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Progress in the Implementation of the IAEA Action Plan on Nuclear Safety

Supplementary Information

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INTRODUCTION

1. The draft IAEA Action Plan on Nuclear Safety (the Action Plan) built on the Declaration of the IAEA Ministerial Conference in June 2011, the conclusions and recommendations of the three conference working sessions of this Conference, the IAEA Fact Finding Mission to Japan and the 2011 INSAG Letter Report to the Director General. The draft Action Plan was adopted by the Board of Governors at its September 2011 meeting and was endorsed by all 151 Member States at the 2011 IAEA General Conference. The ultimate goal of the Action Plan is to strengthen nuclear safety, emergency preparedness and radiation protection of people and the environment worldwide.

2. The Nuclear Safety Action Team established in 2011, immediately after the adoption of the Action Plan, identified and developed 170 specific activities to respond to the 12 actions and 39 sub-actions contained in the Action Plan, with around 650 detailed tasks to implement the Secretariat's activities in the light of the accident at TEPCO's Fukushima Daiichi Nuclear Power Station (the Fukushima accident). An overview of these activities was provided to the Member States at an informal briefing held in January 2012.

3. The Secretariat has launched an Action Plan web site as well as an Action Plan platform in which it provides further information on the Secretariat's activities under the Action Plan and updates on the situation in TEPCO's Fukushima Daiichi Nuclear Power Station (the Fukushima Daiichi NPP), as well as information relating to emergency preparedness, the international legal framework and access to other pertinent documents. The web site provides general information for the public and the web platform provides more detailed information for Member States.

4. The IAEA Director General has submitted reports on the progress on the implementation of the Action Plan at the November 2011, and at the March, June and September 2012 Board of Governors meetings, respectively. This document provides supplementary information to the Report of the Director General on Progress in the Implementation of the Action Plan on Nuclear Safety contained in GOV/INF/2012/11-GC(56)/INF/5.

SAFETY ASSESSMENTS IN THE LIGHT OF THE ACCIDENT AT TEPCO'S FUKUSHIMA DAIICHI NUCLEAR POWER STATION

ACTION: *Undertake assessment of the safety vulnerabilities of nuclear power plants in the light of lessons learned to date from the accident*

BACKGROUND

5. Safety assessments of nuclear power plants are a means of evaluating compliance with safety requirements for all facilities and activities and determining the measures that may need to be taken to ensure strengthened safety. These are carried out and documented by the organization responsible for operating a nuclear power plant, and are independently verified and submitted to the regulatory body as part of the licensing or authorization process.

6. A systematic review of a nuclear power plant (NPP) during the Safety Analysis is necessary to identify all potential weaknesses and cliff edge effects, so that appropriate corrective actions can be taken. Structures Systems and Components (SSCs) will provide assistance during accident mitigation and severe accident management scenarios which should be capable of performing their intended functions. It will therefore be necessary to look beyond the design basis to ensure that there are no vulnerabilities that may prevent mitigation actions to be executed during the accident management and emergency response actions.

7. The Fukushima accident was the result of a combination of two extreme external hazards that occurred sequentially. The first and the initiating event was an earthquake and the second and ensuing event was a tsunami. During the assessment of the impact of external hazards on the design of a NPP, seismic and flooding are normally considered separately. It was also learned that the basic resources that are relied upon to maintain the three fundamental safety functions of reactivity control, heat removal and containment integrity were lost due to the unavailability of electrical power and the ultimate heat sink, resulting in an unmitigated accident progression. This resulted in the loss of control over the installation and eventually in severe damage to the nuclear power plant and the release of radioactive material to the environment.

GOALS

Assessment of the design of nuclear power plants

8. Member States are requested to promptly undertake an assessment of the design of their nuclear power plants against site specific extreme natural hazards and to identify and implement any necessary corrective actions in a timely manner. The Secretariat is requested to provide support to Member States that are undertaking assessments and to undertake peer reviews of these assessments upon request.

IAEA Methodology

9. The Secretariat is requested to develop a methodology and make it available to Member States which may wish to use when carrying out their assessments and to provide assistance and support to Member States in the implementation of the results of their assessments of nuclear power plant design against site specific extreme natural hazards.

ACHIEVEMENTS

Assessment of the design of nuclear power plants

10. The Secretariat organized the first international experts' meeting (IEM) in March 2012, on the topic of Reactor and Spent Fuel. The primary objectives of the IEM were:

- To analyse relevant technical aspects of reactor and spent nuclear fuel management safety and performance related to severe accidents;
- To review what is known to date about the accident at the Fukushima Daiichi nuclear power plant in order to understand more fully its root causes; and
- To share the lessons learned from the accident.
- The IEM showed that significant efforts and actions have been undertaken by Member States and relevant organizations with the common goal of improving safety, ensuring protection against extreme events and enhancing mitigation of severe accidents. Despite differences in approaches, priorities and schedule of implementation, the studies performed by Member States and the areas identified for improvement appeared to converge, with similar conclusions and corresponding actions being identified to strengthen the overall safety framework.

11. The IEM emphasized additional efforts necessary not only to prevent accidents, but also to mitigate their consequences, with a priority on preserving the integrity of containment. Moreover, several efforts from Member States were identified to strengthen severe accident management and to improve emergency response capability. These efforts will greatly strengthen defence in depth. As future lessons may be learned, the IEM provided significant initial insights. The Secretariat has placed the summaries of the IEM Chairperson and Co-Chairpersons and the meeting presentations on the Action Plan website and will produce a report of the IEM.

IAEA Methodology

12. The Secretariat developed a methodology for assessing the safety vulnerabilities of a nuclear power plant based on the IAEA Safety Standards. The methodology provides a step-wise approach to completing a systematic analysis of the impact of extreme natural hazards. Its starting point is the identification of extreme natural hazards that may have an impact on the safety of the nuclear power plant and the consequences that may result from these hazards. The methodology focuses on the assessment of plant response to extreme natural hazards and provides practical methods to assess whether the structures, systems and components and operator actions required to fulfil the necessary safety functions are resilient to the extreme events under consideration. The methodology allows Member States to consider options to enhance the robustness of the plant. The Methodology was made available to Member States through the NSAP web platform in November 2011.

13. The IAEA methodology took into consideration other international efforts for reviewing nuclear power plant design, and testing its resistance against site specific extreme natural hazards. To ensure consistency of approach, the Secretariat participated as observer in the topical meetings of the European Union (EU) stress test review, in February 2012 in Luxembourg where three topical areas were addressed: external hazards, loss of safety systems and severe accident management. The Secretariat considers that the important aspects of the EU stress tests are broadly consistent with the IAEA Methodology.

14. The Secretariat is extending its design review service to include core modules for the peer review of national assessments by Member States. Using the Safety Requirements and Guides of the IAEA Safety Standards Series, this service focuses on the design and safety assessment aspects of protection against extreme events, including defence in depth, safety margins, robustness, cliff edge effects, multiple failures, the prolonged loss of essential systems and recovery actions carried out by the plant operators.

15. At the request of the Government of Japan, the IAEA conducted an international expert mission in January 2012 aimed to review the approach of the Nuclear and Industrial Safety Agency's (NISA) to the Comprehensive Assessments for the Safety of Existing Power Reactor Facilities. The IAEA methodology was used to ascertain whether the NISA's safety assessment process had the appropriate consideration of external hazards, evaluation of safety margins, plant vulnerabilities and severe accident management.

16. The final report of the mission was provided to the Government of Japan and placed on the NSAP website.

CURRENT STATUS OF ACTION

17. The Secretariat has undertaken activities to fulfil its responsibilities under the Action Plan in relation to the assessment of the safety vulnerabilities of nuclear power plants and support and assist Member States in this regard. A methodology that is consistent with international practice is now available to Member States that may wish to use it, along with expert support for its use and the peer review of results.

18. As lessons may continue to emerge in this area, they will be incorporated into the Secretariats activities, as appropriate. In particular, the area that needs special focus is the approach to the prevention of severe accidents and the application of these lessons in Member States.

19. In the light of the recent lessons, the impact of human and organizational factors on safety need to be considered in a more comprehensive manner when undertaking safety assessments of nuclear power plants.

20. The IEM on reactor and spent fuel safety provided the opportunity for Member States to share their experience with these assessments, to discuss and share the lessons learned and widely disseminate this information.

NEXT STEPS

21. The Secretariat will analyse the results from the 2nd Extraordinary Meeting of the CNS, including the six topical areas identified to address the lessons learned from the Fukushima accident, External Events, Design Issues, Severe Accident Management and Recovery, National Organizations (Regulator, TSO, Operator, Government), Emergency Preparedness & Response and Post-accident Management and International Cooperation.

22. The Secretariat will analyse issues and trends for Post-Accident Monitoring (PAM) Systems in Nuclear Power Plants based on lessons learned from the Fukushima accident.

23. The Secretariat will review and update the IAEA Methodology for assessing the safety vulnerabilities of nuclear power plants based on new lessons learned, focussing in particular on key areas such as severe accidents, simulation of accident scenarios, electrical and cooling systems and other engineered safety features related to reactor designs.

24. The Secretariat will develop guidance for the assessment of multi-unit NPP sites in relation to multiple external hazards. To this end, the Secretariat will organize an International Workshop on the Safety of Multi-Unit Nuclear Power Plant Sites against External Natural Hazards in October 2012. The workshop will cover the lessons learned from the effects of past earthquakes on NPPs, assessment of external natural hazards at a site with multi-unit NPP(s) and other nuclear installations, external event probabilistic safety analysis (EE-PSA), risk integration, and external event site safety assessment.

IAEA PEER REVIEWS

ACTION: *Strengthen IAEA Peer Reviews in order to maximize the benefits to Member States*

BACKGROUND

25. The main objectives of the IAEA peer reviews are to provide an independent assessment of the safety of an activity or facility and to assist Member States in improving their performance in the area under review.

26. The benefit of peer reviews for Member States is to obtain independent and objective expert opinion and advice on their activities or facilities and inform them whether they are consistent with IAEA Safety Standards and international good practices. These reviews provide the host Member State with recommendations and suggestions in those areas where improvements are required and also identify good practices worthy of disseminating.

27. Strengthening the IAEA peer reviews and encouraging their use among member States will serve to strengthen the global nuclear safety framework.

GOALS

Strengthen and Enhance Effectiveness of IAEA Peer Reviews

28. The Secretariat is to assess, and enhance as necessary, the effectiveness of the IAEA peer reviews by incorporating the lessons learned to date from the Fukushima accident. The peer review services to be strengthened are in the areas of:

- Regulatory effectiveness- the Integrated Regulatory Review Service (IRRS);
- Operational safety – the Operational Safety Review Team service (OSART);
- Design safety – the Design Safety Review service (DSR) and Site Evaluations; and
- Emergency preparedness and response – the Emergency Preparedness and Response Review service (EPREV).

Enhance Transparency of Peer Reviews

29. The Secretariat is requested to enhance the transparency of the IAEA peer review missions and to promote the sharing of experience and lessons learned among Member States from the utilization of these services, including by making available information on where and when Member States have hosted IAEA peer review missions along with the results of such reviews.

Member States to host IAEA Peer Reviews

30. Member States encouraged to voluntarily host IAEA peer reviews, including follow up reviews, on a regular basis; the Secretariat to respond in a timely manner to requests for such reviews. Each Member State with nuclear power plants to voluntarily host at least one IAEA Operational Safety Review Team (OSART) mission during the coming three years, with the initial focus on older nuclear power plants. Thereafter, OSART missions to be voluntarily hosted on a regular basis.

ACHIEVEMENTS

Strengthen IAEA Peer Reviews

31. The Secretariat has undertaken a comprehensive review of its peer review services and identified a number of areas for their enhancement by incorporating the lessons learned from the Fukushima accident. To this end, the following activities have been completed:

- A specific module has been developed in the light of the implications of the Fukushima accident on regulatory and emergency and response activities, and revised based on the experience gathered during the recent missions. This module has been incorporated into both

the IRRS and EPREV peer reviews, and has been used in all IRRS missions undertaken in nuclear countries since the middle of 2011. As a result, the review of the Fukushima specific issues has been streamlined and yields more focused summaries than the previous missions;

- The topic of severe accident management has been included in the OSART peer review;
- Utilizing the IAEA methodology to assess the safety vulnerabilities of nuclear power plants along with the associated IAEA Safety Standards, a dedicated review of the safety vulnerabilities of nuclear power plant against site specific extreme natural hazards has been developed; and
- New guidelines for review of accident management in the safety assessment area have been developed; and additional guidance has been prepared to enable expert reviewers to effectively address Fukushima related areas for all peer reviews.

Enhance Transparency and Effectiveness of IAEA Peer Reviews

32. The Secretariat has made available, on the IAEA web site, information on where and when peer reviews have been carried out. The Secretariat has consulted Member States to seek their agreement to publish the results of the IAEA peer reviews carried out over the last 10 years. Summaries of the peer review results are being placed on the IAEA's website and the full peer review reports are being placed on the Action Plan platform with the agreement of Member States.

33. There has been an increase in demand for IAEA peer review services in comparison with previous years. The Secretariat is preparing a long term plan to meet this demand taking into account the availability of IAEA and international experts and necessary resources needed. In this regard some Member States have made available a list of contact points and experts with peer review experience.

34. A report on the lessons learned from the IRRS missions carried out from 2006 to 2010 was prepared by the Secretariat and considered by Member States at a workshop held in USA in October 2011. A strong commitment of all relevant national authorities to the IRRS programme was identified as a key element of an effective regulatory framework.

35. The support for the continuation of the IRRS and the improvement proposals expressed by participants will contribute to the effective implementation of the Action Plan. The lessons learned report by the Chairman of the workshop and all IRRS reports have been made available on the Action Plan web platform enhancing transparency with the public.

36. It was concluded that IRRS missions are a powerful tool for regulatory improvement, disseminating good practices, increasing public confidence and initiating international exchange of experience.

37. Proposals identified by the participants for improvement to the service include:

- Upgrading the self-assessment process;
- Constructing an electronic portal for sharing IRRS information; and
- Addressing the synergies with IRRS/OSART missions, the Convention on Nuclear Safety, and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (JC) regarding the review of Member States and facility activities in response to Fukushima Daiichi related issues at the next IRRS lessons learned workshop.

38. The Report also recognizes that an IRRS peer review mission addresses much more than the responsibilities and activities of the regulatory body. More consideration should be given to additional outreach to government bodies for bringing attention to the value of IRRS missions in improving the governmental support and the regulatory framework for safety. This could include greater awareness and participation by representatives of these bodies at the mission entrance and exit meetings.

39. The Secretariat evaluated the effectiveness of OSARTs at a technical meeting in November 2011. Senior nuclear experts from Member States offered several recommendations on how the IAEA can further develop and strengthen its operational safety review services. The most important recommendation was to introduce the topic of Severe Accident Management as a separate review area in the standard scope of an OSART mission. The meeting endorsed the integration of the different types of operational safety services under the umbrella of OSART, to improve the effectiveness of using available resources and harmonising the methodology of these services. The meeting considered that the IAEA operational safety review services, and in particular the OSART programme, were effective in supporting the enhancement of the safety of NPPs during both commissioning and operation. The recommendations and improvements endorsed by the meeting are being incorporated into the OSART peer review service thus contributing to further enhancing the effectiveness of these reviews and the safety of NPPs worldwide.

40. The effectiveness of the EPREV service was reviewed with experts from Member States. The review covered the aspects of the EPREV process, such as inviting and hosting a mission and follow-up mission, the mission results and how EPREV service addresses Fukushima related issues. In the light of lessons learned from the Fukushima accident, the EPREV reports should provide for detailed recommendations concerning control of foodstuffs, agricultural and other long term countermeasures in the event of a severe nuclear emergency. The participants recognized the importance of follow-up missions and the need for continuity of expertise during the initial and follow-up EPREV missions.

41. In order to make improvements and harmonize the approach among several peer review services in the design area, the Secretariat tailored a new peer review service based on a modular approach named Design and Safety Assessment Review Service (DSARS). The objective of DSARS is to provide to the requesting Member State an independent peer review and assessment of plant design safety and to make recommendations on additional actions/analysis to be performed. This service is newly organized in modules that cover the review of the design at different phases based on the IAEA safety standards.

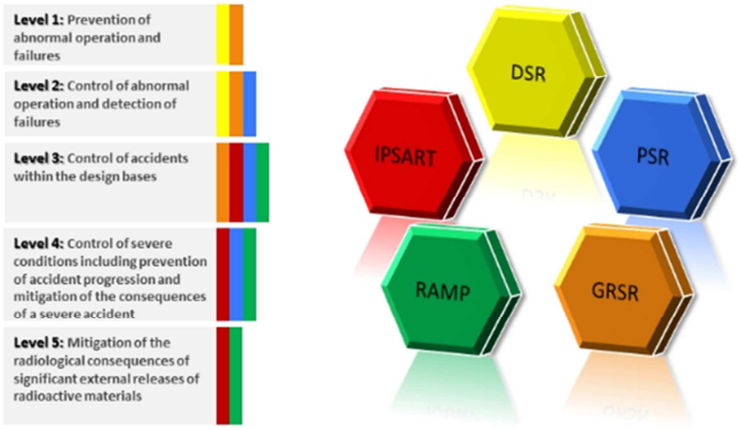

Figure 1 Defence in Depth Assessment through IAEA Safety Assessment Section Services
Ref. INSAG-10

42. The module on Generic Reactor Safety Review (GRSR) is currently being performed for the AES-2006 (also known as VVER-1200) reactor design, with four more requests anticipated within the next two years. The International Probabilistic Safety Assessment Review Team (IPSART) service has been requested by the Kozloduy nuclear power plant in Bulgaria, and a Review of Accident Management Programmes (RAMP) service has recently been requested for the Laguna Verde nuclear

power plant in Mexico. In addition, an Advisory Design Safety Assessment Peer Review Service, tailored for embarking countries, is being developed.

43. The Site and External Events Design (SEED) review service has now replaced the Site Safety Review Service. It incorporates improvements to better address the needs of Member States in the area of site selection, hazard assessment and the design of relevant structures, systems and components. SEED supported site selection and/or site assessment in Bangladesh, Hungary, Jordan and Romania. SEED also assisted in the development of model regulations for sites in Vietnam and in the review of site licensing applications in the United Arab Emirates.

CURRENT STATUS OF ACTION

44. Improvements on the effectiveness of the IAEA peer review services have been carried out and further improvements may be introduced in close cooperation with Member States.

45. Additional lessons learned from the Fukushima accident are being assessed and, as necessary, incorporated in all peer review services to provide more effective reviews, recommendations and advice for safety improvements to Member States facilities and activities.

46. Strengthening transparency and information about the peer reviews results provide the benefit of sharing among Member States experiences to improve safety and adds to public confidence in nuclear power.

NEXT STEPS

47. The activities to be undertaken by the Secretariat include:

- Continuous updating and strengthening of the effectiveness and transparency of these peer review services and incorporating further lessons as they are learned from the Fukushima accident and from the review of the IAEA Safety Standards;
- Improving peer reviews coordination in close cooperation with Member States and other relevant stakeholders, in response to their needs and requests and receiving their support through an established experts database and contact points; and
- Enhancing the consistency of approach between peer review services and strengthening the concept of self-assessment in all relevant safety areas.

EMERGENCY PREPAREDNESS AND RESPONSE

ACTION: *Strengthen emergency preparedness and response*

BACKGROUND

48. Sound preparedness for and effective response to any radiation related (radiological and nuclear) event are essential to avoid or minimize the impacts from those events if they were to occur.

49. The Fukushima accident reinforced the importance of careful attention to emergency preparedness and response (EPR) at all levels, local, national and international.

50. The international emergency preparedness and response framework comprises the legal framework that is provided by the Convention on Early Notification of a Nuclear Accident (Early Notification Convention) and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention), safety standards in the EPR area and operational arrangements, tools and protocols.

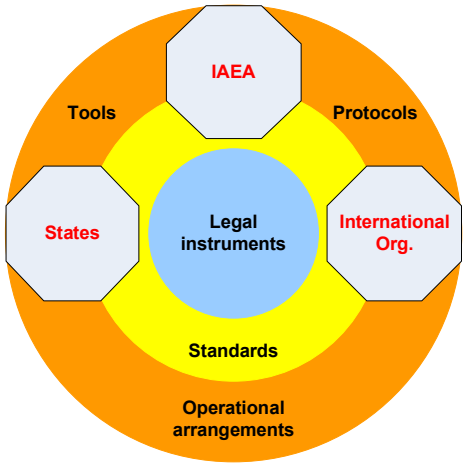

Figure 2 International emergency preparedness and response framework: Overview

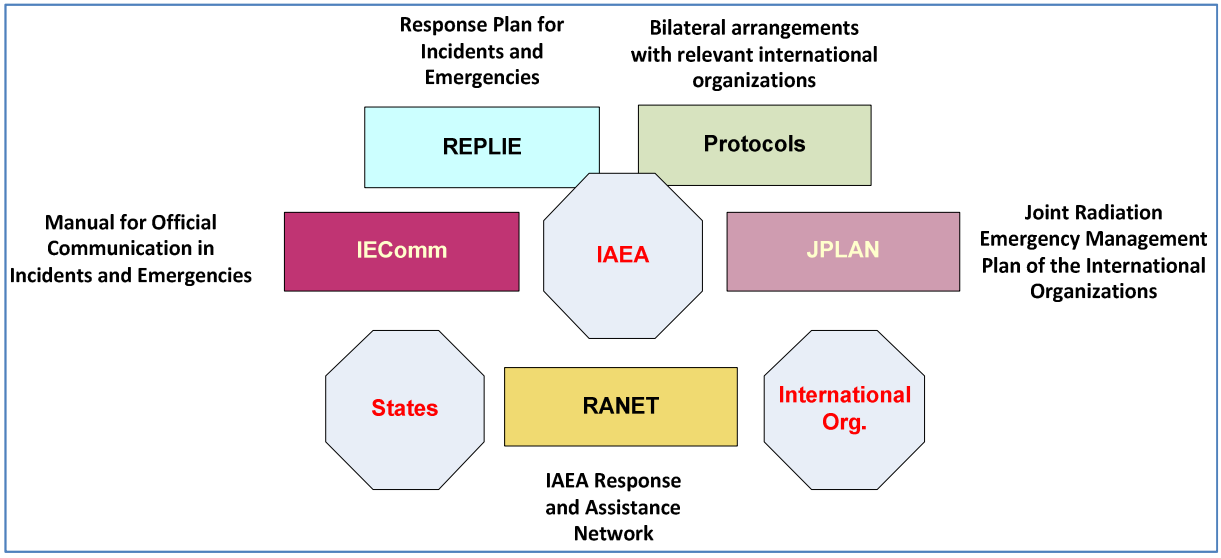

Figure 3 International emergency preparedness and response framework:
Operational arrangements and protocols

51. The Secretariat's role in response to a nuclear or radiological incident and emergency includes: exchanging/sharing information among Member States and international organizations, providing advice and assistance to Member States, informing the media/public and coordinating the inter-agency response.

52. Practical mechanisms and specific arrangements are set out in: the Response Plan for Incidents and Emergencies (REPLIE); the Operations Manual for Incident and Emergency Communication (IEComm); the Response and Assistance Network (RANET); and the Joint Radiation Emergency

Management Plan of the International Organizations (JPLAN). The REPLIE is the Secretariat's emergency preparedness and response plan; the IEComm defines mechanisms and channels for communication among the Secretariat and States/relevant international organizations; the RANET covers international assistance mechanisms; and the JPLAN defines the inter-agency framework for the coordination of emergency preparedness and response.

53. The Fukushima accident demonstrated the overall importance of the Secretariat's role in response to nuclear emergencies, and the need to maintain and further strengthen the IAEA's Incident and Emergency System.

GOALS

Review of national emergency preparedness and response arrangements

54. Member States are requested to conduct a prompt national review and thereafter regular reviews of their emergency preparedness and response arrangements and capabilities. The Secretariat is to provide support and assistance to Member States through Emergency Preparedness Review (EPREV) missions, as requested.

Review and strengthen the international emergency preparedness and response framework

55. All relevant parties (the Secretariat, Member States and relevant international organizations) are requested to review and strengthen the international emergency preparedness and response framework and strengthen the assistance. In addition Member States to consider establishing national rapid response teams, on a voluntary basis that could also be made available internationally through the RANET.

56. The Secretariat, in case of a nuclear emergency and with the consent of the State concerned, is to conduct timely fact-finding missions and to make the results publicly available.

ACHIEVEMENTS

Review of national emergency preparedness and response arrangements

57. The Secretariat has reviewed the effectiveness of the EPREV peer review service in past 10 years, summarised the highlights and lessons learned and presented them at the workshop in June 2012, the purpose of which was to gather and discuss Member States' experience and explore further improvements in the planning and implementation of the EPREV missions.

58. In order to support the strengthening of national emergency preparedness and response, the Secretariat, in the first half of 2012, organized 21 national, regional and interregional training events in different areas of emergency preparedness and response. More than 15 training events are planned for the second half of 2012.

Review and strengthen the international emergency preparedness and response framework

59. The Secretariat convened the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE) meeting in December 2011 where proposals to strengthen the international emergency preparedness and response framework were addressed. Based on the lessons learnt from the Fukushima accident, this meeting recommended that an Ad Hoc working group on transport be established. An objective of this group is the review of transport emergency criteria and identification of areas for improvement. The International Civil Aviation Organization (IACO) will serve as secretariat of this working group.

60. Improvements considered necessary were also identified in the areas of communication among organizations, communication with the public and specific technical communities, and emergency preparedness in general, taking into account the lessons learned in response to the Fukushima accident.

61. In November 2011, the Secretariat received an application from the Preparatory Commission for the Comprehensive Nuclear-Test-Ban Organization (CTBTO) to join IACRNE; on 14 March 2012 the CTBTO became the sixteenth member and a cosponsor of the JPLAN. This will further enhance the EPR capabilities and cooperation among international organizations.

62. The Secretariat has prepared a revision of the JPLAN (to be published as EPR-JPLAN Edition 2013) and distributed it to the IACRNE members for their comments and input.

63. Ways for broadening the assistance capabilities and expanding the functional areas of the RANET are being explored. Particular topics considered in a meeting organized by the Secretariat in February 2012 covered possible assessment and advice to competent authorities for on-site mitigation activities and for ensuring and maintaining RANET rapid response capabilities.

64. The Secretariat has prepared draft Edition 2013 of the RANET publication including new guidance on the roles, responsibilities and actions needed on the part of all members of the assistance network in preparing for, requesting and receiving assistance. Mechanisms to ensure timely assistance have been clarified. A revised draft edition of RANET document was sent to Parties to the Assistance Convention for comments. The publication also includes an additional functional area for providing assessment and advice to competent authorities on the on-site mitigation activities in case of emergencies at nuclear facilities.

65. The Secretariat has initiated a programme for the preparation of RANET review missions and has reported all RANET National Assistance Coordinators to consent to host RANET review missions in their countries.

66. In line with the strategy recommended in the final report of the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies, the Emergency Preparedness and Response Expert Group (EPREG) is in the process of being established to advise the Secretariat on strategy to strengthen and sustain sound international preparedness for nuclear and radiological incidents and emergencies.

CURRENT STATUS OF ACTION

67. The Secretariat's activities have contributed to:

- An increase in Member States' requests for EPREV missions;
- An intensified review and self-assessment of national EPR system;
- A critical review of international EPR framework;
- Upgrades of the Secretariat's EPR arrangements and capabilities;
- Intensified capacity building efforts at national and international level; and
- Preparation of enhanced strategy for effective communication in emergencies.

68. The EPREV peer review service was improved by incorporating the lessons learned to date; as a result, more effective support and assistance is being provided to Member States related to national emergency preparedness and response arrangements.

69. The international emergency preparedness and response framework is being strengthened (IEComm, RANET and JPLAN revised; EPREG in process of being established).

70. Two Member States have registered additional national assistance capabilities under RANET, two Member States have updated their assistance capabilities and one State announced intentions to

register its assistance capabilities. Several RANET registered Member States have requested RANET review missions. It has been suggested that assistance related to international transport should be promoted within RANET.

NEXT STEPS

71. The activities to be undertaken by the Secretariat include:

- Continue to incorporate lessons learned to the EPREV peer review service;
- Publish the revised IEComm, RANET and JPLAN;
- Develop operational procedures on the application of the new RANET capabilities in particular on the on-site mitigation needs in the event of a nuclear emergency;
- Continue to encourage Member States to request EPREV missions and provide experts for these peer reviews;
- Establish the Emergency Preparedness and Response Expert Group (EPREG);
- Develop protocols for preparing and conducting fact-finding missions and making the results publicly available; and
- Fully develop the strategy for enhanced and effective communication in nuclear and radiological incidents and emergencies.

NATIONAL REGULATORY BODIES

ACTION *Strengthen the effectiveness of national regulatory bodies*

BACKGROUND

72. The IAEA Fundamental Safety Principles[1] state that an effective legal and governmental framework for safety, including an independent regulatory body, must be established and sustained.

73. The Governments of Member States are responsible for securing adherence to the international instruments relevant to nuclear safety, such as establishing and maintaining the necessary legal and governmental infrastructure, including an effective independent regulatory body for the regulation of facilities and activities that give rise to radiation risks. An effective, competent and independent regulatory framework is therefore an essential prerequisite to any nuclear programme.

74. To be effective, a regulatory body must have, inter alia, adequate legal authority, technical and managerial competence, and the human and financial resources necessary to fulfil their responsibilities. The regulatory body must ensure that a high level of safety is being maintained by the licensees/operating organizations, take actions to promote and improve safety and also take action to prevent the degradation of safety. The regulatory body should perform its functions in an independent, transparent, timely and efficient way and strive for the continuous improvement of itself and industry performance.

GOALS

Enhance the Integrated Regulatory Review Service (IRRS)

75. Member States are requested to conduct a prompt national review and thereafter regular reviews of their regulatory bodies, including an assessment of their effective independence, adequacy of human and financial resources and the need for appropriate technical and scientific support, to fulfil their responsibilities.

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[1] IAEA Fundamental Safety Principles SF-1

76. The Secretariat is requested to enhance the IRRS for peer review of regulatory effectiveness through a more comprehensive assessment of national regulations against IAEA Safety Standards.

Voluntarily host IRRS missions

77. Each Member State with nuclear power plants is requested to voluntarily host, on a regular basis, an IAEA IRRS mission to assess its national regulatory framework along with a follow-up mission that is to be conducted within three years of the main IRRS mission.

ACHIEVEMENTS

Enhance the Integrated Regulatory Review Service (IRRS)

78. The Secretariat has enhanced the IRRS peer review service to include a more systematic and comprehensive assessment of Member States' emergency preparedness and response within the regulatory framework, in particular highlighting the Requirement *Preparedness and Response for a Nuclear or Radiological Emergency* (IAEA Safety Standards Series No. GS-R-2).

79. A specific review module was developed and incorporated into the scope of IRRS missions. This module focused on the regulatory framework aspects that were identified as relevant in the light of the Fukushima accident by a thorough review of the various reports and documents issued regarding the accident. The tailored module has been uniformly applied in all IRRS missions conducted after the accident. To ensure its continued relevance, the module was reviewed and further enhanced in content and format in June 2012 by using and incorporating into this module the experience gathered during the recent missions. As a result, the review of the Fukushima specific issues is more integrated within the various IRRS modules and yields more concise summaries than in the previous version.

80. In addition, several criteria and a methodology of characterizing the effectiveness and efficiency of the IRRS missions were developed.

81. In January 2012, the Secretariat produced a report on highlights of the results of the IRRS missions for the period 2006-2010. This has been made available to Member States through the Action Plan Platform. It is envisaged that this report will be updated periodically.

Voluntarily host IRRS missions

82. The Secretariat has developed a schedule of the missions requested by Member States that will be conducted between 2012 and 2014.

83. In addition, in the framework of an agreement between the Secretariat and the European Commission, with the consent of the Member States concerned, the Secretariat will be organizing an IRRS mission to each EU Member State every 10 years.

84. The Secretariat has analysed the effectiveness and efficiency of the IRRS missions using feedback from experts with experience from previous IRRS missions and is exploring ways to introduce further improvements in this peer review process.

85. The Fukushima tailored module has been uniformly used in all IRRS missions after the Fukushima accident.

CURRENT STATUS OF ACTION

86. In the area of regulatory effectiveness, the Secretariat's activities contributed to:

- Enhancing the effectiveness through improvements in the IRRS process
- The on-going process of incorporating regulatory lessons learned as they are identified within the regulatory module on Fukushima; and

- An increase in Member States requests for IRRS missions.

87. Several enhancements have been carried out within the IRRS missions. The effectiveness of the regulatory bodies in those Member States that implemented the recommendations and suggestions from the IRRS missions will be strengthened.

88. Current demand for IRRS missions represents a challenge considering the resources available for the Secretariat and the Member States.

NEXT STEPS

89. The activities to be undertaken by the Secretariat include:

- Identify further regulatory implications and enhancements as they may appear and share lessons learned from the Fukushima accident;
- Analyse past IRRS mission results using the experience of IRRS Team expertise and seek potential improvements of the IRRS process in close cooperation with Member States; and develop criteria for the improvement to the effectiveness and efficiency of the IRRS process;
- Prepare further practical guidance for the conduct of IRRS missions for all participants in the IRRS process and produce the second volume of IRRS guidelines;
- Organize an International Conference on Effective Nuclear Regulatory Systems in April 2013; and
- Additional efforts are needed to ensure that more IRRS missions are requested in the future and to provide experts to participate in these missions.

OPERATING ORGANIZATIONS

ACTION: *Strengthen the effectiveness of operating organizations with respect to nuclear safety*

BACKGROUND

90. The IAEA Fundamental Safety Principles[2] state that the prime responsibility for safety rests with the person or organization responsible for facilities and activities that give rise to radiation risks. While the safety of a nuclear power plant is ensured by means of proper site selection, design, construction and commissioning, an effective operating organization ensures that a high level of safety is achieved through the effective management and control of operational activities.

91. This effective management and control depends ultimately on sound policies, procedures, processes and practices; on the capability and reliability of the operating personnel; on comprehensive instructions; and on adequate resources. A positive attitude and conscientiousness on the part of the management and staff in discharging their responsibilities is important to safety.

92. The operating organization discharges this responsibility in accordance with a management system that is an integrated set of interrelated or interacting components for establishing policies and objectives and enabling the objectives to be achieved in an efficient and effective manner.

93. Furthermore the operating organization shall establish and implement an operational safety policy that gives safety the utmost priority, overriding the demands of production and project schedules. The safety policy shall promote a strong safety culture, including a questioning attitude and a commitment to excellent performance in all activities important to safety.

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[2] IAEA Fundamental Safety Principles SF-1

94. The operating organization is also responsible for ensuring that the necessary knowledge, skills, attitudes and safety expertise are sustained at the plant, and that long term objectives for human resources policy are developed and met.

GOALS

Strengthening the effectiveness of operating organizations

95. Member States are requested to ensure improvement, as necessary, of management systems, safety culture, human resources management, and scientific and technical capacity in their respective operating organizations. The Secretariat is to provide assistance in strengthening the effectiveness of operating organizations.

96. Each Member State with NPPs is requested to voluntarily host at least one IAEA Operational Safety Review Team (OSART) mission during the three years from the adoption of the Action Plan, with the initial focus on older nuclear power plants. Thereafter, OSART missions to be voluntarily hosted on a regular basis.

Strengthen cooperation with WANO and other organizations

97. The Secretariat is required to strengthen cooperation with WANO by amending the existing Memorandum of Understanding between the two organizations to enhance information exchange on operating experience and on other relevant safety and engineering areas and, in consultation with other relevant stakeholders, to explore mechanisms to enhance communication and interaction among operating organizations.

ACHIEVEMENTS

Strengthening the effectiveness of operating organizations

98. The OSART service has been enhanced to include priority topics of severe accident management as described in the response to the Action on Peer Reviews. The Secretariat has summarized the highlights of the OSART missions carried out from 2008 to April 2012 and has made the summary available on the Action Plan website. In the period since the adoption of the Action Plan, 7 OSART missions were carried out in 6 Member States. The common issues identified during these missions have been summarized in the OSART highlights for this period and include the topical areas of management, organization and administration, training and qualification, operations, maintenance, technical support, and emergency preparedness and response.

99. The Secretariat organized a Technical Meeting in June 2012 on the topic on Managing the Unexpected from the Perspective of the Interaction between Individuals, Technology and Organization. It was the first meeting of its kind to explore how nuclear safety can be strengthened through a systemic and resilience perspective. Researchers, practitioners and experts from the nuclear community and other relevant organisations contributed to the discussions of the following issues:

- Similarities and differences in the management and mitigation of severe accidents in high reliability organisations in other industrial fields;
- The impact of national culture on safety culture;
- Paradigm shift in risk management modelling from linear and rational to dynamic and complex postulation;
- Lessons learned from managing the unexpected in critical situations. Lessons from three recent airline accidents, the Deep Water Horizon disaster and critical situation management in intensive care clinic, fire fighting and the Fukushima accident were analysed;
- The role of regulatory bodies in managing for the unexpected; and

- The impact and constraints of legal systems on behaviours during the management and mitigation of accidents.

100. One key conclusion of the meeting was that further efforts are required by the nuclear community in order to ensure resilience when handling unexpected events. The reliance on linear and rational risk models needs to be complemented with more systemic and dynamic approaches. A report on the meeting is being prepared and will be made available to the Member States.

Strengthen cooperation with WANO and other organizations

101. The IAEA Director General informed WANO at their Biennial General Meeting in Shenzhen, China, in October 2011 that WANO and the IAEA will play a key role in ensuring that the right lessons are learned from the Fukushima accident and that the necessary improvements in nuclear operating safety are actually put into practice everywhere, and stated that in the aftermath of the Fukushima accident, the partnership between IAEA and WANO must be deepened and intensified.

102. The Secretariat and the WANO held senior level meetings during 2011 and 2012 to discuss ways of improving the coordination of the relevant activities of both organizations and to facilitate the exchange of information arising from each other's activities, while respecting the confidentiality requirements of each organization. A revised MoU has been agreed and is scheduled for signing by both parties during the 2012 IAEA General Conference.

103. Both organizations plan to increase the frequency of their peer review missions. The Action Plan calls for minimum one OSART mission to each Member State with an operating nuclear power plant in the next three years, while WANO has decided to decrease the Peer Review cycle from 6 to 4 years. Increasing the frequency of peer reviews will serve to strengthen Member States operating organizations. The IAEA and WANO have agreed to improve the coordination of their respective peer review missions at nuclear power plants in order to avoid scheduling them too close together. IAEA and WANO will continue to share resources by providing a staff member as reviewer for each other's reviews.

104. The Secretariat is making use of WANO's experience in nuclear safety operations by inviting a representative to attend meetings of the IAEA Nuclear Safety Standards Committee as an observer. In addition, there is closer cooperation between WANO and IAEA in their activities dealing with new utilities and operators in countries embarking on a nuclear power programme.

105. In order to enhance its communications with operating organizations, the Secretariat has signed practical arrangements (PAs) in October 2011 with the China Atomic Energy Authority on cooperation in the field of safe NPP construction; with FORATOM in March 2012 for Energy Policy/Integrated Management System, and the KEPCO International Nuclear Graduate School (KINGS), Korea, in July 2012 in the area of education and training for human resource management. The Secretariat has also contacted other relevant stakeholders in the Research Institute of Nuclear Power Operation (RINPO) China, the State Nuclear Technology Power Corporation (SNTPC) China, the Japan Nuclear Technology Institute (JANTI) Japan, the Electric Power Research Institute (EPRI) USA and the Institute of Nuclear Power Operations (INPO) USA, with a view to signing similar PAs.

CURRENT STATUS OF ACTION

106. Several enhancements have been introduced within the OSART missions. The effectiveness of operating organizations in those Member States that implemented the recommendations and suggestions from OSART review missions will be strengthened.

107. The improvements introduced to the cooperation between IAEA and WANO will result in better coordination of support from both organizations for nuclear power plants and the operating organizations.

108. Additional efforts are needed to engage more Member States to request OSART missions and to provide experts to participate in the peer reviews.

NEXT STEPS

109. The activities to be undertaken by the Secretariat include:

- Promoting the participation on "Nuclear Power Industry Cooperation Forum" organized during the 2012 IAEA General Conference to share relevant experience and strengthen cooperation in the nuclear industry;
- Continue to incorporate lessons learned into the OSART peer review service and disseminate them to Member States;
- Full implementation of the agreed MoU between IAEA and WANO and the agreed PAs between the IAEA and signatory organizations; and
- Identification of other relevant stakeholders, such as Nuclear Owners Group and Nuclear Vendors, with whom to strengthen cooperation and communication using practical arrangements.

IAEA SAFETY STANDARDS

ACTION: *Review and strengthen IAEA Safety Standards and improve their implementation*

BACKGROUND

110. The IAEA Safety Standards have a status that is derived from the IAEA's Statute which authorizes the IAEA "To establish or adopt, in consultation and, where appropriate, in collaboration with the competent organs of the United Nations and with the specialized agencies concerned, standards of safety for protection of health and minimization of danger to life and property and to provide for the application of these standards".

111. The IAEA Safety Standards provide a robust framework of fundamental principles, requirements and guidance to ensure safety. They are developed through an open and transparent process for gathering, integrating and sharing the knowledge and experience gained from the actual use of technologies and from the application of the safety standards, including emerging trends and issues of regulatory importance. They contribute to the establishment of a harmonized high level of safety worldwide by serving as the global reference for protecting people and the environment.

GOALS

Review, and revise the relevant IAEA Safety Standards

112. The Secretariat and the Commission on Safety Standards are requested to review and revise as appropriate, and strengthen the IAEA Safety Standards and improve their implementation using the existing process in a more efficient manner.

ACHIEVEMENTS

Review, and revise the relevant IAEA Safety Standards

113. The Secretariat established a Safety Standards Review Task Force (SSRTF), which developed a draft Safety Standards Action Plan specifically to review the relevant IAEA Safety Standards. The SSRTF undertook a systematic review of the IAEA Safety Standards taking into account the implications of the lessons learned to date from the Fukushima accident. The review focused, as a priority, on the set of Requirements applicable to Nuclear Power Plants and to the Storage of Spent Fuel. This includes all the General Safety Requirements and the Specific Safety Requirements that relate to site evaluation for nuclear installations, and design, commissioning and operation of nuclear power plants.

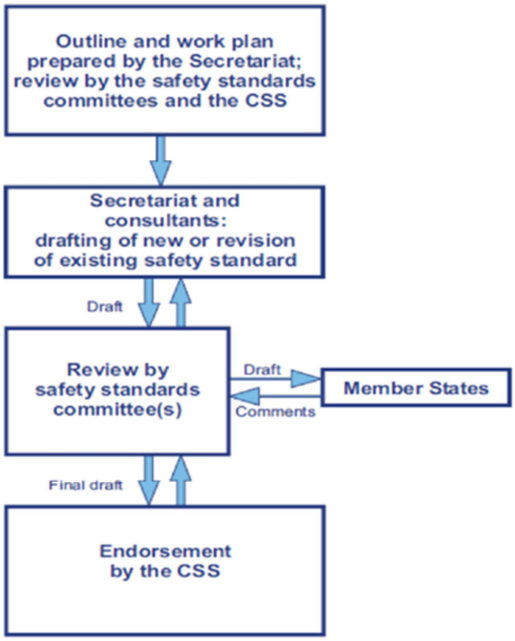

Figure 4 The process for developing a new safety standard or revising an existing standard

114. The Secretariat reviewed in detail more than one hundred issues categorized according to 63 topical areas and addressed each by an overarching requirement in the existing Safety Standards. The review found the overarching requirements to be adequate but identified a number of associated requirements that could be strengthened as well as areas for which further guidance could be provided.

115. In March 2012, the Commission on Safety Standards (CSS) considered the Secretariat's progress report on the review of the IAEA Safety Standards and agreed to the preparation of a document outlining the process to initiate the revision of the Safety Requirements on *Governmental, Legal and Regulatory Framework for Safety* (GSR Part 1), *Site Evaluation for Nuclear Installations* (NS-R-3), *Safety of Nuclear Power Plants: Design* (SSR-2/1), *Safety of Nuclear Power Plants: Commissioning and Operation* (SSR-2/2) and *Safety Assessment for Facilities and Activities* (GSR Part 4), in conjunction with the already agreed revision of *Preparedness and Response for a Nuclear or Radiological Emergency* (GS-R-2) and *The Management System for Facilities and Activities* (GS-R-3). The CSS also supported the proposal from the Secretariat to incorporate these improvements as addenda to the respective Safety Standards and to prepare only one document including all these improvements in order to improve the efficiency of the review and approval. Progress on the review of IAEA Safety Standards was provided to the Director General in a letter report by the Chairperson of the CSS, dated 31 May 2012.

116. The Secretariat prepared the draft document outlining the process for the revision of the relevant Safety Requirements, GSR Part 1, NS-R-3, SSR-2/1, SSR-2/2 and GSR Part 4, in parallel with the on-going revision of GS-R-2 and GS-R-3, which was approved by the four Safety Standards Committees during their meeting in June/July 2012. The draft addenda are being prepared for their review by the Safety Standards Committees at their meeting in October/November 2012.

117. No gaps or deficiencies were identified in the 450 overarching requirements reviewed. Nevertheless, for the set of 'associated requirements', it is proposed to strengthen 20 of the existing associated requirements and to add a further 31 new associated requirements. The most significant additions deal with, for example:

- Consideration of additional provisions to cope with situations involving the loss, over an extended period of time, of off-site power or the ultimate heat sink;
- Consideration of properly identified potential external hazards, including those which may affect the availability of the proper regional infrastructure against extreme external events; and
- The need to ensure that information on the essential safety parameters remains available under severe accident conditions.

118. The letter report also highlighted the need to remain focused on the most significant issues that have clearly emerged as lessons from the Fukushima accident, namely:

- The further strengthening of defence-in-depth by taking into account extreme natural hazards that may exceed the levels taken into account in the design basis and in the current safety requirements;
- The importance of means for maintaining containment integrity;
- The importance of harmonized approaches to support international trade, including for commodities and foodstuffs; and
- The need for a justification process and optimization criteria for remediation and rehabilitation as well as advice on the transition from an emergency to a post-emergency phase.

119. In relation to transport the safety guide "Planning and Preparing for Response to Transport Events Involving Radioactive Material, TS-G-1.2" is being revised to incorporate, inter-alia, the lessons learned from the Fukushima accident. In addition a Technical Meeting addressing some of the initiating events identified through a gap analysis will be held in 2013 to provide feedback to the review of transport safety standards.

CURRENT STATUS OF ACTION

120. Areas for strengthening relevant IAEA Safety Requirements have been identified. All proposals for strengthening safety requirements are to be reviewed by the Committees and CSS in 2012 and consultation with Member States will start in 2013.

121. The Secretariat prepared a document outlining the process for the revision of the relevant Safety Requirements which was agreed by all the Committees and the CSS.

NEXT STEPS

122. The activities to be undertaken include:

- The revision of the Safety Requirements on *Governmental, Legal and Regulatory Framework for Safety* (GSR Part 1), *Site Evaluation for Nuclear Installations* (NS-R-3), *Safety of Nuclear Power Plants: Design* (SSR-2/1), *Safety of Nuclear Power Plants: Commissioning and Operation* (SSR-2/2) and *Safety Assessment for Facilities and Activities* (GSR Part 4), in the already agreed conjunction with revision of *Preparedness and Response*

for a Nuclear or Radiological Emergency (GS-R-2) and *The Management System for Facilities and Activities* (GS-R-3) will take into account detailed proposals based on the lessons learned from the accident;

- Several Safety Guides are also currently under review with priority focussed on the views of the Safety Standards Committees;
- Feedback from Member States about the use of Safety Standards (capacity building, experience with practical use) will be encouraged;
- In the radiation protection area, a number of issues arising from Fukushima accident have been identified for inclusion in new safety guides currently under development;
- Work has commenced on establishing a Working Group with other interested international organizations to document the various international standards for foodstuffs that are in existence, the basis from which they have been derived and the circumstances in which they are intended to be used. This will be a basis for discussions with the Safety Standards Committees on improving the transparency and consistency of the current situation; and
- A detailed review of the BSS is not required at this time. However, as other safety requirements are revised, the implication of these revisions for the BSS will be evaluated and any necessary changes identified.

INTERNATIONAL LEGAL FRAMEWORK

ACTION: *Improve the effectiveness of the international legal framework*

BACKGROUND

123. The current international legal framework for nuclear safety consists of legally binding and non-binding instruments issued to assist those involved in the peaceful uses of nuclear energy.

124. The Convention on Nuclear Safety (CNS) has the objective to achieve and maintain a high level of safety worldwide at nuclear installations through the enhancement of national measures and international cooperation. Nuclear installations covered by the Convention are defined as land-based civil nuclear power plants under a Contracting Party's jurisdiction including such storage, handling and treatment facilities for radioactive materials as are on the same site and are directly related to the operation of the nuclear power plant. Parties to the CNS are required to submit for peer review, a report on the measures it has taken to implement each of the obligations of the Convention.

125. The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention) has the objective to achieve and maintain a high level of safety worldwide in spent fuel and radioactive waste management, through the enhancement of national measures and international co-operation. Its scope of application includes spent fuel and radioactive waste resulting from civilian nuclear reactors and applications and under certain circumstances to spent fuel and radioactive waste from military or defence programmes. The Joint Convention applies to the management of spent fuel and radioactive waste; it also applies to the planned and controlled releases into the environment of liquid or gaseous radioactive materials from regulated nuclear facilities. Like the CNS, the Joint Convention provides for a peer review mechanism as describe above.

126. The Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency and the Convention on Early Notification of a Nuclear Accident (the Emergency Conventions) are the prime legal instruments that establish an international framework to facilitate the exchange of information and the prompt provision of assistance in the event of a nuclear accident or radiological emergency.

These Conventions place specific obligations on the Parties and the IAEA, with the aim of minimizing consequences for health, property and the environment in such cases.

127. In the area nuclear liability, there are currently two international regimes. On the one hand, there is the so-called "Paris regime", which consists of the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy (the Paris Convention), concluded under the auspices of the Organization for Economic Cooperation and Development (OECD), open to OECD Member States and to other States only if all Parties give their consent. The Paris Convention is supplemented by the 1963 Brussels Convention Supplementary to the Paris Convention (the Brussels Supplementary Convention) and both conventions have been amended by Protocols adopted in 1964 and 1982, and will be further amended by Protocols adopted on 12 February 2004, which are, however, not yet in force. On the other hand, there is the so-called "Vienna regime", which consists of the 1963 Vienna Convention on Civil Liability for Nuclear Damage (the 1963 Vienna Convention) and of the 1997 Protocol to Amend the Vienna Convention (the 1997 Vienna Convention), both concluded under the auspices of the IAEA and open to all Member States of the United Nations, its specialized agencies or the IAEA, or to all States respectively. Both the Paris and the Vienna regime follow the same basic principles.

128. In order to create a treaty link between the different regimes, two instruments have been adopted: The first one is the 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (the Joint Protocol), adopted under the joint auspices of the IAEA and the OECD, which aims at bridging the gap between Parties to the Vienna and the Paris regime and extending the rights under one regime to victims in the territory of Parties to the other. The second instrument is the 1997 Convention on Supplementary Compensation for Nuclear Damage (the CSC), concluded under the auspices of the IAEA, which aims not only at establishing treaty relations between States that either belong to the Vienna or the Paris regime but also with other States, provided their national legislation is consistent with the basic principles set out in the Paris and Vienna regime as laid down in the Annex to the CSC. The CSC also aims at increasing the amount of compensation available in the event of a nuclear incident through supplementary funds to be provided by its Contracting Parties.

GOALS

Enhance the effective implementation of the Conventions

129. States Parties are requested to explore mechanisms to enhance the effective implementation of the Convention on Nuclear Safety, the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management, the Convention on the Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

Consider proposals made to amend the Conventions

130. In addition, States Parties are to consider proposals that may be made to amend the Convention on Nuclear Safety and the Convention on the Early Notification of a Nuclear Accident.

Member States to join and effectively implement these Conventions

131. The action also encourages Member States who are not yet party to these Conventions to join and effectively implement their provisions.

Establishing a global nuclear liability regime

132. The action also calls upon Member States to work towards establishing a global nuclear liability regime that addresses the concerns of all States that might be affected by a nuclear accident with a view to providing appropriate compensation for nuclear damage, and specifically calls upon the

International Expert Group on Nuclear Liability (INLEX) to recommend actions to facilitate the achievement of such a global regime.

ACHIEVEMENTS

Enhance the effective implementation of the Conventions

133. The Secretariat is actively supporting the States Parties to the various conventions in their efforts to review the processes and procedures to strengthen the effective implementation of these Conventions.

134. Several Contracting Parties to the CNS (Australia, Canada, France, Germany, the Republic of Korea, the Russian Federation, Spain, Switzerland, the United Arab Emirates, the United Kingdom and the USA) have submitted proposals to enhance the effectiveness of the Convention. At the request of the Presidency of the Extraordinary Meeting and in order to facilitate the Contracting Parties' review of these proposals at the Extraordinary Meeting to be held in August 2012, the Secretariat convened two meetings with the aforementioned Contracting Parties in order to prepare draft documents that reflect the proposals for modifying the CNS procedures and guidance documents (INFCIRCs 571, 572 and 573). The three revised draft INFCIRCs were distributed to all Contracting Parties in July 2012.

135. The fourth Review Meeting of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management in May 2012, discussed seven proposals to increase the effectiveness of the Convention and recommended several amendments to the Guidelines regarding the Review Process and agreed to continue discussing at inter-sessional meetings the enhancement of the effectiveness of the review process. The Secretariat was requested to conduct an editorial review of the agreed changes to the Guidelines, to ensure internal consistency between all guidance documents.

136. The sixth Meeting of Representatives of the Competent Authorities identified under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency was held in April 2012. The Meeting provided, inter alia, an opportunity to discuss the effectiveness of these conventions and recognised the importance of enhancing the implementation of notification arrangements and sharing of information. The Meeting recommended that the Secretariat, in cooperation with the State Parties, explore proposals on mechanisms to improve and strengthen these conventions and expedite the implementation of the strategy contained in the final report of the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies.

137. Two Member States (Japan and the Russia Federation) prepared proposals to discuss the ways to improve implementation effectiveness of the Conventions.

Consider proposals made to amend the Conventions

138. Formal proposals to amend the CNS were submitted by the Russian Federation, Spain[3] and Switzerland, and subsequently circulated to all Contracting Parties on 2 August 2011, 17 May 2012 and 10 May 2012 respectively. They were also to the extent possible reflected in the revised INFCIRC documents and will be discussed at the Extraordinary Meeting of the Convention on Nuclear Safety in August 2012.

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[3] Spain subsequently withdrew its proposal to amend the CNS on 27 July 2012.

139. A formal proposal to amend the Convention on Early Notification of a Nuclear Accident was submitted by the Russian Federation and subsequently circulated to all Contracting Parties on 12 July 2011. At present, the required majority of States Parties in order for the depositary to convene a diplomatic conference to consider the proposed amendments is 56.

Member States to join and effectively implement these Conventions

140. To encourage Member States to join and effectively implement the Conventions, the Secretariat continues to undertake activities to highlight their importance.

141. In particular, the Secretariat has continued to support Member States under its legislative assistance programme by reviewing and providing advice in drafting national nuclear legislation to 16 Member States and providing training in nuclear law to approximately 200 representatives of Member States. The Secretariat is also making arrangements to carry out dedicated awareness missions/seminars to Member States to encourage, inform and raise awareness of national policy-makers about the importance of adhering to other international legal instruments adopted under IAEA auspices. The Secretariat's activities also included organizing the first annual session of the Nuclear Law Institute (NLI) organised by the Secretariat in November and December 2011 which was attended by 84 representatives from 61 Member States (arrangements are underway to hold a second session later in 2012) and the first ever IAEA Treaty Event which was held in the margins of the 55th Regular Session of the General Conference (also to take place on the side-lines of this year's Regular Session). Efforts are under way to develop and further enhance the Secretariat's outreach capabilities through, inter alia, the development of new online training material and a third volume of the Handbook on Nuclear Law.

142. Since the adoption of the IAEA Action Plan on Nuclear Safety in September 2011:

- One Member State deposited its instrument to join the Convention on Nuclear Safety;
- Three Member States deposited their respective instruments to join the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management;
- Three Member States deposited their respective instruments to join the Convention on Early Notification of a Nuclear Accident;
- Three Member States deposited their respective instruments to join the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency;
- One Member State deposited its instrument to join the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage; and
- One Member State signed the Convention on Supplementary Compensation for Nuclear Damage.

Establishing a global nuclear liability regime

143. In order to facilitate the implementation of the specific actions envisaged in the Action Plan in relation to nuclear liability, a Special Session of INLEX was held at IAEA Headquarters, from 14 to 16 December 2011. At this Special Session, INLEX agreed on a number of activities aimed at facilitating the achievement of a global nuclear liability regime as described in the Action Plan, including carrying out joint IAEA/INLEX missions in order to raise awareness of the international nuclear liability regime and encourage wider adherence to the relevant international legal instruments in specific target countries[4]; making presentations on nuclear liability at various Agency and other

[4] To date, five IAEA/INLEX missions have already been dispatched to the following Member States: Vietnam (March 2012), Republic of Korea (April 2012), Jordan (May 2012), South Africa (July 2012) and Ukraine (July 2012). China has also accepted to host an IAEA/INLEX mission later this year and informal discussions are under way with further interested Member States in this regard.

meetings during 2012[5]; and organizing a workshop on nuclear liability at IAEA Headquarters for diplomats and experts from Member States[6].

144. At its 12th regular meeting held from 30 May to 1 June 2012, INLEX also discussed and finalized its "Recommendations on how to facilitate achievement of a global nuclear liability regime", as requested by the Action Plan. They can be accessed under the following link: http://ola.iaea.org/OLA/documents/ActionPlan.pdf

CURRENT STATUS OF ACTION

145. The Secretariat has supported Contracting Parties, upon request, in their efforts to enhance the effectiveness of the Conventions through amendments to processes and procedures and also through proposals for amendments to the Conventions.

146. More Member States became party to the Convention on Nuclear Safety, the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management, the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency and relevant international nuclear liability instruments.

147. The Secretariat has enhanced its outreach activities and legislative assistance programme.

148. Recommendations have been made by INLEX on how to facilitate achievement of a global nuclear liability regime.

NEXT STEPS

149. The activities to be undertaken by the Secretariat in response to this action include:

- Carry out dedicated awareness missions/seminars to encourage, inform and raise the awareness of national policy-makers in Member States about the importance of adhering to the relevant international legal instruments, upon request;
- Continue to provide bilateral legislative assistance to support Member States in drafting the required national nuclear legislation, upon request;
- Enhance the Secretariat's outreach capabilities through inter alia the development of new online training material and a third volume of the Handbook on Nuclear Law;
- Carry out briefings for Permanent Missions of Member States on nuclear law matters; and
- In conjunction with INLEX, to assist in the implementation of the recommendations on how to facilitate the establishment of a global nuclear liability regime, to continue to conduct IAEA/INLX missions and to encourage Member States to give due consideration to becoming party to the global nuclear liability regime and offer consultation upon request.

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[5] Technical Meeting on Topical Issues on Infrastructure Development: Managing the Development of a National Infrastructure for Nuclear Power Plants (24-27 January 2012); 31st Meeting of the Commission on Safety Standards (27-29 March 2012); International Nuclear Safety Group (11-12 April 2012); sixth Meeting of Representatives of the Competent Authorities identified under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (17-20 April 2012); and meeting of the Advisory Group on Nuclear Security (23-27 April 2012).

[6] The Workshop was held on 29 May 2012, at IAEA Headquarters and was attended by 59 diplomats and experts from 34 Member States and one international organization.

MEMBER STATES PLANNING TO EMBARK ON A NUCLEAR POWER PROGRAMME

ACTION: *Facilitate the development of the infrastructure necessary for Member States embarking on a nuclear power programme*

BACKGROUND

150. Launching a nuclear power programme is a major undertaking that requires careful planning, preparation and investment in time and resources. The necessary infrastructure to support the successful introduction of nuclear power covers a wide range of issues, from the physical facilities for the delivery of electricity, the site and supporting facilities for handling radioactive waste, to the legal and regulatory framework to the human and financial resources necessary to implement the required activities. It entails attention to many complex and interrelated issues over a long duration.

151. The Secretariat has identified three phases in the development of the framework leading to the construction and operation of a NPP and three key milestones associated to them, and has developed programmes for assistance and support to be used by Member States. These include increased technical assistance, missions, workshops, and new and updated technical publications.

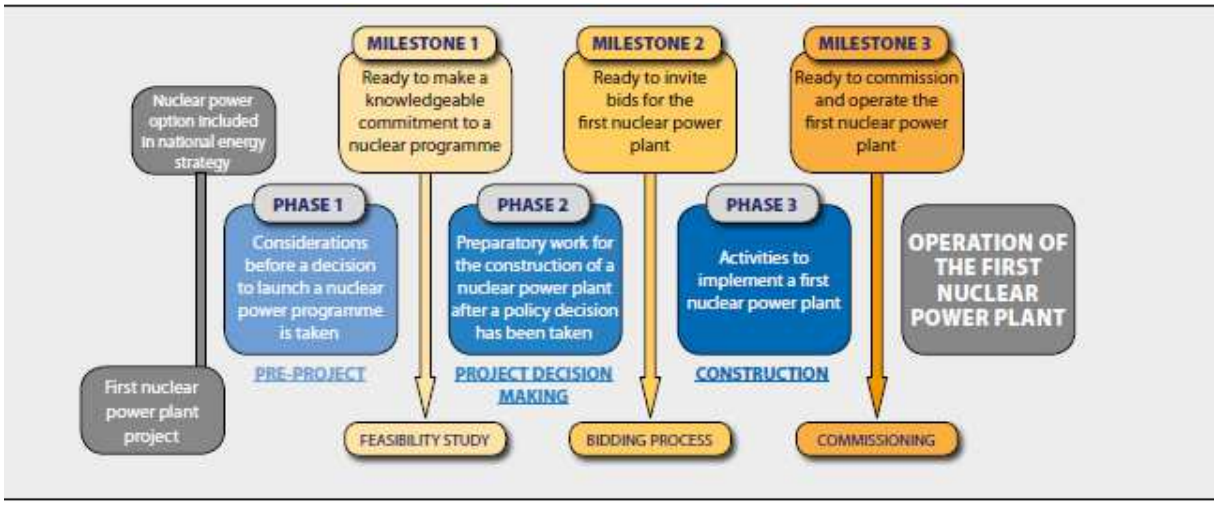

Figure 5 Nuclear Infrastructure Development Programme

152. The Secretariat continued to provide assistance and support in the form of integrated review missions consisting of experts from different technical backgrounds to provide a holistic overview of national infrastructure development. Their objectives are to explain the IAEA guidance publications and available services, and discuss future actions.

153. An essential component of nuclear infrastructure is the safety infrastructure including an effective regulatory framework. The recently published Safety Guide SSG-16 provides a road map for applying the IAEA Safety Standards during the development of the safety infrastructure.

GOALS

Create an appropriate nuclear infrastructure based on IAEA Safety Standards and other relevant guidance

154. Member States are requested to create an appropriate nuclear infrastructure based on IAEA Safety Standards and other relevant guidance. The Secretariat is to provide assistance to Member States as may be requested.

Host Integrated Nuclear Infrastructure Reviews (INIR)

155. Member States embarking on a nuclear power programme are requested to voluntarily host INIR and relevant peer review missions, including site and design safety reviews, prior to commissioning the first nuclear power plant.

ACHIEVEMENTS

Support to Member States in infrastructure development

156. The Secretariat published the document "Establishing the Safety Infrastructure for a Nuclear Power Programme" (IAEA Specific Safety Guide Safety Standard Series No. SSG-16).

157. The guidance documents "Evaluation of the Status of National Nuclear Infrastructure Development" (IAEA Nuclear Energy Series No. NG-T-3.2) and "Milestones in the Development of a National Infrastructure for Nuclear Power" (IAEA Nuclear Energy Series No. NG-G-3.1) are being reviewed taking into account lessons learned in the light of Fukushima accident.

158. Draft guidance on Building a National Position for a Nuclear Power Programme was reviewed by Member States at a Technical Meeting in July 2012. It provides additional information on the development of national policies and the decision-making process to start a nuclear power programme.

159. The Secretariat hosted a workshop on nuclear power infrastructure in January 2012 to share information on Member States experiences in building the necessary infrastructure for a nuclear power programme and the incorporation of lessons learned from the Fukushima accident into their planning process. Participating Member States emphasized their need to communicate and inform the public about national plans for nuclear power and about the lessons learned to date from the Fukushima accident.

160. The Secretariat has developed assistance packages specifically designed to strengthen the technical and managerial competences for safety in embarking countries, including tutorial material, workshops and expert missions. These include a modular approach for the provision of assistance based on the publication "Establishing the Safety Infrastructure for a Nuclear Power Programme" IAEA Specific Safety Guide No. SSG-16 and a self-assessment methodology for safety infrastructure needs. These packages are being made available to Member States through the IAEA web-site.

161. Practical guidance for nuclear regulators, primarily those in Phases 2 and 3, have been developed on the topics of safety regulation, regulatory review and assessment, regulatory inspection and enforcement, human resource development and the use of external support organizations.

162. The 2nd Annual Steering Committee Meeting of the Regulatory Cooperation Forum (RCF) was held in April 2012 at the Headquarters of the Secretariat. Among other things, the meeting focused on assessing the main objectives, activities and overall programme of the RCF. The meeting highlighted the Secretariat's effective promotion and facilitation of the forum. A high-level Senior Regulator's meeting was conducted in Vietnam in June 2012 through the RCF in cooperation with the Vietnamese regulatory body VARANS and other governmental bodies. The main purpose of the meeting was to

help government officials become aware of the importance of an effectively independent and robust Regulatory Body for nuclear power.

Host Integrated Nuclear Infrastructure Reviews (INIR)

163. The Secretariat has updated the nuclear power national infrastructure evaluation methodology, which is described in the INIR guidelines available to Member States. The update incorporates lessons learned from the previous missions as well as from the Fukushima accident.

164. The Secretariat has developed the INIR Phase 3 mission concept for Member States that are in the phase prior to commissioning a nuclear power plant. A preliminary example of Phase 3 evaluation methodology was developed and discussed with Member States in June 2012. An INIR mission in Phase 3 will differ from INIR missions in Phases 1 and 2 and the Secretariat will be required to fully develop specific guidance and a self-evaluation methodology for INIR missions conducted in Phase 3.

165. The Secretariat is developing a catalogue of the services that is expected to be completed in June 2013 that can be offered to embarking Member States.

166. INIR missions have been carried out in Bangladesh and Belarus. Jordan hosted a follow up INIR mission. An IRRS mission was conducted in the UAE in December 2011.

CURRENT STATUS OF ACTION

167. The Secretariat has produced a relevant new safety guide and additional guidance material to support embarking countries. The Secretariat continues to respond to the requests from Member States for INIR missions while also addressing the applicable lessons learned in the establishment of nuclear infrastructures.

168. More Member States embarking on nuclear power would benefit from participating in the RCF.

NEXT STEPS

169. The activities to be undertaken by the Secretariat include:

- Continue to update the modular package for assistance in nuclear infrastructure development and to make it available to Member States:
  - Conduct workshops on: management systems for the regulatory body and interactions with the public and other interested parties in regulatory activities;
  - Make available to Member States the full set of workshop material on the IAEA Safety Infrastructure web page.
- Support and assistance to Member States in performing a self-assessment of their national infrastructure and help them to develop and implement their national action plans to address the gaps identified in their self-assessment;
- Continue to organize peer review missions for embarking countries and encourage Member States to address any gaps identified during those peer review missions and follow up; and
- Continue to develop the guidance documents and evaluation methodology for the INIR mission in Phase 3.

CAPACITY BUILDING

ACTION: *Strengthen and Maintain Capacity Building*

BACKGROUND

170. The Fukushima accident highlighted the need to develop, strengthen, maintain and implement the capacity building programmes of Member States with nuclear power programmes and those planning to embark on such a programme.

171. Capacity building is the systematic and integrated approach that includes education and training, human resource development, knowledge management and knowledge networks to develop and continuously improve the governmental, organizational and individual competencies and capabilities necessary for achieving safe, secure and sustainable nuclear power programme. The capacity building programmes should include education, training and exercises at the national, regional and international levels and cover all the nuclear safety related areas including safe operation, emergency preparedness and response and regulatory effectiveness. It comprises all technical and managerial areas that affect these topics.

GOALS

Strengthen, develop, maintain and implement capacity building programs and incorporate lessons learned

172. Member States with nuclear power programmes and those planning to embark on such a programme are requested to strengthen, develop, maintain and implement their capacity building programs, including education, training and exercises at the national, regional and international levels; to continuously ensure sufficient and competent human resources necessary to assume their responsibility for safe, responsible and sustainable use of nuclear technologies.

173. Member States with nuclear power programmes and those planning to embark on such a programme are requested to incorporate lessons learned from the Fukushima accident into their nuclear power programme infrastructure. The Secretariat is requested to assist Member States upon request.

ACHIEVEMENTS

Strengthen, develop, maintain and implement capacity building programs and incorporate lessons learned

174. The Secretariat has developed guidance including a self-assessment methodology for capacity building activities developed in cooperation with Member States and discussed with them in April 2012 and made it available to Member States in July 2012 through the IAEA NSAP web platform. The Secretariat has prepared a series of seminars on practical demonstration of the application of the self-assessment methodology to take place upon request.

175. The Secretariat organized the first Steering Committee meeting of the Global Nuclear Safety and Security Network (GNSSN) in April 2012. Fifteen Member States and 5 regional safety networks from Asia, Middle East, Africa, Latin America and Europe participated. The meeting participants discussed cooperation and collaboration among all the involved stakeholders within the framework of the GNSSN. The capacity building guidance document and self-assessment methodology were strongly supported by participating countries; they were encouraged to consider applying them in the process of developing and strengthening capacity building in their respective countries.

176. The Asian Nuclear Safety Network (ANSN) also agreed to adopt the new guidance on capacity building and apply it to the ANSN countries to assist Member States in their capacity building activities.

177. The Secretariat has developed a document on managing regulatory body competence for the purpose of providing guidance, for managing the competence of the regulatory body. Additionally, this document provides specific guidance on competence, tasks and training for regulatory staff of countries embarking on a nuclear power programme.

178. The Secretariat has established the Safety Education and Training Peer Review Service (ETPRES) to assist Member States develop and maintain an adequate and sustainable education and training programme in nuclear safety consistent with IAEA Safety Standards and international good practices. The guidelines for the Systematic Assessment of the Regulatory Competence Needs (SARCoN) were produced in June 2012. These provide a systematic approach and step-by-step procedure for identifying potential training needs of regulatory bodies through gap analysis.

CURRENT STATUS OF ACTION

179. The Secretariat has produced guidance to support and assist Member States in their capacity building activities. Additional efforts are needed to promote self-assessment for strengthening and maintaining capacity building in Member States.

NEXT STEPS

180. The activities to be undertaken by the Secretariat include:

- Continue to encourage Member States to develop, maintain and strengthen their national capacity building programmes;
- Continue to assist Member States in developing and implementing their capacity building programmes upon request;
- Continue to provide assistance to support any improvements to capacity building activities identified during the self-assessment of capacity building;
- Continue to encourage Member States to share their measures to strengthen cooperation for capacity building at the regional and international levels; and
- Provide seminars to explain how to use the "Guidance and Methodology for Assessment of Capacity Building in Member States with a Nuclear Power Programme and those planning to embark on such a programme" and to assist Member States in performing self-assessments, upon request.

PROTECTION OF PEOPLE AND THE ENVIRONMENT FROM IONIZING RADIATION

ACTION: *Ensure the on-going protection of people and the environment from ionizing radiation following a nuclear emergency*

BACKGROUND

181. In the aftermath of a nuclear emergency, radionuclides that may have been released to the environment can result in the contamination of residential areas and agricultural land. This can give rise to exposure of the public to ionizing radiation. Such exposures may be protracted over long periods of time and may require actions to reduce radiological impacts.

182. Any protective measures have to be justified to ensure that they do good and are commensurate with the risk.

183. Remedial actions to reduce exposures to ionizing radiation may have social and economic implications. The optimization of protection and safety ensures that radiological impacts are as low as reasonably achievable, with economic, societal and environmental factors taken into account so that the level of protection will be the best possible under the prevailing circumstances. Decisions on optimization will require both qualitative and quantitative judgments to be made on the basis of the results of safety assessments for each situation.

184. The remediation process starts from the characterization of contaminated environments and takes into account radiological criteria, the results of realistic assessment of radiation exposures, the technical feasibility and costs of remediation activities, and their effectiveness in different environments. The overall aim of any remediation programme is to improve the living conditions of the people in areas affected by the accident.

GOALS

Facilitate the use of available information, expertise and techniques for monitoring, decontamination, remediation, removal of damaged nuclear fuel and the management and disposal of radioactive waste

185. The Secretariat, Member States and other relevant interested parties are to facilitate the use of available information, expertise and techniques for monitoring, decontamination and remediation for both on nuclear sites and on the adjacent contaminated areas. In addition, the Secretariat is requested to consider strategies and programmes to improve knowledge and strengthen capabilities in these particular areas.

186. Member States, the Secretariat and other relevant interested parties are requested to facilitate the use of available information, expertise and techniques regarding the dismantling of the damaged facility, including removal of damaged nuclear fuel as well as the safe management and disposal of radioactive waste resulting from a nuclear emergency.

Assessment of radiation doses

187. Member States, the Secretariat and other relevant interested parties are also requested to share information regarding the assessment of exposures to people and radiological impacts to the environment.

ACHIEVEMENTS

Facilitate the use of available information, expertise and techniques for monitoring, decontamination, remediation, removal of damaged nuclear fuel and the management and disposal of radioactive waste

188. The Fukushima accident led to the radioactive contamination of large areas of land around the site. In response, the Government of Japan formulated a programme for the recovery of these areas and launched remediation efforts in off-site areas near the Fukushima Daiichi NPP to enable the return of people who left the contaminated areas after the accident and to improve the living conditions of the people affected by the accident.

189. At the request of the Government of Japan, the Secretariat organized a fact finding mission to support the remediation of the radioactively contaminated land outside the Fukushima Daiichi NPP areas. The mission focused on the remediation activities in the affected areas outside the 20 km Fukushima restricted area. The team concluded that Japan has made rapid progress with the allocation of the necessary resources to develop an efficient programme for remediation, and that the Japanese Government has already started to implement stakeholder involvement arrangements that will be

included in planned future regulatory requirements. The final report was provided to the Japanese authorities in November 2011 and was subsequently shared with Member States and the public.

190. The Secretariat, along with the OECD Nuclear Energy Agency (OECD/NEA), supported the Government of Japan and TEPCO in organizing a workshop and an international symposium in March 2012 on decommissioning of the Fukushima Daiichi NPP. The primary objective of both the international experts' workshop and the subsequent symposium was to foster the dialogue and the information exchange on current and future challenges in implementing TEPCO's roadmap with the participation of international experts, to identify challenges and technical needs for the decommissioning of Fukushima Daiichi NPP, units 1-4 and to explore possible areas for international cooperation to address these challenges.

Assessment of radiation doses

191. Before the Fukushima accident the Secretariat had decided to establish an international programme, "Models and Data for Radiological Impact Assessment" (MODARIA), to develop test and compare methodologies for the assessment of public exposures and radiological impacts for a wide range of exposure situations. The general aim is to improve capabilities in the field of environmental radiation dose assessment by means of acquisition of improved data for model testing, model testing and comparison, reaching consensus on modelling philosophies, approaches and parameter values, development of improved methods and exchange of information. MODARIA focuses on areas where uncertainties remain in the predictive capability of environmental models.

192. The results of radiological assessments are used in the evaluation of the radiological relevance of routine and accidental releases of radionuclides, to support decision making in remediation work and for the performance assessment of radioactive waste disposal. A meeting was held in March 2012 in preparation for the programme launch in November 2012. The work plan has been adjusted to address also experiences from the Fukushima accident.

193. The activities within the framework of the MODARIA Programme place emphasis on improvement of environmental transfer models for reducing associated uncertainties or developing new approaches to strengthen the evaluation of the radiological impact to man, as well as to flora and fauna, arising from radionuclides in the environment.

194. The Secretariat actively participated in the first Research Coordination Meeting of the Coordinated Research Project entitled "Strengthening of Biological Dosimetry in IAEA Member States: Improvement of Current Techniques and Intensification of Collaboration and Networking among the Different Institutes". One of the aims of this meeting was to investigate the possibility of establishing a network of biological dosimetry laboratories which could respond to cases of high personnel radiation exposures incurred during an accident or an emergency.

195. The Secretariat hosted a meeting in June 2012 to facilitate the sharing of information and to review and report on the experiences and lessons learned worldwide in clean-up after an event or accident and decommissioning of nuclear facilities. Experts from Member States and the Secretariat presented their experiences and a first draft of a report was produced. The final report will address planning, stabilisation, characterization, fuel and source term management, decontamination, site remediation, waste management and worker protection and will be made available to Member States.

196. In June 2012 the Secretariat hosted an international symposium on Biological and Environmental Reference Materials where reference materials for use in nuclear emergencies was among the topics discussed. Proposals for a number of suitable environmental reference materials were considered which could also serve as field calibration check for portable monitoring instrumentation used in an emergency. The Secretariat is also undertaking work at its Terrestrial Environment Laboratory in

Seibersdorf to examine potentially suitable environmental materials for reference purposes, such as hay, clover, spruce needles, beech leaves. The suitability of three additional forms of environmental material from the vicinity of Fukushima Daiichi NPP area, soil, rice and cedar leaves are also being considered.

197. To support the Secretariat's capability to undertake fact-finding missions and to conduct rapid surveys of environmental contamination in the event of a nuclear emergency, portable high resolution radiation detection equipment has been acquired and is currently undergoing rigorous field testing.

198. In view of the Fukushima accident, the States Parties to the Regional Co-operative Agreement for Research, Development and Training related to Nuclear Science and Technology (RCA) launched a regional technical cooperation project, "Marine Benchmark Study on the Possible Impact of the Fukushima Radioactive Releases in the Asia-Pacific Region". The project is on-going with the aim to enable RCA States Parties to evaluate the extent and the possible impact of the released radioactivity into the marine environment and to make scientific assessment of the data. The project is expected to be completed by 2015, but interim results will be disseminated accordingly.

CURRENT STATUS OF ACTION

199. Assistance and support was provided to Japan on the remediation of the large areas of contaminated land and international expertise and experience on decommissioning was shared with experts in Japan.

200. An international programme, "Models and Data for Radiological Impact Assessment" (MODARIA), has been established to develop test and compare methodologies for the assessment of public exposures and radiological impacts for a wide range of exposure situations. The work plan has been adjusted to address also experiences from the Fukushima accident.

NEXT STEPS

201. The activities to be undertaken by the Secretariat include:

- Prepare for the International Experts' Meeting (IEM) on Decommissioning and Remediation after a Nuclear Accident in January 2013;
- Review and update as appropriate the Cooperative Arrangements between IAEA, Food and Agriculture Organization (FAO) and other relevant international organisations for information exchange and technical support in the case of a nuclear or radiological emergency, including communication strategies;
- Review and report on the experience and further lessons learned worldwide in clean-up and decommissioning of nuclear facilities and support Member States in developing their competence in the characterization and remediation of sites affected by nuclear and radiological accidents;
- Subject to availability of funds consider initiating a project on clean-up and decommissioning of nuclear facilities in the light of the lessons learned from the Fukushima accident and collect experience on approaches, techniques, tools and equipment to deal with clean-up, decontamination and decommissioning after an accident and make available to Member States;
- Review and update as necessary, the strategies for monitoring radionuclides in environmental media, food and people to facilitate dose assessment and decision-making on countermeasures and remediation and produce a technical report to be made available to Member States;
- Develop remediation strategies for contaminated urban and rural areas for a wide range of environmental conditions and summarize the outcome in a report to be made available to Member States; and

- Consider the feasibility of developing guidance for using levels of activities in environmental media as the basis for supporting decisions on remediation activities and summarize the results in a report to be made available to Member States.

COMMUNICATION AND INFORMATION DISSEMINATION

ACTION: *Enhance transparency and effectiveness of communication and improve dissemination of information*

BACKGROUND

202. Effective, easily understandable and transparent communication during incidents and emergencies is crucial in relation to the public's and media's perception of an organization's emergency management of an event and its consequences. In the case of the Fukushima accident, the Secretariat served as a useful point of reference. Prior to the adoption of the Action Plan, the Secretariat's role in the event of an accident was largely limited to distributing information validated by the country concerned to all Member States and relevant international organizations.

203. A broader role was called for in response to nuclear incidents and emergencies, with a widening of the scope of information and assessments shared with Member States, international organizations and the public, regarding the event progression, the estimation of the source term, and the projected potential radiological impacts on affected populations, in order to meet the expectations of Member States and the public. There is also a pressing need for an integrated, world-wide emergency radiation monitoring display system that will be administered by the Secretariat with access available to all IAEA's Incident and Emergency Centre (IEC) designated contact points. Transparency is also a key element of credibility-building for regulators, operators and international organisations and the public.

204. During the response to the Fukushima accident, communication issues arose that made it necessary to consider reinforcing the implementation of emergency notification, reporting and information sharing arrangements and capabilities. The newly developed protected web site of the IAEA's Unified System for Information Exchange in Incidents and Emergencies (USIE), which replaces the Early Notification and Assistance Convention web site, needs to be fully utilized to ensure efficient and effective information sharing and to enable effective activation of international assistance. Member States with designated points of contact need to register in the USIE in order to receive alert messages via mobile telephone, email and telefax through this system.

205. The International Nuclear and Radiological Event Scale (INES) is a self-reporting tool used by Member States to rate the safety significance of a nuclear or radiological event. The application of INES during the Fukushima accident did not prove very effective. The added complexity of assessing multiple-unit sites affected by multiple severe hazards in the case of Fukushima accident is not covered in the INES manual. Review and improvement of the INES application is under way to make the scale more effective from a communications point of view, with regard to applying the methodology for severe, complex and evolving events.

GOALS

Strengthen the emergency notification system, and reporting and information sharing arrangements and capabilities

206. Member States are requested to strengthen the emergency notification system, and reporting and information sharing arrangements and capabilities. The Secretariat is to assist Member States in this regard.

Enhance the transparency and effectiveness of communication

207. Member States are requested to enhance the transparency and effectiveness of communication among operators, regulators and various international organizations. The Secretariat is to assist Member States and also strengthen its own coordinating role in this regard.

Provision of information during a nuclear emergency

208. The Secretariat is requested to provide Member States, international organizations and the general public with timely, clear, factually correct, objective and easily understandable information during a nuclear emergency. This includes provision of information on the potential consequences of the emergency through the analysis of available information and prognosis of possible scenarios based on evidence, scientific knowledge and the capabilities of Member States.

Organize international experts meetings

209. The Secretariat is requested to organize international experts meetings to analyse all relevant technical aspects and learn the lessons from the Fukushima accident.

Assessment of the Fukushima Daiichi Nuclear Accident

210. The Secretariat is requested to facilitate and to continue sharing with Member States a fully transparent assessment of the Fukushima accident, in cooperation with Japan.

The application of the INES scale as a communication tool

211. The Secretariat and Member States, in consultation with the OECD/NEA and the IAEA International Nuclear and Radiological Event Scale (INES) Advisory Committee are requested to review the application of the INES scale as a communication tool.

ACHIEVEMENTS

Organize international experts meetings

212. The Secretariat organized the first International Experts' Meeting (IEM) on 19-22 March 2012 on the topic of Reactor and Spent Fuel Safety in the light of the Fukushima accident. The meeting analysed at expert level all relevant technical aspects and considered the lessons from the Fukushima accident and disseminated conclusions to Member States and the public.

213. The second IEM on the topic Enhancing Transparency and Communication Effectiveness in the Event of a Nuclear or Radiological Emergency was held on 18-20 June 2012. The meeting analysed at expert level, all relevant aspects for enhancing transparency and effectiveness in communications during a nuclear or radiological emergency, in the light of the Fukushima accident, and identified lessons learned and best practices for improving information dissemination.

214. An IEM on Protection against Extreme Earthquakes and Tsunamis in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant will be held on 4-7 September 2012. The results of this IEM will complement those from the IEM on reactor and fuel safety in identifying detailed safety aspects on seismic and tsunami hazards and their impact on nuclear installations, including interaction

between hazard and structure and in sharing lessons learned. The conclusions will be disseminated to the Member States and the public.

Communication among relevant organisations

215. Upgrade of the Unified System for Information Exchange in Incidents and Emergencies (USIE) is in progress and will be completed during the course of 2012. Adherence of contact points to USIE is steadily increasing. Member States' feedback on the USIE has been gathered and was consolidated at the sixth Competent Authorities Meeting in April 2012. The Secretariat made available to Member States the International Radiation Information Exchange (IRIX) standard version 1, web service interface for USIE using the IRIX and standard training material.

216. The Secretariat published the Operations Manual for Incident and Emergency Communication (IEComm) that replaced the Emergency Notification and Assistance Technical Operations Manual (ENATOM). It is envisaged that its application will improve the information exchange on nuclear or radiological incidents and emergencies between the Secretariat, States and relevant international organizations. The manual provides guidance to the States and relevant international organizations to develop suitable arrangements to interface with each other and the Secretariat. In addition, IEComm is also designed to contain, in one manual, practical information relating to when and how to invoke these arrangements.

217. The Secretariat has produced a draft internal policy document in order to revise its emergency response plans and procedures to provide Member States, international organizations and the general public with timely, clear, factually correct objective and easily understandable information during a nuclear emergency. The Secretariat's capabilities for performing technical assessments in the event of a nuclear emergency have also been reviewed. In particular, for communication with the public, the Secretariat published a document and associated training materials in its EPR Series titled Communication with the Public in a Nuclear or Radiological Emergency that provides practical guidance to those responsible for keeping the public and media informed and for coordinating all sources of official information to ensure a consistent message is being provided to the public before, during and after a nuclear or radiological emergency.

218. The objective of the three-day IEM on Enhancing Transparency and Communication Effectiveness in the Event of a Nuclear or Radiological Emergency was to analyse relevant aspects of enhancing transparency and effectiveness in communication during a nuclear or radiological emergency, and to identify lessons and best practices for improving information dissemination in light of the Fukushima accident.

219. The IEM emphasized the importance of ensuring early, frequent and transparent communication and using plain language for effective, public communications that is understandable to non-technical audiences. Public trust is the basis for organizational credibility, so the communicators involved in response to a nuclear emergency need to focus on building, strengthening, maintaining and, when necessary, rebuilding this trust. The trust and credibility that are achieved before an emergency can be instrumental in maintaining public confidence and facilitating management of response actions during and after an emergency The Secretariat has placed the IEM Chairperson summary and the meeting presentations on the IAEA website.

The application of the INES scale as a communication tool

220. The review of the application of the INES as a communication tool is on-going. The INES Advisory Committee provided input to this review during a meeting held at the Secretariat on 10 October 2011. The INES Advisory Committee suggested that additional guidance on the application of INES in severe nuclear accidents be developed and in its meeting in March 2012 considered the application of INES to the rating of releases of radioactive material to the marine environment. The

Advisory Committee concluded, however, that the preparation of such guidance will be extremely difficult due to the wide variety of different marine environments. The role of the INES Advisory Committee was also discussed. Based on the feedback collected, the revised Terms of Reference for the Committee have been submitted to the INES National Officers for their review.

221. In July 2012 the Secretariat held the biennial Technical Meeting of INES National Officers that reviewed draft Guidance on the Use of INES in Evolving Severe Accident Situations which contains sections on the use of INES when communicating about events affecting multi-unit sites, actions to be taken to prepare for the use of INES in communications during and evolving accident situations, why events with significantly different consequences could have same INES rating and a set of frequently asked questions and corresponding answers related to the use of INES as a communication tool.

CURRENT STATUS OF ACTION

222. The Secretariat's work to develop an enhanced strategy for effective communication in emergencies is on-going.

223. The review of the application of INES as a communication tool is on-going.

224. The International Expert Meetings (IEMs) are the vehicle to share experiences, lessons learned and results among Member States on significant topics in the light of Fukushima accident. Information on the IEMs held has been placed on the IAEA web site.

225. A number of others topics are already considered in further IEM's for 2013 and 2014. The Secretariat will prepare reports containing all information shared and the lessons learned, including the Secretariat perspectives and views, for each IEM, which will be made available to Member States.

NEXT STEPS

226. The activities to be undertaken by the Secretariat include:

- Organise IEMs on the topics of decommissioning, remediation and waste; human and organisational factors for safety and radiation assessments in the aftermath of Fukushima Accident;
- Organise a conference on effective nuclear regulatory system in Ottawa, Canada;
- Encourage Member States to join USIE network, as well as make several functional improvements in USIE system, including promoting the IRIX standards;
- Publish the relevant communication manuals such as IEComm;
- Discuss and agree an assessment methodology for multi-units severe accident with INES Advisory Board and INES National Officers;
- Conduct regular emergency response exercises that include communications among national authorities, international organizations and media;
- Facilitate and encourage information exchange and knowledge sharing among communicators who may be involved in the response to a nuclear or radiological emergency in order to improve competence, as well as to prepare exercises and plain-language explanatory content for media and public dissemination;
- Improve the availability of easily understandable information (e.g. via websites in national languages);
- Support Member State communication capabilities through training programmes and workshops that help deliver concrete results; and
- Undertake efforts to enhance media's knowledge of radiation and nuclear technology.

RESEARCH AND DEVELOPMENT

ACTION: *Effectively utilize Research and Development*

BACKGROUND

227. The Secretariat has a long-standing role in encouraging and supporting research and development (R&D) to further advance the use of nuclear energy.

228. In the light of the Fukushima accident, R&D have critical roles for a better and safer nuclear industry. R&D can be applied, for example, to understand the root causes of the accident and its consequences; to develop preventative measures to ensure that these and other identifiable scenarios do not result in accidents; and to develop mitigation technologies to prevent severe consequences form unforeseen future events. R&D activities focus on acquiring new scientific knowledge but also on developing technical tools required to control risks and help to develop the expertise capabilities.

229. In this regards, the Secretariat continues collecting information on the root causes of the Fukushima accident, how the accident proceeded, and how Member States have responded to apply the lessons learned to existing and future nuclear power plants especially from the viewpoint of utilizing R&D. Member States have completed safety assessment and proposed some countermeasures to existing nuclear power plants, and they have just started or are preparing to start their R&D on assessing and improving their existing reactors and their new reactors which may be deployed in the near future.

GOALS

Conduct necessary research and development

230. Relevant stakeholders are requested to conduct necessary R&D in nuclear safety, technology and engineering, including that related to existing and new design-specific aspects. The Secretariat is to provide support as appropriate.

Utilize the results of research and development

231. Relevant stakeholders and the Secretariat are requested to utilize the results of R&D and to share them, as appropriate, to the benefit of all Member States.

ACHIEVEMENTS

Conduct necessary research and development

232. The Secretariat has initiated the compilation of a database to capture the relevant R&D activities undertaken and will assess and validate this database before it is made available to Member States.

233. In January 2012, the Secretariat organized and hosted the first meeting of the Steering Committee (SC) of the Technical and Scientific Support Organization (TSO) Forum to agree on a plan of work. The objective of the TSO Forum is to strengthen scientific and technical coordination and collaboration among Member States, including countries in the process of expanding or embarking on a nuclear programme, especially for R&D, taking into account the lessons learned from the Fukushima accident. An invitation has been sent to all Member States to participate in this Forum. A presentation on the TSO Forum is planned as a side event during the 2012 IAEA General Conference.

234. The Secretariat reviewed several Member States' R&D activities in April 2012 with the aim of integrating the research efforts in order to improve efficiency and effectiveness. A further review took place in July 2012 on assessing the research needs for accident prevention and mitigation taking into account site specific extreme natural hazards.

235. The Secretariat compiled lessons learned from the Fukushima accident and recommendations from several national and international organizations, and created a comprehensive and concise database of lessons learned with emphasis on technical issues. This database was utilized in meetings with experts from Member States to discuss prevention and mitigation measures for Fukushima-type accidents and to identify the needs for new technologies to be developed in this regard.

236. Member States discussed and suggested several activities in which international collaboration and IAEA leadership are essential, and the priorities were assigned for such activities. The Secretariat has planned a series of technical meetings and workshops to collect, discuss, analyse and assimilate the technologies to cope with Fukushima-type accidents, including certain designs that are already existing (e.g. filtered containment venting systems) and under research and development (e.g. passive core and containment cooling systems). The objectives are to disseminate information on the technologies and to provide a forum to exchange views on Fukushima-type accidents between technology holders and users.

237. The Secretariat organized a meeting with Member States experts focusing on Small and Medium-sized Reactors (SMRs) which generated valuable feedback on technical lessons-learned to be incorporated in the design of engineered safety features of advanced small-reactor technology. The meeting also enabled the Secretariat to identify subjects of near-term and long-term international activities in SMR technology development for advanced engineered safety features designs.

CURRENT STATUS OF ACTION

238. The Secretariat reviewed several Member States' R&D activities with the aim of integrating the research efforts in order to improve efficiency and effectiveness. Work initiated on the compilation of a database to capture the relevant research activities undertaken by Member States is on-going.

239. The Secretariat established the TSO Forum to strengthen scientific and technical coordination and collaboration among Member States, including countries in the process of expanding or embarking on a nuclear programme, especially for R&D and taking into account the lessons learned from the Fukushima accident.

NEXT STEPS

240. The activities to be undertaken by the Secretariat include:

- Identify the international organizations carrying out R&D in the areas of nuclear safety technology and engineering, and the correspondent research activities in connection with the Fukushima accident and store the information in a database;
- Continue supporting the TSO Forum;
- Organize meetings that focus on the engineered safety features performance evaluation through balanced use of deterministic and probabilistic approaches, covering:
    - Assessment of low probability yet high consequence events; and
    - Contribution of non-electric cooling systems (NECS) on core damage frequency (NECS include isolation condensers, gravity driven cooling systems, steam-driven reactor core isolation cooling systems, and passive reactor heat removal systems);
- Report on R&D activities and disseminate information to Member States, as appropriate;
- Continue to identify where areas of further R&D in nuclear safety, technology and engineering in the light of the Fukushima accident are needed and prepare a plan to coordinate a response to these needs;
- Identify areas for mutual cooperation with OECD-NEA in R&D in nuclear safety, technology and engineering in the light of the Fukushima accident; and
- Strengthen existing mechanisms and networks to effectively share relevant results of the R&D and assess the effectiveness of these mechanisms and networks.

IAEA ACTION PLAN ON NUCLEAR SAFETY BUDGET

241. A total of €9.35 million of expenditure for the Action Plan has been incurred by the Agency since the closure of the Emergency Response in 2011 and the inception of the Action Plan in the same year, through to 31 July 2012. Table 1 provides the breakdown of expenditure by Major Programme for this period.

Table 1. Total 2012 expenditures for the IAEA Action Plan on Nuclear Safety
(in € millions, as at 31 July 2012)

Major Programmes	Regular Budget	Extrabudgetary	Total (€)
1	0.56	0.14	0.70
2	0.11	-	0.11
3	4.37	3.53	7.90
5	0.64	-	0.64
Total **	**5.68**	**3.67**	**9.35**

**Major programmes 4 and 6 have no direct activities in support of the Action Plan.

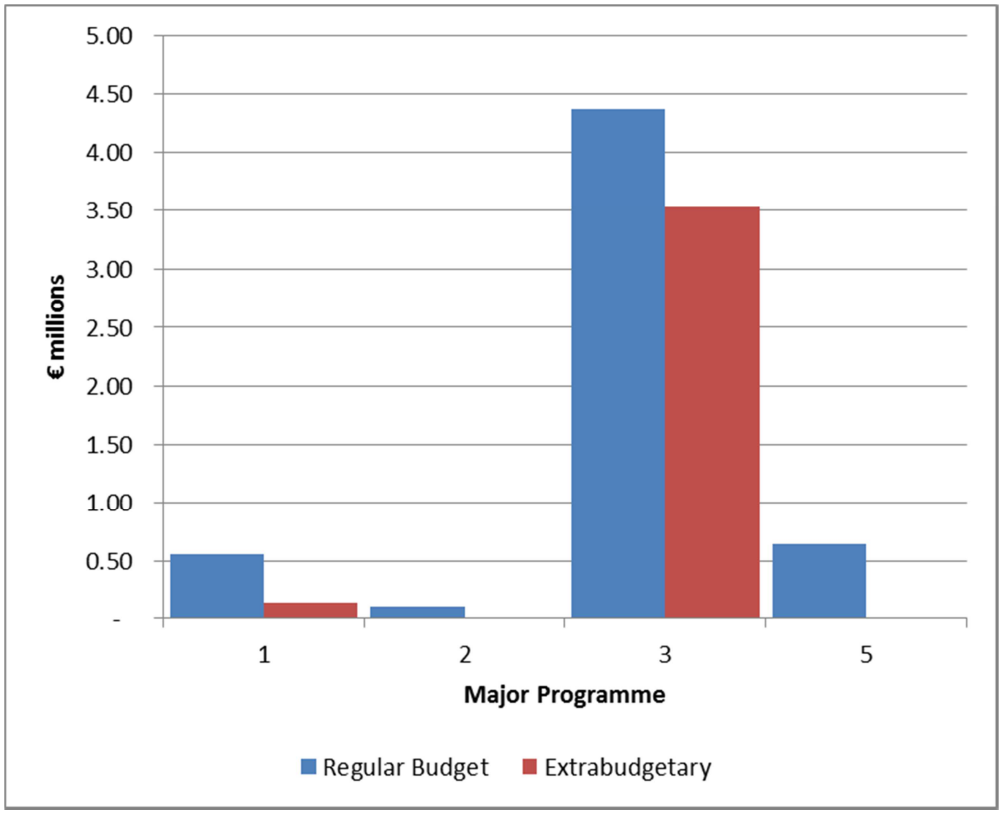

Figure 6 Total 2012 expenditures for the IAEA Action Plan on Nuclear Safety
(in € millions, as at 31 July 2012)