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GOV/2001/29-GC(45)/12
6 August 2001

GENERAL Distr.
Original: ENGLISH

International Atomic Energy Agency
BOARD OF GOVERNORS
GENERAL CONFERENCE

Sub-item 15(b) of the Conference's provisional agenda
(GC(45)/1)

MEASURES TO STRENGTHEN INTERNATIONAL CO-OPERATION IN NUCLEAR, RADIATION, TRANSPORT AND WASTE SAFETY

RADIATION SAFETY
(Secretariat responses to radiation safety issues of Member States)

1. The purpose of this document is to report on actions taken by the Secretariat since the forty-fourth (2000) regular session of the General Conference in response to radiation safety issues of Member States and to secure the concurrence of the Board and the General Conference in envisaged follow-up actions.

I. RADIOLOGICAL PROTECTION OF PATIENTS

Background information

2. In October 1999, the General Conference, in resolution GC(43)/RES/12, requested the Secretariat to organize an international meeting on the radiological protection of patients.

Action by the Secretariat

3. In response to that request, the Secretariat organized the *International Conference on the Radiological Protection of Patients in Diagnostic and Interventional Radiology, Nuclear Medicine and Radiotherapy*, which was held in Torremolinos, Málaga, Spain, from 26 to 30 March 2001 (the Málaga Conference). The Málaga Conference was co-sponsored by the European Commission, the World Health Organization (WHO) and the Pan American Health Organization (PAHO).

4. The findings, conclusions and recommendations of the Málaga Conference were transmitted to Member States under cover of Note by the Secretariat 2000/Note 13 dated 1 August 2001.[1] The Conference recommended that a group of experts, including experts from

[1] Also available on the IAEA's web site: http://www.iaea.org/ns/rasanet/programme/radiationsafety/radiationprotection/malagaconf.htm.
The proceedings of the Málaga Conference will be issued by the IAEA in the near future.

professional societies and regulatory bodies, be convened to formulate an *action plan*, based on its findings, for future international work relating to the radiological protection of patients.

II. SAFETY AND SECURITY OF RADIATION SOURCES

Background information

5. An *Action Plan for the Safety of Radiation Sources and the Security of Radioactive Materials* (the Action Plan) was approved by the Board in September 1999[2] The General Conference subsequently welcomed the progress made in implementing the Action Plan, endorsed the actions taken by the Board in respect of it, and requested the Director General to report, as appropriate, to it at its forty-fifth (2001) regular session on developments in the intervening period.

Action by the Secretariat

6. In December 2000, the Secretariat organized an *International Conference of National Regulatory Authorities with Competence in the Safety of Radiation Sources and the Security of Radioactive Materials* in Buenos Aires (the Buenos Aires Conference), in co-operation with Argentina's Nuclear Regulatory Authority. At its March 2001 session, the Board noted the major findings of the Buenos Aires Conference (in document GOV/2001/13) and requested the Secretariat to assess their implications for the Action Plan, and to inform the Board and the General Conference of any adjustments that might become necessary.

7. Drawing on advice from a group of senior consultants and a technical committee, the Secretariat produced the *Revised Action Plan for the Safety and Security of Radiation Sources* which is reproduced in the Attachment to this document.

8. In April 2001, the Secretariat organized the *First Africa Workshop on the Establishment of a Legal Framework governing Radiation Protection, the Safety of Radiation Sources and the Safe Management of Radioactive Waste*, which was held in Addis Ababa. The Workshop adopted a *"Common Position on the Establishment of a Legal Framework governing Radiation Protection, the Safety of Radiation Sources and the Safe Management of Radioactive Waste"* (the Common Position). In the Common Position, the participants called upon the IAEA to "*create a forum for African countries to consider the* Code of Conduct on the Safety and Security of Radioactive Sources [publication IAEA/CODEOC/2001] *and give it a legally binding effect so that the safe and peaceful use of nuclear technology is not compromised"*. The main elements of the Common Position were taken into account in drawing up the *Revised Action Plan* contained in the Attachment.

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[2] The Action Plan had been presented in document GOV/1999/46-GC(43)/10, with a Corrigendum in document GOV/1999/46/Corr.1-GC(43)/10/Corr.1.

III. INTERVENTION EXEMPTION LEVELS FOR COMMODITIES - THE SCOPE OF REGULATORY CONTROL OF RADIATION EXPOSURE

Background information

9. In September 2000, in resolution GC(44)/RES/15, the General Conference requested the Secretariat "*to develop, using the Agency's radiation protection advisory mechanisms and in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, during the next two years and within available resources,* radiological criteria for long-lived radionuclides in commodities, particularly foodstuffs and wood, *and to submit them to the Board of Governors for its approval*" and requested the Director General to report to it at its forty-fifth (2001) regular session on the implementation of the resolution.

10. The request made of the Secretariat by the General Conference in resolution GC(44)/RES/15 implies the development of a set of *intervention exemption levels* relating to commodities — namely, a set of long-lived radionuclide *activity concentrations* in certain commodities such that any of those commodities with radioactivity levels lower than those specified in the set may be traded without intervention on radiation safety grounds.[3]

11. The *International Basic Safety Standards for Protection against Ionizing Radiation and for the Safety of Radiation Sources* (the International Basic Safety Standards) have already established, for a large number of radionuclides, a set of *activity concentrations* for the purpose of *exemption* (of prospective practices and of radiation sources within prospective practices) from their own requirements; such *activity concentrations* are referred to as *exemption levels*. [4] Also, they have established, for cases of emergency exposure, *generic action levels* for radionuclides in foodstuffs which are expressed in terms of *activity concentrations* of certain radionuclides in certain foodstuffs. In addition, they have established the concept of *clearance* of regulated radiation sources with a view to their release from regulatory control.[5] *Clearance levels*, also expressed in terms of *activity concentration,*

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[3] The International Commission on Radiological Protection (ICRP) has recommended the use of *intervention exemption levels* to indicate a line of demarcation between, on one hand, freely permitted exports or imports and, on the other, imports or exports that should be the subject of special decisions.

[4] *Intervention exemption levels* differ from the *exemption levels* established in the International Basic Safety Standards as follows: *intervention exemption levels* relate to the need to intervene (or not) with control measures in an already existing situation (for example, a situation where there are long-lived radionuclides in a commodity), whereas the *exemption levels* are intended to be applied prospectively to radiation sources that are being introduced and may (or may not) require regulatory control through notification, authorization and inspection (for example, radioactive substances — or devices containing such substances — which are intended for medical, industrial, veterinary or agricultural use).

[5] The International Basic Safety Standards have established a number of concepts aimed at defining the scope of the regulatory control of radiation exposure, as follows: *exclusion* from regulatory control of radiation exposure that is unamenable to such control; *exemption* from regulatory control of practices (and sources within practices) for which such control is unwarranted under specified conditions (and quantitative *exemption levels* in terms of activity and activity concentration); *clearance* from further unwarranted control of radioactive materials within a regulated practice; and *generic action levels for foodstuffs* in emergency exposure situations. The *exemption* concept is based on an international consensus built up jointly by the IAEA and OECD/NEA and reflected in a document issued by the IAEA as *Principles for the Exemption of Radiation Sources and Practices from Regulatory Control*, Safety Series No. 89, IAEA, Vienna (1988).

have been and are continuing to be recommended.[6] (It should be noted that the established *exemption levels* and *generic action levels* differ numerically from the *clearance levels* recommended so far.) Moreover, as stated in preambular paragraph (f) of resolution GC(44)/RES/15, the ICRP had already recommended *generic intervention exemption levels* for commodities; it has also recommended that "… *relevant international organizations should derive … radionuclide-specific intervention exemption levels for individual commodities* …". The development of radiological criteria as requested in resolution GC(44)/RES/15 may well result in a further set of *activity concentrations* for purposes of exemption from regulatory control. The existence of such a further set of *activity concentrations* would almost certainly be a cause of confusion.

Action by the Secretariat

12. Development of the radiological criteria requested in resolution GC(44)/RES/15 has, because of the complex situation described in the preceding paragraph, proved to be technically difficult and controversial. Since the forty-fourth regular session of the General Conference, the Secretariat has accordingly been engaged in a lengthy consultation process, which is summarized below.

13. In November 2000, the Secretariat convened a group of consultants who developed, for a number of commodities, some criteria and quantitative proposals for intervention exemption levels which were numerically different from the exemption levels established in the International Basic Safety Standards and the clearance levels that had been recommended within the context of the IAEA and the European Commission. In view of the confusion which might arise from this diversity of levels, the Secretariat considered that an attempt at rationalization was necessary and that the process might also help in responding to the request made of it in resolution GC(44)/RES/15. Consequently, in February 2001 it convened a meeting of senior experts at the Headquarters of the United Kingdom's National Radiological Protection Board with a view to obtaining advice on a strategy for determining unequivocally the scope of regulatory control of radiation exposure. The senior experts concluded that it would be sensible to use a single set of radionuclide-specific activity concentration levels for the purpose of defining the scope of regulatory control of radiation exposure. Moreover, they recommended an approach that could be adopted in developing this set of values, which

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[6] The IAEA has published a safety guide and a number of technical documents (TECDOCs) containing recommended *clearance levels*; see, for instance: *Application of Exemption Principles to the Recycle and Reuse of Materials from Nuclear Facilities*, Safety Series No. 111-P-1.1, IAEA, Vienna (1992); *Clearance Levels for Radionuclides in Solid Materials, Application of exemption principles*, IAEA-TECDOC-855, IAEA, Vienna (1996); and *Clearance of Materials resulting from the use of Radionuclides in Medicine, Industry and Research*, IAEA-TECDOC-1000, IAEA, Vienna (1998). However, the International Basic Safety Standards did not formally establish quantitative *clearance levels*.

The European Commission has also issued recommendations on *clearance levels*; see, for instance: *Practical use of the concepts of clearance and exemption, Part I — Guidance on general clearance levels for practices*, Radiation Protection 122, EC, Luxembourg (2001); *Recommended radiological protection criteria for the recycling of metals and from the dismantling of nuclear installations*, Radiation Protection 89, EC, Luxembourg (1998); *Recommended radiological protection criteria for the clearance of buildings and building rubble from the dismantling of nuclear installations*, Radiation Protection 113, EC, Luxembourg (2000).

would automatically serve for responding to the request made of the Secretariat in resolution GC(44)/RES/15.

14. Meanwhile, the Secretariat had convened for later in February 2001 a Technical Committee to continue work on the specific issue of radiological criteria for long-lived radionuclides in commodities. The Technical Committee discussed the *intervention exemption levels* for commodities vis-à-vis both the established *exemption levels* and the recommended *clearance levels* for materials and, specifically, *intervention exemption levels for foodstuffs* vis-à-vis the established *generic action levels for foodstuffs* (for example, the guideline levels for radionuclides in food moving in international trade established by the Codex Alimentarius Commission of the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) and the guideline values for drinking water established by WHO).

15. The advice received by the Secretariat from the various bodies which it had convened was considered by the IAEA's Radiation Safety Standards Committee (RASSC) and Waste Safety Standards Committee (WASSC) at a joint meeting in April 2001. RASSC and WASSC endorsed the idea of rationalizing the definition of the scope of the regulatory control of radiation exposure and thereby clarifying the scope of the International Basic Safety Standards. In addition, they confirmed the dose criteria on which to base the calculation of appropriate levels of activity concentration and recommended that particular consideration be given to radionuclides of natural origin because of their ubiquity. They stressed that regulatory authorities should continue to have the power to exempt practices (and sources within practices) involving levels which exceeded those used in defining the scope of the International Basic Safety Standards. They recommended that the Secretariat engage in further consultations with the objective of making proposals for the definition of the scope of the regulatory control of radiation exposure. The outcome of the RASSC and WASSC discussions was considered by the IAEA's Commission on Safety Standards (CSS) in May 2001. Immediately after the CSS's meeting, the Secretariat, pursuant to the recommendation of RASSC and WASSC, convened a group of consultants which developed, for a number of radionuclides, a set of activity concentrations that could be used in defining the scope of regulatory control of radiation exposure and therefore in dealing with the issue of intervention exemption levels for international trade in commodities.

16. Following the lengthy consultation process summarized above, the Secretariat convened, for 23-26 July 2001, a Technical Committee which arrived at recommendations to the Secretariat regarding the main direction for responding to the request made of the Secretariat in resolution GC(44)/RES/15. The report of the Technical Committee was transmitted to Member States under cover of Note by the Secretariat 2001/Note 16 dated 1 August 2001.[7]

17. The main conclusions of the Technical Committee are summarized below:

(a) The Secretariat should complete the work currently in progress on specifying general clearance levels and activity concentration levels for use in international trade in commodities, particularly foodstuffs and wood. The resulting report(s) should be

[7] Also available on the IAEA's web site:
http://www.iaea.org/ns/rasanet/programme/radiationsafety/radiationprotection/scopeofregcntrl.htm

published for critical review and comment as soon as possible. They could serve as interim guidance in meeting the objectives of the General Conference.

(b) It is a matter of concern that several different sets of values, each intended to define the scope of some aspects of regulatory control, will exist at the international level. Their existence could lead to confusion and contradiction in the implementation and enforcement of regulations. The Technical Committee therefore proposed an approach for rationalization through a re-examination of the bases for exclusion, exemption and clearance and for international trade in commodities.

(c) The relevant radiological protection criteria are currently described in IAEA publication Safety Series No. 89 (1988), ICRP publication No. 60 (1990) and the International Basic Safety Standards (1996), somewhat differently in each. The inconsistencies should be addressed.

(d) The objective should be to establish a coherent system of radionuclide-specific levels (expressed in terms of total activity and of activity concentration) for defining the scope of regulatory standards. Schedule I of the International Basic Safety Standards would then be superseded.

(e) Natural radionuclides should be included; a basis for exemption and clearance has been suggested by the Technical Committee.

IV. PREPAREDNESS FOR AND RESPONSE TO NUCLEAR AND RADIOLOGICAL EMERGENCIES

Background information

18. Under the *Convention on Early Notification of a Nuclear Accident* (the Early Notification Convention) and the *Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency* (the Assistance Convention), the IAEA has functions with regard to the dissemination of emergency notifications, emergency information exchange, co-ordinating the provision of emergency assistance, helping States to enhance their emergency preparedness, and liaising with other relevant international organizations. It discharges these functions through its *Emergency Response Centre*, following procedures envisaged in the *Emergency Notification and Assistance Technical Operations Manual* (ENATOM).

19. In 1999 the Secretariat embarked on a major revision of ENATOM with a view to broadening its scope to include emergency notification, information exchange and assistance in situations besides those covered by the two Conventions, to taking into account lessons learned in responding to real events and from emergency exercises, and to reflecting relevant IAEA safety standards, recent developments in communications technology and good practices in the area of emergency preparedness and response. The latest edition of ENATOM was published in December 2000, with two annexes — the *Joint Radiation Emergency*

Management Plan of the International Organizations[8] and a description of the IAEA *Emergency Response Network* (ERNET).[9]

20. In September 2000, the General Conference, in resolution GC(44)/RES/16, encouraged Member States *"to implement instruments for improving their response, in particular their contribution to international response, to nuclear and radiological emergencies"* and *"to participate actively in the process of strengthening international, national and regional capabilities … and to make those capabilities more consistent and coherent"*. Also, it requested the Director General *"to continue to evaluate and, if necessary, improve the capability of the IAEA Emergency Response Centre to fulfil its role"*.

21. In December 2000, the Secretariat began exploring how it could promote the establishment of an enhanced network for communication among emergency response centres.

Action by the Secretariat

22. From 18 to 22 June 2001, the Secretariat held a *First Meeting of Representatives of the National Competent Authorities identified under the Early Notification Convention and the Assistance Convention* to evaluate the effectiveness of the arrangements envisaged in the latest edition of ENATOM and to identify problems that should be resolved before the next edition is issued — in December 2002. A report on the meeting was transmitted to Member States under cover of Note by the Secretariat 2001/Note 14 dated 1 August 2001.[10]

23. On 22 and 23 May 2001, the Secretariat conducted a large-scale exercise (called "JINEX 1") to test the mechanisms for emergency information exchange among Member States and relevant international organizations.[11]. The exercise, co-ordinated through the *Interagency Committee on Response to Nuclear Accidents* (IACRNA), was based on a national-level nuclear emergency exercise at the Gravelines Nuclear Power Plant in France. It was organized in collaboration with WMO, WHO, UN-OCHA and OECD/NEA. The results of the exercise are currently being evaluated.

24. The Secretariat has finalized a Safety Requirements document on *Preparedness and Response for a Nuclear or Radiological Emergency* which has been considered by the

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8 The Joint Radiation Emergency Management Plan of the International Organizations describes arrangements for the provision of medical assistance, through WHO, and humanitarian assistance, through the United Nations Office for the Co-ordination of Humanitarian Affairs (UN-OCHA).

9 ERNET is a network consisting of emergency response teams based in various Member States and drawing on regional emergency response capabilities.

10 Also available on the IAEA's web site:

http://www.iaea.org/ns/rasanet/programme/radiationsafety/radiationemergencies/enatom.htm#top

11 During the JINEX 1 exercise, the IAEA Emergency Response Centre had to be activated in order to respond to a request for assistance, made under the Assistance Convention and reported by the Director General to the Board in June 2001, from the Government of Panama with regard to an emergency involving patients undergoing radiotherapy. The Emergency Response Centre promptly disseminated key information to all contact points identified under the ENATOM arrangements with a view to preventing the occurrence of similar emergencies elsewhere.

Commission on Safety Standards and will be submitted in due course to the Board for approval.

25. Following the publication by WHO of "*Guidelines for iodine prophylaxis following nuclear accidents*", the Secretariats of the IAEA and WHO are, given the concern in a number of countries about the contradiction between those guidelines and intervention levels for iodine prophylaxis established in the International Basic Safety Standards, convening a joint Technical Committee meeting to *assess and review the international safety standards for intervention in emergency exposure situations involving radioactive iodine* in September 2001.

V. OCCUPATIONAL RADIATION PROTECTION

Background information

26. In 1998, the International Conference on Topical Issues in Nuclear, Radiation and Radioactive Waste Safety concluded that further practical guidance was needed on the control of occupational exposure to natural radiation — in particular, occupational exposure to substances containing elevated levels of natural radionuclides and the exposure of aircrews to cosmic rays. In October 1999, in resolution GC(43)/RES/13, the General Conference encouraged all governments *"to join in the current co-operative efforts directed towards the organization of international intercomparison exercises relating to radiation dose measurements for the control of occupational and other exposures, the aim being the harmonized application of dosimetric quantities and techniques"*.

27. Last year the Secretariat informed Member States, through document GOV/INF/2000/13-GC(44)/INF/6, about the adoption of new operating terms and conditions for the *Information System on Occupational Exposure* (ISOE) operated jointly by the IAEA and OECD/NEA.

Action by the Secretariat

28. In November 2000, the Secretariat hosted the ISOE Steering Group's annual meeting, at which the Steering Group approved the ISOE report for 2000 and the ISOE programme of work for 2001. The ISOE report and programme were transmitted to Member States under cover of Note by the Secretariat 2001/Note 15 dated 1 August 2001.[12] In order to demonstrate the value of the ISOE for applied occupational radiation protection at nuclear power plants,[13] the ISOE programme of work for 2001 envisages that the experience acquired in operating the ISOE during the past ten years will be summarized and published in a report entitled *"Ten years of ISOE"*. The report will be considered at the 3rd EC/ISOE Workshop on Occupational Exposure Management in Nuclear Power Plants, to be held in Portorož, Slovenia, from 17 to 19 April 2002.

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[12] Also available on the IAEA's web site:
http://www.iaea.org/ns/rasanet/programme/radiationsafety/radiationprotection/isoe/isoe.htm

[13] The ISOE handles data only from nuclear power plants — not from other types of nuclear facility. Also, it does not handle data on occupational exposure to natural radiation sources.

29. Pursuant to resolution GC(43)/RES/13, the Secretariat has been organizing international and regional intercomparison exercises. Exercises have been completed on the measurement of the operational quantity *personal dose equivalent*, on intercomparisons of survey equipment for the measurement of the operational quantity *ambient dose equivalent*, on the measurement of the basic quantity *activity* of gamma-emitting radionuclides in environmental and urine-analysis samples, and on environmental dosimetry. An international intercomparison of measurements of *activity* of radionuclides in simulated human organs started in February 2001. An international intercomparison for the determination of the *activity* of alpha-emitting radionuclides in human urine samples started in April 2001. Within the framework of the Regional Co-operative Agreement for Research, Development and Training Related to Nuclear Science and Technology (RCA), the third phase of an intercomparison of measurements of the quantity *personal dose equivalent* is due to start in 2001. Intercomparison exercises have highlighted the need to harmonize occupational radiation monitoring approaches and methodologies. The Secretariat is therefore developing a service for the appraisal of the monitoring of occupational radiation protection quantities in Member States.[14]

30. In May 2001, the Secretariat convened a Technical Committee on the *Assessment of Occupational Protection Conditions in Workplaces with High Levels of Exposure to Natural Radiation*, which identified problems and proposed an extensive programme of actions to be taken by the IAEA. A summary of the Technical Committee's report was also transmitted to Member States under cover of Note by the Secretariat 2001/Note 15 dated 1 August 2001.[15]

31. In July 2001, the Secretariat convened a programme committee that embarked on the organization of an *International Conference on Occupational Radiation Protection: Protecting Workers against Exposure to Ionizing Radiation*.[16] The Conference is to be convened by the IAEA together with the International Labour Organization (ILO) and held at the Conference Centre of ILO, in Geneva, from 26 to 30 August 2002. The Conference will be co-sponsored by the European Commission and held with the co-operation of WHO and OECD/NEA. It is expected that the Conference will provide a unique opportunity to promote information exchange in the field of occupational radiation protection.

SUGGESTED ACTION BY THE BOARD

32. It is suggested that the Board,

(a) request the Secretariat to convene a group of experts, including experts from professional societies and regulatory bodies, to formulate, on the basis of

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[14] The key objectives of the service will be to: provide Member States with objective assessments of their provisions for monitoring occupational radiation protection quantities; identify strengths worthy of being brought to the attention of others; promote the use of self-assessment; identify areas where performance should be improved in order to meet international standards; and make recommendations on actions to be taken in order to achieve improvements.

[15] Also available on the IAEA's web site:
http://www.iaea.org/ns/rasanet/programme/radiationsafety/radiationprotection/norm.htm

[16] See, in this connection, item 9 in Annex IV to document GC(44)/6 ("The Agency's programme and budget for 2001").

the findings, conclusions and recommendations of the Málaga Conference, an *action plan for future international work relating to the radiological protection of patients,* and to submit the *action plan* to the Board for approval;

(b) request the Secretariat to implement the *Revised Action Plan for the Safety and Security of Radiation Sources* contained in the Attachment to this document, within existing resources, and, as appropriate, to inform the Board of the progress made in its implementation; and

(c) taking note of the difficulties encountered in responding to resolution GC(44)/RES/15 request the Secretariat to continue working towards meeting the request made of it in that resolution, taking into account the recommendations set out in paragraph 17 of this document, using the mechanisms based on RASSC, WASSC and the Commission on Safety Standards and inviting relevant international organizations to co-operate as appropriate.

REVISED ACTION PLAN FOR THE SAFETY AND SECURITY OF RADIATION SOURCES

INTRODUCTION

Background

In September 1998, following an assessment of the major findings of the first *International Conference on the Safety of Radiation Sources and the Security of Radioactive Materials*, held in Dijon, France, from 14 to 18 September 1998 (the Dijon Conference), the IAEA's General Conference (in resolution GC(42)/RES/12) - inter alia - encouraged all governments "*to take steps to ensure the existence within their territories of effective national systems of control for ensuring the safety of radiation sources and the security of radioactive materials*" and requested the Secretariat "*to prepare for the consideration of the Board of Governors a report on: (i) how national systems for ensuring the safety of radiation sources and the security of radioactive materials can be operated at a high level of effectiveness; and, (ii) whether international undertakings concerned with the effective operation of such systems and attracting broad adherence could be formulated*".

In February 1999, the Secretariat submitted to the IAEA Board of Governors a report prepared in response to the request made of it by the General Conference. The report was taken up by the Board at its March 1999 session. At that session, the Board - inter alia - requested the Secretariat to prepare an action plan that took into account the conclusions and recommendations in and the Board's discussion of the report.

In August 1999, the Secretariat circulated a proposed *Action Plan for the Safety of Radiation Sources and the Security of Radioactive Materials* (the Action Plan) in Attachment 2 to document GOV/1999/46-GC(43)/10; in September 1999, the Board approved the *Action Plan* and requested the Secretariat to implement it. In October 1999, the General Conference endorsed the Board's decision and urged the Secretariat to implement the *Action Plan*.

One of the actions in the Action Plan which was envisaged under the topic "Information Exchange", was to organize an international conference on the control by national authorities of radiation sources and radioactive materials. The Agency, therefore, organized an *International Conference of National Regulatory Authorities with Competence in the Safety of Radiation Sources and the Security of Radioactive Material*, which was held in Buenos Aires from 11 to 15 December 2000 (the Buenos Aires Conference). The Buenos Aires Conference, hosted by the Government of Argentina, was attended by 89 regulatory officials from 57 Member States, 31 of those Member States being participants in the Agency's Model Projects for the upgrading of radiation protection infrastructure, which covers 52 Member States.

At its meetings in March 2001 the Board considered the report on the major findings of the Buenos Aires Conference (GOV/2001/3, 12 February 2001). It noted these major findings and requested the Secretariat to assess the implications of the major findings of the Buenos Aires Conference for the *Action Plan for the Safety of Radiation Sources and the Security of Radioactive Materials*, implement any adjustments to the *Action Plan* that may become necessary in the light of those major findings and of any comments regarding the major findings which Member States may transmit to it, and inform the Board and the General Conference of such adjustments to the *Action Plan* in that event.

In accordance with this request, a consultants' meeting at the end of May 2001, produced a draft *Revised Action Plan on the Safety and Security of Radiation Sources.* This was reviewed and amended during a Technical Committee Meeting, 27-29 June 2001, which was attended by participants from 14 Member States (Argentina, P. R. of China, Finland, France, Georgia, Germany, India, Indonesia, Republic of Korea, Libyan Arab Jamahiriya, Russian Federation, Turkey, UK and USA). This document is the output of that TCM and is presented to the Board for its consideration.

Purpose and scope

The primary purpose of this Revised Action Plan, like its predecessor, is to enable the IAEA to develop and implement activities that will assist Member States in maintaining and, where necessary, improving the safety of radiation sources and the security of radioactive materials over their life cycle. While in principle, the action plan covers all sources of radiation and their uses, it is recognized that *the focus should be on those sources and materials which pose the most significant risks*. In this context, the risks of greatest concern are those related to adverse health effects and significant economic impacts. Since the IAEA is considering the development of a separate action plan related to patient protection, this area is not a major focus here. The action plan also does not deal with commodities contaminated as a consequence of an accident or loss of control over radioactive materials, or for some other reason. Primary consideration is therefore given to sealed radioactive sources of Categories I and II (TECDOC 1191) which might necessitate interventional measures should control over them be lost.

Document Outline

The previous Action Plan was structured to cover seven areas, and this structure is still considered valid. The only minor change to the structure has been to rename one area, the old name of which is given in brackets below.

- Regulatory Infrastructure
- Source Management and Control including the Management of Disused Sources [formerly "Management of Disused Sources"]
- Categorization of Sources
- Response to Abnormal Events
- Information Exchange
- Education and Training
- International Undertakings

In order to simplify considerations of the revised Action Plan, each of the original Action Plan areas is first stated along with the current status of the actions in question and subsequent recommendations. Following this is a brief discussion of the new actions. The order of these does not imply any priority. All recommendations and action are italicized.

REGULATORY INFRASTRUCTURE

A good national regulatory infrastructure is considered to be one of the important elements with regard to the safety and security of radiation sources. In particular, it provides the first level of defence in keeping radiation sources under control and radiation levels from all sources within safe limits. Therefore, *all actions associated with assisting Member States in the identification and remediation of weaknesses should have a high priority.*

Previous Planned Action

- *To establish a service for advising States on the establishment of appropriate regulatory programmes. Two types of service are envisaged.*
  (a) advice on the preparation of regulations and regulatory guidance, including practice-specific guidance; and

  (b) peer reviews of regulatory infrastructures covering systems of notification, authorization, inspection and enforcement in States.

Completed and Ongoing Actions

- The following documents that are under development *should be completed*:
  (a) A Safety Guide on regulatory infrastructure for radiation protection and for the safety of radiation sources in medicine, agriculture, research, industry and education,

  (b) A Safety Report on approaches for the establishment of regulatory infrastructure for radiation safety

  (c) Safety Reports on model regulations for specific practices (in co-operation with WHO and ILO as applicable).

- Work on the Model Project for Upgrading Radiation Protection Infrastructure *should continue.*

- A Radiation Safety Regulatory Infrastructure (RSRI) review service has been established with the purpose of assisting in the development of, or assessing the effectiveness of, regulatory infrastructure for radiation safety. A brochure advertising this service is ready for publication.

- A document on 'Review of Radiation Safety at Industrial Irradiator Facilities' has been drafted and the procedures described in it are to be tested. *Similar procedures for all Category I sources should be developed and implemented.*

New Actions

Some of the specific lessons learned from peer reviews in one country can be of general interest to other countries. In addition, there are often common issues or patterns which can be identified after several reviews have been performed. Therefore there can be considerable benefit from the sharing of information gained from peer reviews.

Similarly, lessons from the common issues identified in peer reviews need to be fed back into the IAEA's documents and training materials.

- *Develop and implement a feedback mechanism from all peer review services. This action should be completed by the end of 2002.*

It is also appropriate that, wherever possible, Member States should critically examine their own capabilities and the effectiveness of their own regulatory programmes. Such self-evaluation and identification of weaknesses is as important for Member States with mature radiation protection infrastructures as it is for those just beginning to develop them.

While regulatory infrastructure is of primary importance, it is recognized that this alone is not enough, but that a country also needs to have a well developed radiation protection infrastructure to be able to implement the regulations. For example, having a law requiring personnel dosimetry is not effective if a dosimetry service cannot be readily obtained. To this end, the Revised Action Plan includes actions which address the complete radiation protection infrastructure not just the regulatory infrastructure.

- *Develop a methodology and supporting documentation to enable Member States to perform self-assessment of their radiation protection infrastructures. The feasibility and utility of using TECDOC-1217 should be considered in this regard. This action should be completed in 2002.*

- *Encourage Member States to perform such self-assessments with the purpose of identifying weaknesses in their radiation protection infrastructures.*

- *Promote mutual assistance between States with the purpose of improving radiation protection infrastructures using the regional networks discussed later under Information Exchange or other mechanisms.*

SOURCE MANAGEMENT AND CONTROL, INCLUDING THE MANAGEMENT OF DISUSED SOURCES [formerly "MANAGEMENT OF DISUSED SOURCES"]

Effective source management and control during the whole source life cycle is essential to prevent radioactive sources from entering the public domain in an uncontrolled manner. This is particularly true for disused sources, which historically have resulted in a large number of adverse health effects to individual members of the public.

Previous Planned Actions

- *To prepare documents on particular aspects of the handling and disposal of disused radioactive sources.*

- *To organize consultations and workshops on technical, commercial, legal and regulatory aspects of the return of disused sources to manufacturers and on the management of disused sources with long-lived radionuclides and of equipment containing such sources.*

Completed and Ongoing Actions

- The following documents that are under development should be completed:
  (a) The management of high-activity disused sources.
  (b) Procedures for the conditioning and storage of long-lived spent sealed sources.
  (c) The management of disused sources involving disposal in boreholes.
  (d) The TCM report on the Return of Disused Sealed Sources to Suppliers/Manufacturers.

- A Safety Guide on the Safety and Security of Radiation Sources is being drafted and *should be completed as soon as possible*. This document will provide guidance on risk assessment methodology and on the security of sources throughout their life cycle. Ultimately, *it should also incorporate the concepts from both the national strategies document referred to in section on "Response to Abnormal Events" and the TECDOC on Categorization of Radiation Sources*.

New Actions

There are certain problem areas associated with the continuity of control throughout the life cycle of radioactive sources. It is widely acknowledged that the controlled export of sources and the return of disused sources are important for enhancing safety, but reaching agreement on how best to achieve them in non-burdensome, commercially fair ways is difficult. However, *the effort to do so needs to be continued (see also section on "International Undertakings").*

- *Facilitate a continuing dialogue (with a meeting in early 2002) among radioactive source manufacturers/suppliers, regulatory agencies and users on such issues as:*
  (a) the export and return of radioactive sources;
  (b) the definition of the operational lifetime of radioactive sources;
  (c) the design and manufacture of radioactive sources in accordance with ISO standards;
  (d) radioactive source inventories.

- *Develop guidance that includes the essential components of a quality management system relating to the life cycle of Category I and II radioactive sources and associated devices, including computerized devices. This action should be completed as soon as possible.*

CATEGORIZATION OF SOURCES

There is a wide range of activities of radioactive sources used in devices, from very low activities, as in smoke detectors, to very high activities, as in industrial irradiators. A categorization system was, therefore, envisaged as a first step towards a graded approach for safely managing and controlling radioactive sources.

Previous Planned Actions

- *To prepare a document on the categorization of sources on the basis of the associated potential exposures and radioactive contamination.*

Completed and Ongoing Actions

- A "Categorization of Radiation Sources" was completed. The Board took note of it at its September 2000 session and authorised the IAEA Director General to issue it. The Agency issued the "Categorization of Radiation Sources" as IAEA-TECDOC-1191 which was published in December 2000. The categorization was based on the following attributes: radiological properties, form of material, practice or activity, exposure scenarios and end-of-life considerations.

New Actions

The current categorization of radiation sources was developed to assist decision-making, both retrospectively, to bring sources under control, and prospectively, to guide the regulatory authority in the prioritization of the use of its resources. As such, the categorization scheme took into account both the potential for accidents causing serious injury or contamination and the probability of such accidents occurring.

When the categorization TECDOC was developed it was envisaged to have many applications. The time is now right to review how it is being used and to draw any lessons from this which may indicate the need for further guidance in its use or further refinement.

- *Review how the Categorization of Sources (TECDOC 1191) is being used and, based on the findings of the review, consider revising it. This action should be completed in 2002.*

RESPONSE TO ABNORMAL EVENTS

The term "abnormal events", as used in this section, refers particularly to events associated with orphan sources. The actions in this section therefore focus on re-gaining control of orphan sources and on upgrading the arrangements for responding to incidents and emergencies.

Previous Planned Actions

- *To prepare guidance on national strategies and programmes for the detection and location of orphan sources and their subsequent management.*

- *To formulate criteria for the development, selection and use of detection and monitoring equipment at border crossings, ports of entry, ports of exit, and scrap yards and other facilities.*

- *To further develop national response capabilities for dealing with radiological emergencies.*

- *To strengthen the Agency's existing capabilities for the provision of assistance in emergency situations.*

Completed and Ongoing Actions

- The following documents are under development and *should be completed by the end of 2001*:
  (a) A TECDOC on "National Strategies for Detecting and Locating Orphan Sources and their Subsequent Management". *This should be consistent with the Safety Guide on Safety & Security of Sources*.

  (b) Three TECDOCs on prevention, detection and response to inadvertent movement and illicit trafficking in radioactive material.

- Standardized regional and national radiological emergency response training courses are in advanced stages of preparation and are being pilot tested in several languages. *These should be completed by the end of 2001*.

- The following documents have been completed:
  (c) Nuclear Accident/Radiological Emergency Assistance Plan (EPR-NAREAP 2000).

  (d) IAEA Emergency Response Network (EPR-ERNET 200).

  (e) Joint Radiation Emergency Management Plan of the International Organizations (EPR-JPLAN 2000).

  (f) Emergency Notification and Assistance Technical Operations Manual (EPR-ENATOM 2000).

- The Emergency Notification and Assistance web-site (ENAC) is operational.

- A first meeting of the Competent Authorities to the Early Notification and Assistance Conventions has been scheduled. This meeting *should be used to clarify and obtain agreement on key emergency response issues*.

- The development of the organizational structure and criteria for emergency teams and the training of IAEA responders *should continue*.

New Actions

The proposed TECDOC on "National Strategies for Detecting and Locating Orphan Sources and their Subsequent Management" will provide guidance to Member States. The first action in regaining control over radiation sources is to perform an evaluation of what the national threat risk is and to then plan the most effective actions based on this evaluation.

- *Encourage Member States to use the TECDOC on "National Strategies" to perform a national evaluation of the threat, risk, and the potential effects on health, property and the environment that may arise from orphan sources.*

The actions recommended below should be implemented to further improve both national and IAEA emergency response capabilities.

- *Make the Emergency Preparedness Review Service available to all Member States, and especially those with identified regulatory infrastructure weaknesses.*

- *Prepare a TECDOC on emergency response exercises with off-the-shelf exercises for radiological response along with associated training material.*

- *Complete the establishment of ERNET and further develop its operational capability. ERNET should include capability to appropriately deal with abnormal events involving radiation sources.*

- *Develop as soon as possible, and in collaboration with WHO, standardized training material on medical response preparedness.*

- *Prepare a TECDOC on public information management during radiological emergencies during 2002-2003.*

INFORMATION EXCHANGE

Although awareness of the issues surrounding radiation accidents has grown, it is by no means universal. There is, therefore, a need to continue raising awareness of the hazards arising from radiation sources by providing a forum for exchange of information, reporting abnormal events and disseminating the lessons to be learned from accidents and other abnormal events.

Previous Planned Actions

- *To organize an International Conference on the Control by National Authorities of Radiation Sources and Radioactive Materials.*

- *To organize regional workshops on specific topical issues.*

- *To develop an international database on missing and found orphan sources or to modify an existing database so as to include such sources.*

- *To fully develop and maintain the international database on unusual radiation events (RADEV) and make it available to Member States.*

- *To develop a repository of information on the characteristics of sources and of devices containing sources, including transport containers, and to disseminate the information, with consideration of the advisability of dissemination through the Internet.*

Completed and Ongoing Actions

- An International Conference of National Regulatory Authorities with Competence in the Safety of Radiation Sources and the Security of Radioactive Materials was held 11-15 December 2000 in Buenos Aires.

- A Regional Action Plan workshop to raise the regional level of awareness of the objectives of the Action Plan was held in Vienna in 2000. Further Regional Action Plan workshops are scheduled over the next two years. *These are seen as a key aspect of the development of the regional networks discussed later and should be continued.*

- The action requiring an international database on missing and found orphan sources has begun as a simple list on the ENAC web page. *Further development should depend on the determination of its utility.*

- The development of RADEV is progressing and *periodic reports from the RADEV data covering trends and lessons to be learned, should be distributed.*

- The software for a radiation source catalogue database has been prepared and data are being gathered and entered. When this is reasonably complete *it should be disseminated to appropriate parties.*

New Actions

Occasional conferences on the safety of radiation sources and the security of radioactive materials have the benefit of maintaining awareness of the issues as well as providing feedback on the effectiveness of the various measures.

- *Organize a Second International Conference of National Regulatory Authorities with Competence in the Safety of Radiation Sources and the Security of Radioactive Materials, in 2004, pursuant to the Buenos Aires Conference's conclusion that there should be follow-up conferences at frequent intervals.*

RADEV is being designed to be user-friendly so that Member States will be willing to use the same software for their own national database. This will greatly facilitate the exchange of information to and from IAEA's central database of unusual events.

- *Once RADEV has been successfully tested, make the software available to Member States, by early 2002, for them to use in establishing their own national database.*

- *Encourage Member States to use RADEV to collect and disseminate information and lessons learned from unusual events.*

There are a number of IAEA databases with different reporting requirements and different contact points in Member States. Sometimes different agencies or contact points in the Member State are requested to provide similar information to different staff of the IAEA. This leads to confusion regarding reporting requirements and methodologies. In addition, there can be a lack of clarity regarding the purposes of the various databases and the usefulness of the information they are gathering.

- *Clarify, modify and rationalize where necessary, the objectives and inter-relationships among the different IAEA databases concerning radiation sources and events. These include, but are not limited to the list of missing and found sources, the Illicit Trafficking Database (ITDB), RADEV and the compendium of sources. This action should be completed by the start of 2002.*

The Action Plan regional workshops on the safety and security of sources are helping to increase awareness of problems and their potential solutions. However, there would be additional benefits from further exchange of information between the personnel involved, particularly on a regional basis where there is a common language and culture. The development of regional networks would provide a framework within which self-help and mutual assistance could grow, thereby reducing reliance on the IAEA.

- *Establish and support regional networks to promote further informal mutual assistance. Considering that radioactive source issues in neighouring countries may impact Member States, the regional networks should also allow non-IAEA Member States to be included.*

- *Consider establishing a listserver to facilitate communication amongst those involved with radiation source safety both on a regional and world wide basis. This would provide another means of sharing information regarding events and lessons learned as well as encouraging self-help and peer mentoring.*

- *Create an integrated web site devoted to the safety of radiation sources and security of radioactive materials with information on relevant meetings, courses and workshops as well as links to related documents and databases. This could also include a list of Member State contact authorities/persons concerned with the safety of radiation sources. This action should be completed in 2002.*

- *Incorporate lessons learned from all the information exchange processes into the development and revision of training material. This action should be completed in 2002.*

- *Develop an adaptable communications "tool kit" both in print and CD-ROM to enable Member States to effectively communicate key messages regarding the safety and security of radioactive sources to groups such as: government authorities, users, customs officers, scrap metal and foundry workers, emergency response personnel, magistrates and the general public. This action should be completed in 2002.*

EDUCATION AND TRAINING

Education and training has been seen by the Agency, for many years, as an essential pre-requisite to any successful radiation protection programme.

Previous Planned Actions

- *To intensify post-graduate educational course activities in accordance with General Conference resolution GC(XXXVI)/RES/584 on "Education and training in radiation protection and nuclear safety" and to develop, in a systematic way, syllabuses and training material for specific target groups and specific uses of radiation sources and radioactive materials.*

Completed and Ongoing Actions

- Postgraduate educational courses in Arabic, English and Spanish are being implemented and *should become routine. Such courses in other IAEA official languages should be organized* consistent with the IAEA Strategic Plan for Radiation Safety Education and Training.

- More than 30 national and regional practice-specific training courses have been implemented. *These should continue as needed.*

- *Complete the standardized practice-specific training modules* with special consideration to the practices covered by Category I and II sources from the Categorization of Sources (TECDOC 1191).

- A “Strategic Approach to Education and Training in Radiation and Waste Safety: Strategic Plan 2001 -2010”, has been prepared by the Secretariat and is to be submitted to the Board and the General Conference. This plan addresses the long term self-sufficiency objectives as well as the use of regional centres and institutions.

New Actions

Formulation of the Agency’s “Strategic Approach to Education and Training in Radiation and Waste Safety: Strategic Plan 2001 - 2010”, precludes the need for new actions in this revision of the Action Plan.

INTERNATIONAL UNDERTAKINGS

The Board of Governors requested the Director General “to initiate exploratory discussions relating to an international undertaking in the area of the safety and security of radiation sources”. The objective of such an undertaking would be to reinforce the commitment of States to establishing and maintaining appropriate regulatory infrastructures for the safety of radiation sources and the security of radioactive materials.

Previous Planned Actions

- *To initiate a meeting of technical and legal experts for exploratory discussions relating to an international undertaking in the area of the safety of radiation sources and the security of radioactive materials.*

Completed and Ongoing Actions

- A Code of Conduct on the Safety and Security of Radioactive Materials was finalized by an open-ended meeting of technical and legal experts convened by the Secretariat and submitted to the Board which took note of it, and requested the Director General to circulate it to all States and all relevant International Organizations. The Agency published the Code of Conduct, and a Note Verbale regarding it was sent to all Member States and International Organizations.

- The Board also requested the Director General to organize consultations on decisions which the Agency's policy-making organs may wish to take in the light of the report of the chairman of the open-ended meeting, regarding - inter alia - the application and implementation of the Code of Conduct on the Safety and Security of Radioactive Materials, and to make recommendations thereon to the Board.

- On 27 April 2001 the Secretariat organized the First Africa Workshop on the Establishment of a Legal Framework Governing Radiation Protection, the Safety of Radiation Sources and the Safe Management of Radioactive Waste. The workshop, which was held in Addis Ababa, Ethiopia, and was attended by representatives from 14 States (Angola, Egypt, Ethiopia, Ghana, Kenya, Libyan Arab Jamahiriya, Mauritius, Namibia, Nigeria, Sudan, Uganda, United Republic of Tanzania, Zambia, Zimbabwe) adopted a "Common Position", which - inter alia - called upon the IAEA "to create a forum for African countries to consider the Code of Conduct on the Safety and Security of Radioactive Materials, and give it a legally binding effect so that the safe and peaceful use of nuclear technology is not compromised".

New Actions

Should the Code of Conduct on the Safety and Security of Radiation Sources be fully implemented by all Member States, it would go a long way towards solving many safety problems concerning radiation sources. Therefore, the next step is to encourage full application of the Code and learn of its strengths and weaknesses while holding consultations on decisions which the Agency's policy-making organs might wish to take in the light of the report of the Chairman of the Open-ended Meeting at which the Code was finalized.

As to the import and export of radioactive sources, the Chairman of the Open-ended Meeting reported that the participants felt that the main responsibility for the safe management of radioactive sources rested with the importing State, which should consent to the import of such sources only if it had the technical and administrative capability needed to manage them in a safe manner. No agreement was reached regarding any obligations of exporting States in this regard. The next step in this area is, therefore, to hold further consultations with Member States regarding responsibilities of States exporting radioactive sources.

- *Consult Member States on their experience in implementing the Code of Conduct with the purpose of compiling and disseminating a list of best practices. The consultation should begin in 2002, thereby allowing some time for experience with implementation.*

- *Following the consultations on the effectiveness of the Code of Conduct convene a meeting in 2002 to consider the necessity of any further actions related to the Code and make recommendations to the Board as appropriate.*

- *Follow up the discussions regarding possible responsibilities of exporting States which took place during the formulation of the Code of Conduct. This action should be completed as soon as possible.*

Many radiation injuries could have been prevented if the radiation source or the device containing the source had been clearly identified as being hazardous. Experience has shown that the radiation trefoil is not fulfilling this purpose. An ideal warning label would immediately convey the dangerous nature of the source independently of the language or educational level of an observer.

- *As a highest priority, explore the possibility of developing and implementing a universal system of labelling such that any member of the public is immediately aware of the dangers associated with hazardous radiation sources.*

    (a) Determine the quickest and most feasible way of developing and introducing such a labelling system with ISO and IEC.

    (b) Facilitate the implementation of a cost-effective labelling system as soon as possible by all applicable parties.

    (c) Develop and implement a communications plan to raise public awareness regarding the labelling system.

It is recognized that the safety of radiation sources is a worldwide problem that can impact Member States as well as non-Member States equally. The IAEA has a broad range of useful experience in this field that should be shared in any way necessary.

- *Provide technical advice on the request of non-Member States as appropriate, and in accordance with the decisions of the Board (GOV/2810, GOV/OR.868, GOV/2818, GOV/OR.878).*