperation Dept., The Cooperation Council for the Arab States of the Gulf, the welcome address was given by Mr D. Ridikas, the IAEA Scientific Secretary of the workshop and Technical Officer of the TC project RAS4030. The self-presentation of all participants followed. Mr Ahmed Al-Rawas (Oman) was nominated as the chairperson and Ms Ilham Y. Al-Qaradawi (Qatar) was appointed as the *rapporteur* of the workshop. Thereafter, followed a brief presentation by Mr D. Ridikas, the IAEA Scientific Secretary, on major research reactor related activities under the IAEA sub-programme D2 and specific objectives of the workshop.

The entire 1st day of the workshop was exclusively dedicated to the IAEA experts' lectures in order to provide information, experience and skills in the preparation and formulation of strategic, business and management plans for developing a nuclear training centre for capacity building and research with two major components, namely a research reactor and a particle accelerator. The summaries of all experts' presentations are included in Annex I. Some time was allocated for discussions right after each expert's presentation as well as at the very end of this day.

During the 2nd day of the workshop the presentations on elaboration of draft strategic, business and management plans for developing a nuclear training centre for capacity building and research were given by representatives of GCC countries, namely Kuwait, Oman, Qatar and Saudi Arabia. The corresponding summaries can be found in Annex II. These four individual presentations were followed by discussions, with participation of other GCC representatives as well as the experts. No presentations were made by the representatives from Bahrain and United Arab Emirates, although they were present at the workshop.

The remaining 3rd day was organized in the form of round table discussions in order to prepare the information table (see Table 1) relevant to the individual country's needs/demand for products and services that the future nuclear research and technology centre should provide.

Table 1: Present and future potential needs-demand table in the GCC region

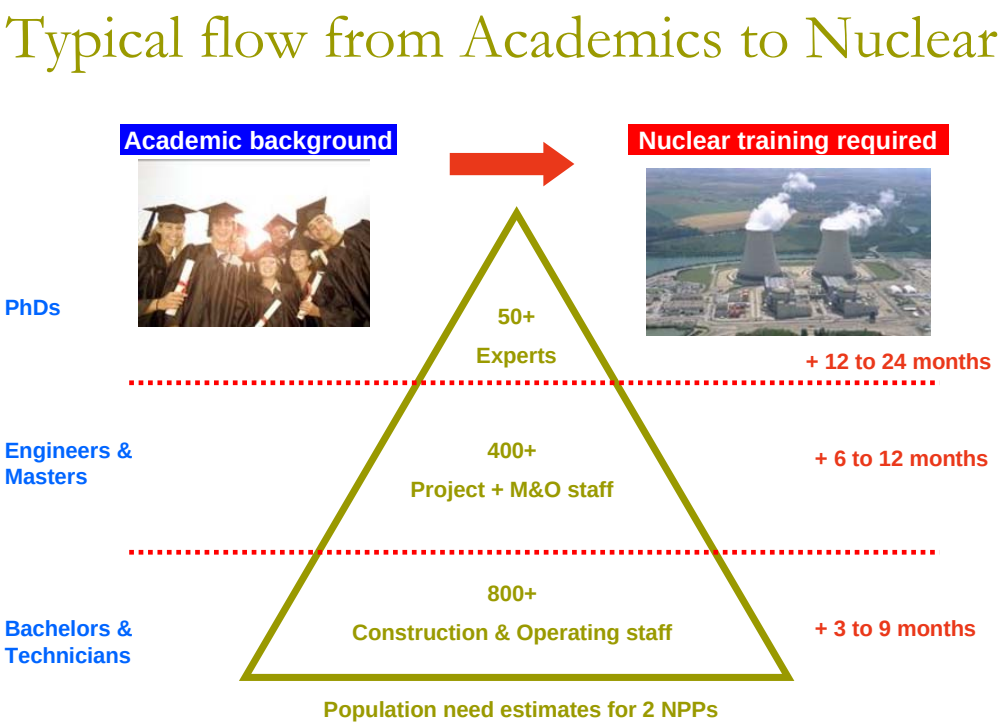
GCC country	Nuclear Education & Training	Radioisotopes	Irradiation services	Analytical services	Basic Research	Neutron Beam Applications	Nuclear Medicine & Radiotherapy
Bahrain	Not provided	Not provided	Not provided	Not provided	Not provided	Not provided	Not provided
Kuwait	Yes, including support for nuclear power	Yes, petroleum industry in particular (sealed sources, tracer elements?)	NTD of Si for solar power (renewable energy). Food preservation.	Yes, petroleum industry in particular (NAA, AMS, etc.)	Yes, Experimental Nuclear Physics	Yes, neutron scattering, neutron radiography	Yes, applications in nuclear medicine
Oman	Yes, national expertise in the field	Yes, in support of hospitals using radioisotopes (e.g., I-131)	NTD Si for solar power (renewable energy)	PIXE	Yes	Radiography, NDT, neutron scattering	PET scanners
Saudi Arabia	Yes, at all levels; nuclear engineering to increase the capacity, physics of health, radiation, and relevant engineering disciplines.	Yes, (high potential need for Mo99, Ir192, Co60, and other isotopes, e.g. tracer elements). Isotopes production could be by expanding the current cyclotron activites and capabilities as well as through RR.	Application in Food preservation, material irradiation, and sterilisation, R&D in flue gas treatment, waste water treatment both industrial and research level, etc.	NAA, PGNA, fast neutron activation analysis	Yes (e.g., development of accelerator technology)	Radiography, NDT, neutron therapy	Heavy ion accelerator for hadron-therapy Radiotherapy services Exapnsion of cyclotron and PET capabilities and activities
Qatar	Yes, radiation protection & safety	Yes, nuclear medicine in particular, e.g. Na22, Co60, and Mo99.	NTD Si for solar power (renewable energy). Agriculture, polymer irradiation	NAA	Yes	Neutron scattering, radiography, NDT	Cyclotron for proton therapy, PET scanners
UAE	Yes, now; including support for nuclear power: nuclear engineering (MSc & PhD) & medical physics (BSc)	Use in hospitals and petroleum industry, education & training	NTD Si for solar power (renewable energy)	NAA, PIXE	Material research and testing for space applications	NDT	PET scanners
GCC country	**Nuclear Education & Training**	**Radioisotopes**	**Irradiation services**	**Analytical services**	**Basic Research**	**Neutron Beam Applications**	**Nuclear Medicine & Radiotherapy**

Another dedicated requirements table was prepared (Table 2) and provides information on specific needs related to the human capacity and infrastructure building for the construction and operation of the 1st Nuclear Power Plant (NPP).

Table 2: Specific requirements for building and operating the 1st NPP

GCC 2006 declaration relevant to formulation of joint programme on feasibility study of introducing nuclear power for electricity generation and seawater desalination in the GCC region. Clear need of education and training for capacity building in nuclear engineering and related fields. **Assumption: building and operating the 1st NPP consisting of 2 reactor units.**			
Staff requirements			Expertise/institution requirements in support of different stakeholders
50 staff members with high level expertise; PhD level	400 staff members for Project + M&O; MSc & Engineers	800 staff members for construction + operation; BSc & Technicians	Government Regulator Utility

The scheme below is complementary to Table 2 and further emphasizes the need for dedicated nuclear training; only academic background being not sufficient in this case. *Source: Mr B. Castanet, AREVA, France*



Finally, the concluding discussion session was held to prepare the draft workshop report, formulate recommendations, schedule and agree on future work-plan, both in the national and regional context.

4. CONCLUDING REMARKS

Based on the constructed needs/demand Table 1, it was agreed and concluded that

- Present and potential future needs justify the development of a nuclear centre(s) for research, technology and capacity building for peaceful purposes,
- Both research reactor (RR) and particle accelerator seem to be crucial components of the future centre(s),
- Clear overlap of numerous needs by all 6 GCC countries strongly support a regional coordination, common efforts and regional approach to meet these requirements,
- In this context, assistance from regional and international institutions with relevant experience is required.

Based on a speculative assumption that one intends to build in the region the 1st NPP consisting of 2 reactor units, the following requirements apply *(here the reference is made to the GCC 2006 declaration, relevant to the feasibility study for introducing nuclear power for electricity generation and seawater desalination):*

Minimum requirements and the need for an immediate action relevant to the nuclear capacity building:

1. Expand existing and develop relevant education capacities at the universities,
2. Create and operate competent technical expertise and services institution(s) to support regulators and/or operation of the future NPP,
3. Create and operate a dedicated nuclear training centre.

Taking into account the entire list of needs given in Table 1:

4. (1+2+3) can be implemented more effectively with the assistance/support of a nuclear research and technology centre.

5. RECOMMENDATIONS

During the discussion on current status and future needs in the domain of nuclear capacity building, associated research and technology in the GCC region, the participants formulated the following specific recommendations:

A) To the GCC:

- Ensure the continuation of the IAEA TC project RAS4030 “Developing a Regional Nuclear Training Centre for Capacity Building and Research” with the mandate of involved counterparts to prepare a roadmap for the establishment of a nuclear science and technology research center considering in the context of the possible introduction of nuclear energy for electricity production and water desalination in the region.

- Request individual GCC member states to ensure the follow up and enhance internal communication towards implementation of the IAEA TC project RAS4030 "Developing a Regional Nuclear Training Centre for Capacity Building and Research"

- Facilitate and support regional coordination, common efforts and regional approach to meet the overlapping individual member states' needs in nuclear capacity building, related research and technology development for peaceful purposes

- With assistance of the IAEA, support organization of scientific visits to the highly regarded research and technology centers, including research reactors and/or particle accelerators and other relevant facilities (e.g., waste management sites, etc.)

- Encourage GCC member states to expand existing and/or develop relevant nuclear education and research programs at the universities and research centres

B) To the IAEA:

- If available, provide the GCC countries with a realistic example of the existing Strategic, Business and Management plan of a nuclear research centre for capacity building and research (e.g., Morocco, Algeria, etc.)

- Provide the GCC countries with detailed and timely information on training courses relevant to RRs/accelerators and their applications, organized by IAEA and other organizations/institutions

- Facilitate organization of scientific visits to the highly regarded research and technology centers, including RR and/or particle accelerator with an appropriate utilization experience.

- In the future project meetings, IAEA will work on involvement of experts from similar nuclear research and training centers with different experiences of utilization and different capacity.

6. RECOMMENDED WORK PLAN FOR THE NEXT 12 MONTHS

Action	Deadline	Coordination
The 1st Working Draft Document, titled "A Nuclear Power Strategic Plan for the GCC Region" is submitted to the IAEA	01/12/2009	GCC
The draft documents on Strategic, Business and Management plans for "Developing a Nuclear Training Centre for Capacity Building and Research" is submitted to the IAEA by individual GCC countries	01/02/2010	Individual GCC countries
Experts & IAEA evaluate the draft documents provided by the individual GCC countries and return their input/suggestions to the GCC country counterparts	01/04/2010	Experts & IAEA
The final documents on Strategic, Business and Management plans for "Developing a Nuclear Training Centre for Capacity Building and Research" is submitted to the IAEA by individual GCC countries	01/07/2010	Individual GCC countries
Final meeting is organized among GCC counterparts and the IAEA experts to finalise the regional GCC Strategic, Business and Management plan for "Developing a Nuclear Training Centre for Capacity Building and Research"	04/10/2010	GCC & IAEA

7. CONCLUDING SESSION

During the concluding session the experts felt that it was important to highlight a number of final remarks to the GCC representatives:

- Leading research and technology breakthroughs in nuclear field will not be possible without dedicated facilities and infrastructures
- National efforts will be the driving force to build the needed capacity and facilities. However, a joint research and technology centre, with comparable structure and functions as Joint Research Centre (JRC, http://ec.europa.eu/dgs/jrc) in Europe, might be an option for common interest and regionally strategic goals
- Formulation of both nationally and regionally justified needs is primordial for everyone, and the necessary time should be taken to define these needs at the very beginning, without forgetting the long term strategic plans. Planning should be supported by skills, knowledge and experience, with input and support both from inside (internally) and outside (externally).
- Clear distinction between research and training centres should be made. Dedicated efforts at the universities are necessary, but this alone will not be sufficient to reach the goals for the human capacity building needed for the 1st NPP in the region
- National project counterparts should enhance their involvement in the project, including internal discussions, exchange of information, meetings and other related efforts both on the national and regional level.
- The IAEA should promote and assist in share expertise between GCC countries and other involved MSs in LWR cooling and desalination.

Finally, the participants concluded that the Workshop was a very useful and constructive event. The IAEA experts' presentations, their participation in discussions and the input that they provided, entirely fulfilled the expectations. At the very end, Mr D. Ridikas (IAEA) thanked Qatar and GCC representatives for hosting this meeting, and for their exceptionally good local organization and assistance. Equally, Mr D. Ridikas thanked all experts and GCC participants for their valuable contribution to this meeting, and for their recommendations.

ANNEX I. EXPERT LECTURES: ABSTRACTS

8. MR DANAS RIDIKAS, IAEA;

Objectives of the Workshop

This paper will give a brief introduction to the programmatic structure of the Research Reactor (RR) related activities under sub-programme D2 of the IAEA. The project D2.01 on "Enhancement of utilization and applications of RRs" will be presented in more detail with emphasis on two major activities, namely "RR coalitions, networks and centres of excellence" and "Update and management of RR Data Base".

As for the Objectives of the Workshop, the main topics to be discussed during this meeting are relevant for the **preparation and formulation of strategic, business and management plans for developing a nuclear training centre for capacity building and research with the following particular components: i) research reactor, ii) particle accelerator, and iii) nuclear education and training centre.** The complete programme of the workshop will include expert lectures and working sessions. During these working sessions the participants from GCC Member States are expected to take an active participation in terms of presentations, discussions, and reporting towards preparation of their respective strategic, business and management plans for developing a nuclear training centre for capacity building and research. Both national and regional contexts should be considered.

Recommended references

[1] "Strategic Planning for Research Reactors", IAEA TECDOC 1212, 2001, available electronically at http://www-pub.iaea.org/MTCD/publications/PDF/te_1212_prn.pdf

[2] "Applications of Research Reactors", IAEA TECDOC 1234, 2001, available electronically at http://www-pub.iaea.org/MTCD/publications/PDF/te_1234_prn.pdf

[3] "Utilization Related Design Features of Research Reactors: A Compendium", IAEA Technical Report Series 455, 2007, available electronically at http://www-pub.iaea.org/MTCD/publications/PDF/TRS455_web.pdf

[4] "Optimization of Research Reactor Availability and Reliability: Recommended Practices", IAEA Nuclear Energy Series *NP-T-5.4*, 2008, available electronically at http://www-pub.iaea.org/MTCD/publications/PDF/Pub1338_web.pdf

[5] Operational Research Reactors in the World, IAEA working material, available at http://www-naweb.iaea.org/napc/physics/research_reactors/database/RR%20Data%20Base/datasets/foreword_home.html

9. MR AÏT ABDERRAHIM HAMID, SCK•CEN, BELGIUM;

Strategic plans in the context of embarking on nuclear power: national & regional

Based on the experience of the various countries having matured the use of nuclear power, we will summarize the prerequisites needed for any country aiming to embark today in deploying and using nuclear power. The paper will review the needed commitments and duties of the various stakeholders namely; governments, nuclear power plant (NPP) designer, NPP owner, NPP operator, NPP manufacturer, the utilities and the research institutions. The role of safety and regulatory body will be also described and its role in building the needed public confidence and broad-based support to help inform and enable policy decisions.

Belgium produces today 58 % of its electricity by nuclear energy. In the second part of the paper we will illustrate the different steps representing the Belgian roadmap for getting to the present day situation and what are the perspectives for nuclear energy in this country. The Belgian roadmap can be characterized by the five following steps:

1. Paving the road for nuclear energy
2. Mastering technology for NPP-development
3. Industrial deployment of first NPP’s
4. Deciding on next generation of NPP’s
5. Maturing the use of NPP's; through management and improvement of NPP’s.

In the last part of the paper we will propose a potential fast track roadmap for implementing nuclear power in the GCC member countries taking advantage of the IAEA CUC technical reports and the international collaboration as well as the advantages one can reach from the strategic and economic point of views by considering a regional rather than a national development of nuclear energy.

10. MR BERTRAND CASTANET, AREVA, FRANCE;

Case of Nuclear Education and Training

Many Countries with an existing nuclear power base experience an aging of the population of people knowledgeable in nuclear technology. Among the many root causes, one may quote the lack of interest of young students for scientific matters in general and the lack of new projects over the last 20 years. This is no longer true: increasing concerns on the availability of Oil & Gas in the long term, the climate change issue, awareness of the importance of self sufficiency in the energy field and, last but not least, new perception of nuclear energy competitiveness is leading many countries to revise their policy regarding nuclear energy. A key element to support the anticipated growth of nuclear energy in "nuclear" countries but also in "newcomer" ones will be the availability of well trained people at any level of future responsibility (from the technician running a facility to the policy maker or the electricity company manager).

As a leading country in the nuclear field, with 58 large reactors in service generating 78 % of CO_2-free electricity and an R&D budget comparable with those of far larger countries, France has been able to maintain a high level of competences and permanent progress in technology sustaining a high level of training activity & capacities for its own needs. Several countries have already benefited from this situation. However, it is recognized that the volume of recruitments should increase twofold in the coming years, to reach a rate of 2500 people / year (of which 2/3 Engineers & PhDs), just to replace the existing workforce in France, not taking into account the needs for export markets. The current education system can deliver about 50 % of them and several initiatives have been taken by the authorities to boost training capacities, e.g. launching in Sept. 2009 of the International Master of Nuclear Engineering by ISTN & partners + several local initiatives by various universities or "Grandes Ecoles". Besides this national needs, AREVA as a worldwide company experiences a tremendous need to develop its technical capacities throughout the world in all its areas of activity from mining to Front end, reactors & services, and management of the Back end of the fuel cycle.

The "Nuclear Renaissance" and the ~50 countries that are potential Nuclear Power Newcomers, raise new issues as these all aim to develop their nuclear infrastructures at the same pace (i.e. commercial operation planned between 2020-2025): there is limited time and capacity to develop their own regulatory, engineering and operating resources in accordance with the *IAEA "Milestones in the Development of a National Infrastructure for Nuclear Power*", particularly with regards to the "*Management"* and "*Human Resources Development issues"*.

The purpose of the presentation is to share with the audience some initiatives developed by AREVA and other partners (e.g. ANDRA, CEA, EDF, EON, GDF Suez, INSTN, IRSN…) in the field of Nuclear Education and Training that Newcomers may use to develop and hire well trained resources for their research and commercial nuclear activities, in accordance with their respective strategies.

The presentation will focus on a few successful examples of international training initiatives implemented in the area of Nuclear Research (Morocco), nuclear feasibility studies (Jordan, Vietnam…), Project Management (South Africa), Operators training and Technology transfer (China, Japan…). It will also highlight some cooperative actions initiated at European level (by Education or Safety networks like ENEN or ETSON, by Vendors & Utilities (e.g. European Nuclear Leadership Academy)) and at Regional level (International Master in Nuclear Engineering in France, Nuclear skills Academy in the UK, plus other initiatives being considered in Central Europe…). The necessary link between training and research to develop high levels of competences and, in that respect, the role of research centers and research reactors will be underlined.

AREVA will provide its own feedback on the recent implementation of an International Campus in Aix en Provence where about 2500 European managers will be trained on a yearly basis (similar establishments are being considered in America, Asia and the Middle East), with the possibility of providing tailored modules for customers and partners. Most training courses involve simulators and computer-aided systems, with a large place given to site visits and interactions with professionals and

experts largely available in the region where the most advanced installations are located: Power Plants and Fuel facilities in the Rhone Valley, Prototype & Research Reactors in Cadarache, including the ITER project…

AREVA and its partners coordinated in France by AFNI (Agence France Nucléaire International) share the view that to be successful, Nuclear Energy requires 1) a high level of awareness and education to help define a global state energy policy 2) a strong industrial infrastructure to build and operate the future nuclear installations safely and economically 3) a very strong vocational and tutorial training system, particularly when it comes to safety and security 4) Business & Communication skills to allow public acceptance. They are ready to support any regional initiative in all four areas.

11. MR LOWRY CONRADIE, ITHEMBA LABS, SOUTH AFRICA;

Case of Accelerators

The history of particle accelerators in terms of the maximum particle energy and beam intensity achieved will be briefly reviewed. The different types of accelerators and their main applications, with some examples, will be explained. Dedicated as well as multi-disciplinary accelerator facilities will be discussed. The applications of the multi-disciplinary accelerator facilities at iThemba LABS will be treated in greater detail to illustrate the many uses of cyclotrons and Van de Graaff accelerators.

The main accelerator at iThemba LABS is a K200 variable-energy, separated-sector cyclotron (SSC). High-intensity proton beams are pre-accelerated in a K8 solid-pole injector cyclotron, with an internal PIG (Penning Ion Gauge) ion source, before injection into the SSC. The second solid-pole injector cyclotron has an external ECR (Electron Cyclotron Resonance) ion source, for acceleration of heavy ions, and a polarized hydrogen ion source. A 66 MeV high-intensity proton beam is provided for the production of radioisotopes in two target stations and for neutron therapy with an isocentric system. A low-intensity 200 MeV proton beam is used for proton therapy. Low-intensity beams of light and heavy ions are available for nuclear physics research in vaults equipped with a scattering chamber, a crystal ball and a K600 spectrometer. Beams from the two Van de Graaff accelerators are directed to areas for solid state physics and materials research using PIXE (Proton-Induced X-ray Emission) and a microprobe. Facilities for AMS (Accelerator Mass Spectroscopy) are currently under construction. The accelerators, important aspects of the beam lines such as fast beam switching and beam splitting, the user facilities, equipment for handling radioisotope production targets and the beam requirements of the different users will be presented. An important user requirement is that the beam should be stable and that beam delivery should be reliable, especially for the treatment of patients and production of radioisotopes for hospitals. A few brief remarks will therefore be made on the supply of electric power and temperature-stabilized cooling water for accelerators.

Accelerator facilities provide excellent opportunities for training of students in a wide variety of disciplines and gaining experience in designing and building complex electromechanical equipment. In addition to training in the applications such as nuclear physics, materials research and medical physics the accelerators themselves provide opportunities for training in accelerator physics and engineering. Some of the following topics will be discussed: beam dynamics and orbit calculations, using analytic and numerical methods, in the accelerators and beam lines; design and construction of a wide variety of electromagnets and resonators; small-signal electronic equipment for beam diagnostic equipment; vacuum systems consisting of pumps, valves, pressure gauges, control and interlocking systems.

Procedures and guidelines to follow when initiating the establishment of a multi-disciplinary accelerator facility will also be proposed.

12. MR STEVE REESE, RADIATION CENTER, OREGON STATE UNIVERSITY, USA;

Case of Research Reactors

Strategic planning is an important part of managing a research reactor. Not only does it provide the obvious benefit to business and marketing plans, it provides guidance to the reactor staff and helps to create a proper safety culture. This presentation will review the applicable IAEA guidance documents on formulating research reactor specific strategic plans, with particular attention paid to IAEA - TECDOC - 1212, *Strategic Planning for Research Reactors*. The process generally involves two phases.

- The first phase, or information gathering phase, involves gathering information on reactor capabilities, understanding of who the stakeholders are, performing a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis, articulating the importance of the funding source, and clearly understanding the direction the management of the facility wishes to take the facility.
- The second phase, the actual writing of the document, can begin once all the data has been gathered and formulated. Information and examples of the main sections of the document are presented.

These sections include, but may not be limited to, the executive summary, introduction, vision and mission statements, identification of major objectives, selection of specific objectives that necessarily derive from the major objectives, and a identified mechanism for periodic document review and feedback.

13. MR KEVIN ALLDRED, INT. NUCLEAR ENTERPRISE GROUP, USA;

Business Plans: National & Regional Context

The presentation presents the purpose and benefits of the business plan, as well as providing a table of contents of a typical plan, with guidance on the issues under each heading, and with references to relevant IAEA publications. It notes that the business plan should focus not only on the information and issues underpinning the creation of the centre, but also on longer term sustainability. Many existing research reactors that were created as national 'prestige' facilities are facing financial and utilization pressures. Just 'being available' no longer suffices - utilization and role must be actively managed at the outset to maintain the relevance to national priorities and the world-class reputation that inspires staff.

The business plan should be a storyboard for the centre – presenting information for decision-makers, users, and centre staff. Informed by the business plan, the reader can understand clearly what the Regional Research Centre plans to achieve, what resources are required to create it, from where those resources will be found, and what needs to be done to maintain the centre's focus and relevance in the longer term. The answers to these questions will likely strongly favor a regional approach.

The business plan provides a logical way to justify the decisions underpinning the new centre, and communicates the priorities of the sponsors and the facility's management. It will provide answers to the following questions: who/what is the centre; who are the customers (stakeholders and users); what will the centre achieve; how will it achieve its goals; what will the centre do, which facilities will it have, and what services will it provide, how they can be accessed; how will the centre be organized to meet the immediate needs of its stakeholders and users, and how will it ensure that its performance is maintained long-term; how will the centre provide value for money; where will it be located; whether, for what, and how will the centre seek and use non-governmental funds; what financial and non-financial resources are needed for the support of the centre; and why is the centre important?

The process of developing the business plan is in itself important, because it will force systematic consideration of the important issues and help to build the consensus needed for success. The business plan will therefore not only help to create the centre, but also to ensure that it starts-out in control of its destiny and able to pro-actively expand its value as a regional resource to the GCC countries.

ANNEX II. INDIVIDUAL SUMMARIES BY GCC COUNTRIES

14. BAHRAIN

No presentation given during the workshop.

15. KUWAIT

- Kuwait is planning to build an NPP, and therefore operator preparation is needed.
- Expected installed capacity of the NPP is not known yet
- 6 engineers are nominated to become core of the project
- Present strategy: the critical mass of staff will be trained abroad, and these will train others
- Interested in one engineer to participate in the IAEA 6 week training course, managed by the Eastern European RR Initiative (EERRI), and would like course details.
- Some dedicated training is in progress at existing fossil-fired power and distillation stations. This includes training relevant to operation, maintenance, and emergency situations.
- Possibility to involve requests from other GCC countries
- Support of having a dedicated nuclear training centre in the context of embarking on nuclear power

Discussion: A regional approach for the 1st NPP in the GCC region might be a solution. However, individual initiatives will be the driving force. Meeting with AREVA is already made. The 1st stage assessment is ongoing. This also confirms the GCC intentions in nuclear power program for peaceful purposes.

16. OMAN

- Population 2.5 million, with annual growth rate about 3 %
- Nuclear based techniques used in petroleum exploration, industrial radiography, material research, medical diagnosis, etc.
- Present and future energy needs are linked to the 3 % population and 4.8 % economy annual growth
- Presently the country is dependent on gas, and recently started to import… coal
- Solar and nuclear energies are seen as potential for the mixed energy basket, this is also a long term future for electricity and water supplies
- Requirements for establishment of needed infrastructure based on international standards and norms
- Ready/open for regional and international cooperation
- Nuclear medicine: increase in demand by a factor of 5 during last 10 years. Facilities available: 2 dual head cameras, 1 PET, etc. Clear needs for radiopharmaceuticals and development of radioisotope laboratory with standard functions
- Nuclear centre with RR and/or accelerator is justified by potential concrete nuclear applications, radiation safety & protection, human capacity building, support to universities carrying research in material sciences, growing interest of associated industrial partners.
- GCC regional cooperation in the fields of nuclear industry, radioisotope production, material testing, human training, other relevant research was emphasized
- Non-power nuclear techniques are needed independently of the nuclear power program

Discussion: There is a potential for a number of nuclear applications even without considering the 1st NPP in the region. Nuclear medicine is a real driving need. For example, regional approach is desired and would be an optimal solution as long as radioisotope production and transportation logistics is concerned. Other activities might need less coordination. Consultations with IAEA and experts should be continued.

17. SAUDI ARABIA

The Kingdom of Saudi Arabia has an area of about 1,960,582sqkm and around 27,601,000 inhabitants of which an estimated 5.5 million are foreign residents. An increase to 36.4 million in the next 15 years is predicted. The capital and largest city is Riyadh with 4.7 million inhabitants. Saudi Arabia's landscape contains deserts, mountain ranges, flat coastal plains, and the rocky remains of hardened lava flows. Extreme heat and aridity are characteristic of most of KSA. There are no permanent rivers or lakes in this vast country. KSA's Red Sea coastline stretches about 1,760 kilometers while its Arabian Gulf coastline is roughly 560 kilometers long. KSA lacks permanent lakes and rivers, but considerable reserves of groundwater have been discovered across the country, although most of this water is brackish water. Desalination plants on the Arabian Gulf and Red Sea coasts provide important, but expensive, sources of water. In addition, more than 200 dams built across wadis capture seasonal rainwater temporarily. Recently, building underground dams becomes a trend in the country water structures. Saudi Arabia has one of the largest desert in the world, known as A'rub' al Khali (the Empty Quarter), it is in the south-south east, with an area of about 650,000 sq km. GDP (PPP) was estimated in 2008 at USD 594 billion and GDP per capita at USD 23,834, expected to rise to USD 33,500 in 2020.

- Considerable efforts made on the national level to prepare the national strategy plan relevant to Science and Technology with contribution of more than 500 participants during the last 3 years

- Long term vision: become leading country in Science and Technology, establish top-level infrastructure for science, technology and innovation by 2025

- Priority list in the long term strategy: water, oil & gas, petrochemical, nanotechnology, biotechnology, information technology, energy, environment, etc. Note: nuclear technology/energy is not directly mentioned

- Next 5 years plan already includes approved budget; Science and Technology Centre designed and planned; implementation has started; US, Europe, etc. are involved and consulted; regulations and procedures discussed

- Clear future needs: Heavy Ion Accelerator

- A semi commercial Electron beam accelerator for irradiation processing is under construction; other facilities include Co-60 irradiators, fast neutron generator. Industrial EB accelerators do exist (three EB) for food processing. Two commercial large Co-60 Gamma irradiators are in operation for medical sterilization.

- National project is ongoing in creation of the King Abdullah Oncology and Liver Disease Center. A KACST center of excellence with the main heavy ion facility will be established for supporting the clinical needs of the King Abdullah's Center as well as R&D.

- Equally, the efforts are made to work on radioactive waste management including establishment of the national waste plant; IAEA is heavily involved in these activities.

- Nuclear engineering as well as physics, medical physics, and health physics BSc and MSc and PhD programs have already started.

- Saudi Arabia proposed a draft document on “GCC Nuclear Power Strategic Plan”. It includes both individual countries’ and also common GCC strategy. This yet to be approved for review by the GCC states

Discussion: One should do what one needs to do (not what one wants or others are doing). In other words, actual needs-demand is the most important and should be a driving force. Therefore, formulation of justified needs is primordial for everyone, and the necessary time should be taken to formulate these needs at the very beginning, including the long term planning.

18. QATAR

- Presently 2.8 % of GDP is attributed for research and development
- Alternative energy resources (e.g. nuclear and solar) in addition to presently available oil and gas are also explored
- Nuclear medicine, industrial radiography, NDT & agriculture are ongoing activities under the IAEA projects; it also includes education, training and basic research programs
- Nuclear and radiation facilities available: gamma spectroscopy, Co-60 gamma irradiator, positron physics laboratory, including beam based on Na-22 source
- Radioprotection law is approved in 2002, "early warning system" established all over the country, it also includes the border monitoring system
- In the near future several agreements and treaties to be signed; additional dedicated legislation would be required, including development of human/infrastructure resources if the nuclear centre to be established
- Medical applications seem to be the driving force for the future research and technology centre (e.g. Sidra hospital, cyclotron for radioisotope production, RR for the same purpose + research & training); Opening of the Sidra hospital is expected in 2011 as an academic medical centre, what could become a part of a much bigger initiative; dedicated biomedical centre is also to be built; PET scanners will be installed. In this context a Large Cyclotron research centre is needed/planned for radioisotope production and basic research including proton/neutron therapy. Budget is already allocated for this purpose
- Cooperation is ongoing with a number of international institutions including USA, Korea, IAEA, WNU, ANSTO, CERN
- One of the objectives: strengthen cooperation with the IAEA and developed nuclear power countries
- Assuming Qatar decides to embark on nuclear energy, the following critical issues should be addressed: site availability for the 1st NPP, 1000-1600MWe grid stability, available staff and human capacity building. Therefore, at the moment nuclear power is seen as a common GCC regional initiative
- Present strategy: 1) Nuclear Research and Technology Centre, and later 2) NPP. At some point (1) is conditioned by (2), therefore the present situation remains on stand-by and waiting for an official decision to be made

Discussion: Nuclear Research and Technology Centre might be justified even if Qatar did not continue its path to develop its own nuclear energy program.

19. UNITED ARAB EMIRATES

No presentation given during the workshop.

ANNEX III. AGENDA OF THE WORKSHOP

III-1. Monday, 28 September 2009

	Opening Session
08:30 – 09:00	Arrival of participants and administration
09:00 – 09:30	Welcome and Opening Remarks **Representatives of GCC, government of Qatar & IAEA**
	Selection of the Chairperson and Rapporteur
	Approval of Agenda
	Administrative remarks
09:30 – 10:00	Objectives of the Workshop, **Mr Danas Ridikas, IAEA**
	Session 1: Elaboration of Strategic, Business and Management Plans
	Experts' Lectures (45 min presentation + 15 min discussion within allocated time)
10:00 – 11:00	Strategic plans in the context of embarking on nuclear power: national & regional, **Mr Aït Abderrahim Hamid, Belgium**
11:00 – 11:30	*Coffee break*
11:30 – 12:30	Case of Nuclear Education and Training, **Mr Bertrand Castanet, France**
12:30 – 14:00	*Lunch time*
	Session 1: *(Cont'd)*
14:00 – 15.00	Case of Accelerators, **Mr Lowry Conradie, South Africa**
15:00 – 16.00	Case of Research Reactors, **Mr Steve Reese, USA**
16:00 – 16:30	*Coffee break*
16:30 – 17.30	Business Plan: National & Regional Context, **Mr Kevin Alldred, USA**
17:30 – 18.00	Discussion, summary, conclusions of Session 1

III-2. Tuesday, 29 September 2009

Session 2: Elaboration of Strategic, Business and Management Plans

Reports by participants from GCC states (30min presentation + 10min discussion)

Needs; relevant strategic, business and management plans; vision and commitments (national + regional contexts)

09:00 – 09:40	Bahrain (no presentation)
09:40 – 10:20	Kuwait
10:20 – 10:50	*Coffee break*
10:50 – 11:30	Oman
11:30 – 12:10	Saudi Arabia
12:10 – 14:00	*Lunch time*
	Session 2: ***(Cont'd)***
14:00 – 14.40	Qatar
14:40 – 15.20	United Arab Emirates (no presentation)
15:20 – 15:50	*Coffee break*
	Session 2: ***(Cont'd)***
15:50 – 16:30	From national to regional vision and efforts by the Chairperson of the Workshop
16:30 – 17:30	Discussion, summary, conclusions of Session 2

19:00 – Hospitality event

III-3. Wednesday, 30 September 2009

Session 3: Discussion/Preparation/Modification of draft National/Regional

Strategic, Business and Management Plans

Presentation of Summary reports by participants from GCC states (10 min each), discussed and commented by experts (5 min per presentation)

09:00 – 10:30 Discussion

10:30 – 11:00 *Coffee break*

11:00 – 12:30 Finalisation of summary reports

12:30 – 14:00 *Lunch time*

Session 4: Preparation of Meeting Report

14:00 – 15.30 Preparation of meeting report, formulation of recommendations, scheduling of future activities relevant to finalisation of Strategic, Business and Management Plans (national + regional)

15:30 – 16:00 *Coffee break*

Session 5: Meeting Wrap-up

16:00 – 16:30 Summary of the meeting and final remarks

ANNEX IV. LIST OF PARTICIPANTS

RAS4030/9001/01
Workshop on the Elaboration of Strategic, Business and Management Plans
Qatar, Doha, 2009-09-28 - 2009-09-30

List of Participants
(as of 2009-08-31)

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