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GOV/2002/39-GC(46)/15
19 August 2002

GENERAL Distr.
Original: ENGLISH

International Atomic Energy Agency
BOARD OF GOVERNORS
GENERAL CONFERENCE

Item 4 of the Board's provisional agenda (GOV/2002/38)
Item 15 of the Conference's provisional agenda (GC(46)/1)

STRENGTHENING THE AGENCY'S ACTIVITIES RELATED TO NUCLEAR SCIENCE, TECHNOLOGY AND APPLICATIONS

Report by the Director General

1. In September 2000, in resolution GC(44)/RES/21 on "Strengthening the Agency's activities related to nuclear science, technology and applications", the General Conference recommended "that the Secretariat report biennially to the Board of Governors and to the General Conference on progress made in the areas of Nuclear Science, Technology and Applications." Progress in these areas is reported in the Nuclear Technology Review 2002 (GC(46)/INF/5), the Agency's Annual Report for 2001 (GC(46)/2), in particular the Technology section, and the Technical Co-operation Report for 2001 (GC(46)/INF/4).[1] Since the preparation of these reports, the Agency convened a meeting on Managing Nuclear Knowledge (in June 2002). Attachment 1 to this document gives a progress report on this area of the Agency's activities.

2. This document also contains the following reports on the implementation of General Conference resolution GC(45)/RES/12 on "Strengthening the Agency's activities related to nuclear science, technology and applications":

Attachment 2	report on the implementation of GC(45)/RES/12 D on "Support to the Organization of African Unity's Pan African Tsetse and Trypanosomiasis Eradication Campaign (PATTEC)".
Attachment 3	report on the implementation of GC(45)/RES/12 E on "Drought in Central America".
Attachment 4	report on the implementation of GC(45)/RES/12 F on "Agency activities in the development of innovative nuclear technology".

RECOMMENDED BOARD ACTION

3. It is recommended that the Board take note of the reports contained in Attachments 1–4 to this document.

[1] The Annual Report of Activities and Statistics for 2001 for Co-ordinated Research Projects is available on the Agency's WorldAtom website.

MANAGING NUCLEAR KNOWLEDGE

BACKGROUND

1. Recently, a number of trends have drawn attention to the need for better preservation and enhancement of nuclear knowledge. The nuclear workforce is aging — that is, more and more nuclear workers are approaching retirement age without a corresponding 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 are giving up their nuclear education programmes altogether. In recognition of these and other trends, the General Conference, as well as the Board of Governors and a number of advisory committees[2], have called for measures to better identify the nature and scope of the problem, to understand what Member States are doing to address it, and to determine what co-operative international actions might be appropriate.

MEETING ON MANAGING NUCLEAR KNOWLEDGE

2. In response to operative paragraph 5 of GC(44)/RES/21 on "Strengthening the Agency's Activities Related to Nuclear Science, Technology and Applications", and the recommendations of the Agency's advisory groups, the Agency convened a meeting on Managing Nuclear Knowledge in June 2002 attended by more than 70 participants from 35 Member States and international organizations. The purpose of the meeting was to sharpen the awareness and understanding of the emerging concern about the preservation and enhancement of knowledge and expertise in nuclear science, technology and applications and to better comprehend the role of the Agency in this process. The full report of the meeting is available on the Agency's WorldAtom website.[3]

3. The presentations at the meeting covered: present and future development of nuclear knowledge; education, training and research; safety perspectives on managing nuclear knowledge; the perspective of developing countries; the perspective of the industry; managing nuclear knowledge for sustainable development; the perspective of governments; and present needs and future perspectives for nuclear knowledge.

4. Participants came to the following major conclusions:

   a. There is an immediate need to preserve existing knowledge in nuclear science, technology and peaceful applications for future generations, though the need is more pressing in countries with nuclear power programmes.

   b. Irrespective of current national energy policies, the need to maintain or even enhance the nuclear knowledge base will persist.

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[2] This includes the Senior Expert Group which reviewed the Agency's programme of activities in 1998, the Standing Advisory Group on Nuclear Energy (SAGNE), the Standing Advisory Group on Nuclear Applications (SAGNA), the International Nuclear Safety Advisory Group (INSAG), and the Standing Advisory Group on Technical Co-operation (SAGTAC).

[3] Available at www.iaea.org/km/pages/meeting1.html

c. Preserving and further enhancing nuclear science, technology and applications is important for socio-economic development. This requires knowledge preservation and capacity building on three levels: a) basic nuclear science, b) technology, and c) engineering and operation.

d. The Agency has an obligation to lead activities in this area by complementing and, as appropriate, supplementing activities by governments, industry, academia and international organizations. International co-operation is of vital importance.

e. The Agency should assist Member States to ensure the preservation of viable nuclear education and training, which is a necessary prerequisite for succession planning.

5. Six priority areas are recommended for immediate attention by the Agency:

a. Integrating existing nuclear data and information bases (including those in Member States) in the form of an easily accessible "Nuclear Knowledge Portal".

b. Promoting networking of institutions for nuclear education and training in Member States in co-ordination with existing activities.

c. Developing guidance documents on the preservation of nuclear knowledge.

d. Implementing targeted preservation of knowledge projects.

e. Designing and implementing outreach activities to improve the general knowledge in society of the benefits of nuclear science, technology and applications.

f. Facilitating the development of curricula for internationally accepted higher university degrees on "nuclear technology", e.g. by networking universities.

6. The participants in the meeting took note of the present activities of the Agency and strongly urged further increase in the level of attention to its knowledge preservation and enhancement activities.

SUPPORT TO THE ORGANIZATION OF AFRICAN UNITY'S PAN AFRICAN TSETSE AND TRYPANOSOMIASIS ERADICATION CAMPAIGN (PATTEC)

BACKGROUND

1. In September 2001, in resolution GC(45)/RES/12 D, the General Conference requested the Agency "in co-operation with Member States and relevant international organizations, to continue supporting African Member States in their efforts to eradicate tsetse flies and in particular to support the OAU's Plan of Action for the eradication of tsetse flies through the utilization of the SIT (Sterile Insect Technique) within available resources". The resolution also called upon Member States to provide technical, financial and material support to African States in their efforts to eradicate tsetse flies and stressed the need for international co-operation to enable African countries to widely utilize the SIT for tsetse fly eradication, wherever possible through the TCDC (Technical Co-operation among Developing Countries) mechanism.

2. It further requested the Director General to report on the progress made in the implementation of this resolution to the Board of Governors and to the General Conference at its forty-sixth session.

PATTEC Plan of Action

3. Tsetse flies are a major trans-boundary problem affecting 37 African countries and are one of the greatest constraints to the continent's socio-economic development, severely affecting human and livestock health, limiting land use, causing poverty and perpetuating underdevelopment. In recognition of the severity of the problem, African Heads of State and Government of the then Organisation of African Unity (OAU)[4] made a decision at their 2000 Summit in Togo to free Africa of tsetse flies. Subsequently, the Heads of State and Government endorsed an Action Plan for implementing the decision – the Pan African Tsetse and Trypanosomosis Eradication Campaign (PATTEC) at their 2001 Summit in Lusaka, Zambia. The PATTEC Plan of Action recognizes the technical and economic feasibility, the environmental friendliness and the indispensability of the SIT for creating tsetse-free zones.Over several years the Agency has played an important role in conducting and co-ordinating research and development on tsetse SIT as well as transfer of the technology to African Member States. The SIT played a central role in the eradication of tsetse flies from Zanzibar Island, United Republic of Tanzania, in 1997.

DEVELOPMENTS SINCE THE GENERAL CONFERENCE'S 2001 SESSION

IAEA Support to PATTEC

4. The Agency's direct contribution to the PATTEC Plan of Action includes one regional and six national technical co-operation (TC) projects (Ethiopia, Kenya, Mali, South Africa, Tanzania and Uganda). Over $4 million have been utilized in 10 African Member States in

[4] As of 9 July 2002, the OAU was replaced by the African Union.

the biennium 2001–2002 under the TC programme in addition to the extrabudgetary contributions.

5. The support of the Agency to PATTEC through the regional project includes the services of three technical experts. A regional training course under the TC programme on Geographic Information Systems (GIS), which is a tool for planning and monitoring of tsetse and trypanosomosis (T&T) intervention projects and related agricultural development, was held in collaboration with FAO for West African Member States in Ouagadougou, Burkina Faso, in May 2002. PATTEC, FAO and the Agency plan to organize a similar course for East Africa in Addis Ababa, Ethiopia, later in 2002.

6. In an outreach exercise conducted in May 2002, the Agency organized field visits by international journalists to experience the impact of T&T on African agriculture and human health. This resulted in a number of major articles in newspapers and journals that enhanced public awareness of the poverty and health dimension of the problem and the role of the SIT towards a sustainable solution to this problem.

7. The Agency is implementing three co-ordinated research projects (CRPs) relevant to tsetse SIT, namely on tsetse population genetics, tsetse rearing automation, and tsetse attractants. Additionally, research on tsetse will continue at the Agency's laboratories at Seibersdorf in support of PATTEC objectives.

Provision of Funds and Support by Member States

8. The Secretariat has been co-ordinating funds and support by Member States within its TC programme. In addition to the extrabudgetary funds already available to the TC projects (regional TC project - Norway[5], USA[6]; and project in Ethiopia - USA[7]), the United Nations Fund (UNF or "Turner Fund") and the USA provided financial support of $150 000 each for use in the regional TC project as direct support for activities in the PATTEC Plan of Action. These funds have been earmarked for PATTEC workshops and regional training. If additional funding becomes available from the UNF in the form of a planning grant, an area-wide T&T intervention programme in West Africa will be prepared.The funds would be utilized for:

a) conducting a pilot feasibility assessment on area wide T&T intervention in WestAfrica, with communities in the agriculturally high productive Moist Savannah Zone (MSZ), also referred to as the "cotton belt", as the key beneficiaries;

b) identifying the optimal location of and design development for a subregional tsetse factory in West Africa;

c) developing an environmental assessment and an outline of a land usage plan to ensure sustainable utilization of available natural resources after the creation of a tsetse fly free zone.

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[5] $ 453 401 (made available in 2001)

[6] $ 236 200 (made available in 2001)

[7] $ 1 214 000 (provided since 1997)

International Co-operation

10. The Agency is encouraging close subregional technical co-operation for integrated and area-wide intervention campaigns. An example is the agreement between Burkina Faso and Mali in October 2001, with OAU and IAEA as the first co-signing partners. The Agency has also contributed to the organization of the second WHO/MSF[8]/IAEA Training Course on African Trypanosomiasis, organized in November 2001 by WHO in Lyon, France.

11. A workshop was held in May 2002 at the FAO headquarters, Rome, to identify and harmonize the respective roles and responsibilities of PAAT[9], PATTEC and other major stakeholders. The workshop resulted in the first joint press release[10] of OAU, FAO, WHO, and IAEA, on joint international action against the T&T problem. Criteria and guidelines were reviewed in the context of sustainable agriculture and rural development. In addition, sequential steps were identified in the development cycles of multilateral projects that will require large scale international funding, specifying the collaborative and co-ordination roles of PAAT and PATTEC.

[8] Medecins Sans Frontières

[9] PAAT: Programme Against African Trypanosomiasis: a forum used by OAU, FAO, WHO and IAEA to concert their efforts.

[10] http://www.iaea.org/worldatom/Press/News/tsetse_battle.shtml

DROUGHT IN CENTRAL AMERICA

BACKGROUND

1. In September 2001, in resolution GC(45)/RES/12 E, the General Conference requested the Secretariat "to continue to assist, in co-operation with other relevant international organizations, and subject to the availability of resources, the Member States concerned in the Central American region, especially the countries affected by the drought and famine (Guatemala, El Salvador and Nicaragua), within the framework of the Agency's technical co-operation programme on isotope hydrology, taking into account the applications of these techniques in other areas and with a view to promoting better knowledge and use of the water resources in order to assist in preventing and avoiding the situations like the present drought and the consequent public health crisis due to the shortage of food".

2. It further requested the Director General to submit a report on the implementation of this resolution to the General Conference at its forty-sixth session.

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3. Following the adoption of the resolution, the Secretariat invited Guatemala, El Salvador and Nicaragua to present requests for assistance through the Agency's technical co-operation programme. They were requested to specify the national problems to be resolved and the current mitigation efforts, to enable the Agency to provide appropriate assistance through the regional technical co-operation project on sustainable management of groundwater resources.

4. El Salvador has submitted a proposal for a technical co-operation project related to detection of leakages in hydroelectric dams. It is proposed to expand the scope of this project by covering the hydrological study of the whole dam basin. The project will also train experts from El Salvador in isotope hydrology techniques and assist in the development of an El Salvador national project for better management of groundwater resources.

5. In the field of isotope hydrology UNESCO is an important partner for the Agency through its Isotopes In Hydrology (IHP) programme. The Agency and UNESCO work together in the Joint International Isotopes in Hydrology Programme (JIIHP) to improve implementation and co-ordination of hydrological programmes. Following the General Conference resolution, the Secretariat invited the regional representative of UNESCO-IHP in Latin America and the Director of CATHALAC (Water Center for the Humid Tropic of Latin America and the Caribbean, jointly established by UNESCO and the Government of Panama) to co-ordinate their activities with the Agency for tackling the problem and for strengthening local capacity in water resources management. A joint strategic plan is being proposed to increase the knowledge on groundwater exploitation possibilities and exploration techniques in Central America.

6. At the Steering Committee Meeting of the JIIHP in June 2002, the Agency raised the issue of drought in Central America. The agenda included consideration of the establishment of a regional centre in humid and tropical zone hydrology in co-ordination with the IHP National Committee of Panama. It further considered how to combine and co-ordinate efforts for the better use and management of groundwater resources in Central and Latin American countries.

7. As a result, a four-week training course in Spanish in collaboration with the IHP National Committee is proposed. The University of Panama, Faculty of Natural Sciences, has shown interest in hosting this course, which may take place in Panama in September 2003. Participants from Central America will be given priority in pursuance of Agency's efforts to assist in the implementation of the resolution.

8. Additionally, Panama has been invited to the training programme on the Regional Hispano-American Training Course on Hydrogeology to be held in Uruguay on September 2002 under a regional project. Candidates from Panama have been selected to participate in an Agency training course on isotopes in groundwater management, which will be held in Graz, Austria, in September-October 2002.

9. Further actions will depend on continuing discussions and agreed actions with the Member States concerned.

INTERNATIONAL PROJECT ON INNOVATIVE NUCLEAR REACTORS AND FUEL CYCLES (INPRO)

BACKGROUND

1. In September 2001, in resolution GC(45)/RES/12 F, the General Conference requested the Director General "to report on the progress made in the implementation of this resolution to the Board of Governors and to the General Conference at its forty-sixth session". The resolution recognized the "unique role that the Agency can play in international collaboration in the nuclear field" and invited "interested Member States to contribute to innovative nuclear technology activities". It also invited the Secretariat "to take further measures, within available extra budgetary resources, to continue its efforts in these areas".

2. The Agency established the "International Project on Innovative Nuclear Reactors and Fuel Cycles", INPRO, in pursuance of General Conference resolution GC(44)/RES/21. The objectives and the structure of INPRO and the results of the first meeting of the Steering Committee of INPRO were presented at a special side event during the 44th regular session of the General Conference in 2001.

3. This document provides progress on INPRO as of July 2002.

DEVELOPMENTS SINCE THE GENERAL CONFERENCE'S 2001 SESSION

Steering Committee Meetings

4. At its second meeting in December 2001, the INPRO Steering Committee noted the progress reports presented by the Secretariat and made several recommendations with regard to the technical approaches taken by INPRO. It also noted the intention of several Member States to contribute to INPRO in terms of scientific and technical resources and suggested that the Secretariat consider those Member States as INPRO members, depending on the nature of the contributions. The Steering Committee supported the recommendation made by the Standing Advisory Group on Nuclear Energy (SAGNE) at its meeting in October 2001 for an enhanced role of innovative programmes within Major Programme 1 on Nuclear Power, Fuel Cycle and Nuclear Science.

5. During the third meeting of the INPRO Steering Committee in May 2002 the results achieved within the project were reviewed and discussed and the Steering Committee provided the Agency with guidance on the next steps and future directions. It was also agreed to add another qualification for formal membership in INPRO. Specifically, a Member State can become an INPRO Member by performing work on a work package "at home" that is defined in agreement with the Agency and involves at least three person-months of effort cost free to the Agency.

6. As of July 2002, the following Member States and international organizations have become INPRO Members: Argentina, Brazil, Canada, China, Germany, India, Netherlands, Republic of Korea, Russian Federation, Spain, Switzerland, , Turkey and the European Commission. In total, 16 cost free experts have been nominated by INPRO Members and have been working at the Agency as members of the INPRO International Co-ordinating Group (ICG).

Project Implementation

7. Phase-I of INPRO was initiated in May 2001. During Phase-I, work is subdivided into two sub phases:

- Phase-IA (in progress): Selection of criteria and development of methodologies and guidelines for the comparison of different concepts and approaches, taking into account the compilation and review of such concepts and approaches, and determination of User Requirements.

- Phase-IB (to be started after Phase-IA is completed): Examination of innovative nuclear energy technologies made available by Member States against criteria and requirements. This examination will be performed by Member States on the basis of User Requirements, criteria and methodology established during Phase-IA.

8. For Phase-IA, six tasks were established: "Resources, Demand and Economics"; "Environment, Fuel Cycle and Waste"; "Safety" (with the sub tasks of: "Innovative Nuclear Reactors and Fuel Cycle Installations Safety" and "Waste Management Safety"); "Non-proliferation"; "Cross-cutting Issues on Institutions, Infrastructure, Social Aspects, Sustainability"; and "Cross-cutting Issues on Criteria and Methodology".

9. A homepage for INPRO has been established under:
http://www.iaea.org/programmes/ne/nenp/nptds/newweb2001/inpro/entirelyinpro.htm.

International Co-ordination and Outreach

10. INPRO seeks to interact with other national and international stakeholders and initiatives to ensure effective co-ordination and co-operation in a complementary manner, e.g. with the Generation IV International Forum (GIF) and the OECD. The Three-Agency Study, a study jointly conducted by IEA, OECD/NEA and the Agency on "Innovative Nuclear Reactor Developments – Opportunities for International Co-operation" has been provided to INPRO as the joint input of all three participating Agencies. In GIF, the Agency participates as an observer in the meetings of the Policy Group, and Agency staff participate as members on the GIF Technical Working Groups and Cross-cutting Groups. In addition, status reports on INPRO were presented in many international meetings.

Progress on the Technical Level

11. In the area of Resources, Demand and Economics, a range of scenarios describing what the world's energy system might look like from now until the middle of the century, and what nuclear energy's most profitable roles might be were examined. From the scenarios in the Special Report on Emissions Scenarios (SRES) of the Intergovernmental Panel on Climate Change (IPCC) four scenarios were selected for the INPRO project. Each provides a baseline projection for future nuclear generated electricity and hydrogen demands that reflects SRES assumptions. These were examined and varied systematically to identify plausible demand ranges for nuclear energy that are consistent with each scenario's storyline while encompassing more aggressive approaches for improvement of nuclear power economics. This analysis of nuclear power and hydrogen demands has been supplemented by other demands projected for nuclear desalination, heat application, and fossil fuel upgrading for each scenario. An initial draft contribution to the *Innovative Nuclear Reactors and Fuel*

Cycles Report was reviewed at a Moscow Workshop in April 2002. The above work will generate broad economic criteria for nuclear energy to be competitive in each of the selected SRES scenarios.

12. The development of User Requirements in the area of Environment, Fuel Cycle and Waste continued. Two consultants meetings have been held. During the first meeting, held in January 2002, User Requirements were further developed and defined and approaches to the application of materials flow accounting and environmental impact assessment methodologies for the INPRO were devised. Subsequently, the third INPRO Steering Committee meeting proposed further refinement of the User Requirements, which was the objective of the second consultants meeting held in June 2002.

13. For the development of User Requirements in the area of Safety, two sub-tasks have been formulated:

On the sub-task on User Requirements for Safety of Innovative Nuclear Reactors and Fuel Cycle Installations, three consultants meetings have been held. As a result, an interim report on User Requirements for Safety of Innovative Nuclear Rectors and Fuel Cycle Installations has been prepared. In particular, five top-level User Requirements have been formulated. The report contains a vision of nuclear safety for innovative systems, which is an idealization of what is desirable in nuclear safety based both on current national/regional trends and on what might be achievable technologically in the next 50 years or beyond. Relative to current nuclear safety strategies, greater emphasis is given to inherent safety characteristics and the defence in depth strategy is applied to fuel cycle installations as well as reactors.

On the sub-task on User Requirements for Waste Management Safety, work has continued with a consultants meeting on the subject that was held in January 2002. Four high level User Requirements for Waste Management Safety were derived. Based on the User Requirements, a list of R&D activities for Waste Management Safety was developed. Each of the R&D activities was classified as an immediate, medium term or longer term need.

14. In the area of User Requirements for Non-proliferation, a project plan was prepared in October 2001 to address the proliferation resistance part of INPRO, i.e., development of User Requirements in terms of principles, guidelines and criteria for proliferation resistant nuclear energy systems; development of methodologies for assessing proliferation resistance; and the Agency's safeguards review process for proliferation resistance. A consultants meeting was held in December 2001 in Vienna to consider proliferation resistance principles; these principles need further consideration.

15. In the area of Cross-cutting Issues on Institutions, Infrastructure, Social Aspects, and Sustainability, a workshop was held in November 2001. The discussions in the workshop, the recommendations, and further review of them indicate that the development of an adequate infrastructure will be a key issue, particularly in case of considerable growth in the use of nuclear energy in Member States that have not developed and used nuclear energy until now. Further, some innovative concepts could reduce infrastructural needs: for instance, whole-life fuel cores eliminating the need to establish fuel handling routes; while international design certification might reduce the regulatory load.

16. In the area of Cross-cutting Issues on Criteria and Methodology, two consultants meetings on "Methodology of assessment and comparison of innovative nuclear technologies" have been held.

17. In the first meeting, in September 2001, it was recommended that the methodology for future nuclear technology assessment should take a top-down approach. Social, ecological and economic constraints on future nuclear power deployment should be defined, addressing particularly the sustainability of future energy supplies. Additional regional constraints (e.g. industrial development, infrastructure requirements) should also be defined. From these, User Requirements can be derived for future nuclear power systems, and alternative approaches can be identified for meeting these requirements. Given uncertainties about future energy demands and other key market features, no definitive ranking of User Requirements is possible.

During the second consultants meeting, held in November 2001, the interim report was discussed, and the logical hierarchy of assessment was agreed. It was recommended that the methodology be further developed to accommodate regional requirements.