

A STRATEGY FOR

NUCLEAR SCIENCES AND APPLICATIONS

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1. Overview

The Agency's 1999 Medium Term Strategy for the period 2001–2005, (GOV/1999/69), described its strategic goals and specific objectives, the means proposed to meet them, and the indicators for assessing performance. A key element of the strategy was a commitment to integrate all relevant activities independent of programme location under three broad pillars of (i) technology, (ii) safety, and (iii) verification. The goal for the "technology" pillar was identified as "Enhancement of the contribution of nuclear technologies towards meeting, in a sustainable manner, the needs and interests of Member States."

Major Programme 2 provides the core scientific and technical support to Member States for applications other than power engineering. The Department of Nuclear Sciences and Applications implements this Major Programme, mostly together with other Departments, especially Technical Cooperation.

The work of the Department is directly relevant to and has been shaped by the international consensus on priorities for development and the means to meet them, development of which began with the Rio Declaration on Environment and Development (1992). The World Summit on Sustainable Development (WSSD), Johannesburg, 2002, reinforced the Rio call for co-operation among States to strengthen national capacity building for sustainable development and stressed that enhancing the development, adaptation, diffusion and transfer of technologies, including new and innovative technologies, remain priorities. The Agenda 21 Action Plan and the Millennium Declaration identified Water, Energy, Health, Agriculture and Biodiversity as priorities and key areas for action.

These priorities are reflected in the structure of Major Programme 2, which consists of five programmes -- Food and Agriculture; Human Health; Water Resources; Protection of the Marine and Terrestrial Environment; and Physical and Chemical Applications -- and in the Mission that will guide the Agency's work in nuclear sciences and applications:

To contribute to sustainable development in Member States through the use of nuclear sciences and their applications in food and agriculture, human health, industry, water resource management, and environmental monitoring, research and protection, with due regard to safety.

Of course, Major Programme 2 focuses on those nuclear techniques and technologies that are indispensable to the mission or that have a comparative or competitive advantage over non-nuclear techniques in terms of cost-effectiveness, or are complementary to non-nuclear techniques. In addition, the Agency does not work in isolation. The WSSD process called for partnerships to be formed wherever these would increase the effectiveness of the planned assistance.

With these factors in mind, the vision for the Department is that by 2010 the Agency's work in the area of nuclear sciences and applications will have made a positive contribution to sustainable development through activities that:

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- *assist developing countries to evaluate, develop, and apply appropriate applications of nuclear science and technology;*
- *help to develop innovative applications of nuclear sciences in the fields of food and agriculture, human health, management of water resources, industry and environmental protection;*
- *contribute significantly to maintaining, broadening and disseminating the existing knowledge base in nuclear sciences and applications and to creating new important basic knowledge in the field of nuclear sciences;*
- *Utilize partnerships with other relevant bodies, both private and public, for the effective transfer of nuclear science and its applications.*

2. STRATEGY DEVELOPMENT AND REVIEW

In developing and implementing this vision, there is a need for appropriate coordination within the Agency and with Member States, flexibility in adapting Agency programmes and activities to meet changing needs and to incorporate emerging technologies, the development of the necessary infrastructures, and the timely dissemination of information. A strategy to realize this vision is outlined in Section 4 in terms of five broad objectives, corresponding sets of specific objectives, means to realize them, and expected outcomes. Particularly important factors in implementing this strategy are:

-- More than half of the Agency's activities in nuclear sciences and applications is implemented through the Technical Cooperation programme. Thus, the Technical Cooperation Strategy (GOV/INF/2002/8/Mod1) has been fully considered in formulating the strategy for nuclear sciences and applications.

-- The strategy builds upon and will further strengthen existing commitments to Member States and Institutions. Programme outputs and outcomes will be set realistically to ensure the efficacy of the strategy.

-- The strategy is designed through about 2010, long enough to evaluate outcomes and for present conditions to persist. On the other hand, initial assumptions can lose their robustness with the passage of time, and the strategy will need to be kept under review and adjustments made as necessary.

-- Member States have differing needs and these evolve over time. Continuing consultations with all stakeholders will be necessary to maintain relevance. Sufficient flexibility will be maintained to ensure that resources are brought to bear where most needed.

-- New technologies and applications may emerge. Consultations with major stakeholders and appropriate lead times will allow strategic changes of technical or scientific direction and permit appropriate resource allocations to be put into effect.

-- Member States will benefit from nuclear applications only when they are aware of and can take effective advantage of them safely. Consequently, the strategy seeks to strengthen human resources, national research and educational capacities, and legal and regulatory infrastructures and to make widely and easily available comprehensive, timely and objective scientific and technical information.

-- The advancement of nuclear science and technology is, in many areas, resource intensive. To enhance cost effectiveness and efficiency, inputs from various stakeholders (Member States, donor agencies, UN organizations etc.) must be utilized, for example, through collaboration and information sharing.

-- The emergence of private sector nuclear applications in developing countries will decrease the stake holding of governments and UN organizations. Thus, more selective involvement of the Agency in its role as an inter-governmental organization will be required. However, market forces do not always drive critical technologies for developing countries, and various private-public partnership models will need to be examined.

-- Many issues are addressed by other UN agencies and donor organizations, and there are a number of institutions in Member States (e.g., national research institutes, universities, and atomic energy institutes) that have relevant expertise. Thus, partnerships with other international organizations as well as with centres of expertise in Member States are crucial to avoid duplication of effort and to enhance synergy between programmes.

In order to take these factors into account in the development, review, and implementation of the strategy, the Agency needs a mixture of inputs from Member States and from technical experts. Of particular importance are international conferences, symposia and other meetings, especially meetings of the General Conference and the Board of Governors of the Agency. Regional meetings are also important in order to facilitate the participation of main Member State stakeholders, permit a focus on a region that may have unique challenges and opportunities, and facilitate cross-sectoral programme reviews, thereby assisting consensus building.

The strategy will rely heavily on Agency staff, but independent scientific and technical advice is indispensable. Member State understanding of relevant development issues will continue to be used to generate fresh ideas. Agency expertise will be supplemented by outside expertise through Advisory Groups, Consultants Meetings, and interactions with the broader scientific and development communities. Coordinated Research Projects and interactions with Collaborating Centres will serve as a source of fresh thinking and ideas and as a means to facilitate the utilization of nuclear sciences and applications, especially in the least developed countries.

3. DELIVERING THE BENEFITS OF NUCLEAR SCIENCES AND APPLICATIONS

Development of new applications and delivery of the benefits of nuclear sciences and applications for sustainable development to Member States will rely on a variety of mechanisms. In addition to TC projects, the main mechanisms are outlined below,

recognizing that optimal delivery of programmes in nuclear sciences and applications will require the adoption of a mix of these mechanisms as well as effective in-house management.

Research

Research can produce new technologies for the long-term and improve present applications. It plays an important role in enhancing the development of know-how in Member States and in improving their scientific base. It can be exploratory in nature and lead to the generation and dissemination of new knowledge. Emphasis, however, will be placed on applied or adaptive research aimed at improving or modifying elements of an already available technology in order to make it applicable to the specific needs of Member States. An important objective is to identify gaps in understanding and filling these gaps or encouraging others to do so.

Within this context, two research frameworks will be utilized. One framework consists of Coordinated Research Projects (CRP). It uses networks of Member State research institutions and includes a new CRP concept that provides for the sponsoring of Ph.D. students, which will increase the sustainability of projects and the pool of expertise. The second is individual or group research to address a priority area where there is no advantage to operate in a network format.

Training and Education

Training and education is crucial for effective and sustainable technology transfer to Member States, particularly in developing Member States. Four types of training will be offered: (1) training courses to create awareness among scientists and technicians and impart know how; (2) short-term fellowships to provide scientists and technicians with hands-on experience; (3) university undergraduate training to impart know-how early in the careers of students; and (4) higher degree training, including Ph.D. training, to impart in-depth understanding of nuclear sciences and applications.

Meetings

Meetings such as conferences and symposia provide significant inputs to programme formulation. Consultants meetings, research coordination meetings and advisory groups are important mechanisms for reviewing and synthesizing new information. Meetings are also a valuable part of programme implementation and can help to monitor programme outcomes. They can help to promote a common understanding of key issues and to focus attention on issues of relevance to Member States.

Laboratory Activities

The Agency's Laboratories in Seibersdorf, Monaco, and Vienna play an important role in the delivery of the Agency's programmes in nuclear sciences and applications through provision of quality assurance and quality control techniques; research and development to fill knowledge gaps; training of scientists; development of standardized and internationally

accepted experimental methodologies; and assistance to Member States in managing nuclear instrumentation.

Programming and Review of the Strategy

The Board of Governors approves Agency's activities based on biennial submissions of the Programme and Budget. Activities in support of nuclear sciences and applications, as outlined in the strategy, will be defined in the Programme and Budget documents and subsequently reported in the Agency's Annual Report. Significant results will be reported, where applicable, against the strategy objectives. It is intended to review the strategy as appropriate for relevance and effectiveness and to make adjustments as necessary.

4. STRATEGIC OBJECTIVES AND IMPLEMENTATION

Consistent with the Millennium Declaration and the recommendations of the Johannesburg WSSD of 2002, the major priorities in the period in question are contributing to: improving health care, managing water resources and providing access to safe drinking water, improving agricultural productivity and food safety, and protecting the environment. Although the strategy is set forth in broad terms, implementation will focus on activities where nuclear and isotope techniques have demonstrated their ability to contribute to socio-economic improvements, either alone or together with other methods. Although the strategy foresees the possibility of changes in priorities and the full range of activities is large, particular emphasis will be placed initially on:

Human Health: nuclear and radiation medicine to diagnose and treat cancer and infectious diseases; radioisotopes to identify drug resistant strains of malaria and tuberculosis.

Agriculture: use of nuclear techniques and radiation to develop practices that enable crop and livestock production systems to be intensified sustainably and that improve food quality and safety.

Water Resources: use of isotope hydrology in mapping underwater aquifers and to investigate and recover from drinking water contamination; prevention of pollution from surface sources; understanding and preventing ground water salination.

Environmental Protection: use of nuclear techniques to conduct environmental assessments and to assist in the remediation of polluted terrestrial, aquatic/marine areas and coastal zones; studies on pollution (radioactive and conventional) through isotopic and nuclear techniques in a variety of different environments.

Industrial Development: use of radiation and radioisotopes to sterilize medical and industrial products, to develop radiopharmaceuticals, and to promote nuclear techniques in industries of value to developing countries.

Nuclear Science: utilization of research reactors and accelerators, e.g., for isotope production, materials testing, or diagnostic or therapeutic purposes; maintenance of nuclear instrumentation.

Broad Objectives

The strategy aims at fulfilling five broad objectives: (1) assess what is needed and available to use now; (2) implement effectively proven nuclear technologies; (3) explore future

opportunities; (4) improve existing techniques and develop innovative applications; and (5) optimise cooperation with traditional partners and initiate co-operation with non-traditional partners. These are described below, together with the means to accomplish them and the expected outcomes.

Specific Objectives and Implementation

1. To assess the value of available and applicable nuclear sciences and technologies with the potential to meet the needs and sustainable development goals of Member States, taking into account alternative technologies.

- 1.1 Produce thematic plans in mature fields of nuclear science and technology applications by 2005.
- 1.2 Identify Member States' priorities and focus Agency efforts where they can best contribute towards sustainable socio-economic impact.
- 1.3 Identify regional needs to produce frameworks for regional programmes.

Means

- Consultations with Member States and key stakeholders, other organizations and relevant stakeholders; conferences and meetings with consultants, experts, and Member State representatives.
- Interaction with major international and national research organizations and collaborating centres, in-house expertise, and experience.
- Coordinated Research Projects.

Outcomes

- Assessments of socio-economic potential of main nuclear and non-nuclear technologies and appropriate recommendations published by 2007.
- Thematic Plans available for all key thematic areas of nuclear applications by 2007.
- Country Programme Frameworks (CPF) agreed for all developing Member States by 2007.
- Applications with demonstrated impact in Member States assigned priority in budget allocations in the 2006-2007 programmes.

2. To effectively transfer nuclear technologies and related know-how with proven value for sustainable development.

- 2.1 Transfer mature technologies to institutions/organisations capable of sustained implementation.
- 2.2 Facilitate benchmarking and implementation of appropriate mechanisms to ensure continuing excellence and quality in application of transferred technology.
- 2.3 Further develop and disseminate quality assurance (QA) and quality control (QC) programmes.
- 2.4 Improve the collection, validation, and dissemination of information through effective use of information technology.

Means

- Provide scientific and technical training and expert advice.
- Help improve curricula of institutions of higher learning in developing Member States.
- Provide equipment to assist in establishing laboratories necessary for the integration of nuclear techniques in relevant development activities.
- Promote awareness of the need for and establish QA/QC programmes.
- Enhance information collection and dissemination via the internet and electronic means such as CD-ROMs both in-house and in Member States and relevant organizations.

Outcomes

- Higher degree training incorporated in Agency-supported projects by 2006.
- Standardized Operating Protocols and guidelines for main nuclear applications and available methods published by 2005 and updated periodically.
- Criteria established for designating centres for QA/QC for major applications by 2005.
- Reach agreement by 2007 with designated QA/QC centres for the development and implementation of procedures for specific technologies.
- Establish comprehensive web pages by 2004, produce all important publications on CD-ROMs for distribution to users by 2005. Refine databases as information becomes available and ensure dissemination through electronic and other means.

3. To explore future opportunities for the potential contribution of nuclear science and applications towards the socio-economic development of Member States.

- 3.1 Identify the most promising lines of research and development, with emphasis on needs of least developed countries.
- 3.2 Identify potential fields of endeavour and assess and advance innovative concepts and new applications of radiation and isotopic technologies.

Means

- Advisory Group, Consultants, and Technical Committee Meetings.
- Coordinated research projects aimed at developing innovative concepts and filling critical knowledge gaps in nuclear sciences and applications.
- Socio-economic analyses.

Outcomes

- Assessment completed for emerging nuclear technologies that have potential for significant socio-economic benefits, especially in developing countries, by 2007.
- Publication of all advancements in nuclear sciences and applications from Agency-supported programmes in pertinent peer-reviewed journals and appropriate dissemination of results.

4. To support and facilitate Agency efforts aimed at expanding the scope and applicability of current nuclear technologies; improving existing nuclear technologies, and developing innovative applications for nuclear science and technology.

- 4.1 Carry out a prioritisation of potential activities and implement a process of continual renewal through introduction of a proportion of new activities on a regular basis.
- 4.2 Disseminate the outcomes of knowledge and technology developments and improvements and promote the implementation of the relevant findings.

Means

- Based on technologies assessed as having potential for significant socio-economic benefits, especially in developing countries, consult Member States on a regular basis to establish priorities for future Agency actions, regional or global.
- Convene AGMs to advise on future programme directions.
- Disseminate results of AGMs using information technology, consult Member States for agreement on new programmes.
- Design CRPs to support new activities.

Outcomes

- Concurrent with development of Thematic Plans, develop new topics for implementation starting in 2006.

5. To optimize synergies with traditional partners and develop co-operation with non-traditional partners

- 5.1 Foster co-operation with existing partners involved in fields of common interest in order to facilitate more efficient and cost-effective programme delivery.
- 5.2 Review existing and develop new modalities of working with Member States, other UN organizations, and private industry (Public-Private Partnerships) and other non-traditional partners, e.g., NGO's.

Means

- Involve partners in activities such as Thematic Planning, CPFs, AGMs, CMs.
- Consultations leading to formal arrangements or agreements.
- Co-funding of Agency activities by industry and other non-traditional partners.
- Use of results (products/techniques) of Agency programmes by Member States through private industry and non-traditional partners

Outcomes

- Joint projects or activities with UN organizations with common interests by 2005.
- Framework for cooperating with private industry and other non-traditional partners in effect by 2006.