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[1] (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 unanimously endorsed by 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 Action Plan requested the Director General to report on the progress in its implementation to the Board of Governors and General Conference in 2012, and subsequently on an annual basis as may be necessary. 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/2015/43-GC(59)/INF/14. During the period covered by this Report, around ten new extra budgetary projects have been initiated by the Secretariat under implementation of the Action Plan on Nuclear Safety. These projects are related to significant key areas of the Action Plan and are described in Annex III to this Supplementary information.

3. This is the fourth and final annual report on the progress in the implementation of the Action Plan. The report provides detailed supplementary information on the progress made since the previous annual report in 2014. In line with previous annual reports, it covers the implementation of the Action Plan as a whole and for each action. The report also contains a summary of the major achievements of the Action Plan since its adoption in 2011 and an outline of the future activities to be continued by the relevant Secretariat Departments beyond 2015, as described in Annex I. The report includes:

- The goals;
- A brief background;
- Details of the achievements of the Secretariat in the reporting period;
- An overview of progress of implementation;
- A summary of the implementation activities since the adoption of the Action Plan; and
- The continuation of Action Plan projects by the relevant Departments of the Secretariat.

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

ACTION 1: *Undertake assessment of the safety vulnerabilities of nuclear power plants in the light of lessons learned to date from the accident.*

GOALS

Assessment of the design of nuclear power plants

4. Member States are requested to promptly undertake an assessment of the design of their nuclear power plants (NPPs) against site specific extreme natural hazards and to identify and implement any necessary corrective actions in a timely manner. The Secretariat to provide support to

[1] https://www.iaea.org/sites/default/files/actionplanns.pdf

Member States that are undertaking assessments and to undertake peer reviews of these assessments upon request.

IAEA Methodology

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

BACKGROUND

6. Safety assessments of NPPs 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 an NPP, and are independently verified and submitted to the regulatory body as part of the licensing or authorization process.

7. During the period covered by this annual report, the Secretariat continued to support Member States in conducting assessments of the design of their NPPs against extreme natural hazards.

ACHIEVEMENTS

8. In September 2014, the Secretariat organized and conducted a consultancy meeting in Moscow, the Russian Federation on the complementary safety assessments of NPPs against extreme external events. The objective of the meeting was to exchange information on methods for safety assessment used by the Russian Federation and by the Secretariat. The meeting was attended by six participants from the Russian Federation and the Secretariat who exchanged information on recent developments in the use of probabilistic safety assessment (PSA) based methods for complementary assessment of the robustness of NPPs' against the impact of extreme events. The approach used in the Russian Federation to PSA and fault sequence analysis (FSA) and the Fault Sequence Tool for Extreme Events (FAST-EE) developed by the Secretariat were also discussed. The meeting participants prepared an outline of an IAEA TECDOC on this topic planned to be published in 2016.

9. The Secretariat organized and conducted a consultancy meeting in September 2014 in Vienna, Austria on Severe Accident Analysis and Management for VVER NPPs. The meeting was attended by two experts from two Member States who shared information on on-site accident management strategies and programmes and emergency operating procedures. The meeting identified topics to be considered during a Technical Meeting planned for October 2015 on Topical Issues of Severe Accidents Analysis and Management for VVER NPPs. The objectives of the Technical Meeting are:

- To share improvements made to accident management programs;
- To discuss IAEA guidance on accident management procedures;
- To identify the need for additional or more detailed guidance;
- To consider how to effectively train and equip operators to effectively implement accident management procedures.

10. The evaluation and dependability of software important to safety is an essential and difficult aspect of the safety justification for digital Instrumentation and Control systems. In September 2014, in the Republic of Korea, the Secretariat organized and conducted a Technical Meeting on the Evaluation and Dependability Assessment of Software for Safety Instrumentation and Control Systems at NPPs. The purpose of the meeting was to discuss commonly encountered difficulties and

to share best practices or strategies used in the evaluation and dependability assessment. The Secretariat will disseminate information on the lessons learned through a new Nuclear Energy series report on this topic which is planned to be published in 2016.

11. The Secretariat is finalizing the TECDOC on *Considerations on the Application of the IAEA Safety Requirements for Design of Nuclear Power Plants*. The main purpose of this TECDOC is to provide insights for the clarification of the new NPP design Safety Requirements introduced in SSR-2/1[2] and subsequently in SSR-2/1 (Rev. 1)[3]. The TECDOC also identifies terms that need further clarification to make their definitions more consistent with the latest Safety Requirements including, 'design extension conditions' and the concept of 'practical elimination'. The TECDOC is planned to be finalized by the end of 2015 and published in 2016.

12. The Secretariat organized and conducted a Technical Meeting in September-October 2014 in Vienna, Austria, on the Safety Design of Auxiliary and Supporting Systems for NPPs. The meeting was attended by nine participants from seven Member States with the objective of sharing national views on the design considerations for auxiliary and supporting systems that are important to safety but are not covered by the existing safety standards for NPPs. These systems include lighting, fire protection and ventilation. The lessons learned from the Fukushima Daiichi accident regarding these systems were clarified from the perspective of the national regulatory bodies and the nuclear operators.

13. In October 2014, the Secretariat and the Concern for Production of Electric and Thermal Energy at Nuclear Power Plants jointly organized a national workshop in Moscow, Russian Federation, to consider the lessons learned from the Kashiwazaki-Kariwa, Fukushima Daiichi, Onagawa and North Anna NPP seismic safety cases. The workshop was attended by more than 40 participants from the Russian Federation with the objective of sharing information and discussing the lessons learned from the impact of natural events on NPPs in Japan and the United States of America. The workshop considered the impact of ground motion on civil structures and equipment, the performance of safety systems and the methodologies and approaches used for seismic hazard assessment. The workshop also covered the assessment of external natural hazards at NPP sites with multiple units.

14. In December 2014, the Secretariat organized and conducted a consultancy meeting on Severe Accident Mitigation through Improvements of Reliable Containment Cooling and Filtered Venting for Design Basis Accidents and Beyond Design Basis Accidents in Vienna, Austria. The meeting was attended by nine participants from five Member States that included researchers and technical experts with knowledge on design and operation of containment cooling systems and filtered containment venting systems. The objectives of the meeting were to prepare for a Technical Meeting to be held in August-September 2015 and draft an outline for a Nuclear Energy Series report on this topic. The report will also take account of the outcomes of the IAEA's International Experts' Meeting (IEM) on Severe Accident Management held in March 2014.

15. The consultancy meeting considered Member States experience in the design and testing of containment cooling and venting systems, as well as upgrades to such systems at existing NPPs to provide filtered discharges from the NPP containment in the event of a DBA and BDBA. The engineering test programs used by some Member States to validate the performance of vent systems to clarify what phenomena they are able to withstand were also reviewed. The criteria for determining when, in the event of an accident, the vent system must be used to prevent containment failure and an

[2] Safety of Nuclear Power Plants: Design (IAEA Safety Standards Series No. SSR-2/1)
[3] Safety of Nuclear Power Plants: Design (IAEA Safety Standards Series No. SSR-2/1 (Rev. 1))

uncontrolled release of radioactive material were also considered. The participants recognized that some NPP owner's groups[4] and national regulatory bodies have placed significant emphasis on studying severe accident sequences for the purpose of developing appropriate Emergency Protection Guidelines. The meeting highlighted the specific interests of embarking countries on this topic and the need to document the approaches available in advanced NPP designs to protect the containment under BDBA conditions. The meeting also considered the application of PSA to the containment venting system and the impact that venting could have on the frequencies of releases of radioactive material for different NPP designs. The results of this meeting will be used to inform the preparation of a Technical Meeting on Severe Accident Mitigation through Improvements in Filtered Containment Venting for Water Cooled Reactors to be held in September 2015 in Vienna, Austria.

16. The Secretariat is preparing a Technical Meeting on Topical Issues of Severe Accident Management Guidelines and Emergency Operating Procedures for NPPs to be held in Vienna, Austria, in October 2015. The objective of this meeting is to support Member States in enhancing and maintaining their capabilities for severe accident analysis and severe accident management. The meeting will provide a forum at which best practices related to the development and implementation of accident management programmes can be shared. In particular, the meeting aims to:

- Share improvements made to accident management programmes following the Fukushima Daiichi accident;
- Share relevant IAEA safety standards and national regulatory requirements dealing with accident management to enhance the effective implementation of accident management for NPPs;
- Share the best knowledge and practices for enhancing and maintaining capabilities in severe accident analysis and management; and
- Discuss effective training and exercise methods to improve the implementation of accident management procedures and guidelines.

17. In February 2015, the Secretariat conducted a consultancy meeting in Vienna, Austria, to discuss the need for an eastern European region safety network. The meeting was attended by seven experts from seven Member States. The objective of the meeting was to exchange information about existing regional safety networks and to discuss the need for and possible characteristics of a safety network for the eastern European region. The meeting allowed selected experts from the region to engage in an open discussion on the need for such a network, to define the objectives, scope and activities of an eastern European region safety network within the Global Nuclear Safety and Security Network (GNSSN), to define the organizational structure based on an example of Terms of Reference prepared by the Secretariat, and to provide recommendations for next steps. In May 2015, the Secretariat organized and conducted a second consultancy meeting on this topic in Vienna, Austria, to exchange information about existing regional safety networks and to discuss the need for and possible characteristics of safety network to be developed in the European and central Asian regions. The meeting, attended by eight experts from six Member States, built on the initial ideas of an eastern European region safety network, discussed at the consultancy meeting in February 2015. The participants proposed to expand the geographical scope to include the European Union, Switzerland, and possibly all central Asian Member States. The experts considered the purpose of such a network would be to:

[4] NPP owner's groups are organizations dedicated to providing cooperation, mutual assistance and exchange of information for the successful support, development, operation and maintenance of specific types of NPP. Examples of such groups are the CANDU, BWR and VVER NPP owner's groups.

- Provide capacity building initiatives at a regional level;
- Facilitate sharing of experience and good practices;
- Develop regional cooperation projects; and
- Cooperate with existing safety networks in the region for better coordination and for an improved understanding of nuclear safety related issues.

18. In March 2015, the Secretariat organized and conducted a consultancy meeting in Vienna, Austria, on Complementary Assessment of NPP Robustness against the Impact of Extreme Events attended by five experts from two Member States. The objective of the meeting was to compare and benchmark the complementary safety assessment methods developed in the Russian Federation as a response to the Fukushima Daiichi accident and the Fault Sequence Analysis (FSA) method developed by the Secretariat. The outcome of the meeting was an improved understanding of possible gaps in existing methods of assessment of the potential impact on NPPs of extreme external events. The FSA method combines the PSA approach with the operating limits of systems, structures and components to identify critical fault sequences that may be caused by postulated external hazards or their combinations. The method uses existing results of deterministic assessments and PSA and allows for the assessment of any feasible combination of hazards and their magnitudes as well as long duration accident sequences.

19. One result of the consultancy meeting was a draft IAEA Technical Report entitled *Overview of the Considerations Pertaining to PSA-Based Methodologies for Complementary Assessment of NPP's Robustness against the Impact of Extreme Events*. The draft report outlines the different aspects that need to be taken into consideration for reliable safety assessments. These considerations include uncertainties in the phenomena associated with severe accidents and natural hazards, the lack of consideration of combinations of events/hazards and of issues associated with multi-unit NPP sites. Other areas of uncertainty covered in the draft report include the time period modelled in a PSA, the uncertainties associated with decision-making and the effect of extreme events on human behaviour. The limits on the application of PSA are considered along with the need for different approaches to the assessment of new and old NPPs and how the use of portable equipment can be dealt with by PSA. The meeting concluded that a more comprehensive systematic approach needs to be developed for complementary assessment of NPP protection against extreme external events. These assessments need to cover a wide range of possible hazards and their possible combinations and correlations, as well as accident sequences of longer duration. The Secretariat is preparing a Technical Meeting to be held in November 2015 in Vienna, Austria, to further develop a Technical Document on *Considerations for Complementary Safety Assessment in the Light of the Fukushima Daiichi Accident*.

20. In June 2015, the Secretariat organized and conducted an International Conference in Vienna, Austria, on Management of Spent Fuel from Nuclear Power Reactors – An Integrated Approach to the Back-End of the Fuel Cycle. The meeting was attended by over 200 experts from 41 Member States. The objective of the Conference was to highlight the importance of an integrated long term approach to the management of spent fuel from NPPs and to discuss the progress achieved with regard to the back end of the nuclear fuel cycle as well as associated challenges in technology, regulation and safety. The experts considered that there is a need to make clear to relevant stakeholders that optimized waste and spent fuel management solutions are available. The experts noted that different Member States have different approaches to the management of spent fuel. For example, some Member States use wet storage techniques for spent fuel while others use dry storage. Some Member States store spent fuel centrally while others employ localized storage facilities. Reprocessing of spent fuel is being undertaken by some Member States while others are considering direct disposal. While the optimum approach may be different for each Member State the benefits and challenges for each

option were highlighted and discussed. The participants considered that an integrated approach to the back end of the nuclear fuel cycle is imperative for a successful long term nuclear power programme.

21. The outcomes of the conference contributed to identifying areas for future work, including:

- The spent fuel storage options in support of the integrated approach;
- The status and challenges in an integrated approach;
- Ageing management programmes;
- The impact of the front end of the nuclear fuel cycle on the back end;
- The research and development(R&D) activities required to deliver an integrated approach; and
- The safety aspects of spent fuel management.

22. During the reporting period, the Secretariat published an *IAEA Report on Severe Accident Management in light of the Fukushima Daiichi Accident*[5].

23. The Secretariat prepared drafts of the following Safety Reports planned to be published in 2016:

- *Framework and Process for Multi-Unit Site Probabilistic Assessment;*
- *Assessment of External Flooding (including Tsunami) and High Wind Hazards in the Site Evaluation for Nuclear Installations;*
- *External Hazard Considerations for Single and Multi-Unit Probabilistic Safety Assessment;*
- *Technical Approach to Multi-Unit Site Probabilistic Safety Assessment.*

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

24. The following paragraphs provide a summary of the major achievements from the implementation of activities under Action 1 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

25. All Contracting Parties to the Convention on Nuclear Safety (CNS) with NPPs have reported on the national assessments of the vulnerabilities of their NPPs against site specific extreme external events. These assessments focused on issues such as the capability of NPPs to withstand loss of electric power supply and loss of ultimate heat sink, safety margins for beyond design basis events; possible cliff-edge effects[6] were identified and arrangements for managing severe accidents were reviewed. Most of these safety assessments have been carried out according to internationally organized processes which have included a subsequent peer review. Contracting Parties have also reported on the improvements implemented as a result of these assessments, such as the provision of additional mobile diesel generators and mobile pumps, as well as measures to mitigate the impact of severe accidents by maintaining containment integrity through cooling and venting, as well as improved severe accident management programmes. Some Contracting Parties have also introduced

[5] https://www.iaea.org/newscenter/focus/nuclear-safety-action-plan

[6] In a nuclear power plant, a cliff edge effect is an instance of severely abnormal plant behaviour caused by an abrupt transition from one plant status to another following a small deviation in a plant parameter, and thus a sudden large variation in plant conditions in response to a small variation in an input.

requirements for probabilistic safety assessment into their national regulations, as well as the requirement for periodic safety reviews.

26. The Secretariat provided assistance and support to Member States in the implementation of their national assessments of the design of NPPs against site specific extreme natural hazards. The Secretariat organized and conducted four international experts' meetings (IEMs) relevant to Action 1 dealing with Reactor and Spent Fuel Safety (IEM 1)[7], Protection against Extreme Earthquakes and Tsunamis (IEM 3)[8], Human and Organizational Factors (IEM 5)[9] and Severe Accident Management (IEM 7)[10].

27. The DiD concept has been the basis for design and operation of NPPs since the early days of the nuclear era, and its application remains fundamental to nuclear safety. The IEMs and other relevant international conferences[11] emphasized that while the DiD concept remains valid, the application of the concept needs to be strengthened and also focus on both the prevention of accidents and the mitigation of accident consequences should an accident occur. In addition, the application of the DiD concept needs to be periodically re-examined over the entire life of an NPP and extreme external hazards need to be addressed in periodic safety reviews as such hazards can result in common cause failures that may simultaneously jeopardize several levels of DiD.

28. The lessons learned from assessing the impact of extreme natural hazards on NPPs were shared at IEM 3. These lessons included the need for sufficient safety margins when natural hazards are being evaluated and the need to consider the potential for cliff-edge effects. The uncertainties associated with the assessment of natural events needs to be taken into account and the collection of prehistoric data for seismic hazard assessments is necessary. The IEM also highlighted the importance of the consideration of the complex interactions of equipment and human performance in the evaluation of the effectiveness of various defence in depth features which were further explored during IEM 5.

29. Both IEM 1 and IEM 3 identified issues associated with the safety assessment of multi-unit NPP sites against a combination of natural hazards. In response, the Secretariat undertook a series of activities to share and exchange information and experience among Member States and to develop guidance for the assessment of multi-unit NPP sites in relation to multiple external hazards. These activities included:

- An International Workshop on the Safety of Multi-unit NPP Sites against External Natural Hazards in Mumbai, India, in October 2012;
- A Technical Meeting on 'Safety Assessment of Operating Nuclear Power Plants' in Vienna, Austria in December 2012;
- A Technical Meeting on Evaluation of Nuclear Power Plant Design Safety in the Aftermath of the Fukushima Daiichi Accident in Vienna, Austria in August 2013;

[7] International Experts' Meeting on Reactor and Spent Fuel Safety in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant Vienna, Austria 19-22 March 2012
[8] International Experts´ Meeting on Protection against Extreme Earthquakes and Tsunamis in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant Vienna, Austria 4 - 7 September 2012
[9] International Experts' Meeting on Human and Organizational Factors in Nuclear Safety in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant Vienna, Austria 21-24 May 2013
[10] International Experts' Meeting on Severe Accident Management in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant Vienna, Austria 17–20 March 2014
[11] International Conference on Topical Issues in Nuclear Installation Safety Vienna, Austria 21-24 October 2013

- A regional workshop on Siting and Site Evaluation for Nuclear Installations in South Africa in September 2013;
- An International Conference on Defence in Depth jointly with the Organisation for Economic Co-operation and Development's Nuclear Energy Agency (OECD/NEA) in Vienna, Austria in October 2013;
- A Technical Meeting on Probabilistic Safety Analysis Quality for Various Applications in Nuclear Power Plants: Extension to Internal and External Hazards, Low Power and Shutdown Modes of Operation in Vienna, Austria in December 2013; and
- A Technical Meeting on Developing Methodologies for Complementary Assessment of Nuclear Power Plants' Robustness against the Impact of Extreme Events in Vienna, Austria in July 2014.

30. The seventh in the series of IEMs dealt with the topic of management of severe accidents. The IEM emphasized the importance of regulatory oversight of the severe accident management programmes of the operating organizations and considered that severe accident management guidelines (SAMGs) should be strengthened. In particular, the SAMGs need to be extended to include spent fuel pools and NPP operations at low power and shutdown conditions.

31. The Secretariat organized and conducted an expert mission to the Onagawa NPP in Japan in July 2012. The objective of the mission was to examine the possible effects of the Great East Japan Earthquake on the performance of structures, systems and components (SSCs) important to safety at the Onagawa NPP. The mission concluded that despite prolonged ground motion and a significant level of seismic energy input, the SSCs at Onagawa NPP performed their intended functions without suffering any significant damage.

32. The following documents relevant to Action 1 have been published:

- *Review of Seismic Evaluation Methodologies for Nuclear Power Plants Based on a Benchmark Exercise (*IAEA TECDOC Series No. 1722); and
- *A Methodology to Assess the Safety Vulnerabilities of Nuclear Power Plants against Site Specific Extreme Natural Hazards*[12].

33. The reports of the Contracting Parties to the CNS and the information shared by Member States at IEMs and other fora have presented the activities that have been undertaken under the national assessments of the design of NPPs against site specific extreme natural hazards and the corrective actions that have been taken. Despite differences in approaches to these national assessments and in the priorities and schedule of implementation, the studies and the areas identified for improvement appeared to converge, with similar conclusions and corresponding actions being identified to strengthen the overall safety framework worldwide.

FUTURE ACTIVITIES

34. The activities carried out in response to Action 1 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue to support Member States in performing assessments of the safety vulnerabilities of NPPs and in the implementation of the results;

[12] https://www.iaea.org/sites/default/files/vulnerabilitiespowerplants.pdf

- Compile the results of national assessments provided by Member States to be presented to the seventh Review Meeting of the CNS;
- Respond to requests to undertake peer reviews of national assessments; and
- Continue to review and to revise the IAEA methodology based on lessons learned as appropriate.

IAEA PEER REVIEWS

ACTION 2: ***Strengthen IAEA Peer Reviews in order to maximize the benefits to Member States***

GOALS

Strengthen and Enhance Effectiveness of IAEA Peer Reviews

35. The Secretariat is requested to assess, and enhance as necessary, the effectiveness of the IAEA peer reviews by incorporating the lessons learned to date from the Fukushima Daiichi 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 (OSART) service;
- Design safety - the Design and Safety Assessment Review Service (DSARS);
- Emergency preparedness and response - the Emergency Preparedness Review service (EPREV);
- Site evaluation - the Site and External Events Design review service (SEED); and
- Nuclear infrastructure - the Integrated Nuclear Infrastructure Review service (INIR).

Enhance Transparency of Peer Reviews

36. The Secretariat is requested to enhance the transparency of the IAEA peer review services and to promote 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 review missions along with the results of such reviews.

Member States to host IAEA Peer Reviews

37. Member States 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 NPPs is encouraged to voluntarily host at least one IAEA OSART mission during the coming three years, with the initial focus on older operating NPPs. Thereafter, OSART missions are to be voluntarily hosted on a regular basis.

BACKGROUND

38. 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.

39. During the period since the last annual report the Secretariat continued to review the effectiveness of its peer review services and to improve these by incorporating the lessons learned from the Fukushima Daiichi accident and from discussions on the needs of Member States. The

Secretariat continued to make updated information on where and when peer reviews have been carried out available on the IAEA website.

ACHIEVEMENTS

40. The Secretariat continued to analyse the results of past IRRS Missions and is preparing a report covering the core regulatory areas which are directly related to nuclear safety. The objectives of the report are to:

- Present the observations and conclusions from an analysis of the IRRS missions conducted in Member States with operating NPPs in the period 2006-2013;
- Contribute to the continuous improvement of the IRRS and to the revision of IAEA safety standards relating to the IRRS process; and
- Support transparency and the dissemination of information to Member States on activities to strengthen the effectiveness of national regulatory bodies.

41. As a result of the Technical Meeting on Lessons Learned from Past EPREV Missions, held in July 2014, the Secretariat organized and conducted a consultancy meeting to revise the EPREV guidelines and implement the recommendations of the Technical Meeting. The revised guidelines will include criteria for the future conduct of missions. A final draft of the guidelines was produced in June 2015, to be made available as working material for the EPREV expert reviewers in the fourth quarter of 2015. In January 2015, a home-based EPREV training and test package was developed and was implemented as a pilot for the United Arab Emirates EPREV mission conducted in March 2015.

42. In December 2014 in Vienna, Austria, the Secretariat organized and conducted a consultancy meeting to review the draft Operational Safety Review Team (OSART) Guidelines. The meeting was attended by five experts from five Member States who took into consideration the lessons learned from Fukushima Daiichi accident and the revision of the IAEA safety standards in the revised OSART guidelines. The experts considered the topics of severe accident management, PSA, long term operations and the assessment of safety culture to be applied during OSART missions. The revised OSART Guidelines are to be published by the end of 2015.

43. During the reporting period, the Secretariat launched the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation, ARTEMIS. The scope of ARTEMIS covers Member States' organizations, facilities and activities involving radioactive waste or spent fuel management, radiological impact assessment for human health and the environment, the management of residues arising from uranium production as well as decommissioning and remediation of sites contaminated by radioactive materials. ARTEMIS is based on the relevant IAEA safety standards and technical guidance, as well as international good practice.

44. The Secretariat continued to encourage Member States to publish the results of IAEA peer review missions. In addition, the Secretariat continued to make available on the Action Plan platform[13] updated information on Member States activities regarding the peer reviews, including those peer reviews that have already been carried out and those that are planned for the future.

45. During the period covered in this annual report, the Secretariat conducted:

- 9 IRRS missions to Armenia, Cameroon, Croatia, France, Hungary, India, Malta, the Netherlands, and Zimbabwe;

[13] https://www.iaea.org/newscenter/focus/nuclear-safety-action-plan

- 7 follow-up IRRS missions to Finland, the Republic of Korea, Slovakia, Slovenia, Switzerland, the United Arab Emirates and Viet Nam;
- A preparatory IRRS mission to Japan;
- 3 Integrated Nuclear Infrastructure Review (INIR) missions to Jordan (INIR2), Kenya (INIR1) and Nigeria (INIR2);
- A follow-up Integrated Nuclear Infrastructure Review (INIR) mission to Viet Nam;
- 6 OSART missions to France (Flamanville Units 1 and 2), Hungary (Paks), the Netherlands (Borssele), the Russian Federation (Kola), the United States of America (Clinton) and Japan (Kashiwazaki-Kariwa);
- 2 follow-up OSART missions to France (Chooz) and Mexico (Laguna Verde);
- A Corporate OSART mission to France (EdF);
- A follow-up Corporate OSART mission to the Czech Republic (ČEZ);
- A Pre-EPREV mission to Hungary;
- 4 EPREV missions to Ghana, Kenya, Nigeria, and the United Arab Emirates;
- 2 pre- Site and External Events Design service (SEED) missions to Bolivia and Viet Nam;
- 4 SEED missions to China, Saudi Arabia, Sudan and Viet Nam;
- A pre-Safety Assessment of Long Term Operation (SALTO) mission to Mexico (Laguna Verde);
- 2 SALTO missions to Belgium (Tihange 1) and the Czech Republic (Dukovany);
- 2 International Probabilistic Safety Assessment Review Team (IPSART) missions to Armenia (Armenian) and Switzerland (Leibstadt).

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

46. The following paragraphs provide a summary of the major achievements from the implementation of activities under Action 2 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

47. The Secretariat has undertaken a comprehensive review of its peer review services and identified a number of areas for their enhancement. These enhancements were based on the lessons learned from the Fukushima Daiichi accident, the feedback from those Member States hosting peer reviews and also from experts participating in the peer review missions. These enhancements have included:

- A specific module incorporated in both the IRRS and EPREV peer reviews relating to the implications of the Fukushima Daiichi accident;
- A Basic IRRS Training (BIT) course to provide for a pool of experienced expert reviewers for the IRRS programme;
- The topic of severe accident management has been included in the OSART peer review service;

- A Corporate OSART service has been introduced to review those centralized functions of the corporate organization that affect all the operational safety aspects of an NPP;
- The Site and External Events Design (SEED) review service has replaced the Site Safety Review Service and incorporates improvements in the areas of site selection, hazard assessment and the design of relevant structures, systems and components;
- A new peer review service, the Design and Safety Assessment Review Service (DSARS) has been introduced to provide independent peer review and assessment of plant design safety;
- An evaluation methodology and guidance for INIR Phase III has been developed; and
- A new peer review service for the Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation, ARTEMIS has been introduced.

48. The Secretariat continued to encourage Member States to publish the results of IAEA peer review missions. The Secretariat continued to make available on the Action Plan Platform[14] updated information on Member States activities regarding the IAEA peer reviews, including those peer reviews that have already been carried out and those that are planned for the future. 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.

49. The IAEA peer review services have been strengthened and Member States' interest in these services has significantly increased since the adoption of the Action Plan in September 2011. However, a number of Member States have yet to respond to the Action Plan to voluntarily host IAEA peer reviews and others have yet to request such reviews focused on their older NPPs.

FUTURE ACTIVITIES

50. The activities carried out in response to Action 2 that will continue as part of the regular activities of the relevant Secretariat Departments include:

- Continue to strengthen the effectiveness of the peer reviews;
- Continue to encourage Member States to host peer reviews;
- Continue to encourage Member States to provide experts for peer review missions in the areas of regulatory effectiveness (IRRS), operational safety (OSART), design safety (DSARS), emergency preparedness and response (EPREV) and nuclear infrastructure (INIR);
- Continue to encourage Member States to provide, every five years, a list of IAEA peer reviews to be requested, upon which a schedule shall be prepared taking into account the human and financial resources from Member States; and
- Continue to provide information on where and when Member States have hosted IAEA peer review missions along with the results of such reviews on the IAEA website.

[14] http://www-ns.iaea.org/actionplan/missions.asp

EMERGENCY PREPAREDNESS AND RESPONSE

ACTION 3: *Strengthen emergency preparedness and response*

GOALS

Review of national emergency preparedness and response arrangements

51. 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

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

53. 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 of such missions publicly available.

BACKGROUND

54. Sound preparedness for and effective response to any radiation related (radiological and nuclear) event are essential to avoid or minimize the impacts of those events if they were to occur. The Fukushima Daiichi accident reinforced the importance of careful attention to EPR at all levels: on-site, local, national and international.

55. During the period covered by this annual report, the Secretariat continued to support Member States in the strengthening of national and international emergency preparedness and response arrangements, and continued to encourage Member States to register their assistance capabilities in RANET.

ACHIEVEMENTS

56. To assist Member States in maintaining and enhancing their EPR capabilities, during the reporting period the Secretariat organized and conducted 44 training events at the interregional, regional and national levels. The Secretariat also organized 23 expert missions to provide advice on subjects ranging from the assignment of emergency roles and responsibilities to the development of a solid technical basis for the development of EPR arrangements.

57. The Secretariat organized and conducted a consultancy meeting in Vienna, Austria, in December 2014 to address a recommendation made by the Emergency Preparedness and Response Expert Group (EPREG) to develop a standardized self-assessment exercise package enabling Member States to evaluate their EPR systems for responding to severe emergencies. The meeting was attended by three experts from three Member States where a plan was developed for a methodology on the realistic assessment of EPR capabilities for a range of challenging emergencies based on the existing concept of national self-assessment.

58. The Secretariat organized and conducted a consultancy meeting in Vienna, Austria, in March 2015, attended by four experts from four Member States, to complete the design and test the Emergency Preparedness and Response Information Management System (EPRIMS). This system

allows Member States to complete an Emergency Preparedness and Response (EPR) self-assessment on-line. In addition, through this system, Member States can also provide the Secretariat with technical data related to EPR concerning their NPPs which would serve as a reliable source for the Secretariat's assessment and prognosis process during a nuclear or radiological emergency.

59. The Secretariat continued to encourage Member States to register their assistance capabilities in the Secretariat's Response and Assistance Network (RANET), in particular in the new functional area of Nuclear Installation Assessment and Advice. New registrations were received from Belgium and Republic of Korea, while the United States of America added capabilities in the new functional area.

60. The Secretariat organized and conducted three international workshops at the IAEA RANET Capacity Building Centre in Fukushima, Japan in November 2014. The first workshop dealt with Notification, Reporting and Requesting Assistance and was attended by 12 participants from 12 Member States from the Asia and the Pacific region. The workshop provided guidance to Member States on the procedures for coordination with IAEA in the event of a nuclear or radiological emergency. The second workshop focused on EPR with the objective of training participants in the actions to be undertaken in assisting populations during a nuclear or radiological emergency. The workshop was attended by ten participants from municipalities and organizations in the Fukushima Prefecture. The third workshop was attended by 25 participants from nine Member States which have registered radiation survey capabilities as Field Assistance Teams in RANET. The objective of the workshop was to enhance RANET capabilities and the international assistance framework through exchange of information and experience. Environmental monitoring activities were conducted within the Restricted Area surrounding the Fukushima Daiichi NPP.

61. A further workshop was conducted at the Fukushima RANET Capacity Building Centre in Japan in April 2015 on Monitoring during a Nuclear Radiological Emergency and was attended by 17 participants from eight Member States. The objective of the workshop was to train participants in the types of radiological monitoring to be performed in response to a nuclear or radiological emergency and to be able to interpret the results of radiological monitoring in order to make decisions to protect the public.

62. During the reporting period the Secretariat held discussions with the relevant authorities in Brazil, Hungary, Indonesia and Japan on hosting further Capacity Building Centres in the medical, first-response and onsite aspects of EPR.

63. During the reporting period, the Secretariat conducted a number of ConvEx-1[15] and ConvEx-2[16] exercises. The problems identified in the exercises were analysed by the Secretariat and immediate actions were taken. The summary evaluations were made available to Member States. The participation in a ConvEx-2 exercise held in 2015 increased by 40% compared to the corresponding exercise held in 2014.

64. The Secretariat organized and conducted a series of consultancy meetings for developing the safety guide on the *Arrangements for the Termination of a Nuclear or Radiological Emergency*. The meetings were held in Vienna in December 2014, March 2015 and July 2015. Each meeting was attended by five experts from five Member States. The July 2015 meeting also included three experts from three international organizations. The IAEA General Safety Requirements No. GSR Part 3[17]

[15] ConvEx-1 are designed to test emergency communication links with contact points in Member States
[16] ConvEx-2 is designed to test specific parts of the international response system.
[17] Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards General Safety Requirements (IAEA Safety Standards Series No. GSR Part 3)

defines three different types of radiation exposure situations: planned, emergency and existing exposure situations. The management of long-term exposures following a nuclear or radiological emergency is recommended to be treated as an existing exposure situation. The aim of the Safety Guide is to support Member States in developing arrangements for preparedness to respond to a nuclear or radiological emergency in relation to the termination of an emergency situation and the subsequent transition to an existing radiation exposure situation or to a planned radiation exposure situation. The participants reviewed the draft Safety Guide and provided suggestions for its further development.

65. Draft Guidelines for response and assistance products during a nuclear or radiological emergency were developed in consultation with Member States. Response and assistance products are the results of response and assistance actions, such as the assembly of raw radiation monitoring data, processed radiation monitoring data, or assessment results. These products are designed to contribute to the decision making process for protecting the public from ionizing radiation during a nuclear or radiological emergency. The guidelines are intended to further strengthen the international assistance mechanism by providing additional guidance for Member States providing and receiving international assistance regarding the types of products to be generated during the response to a nuclear or radiological emergency.

66. The annual meeting of the Emergency Preparedness Expert Group (EPREG) was held in June 2015. The EPREG members discussed outcomes of the IEM on Assessment and Prognosis in Response to a Nuclear or Radiological Emergency and the establishment of a new Safety Standards Committee (Emergency Preparedness and Response Standards Committee - EPReSC) and how to incorporate EPREG functions into the work of EPReSC. The EPREG members agreed that after establishment of EPReSC, EPREG can be discontinued.

67. The Secretariat continued preparations for organising a conference in October 2015 in Vienna, Austria, on Global Emergency Preparedness and Response. The conference is being organized in cooperation with the following bodies[18] CTBTO, the European Commission, Europol, FAO, ICAO, ILO, IMO, INTERPOL, OECD/NEA, PAHO, UNEP, UNOOSA, WHO and WMO. The conference will provide an opportunity for participants to exchange information and share experiences in EPR, discuss challenges, and identify key priorities in further improving readiness for nuclear and radiological incidents and emergencies. The topics will include emergency management, protection strategies, communication, public health and medical response, waste, international cooperation, education and training and past experiences.

[18] The Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), the European Commission (EC), the European Police Office (EUROPOL), The Food and Agriculture Organization of the United Nations (FAO), the International Atomic Energy Agency (IAEA), the International Civil Aviation Organization (ICAO), the International Labour Organization (ILO), the International Maritime Organization (IMO), the International Criminal Police Organization (INTERPOL), the International Maritime Organization (IMO), the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), the Pan American Health Organization (PAHO), the United Nations Environment Programme (UNEP), , the United Nations Office for Outer Space Affairs (OOSA), the World Health Organization (WHO) and the World Meteorological Organization (WMO).

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

68. The following paragraphs provide a summary of the major achievements from the implementation of activities under Action 3 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

69. All Contracting Parties of the CNS with NPPs reported on their activities to review their EPR arrangements and also the measures taken to strengthen these arrangements, including the consideration of:

- Longer duration emergency situations;
- Events at multi-unit NPP sites; and
- Extensive infrastructural damage that can impact on-site and off-site emergency plans.

70. At the national level, the measures reported by the Contracting Parties to strengthen EPR arrangements include enhancement of existing on-site and off-site emergency control centres that are protected from extreme external events and radiation hazards. The means for communication have been strengthened through the introduction of mobile communication centres or additional portable satellite phones to secure vital information in case of a prolonged loss of electrical power.

71. The Secretariat continued to support Member States in their efforts to strengthen EPR arrangements and capabilities at operator, local, national, regional, and international levels by reviewing relevant guidelines and by conducting workshops and training activities.

72. The Secretariat published the *IAEA Report on Preparedness and Response for a Nuclear or Radiological Emergency in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant*[19]. The report emphasizes the importance of clearly allocating the functions and responsibilities of all relevant stakeholders in the EPR framework and the need to have national communication plans in place before an emergency occurs. This will ensure that clear, objective and understandable information can be made available to the public. In addition, all EPR arrangements must be realistically tested and decision makers must regularly participate in exercises.

73. The Secretariat has continued to work with State Parties to the Assistance Convention[20] to increase the registration in RANET. In order to provide States Parties with information regarding the National Assistance Capabilities (NAC) registered in the RANET, in January 2013, the Secretariat launched the RANET database on the Unified System for Information Exchange in Incidents and Emergencies (USIE) website. The database features all information related to the NAC registered field assistance teams and external based support registered resources.

74. The Secretariat published the *IAEA Response and Assistance Network* (EPR-RANET, edition 2013) which includes new guidance regarding the roles, responsibilities and actions needed on the part of all members of the Network to prepare for, request and receive assistance in the event of an emergency. The publication also includes an additional functional area to provide assessment and advice to competent authorities for on-site mitigation activities in case of emergencies at nuclear facilities

75. Practical Arrangements (PAs) have been made between the IAEA and the Ministry of Foreign Affairs of Japan under which the IAEA Response and Assistance Network (RANET) Capacity Building Centre was designated in the Fukushima City. As part of its efforts to strengthen the

[19] https://www.iaea.org/sites/default/files/preparedness0913.pdf
[20] Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency

assistance mechanisms to ensure that necessary assistance is made available promptly, the Secretariat conducted in May 2013 the first RANET workshop at this centre. Further workshops have been conducted during this reporting period. The Secretariat is discussing the designation of Capacity Building Centres with other Member States in Asia as well as in Europe and South America.

76. The Secretariat established the Emergency Preparedness and Response Expert Group (EPREG), to provide advice on strategies to strengthen and sustain sound international preparedness for nuclear and radiological emergencies. The Secretariat is establishing a new Safety Standards Committee, the Emergency Preparedness and Response Standards Committee (EPReSC), which will be open to all Member States.

77. The Secretariat published the *Joint Radiation Emergency Management Plan of the International Organizations* (EPR-JPLAN, Edition 2013) in July 2013 which incorporates a revised emergency classification scheme, elaborated response actions, additional clarification of response arrangement and tasks, updated capabilities and contact details of participating organizations, and updated list of publications and legal instruments of relevance to emergency preparedness and response.

78. In addition, the following documents relevant to Action 3 have been published:

- *Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor* (EPR-NPP Public Protective Actions, 2013);
- *Considerations in Emergency Preparedness and Response for a State Embarking on a Nuclear Power Programme – Training Materials* (EPR-Embarking/T, 2013).

79. The reports of the Contracting Parties to the CNS and the information shared by Member States at IEMs and other fora have presented the national activities undertaken in response to the Action Plan to strengthen emergency preparedness and response.

FUTURE ACTIVITIES

80. The activities carried out in response to Action 3 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue to strengthen EPR safety standards and guides and incorporating lessons learned to the EPREV peer review service;
- Encourage Member States to provide a summary of results of the EPREV reviews;
- Invite relevant International Governmental Organizations that are not yet cosponsoring the JPLAN to become participating organizations of the IACRNE[21];
- Encourage those Member States with registered national assistance capabilities in RANET to host IAEA missions to review their registered capabilities; and
- Produce a programme of RANET reviews missions.

[21] IACRNE - Inter-Agency Committee on Radiological and Nuclear Emergencies

NATIONAL REGULATORY BODIES

ACTION 4: *Strengthen the effectiveness of national regulatory bodies*

GOALS

Enhance the Integrated Regulatory Review Service (IRRS)

81. 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.

82. 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

83. Each Member State with NPPs 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.

BACKGROUND

84. The IAEA Fundamental Safety Principles state that an effective legal and governmental framework for safety, including an independent regulatory body, must be established and sustained. The Governments of Member States are responsible for securing adherence to the international instruments relevant to nuclear safety through 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.

85. During the period covered by this annual report, the Secretariat continued to undertake activities to support strengthening the effectiveness of national regulatory bodies by organizing and conducting national and regional workshops, concluding practical arrangements with relevant bodies and developing and publishing appropriate guidance for regulatory bodies.

ACHIEVEMENTS

86. The CANDU PSA Working Group of the Forum for Senior Regulators of CANDU Reactors held its annual meeting in Canada in July 2014. The CANDU PSA Working Group has initiated activities for a new IAEA Safety Report to address PSA as applied to CANDU-type NPPs, as this is not specifically covered by the current IAEA Safety Guides. The report is to be considered during the next revision of the relevant IAEA safety standards.

87. During the 58th regular session of the General Conference, the Secretariat organized and conducted the Senior Regulators' Meeting. The meeting considered the role of the regulatory body in strengthening the implementation of the concept of DiD. The participants discussed the importance of achieving an adequate balance between accident prevention and mitigation along with the need to demonstrate that the safety provisions at different levels of DiD are sufficiently reliable and, to the extent possible, independent from each other. The participants highlighted the need for national regulatory bodies to take into account human and organizational factors in nuclear safety as well as engineering factors and also the benefits of using deterministic and probabilistic safety assessment tools to achieve a balanced NPP design. The participants reported that national regulatory bodies are working together through the auspices of the IAEA, the OECD/NEA and Western European Nuclear

Regulators Association (WENRA) to harmonize the interpretation and implementation of some aspects of defence in depth that need further attention in the light of the Fukushima Daiichi accident

88. The Secretariat organized and conducted the Regulatory Cooperation Forum (RCF) Steering Committee and plenary meetings during the 58th regular session of the General Conference. The goals, objectives and activities of the RCF over the past 12 months were reviewed. The support that has been arranged through the RCF for Member States embarking on nuclear power programmes was presented including the support provided to Jordan and Viet Nam. The RCF has engaged in the development of action plans to commence support for Belarus and Poland. Representatives of both support providers and recipients, including Belarus, the European Commission, Poland, the Russian Federation and Viet Nam, commented on the benefits gained from their collaboration with the RCF. The participants emphasized that the RCF was instrumental in highlighting the necessity of an independent and effective regulatory body, particularly for newcomer Member States, and in providing coordinated support for the different stages of development of such a regulatory body.

89. The RCF continued to assist in the development of effectively independent and robust nuclear safety regulatory bodies. Upon the request of Belarus, the RCF implemented a safety culture mission to Belarus in December 2014 in order to support efforts for establishing an effectively independent regulatory body. The mission highlighted the importance of developing a strong safety culture at the national level from the beginning of a nuclear power programme. The RCF Steering Committee Meeting and the Collaboration Meeting with the European Commission (also known as the Support Meeting), were held in Brussels in May 2015. Topics of discussion included future coordination of support activities, exchange of experience of regulatory infrastructure development, and work on updating the action plans of RCF recipient countries (Belarus, Jordan, Poland and Viet Nam).

90. The Secretariat organized and conducted the second Basic IRRS Training Course in October 2014 in Vienna, Austria. The objective of the training course was to provide information and guidance to experts from regulatory bodies who may participate as reviewers in future IRRS missions. The course was attended by 61 participants from 41 Member States and covered all aspects of the IRRS programme important for the expert reviewers including the principles and bases of the IRRS process as well as lessons learned from past IRRS missions.

91. In October 2014, the Secretariat organized and conducted a Technical Meeting in Vienna, Austria, on the Integration of Safety Culture into Regulatory Practices and the Regulatory Decision Making Process. The meeting was attended by 36 experts from 27 Member States. The objectives of the meeting was to share knowledge and experience gained in implementing safety culture improvement programmes in regulatory bodies and the conduct of effective oversight of licensees' safety culture. The IAEA methodology for the self-assessment of safety culture was presented. A common understanding and awareness was observed on the dual role of regulators, namely, oversight of the licensees' safety culture and the regulatory body's internal safety culture and its impact on the licensee's safety culture. Regulatory bodies need to promote and foster the safety culture of the operating organizations through the implementation of its regulatory activities was emphasized. The experts recognized that there is a growing interest and awareness of safety culture by regulatory bodies and concluded that significant progress has been made on the topic during the last two to three years. The experts observed that continuous improvement in safety culture is a challenge for all regulatory bodies, particularly for the Member States embarking on a nuclear power programme. Further work needs to be initiated in collaboration between the Member States and the Secretariat to address these challenges and develop appropriate guidance.

92. As an outcome of the meeting, the Secretariat is preparing guidelines for the self-assessment of safety culture of the regulatory body. The IAEA has also initiated the development of a TECDOC

on Safety Culture in the Regulatory Body. The TECDOC will provide an overview of practices for promoting and evaluating safety culture in regulatory bodies and the regulatory oversight of safety culture in operating organizations. The TECDOC is planned to be published in early 2017.

93. The fourth in a series of workshops on Lessons Learned from the IAEA Integrated Regulatory Review Service (IRRS) was jointly organised by the Secretariat and the Rostechnadzor of the Russian Federation. The workshop was held in Moscow, Russian Federation in December 2014. The workshop continued the series of similar meetings previously held in France (2007), Spain (2008) and Washington (2011), aimed at strengthening the IRRS service in order to maximize the benefits to Member States. The workshop was attended by 47 senior regulators from 25 Member States and provided an international forum for exchange of recent experience in the implementation of the IRRS programme from 2011 to 2014. The further development of the IRRS process was discussed in relation to the main phases of an IRRS mission including: the preparatory phase, the conduct of a mission, the post-mission phase and the follow-up mission. The participants highlighted the importance of the preparatory work and self-assessment as a learning process for the host Member State. The participants agreed that follow-up missions are a very important part of the IRRS service and suggested that there should be sufficient time between the main mission and the follow-up to allow the host country to effectively address the recommendations and suggestions.

94. The participants concluded that the workshop provided an important opportunity to strengthen the IRRS process, and the support and proposals for improvement made by the participants will contribute to the continuous strengthening of the IRRS mission effectiveness. These proposal included:

- The Secretariat to ensure consistency in the interpretation of IAEA safety standards and the development of suggestions and recommendations during IRRS missions;
- The Secretariat to explore the means to ensure that the self-assessment results are taken into account during a mission;
- The Secretariat to consider developing specialized training for the IRRS team leaders and deputy team leaders;
- The Secretariat to complete the compilation of observations from all IRRS missions and make it available to Member States; and
- Future IRRS missions will include the need for a follow-up mission.

95. In June 2015, the Secretariat organized and conducted the first Zwentendorf NPP Inspection Workshop, in Austria, specifically tailored for inspectors working for national regulatory bodies. The workshop included hands-on training and provided an introduction to regulatory inspection skills and methods. The workshop is designed to place inspectors in real-life scenarios, using the Zwentendorf facility as a practical laboratory. Members of the RCF, including Belarus, Jordan, Poland and Viet Nam participated in the workshop.

96. The Secretariat organized and conducted a preparatory IRRS mission in July 2015 to the Nuclear Regulation Authority in Tokyo, Japan. The IRRS mission to Japan is planned for early 2016.

97. The Secretariat organized and conducted the following national and regional workshops related to strengthening regulatory effectiveness in Member States:

- A national workshop on the Lessons Learned for the Regulatory Body in the light of the Fukushima Daiichi accident in September 2014 in the Islamic Republic of Iran;

- A regional workshop on Development of an Integrated Management System Model Based the IAEA safety standards[22] in November 2014 in Malaysia; and
- An ANSN regional workshop on Nuclear Safety Tailored for Regulators in December 2014 in the Republic of Korea.

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

98. The following paragraphs provide a summary of the major achievements from the implementation of activities under Action 4 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

99. Contracting Parties to the CNS have reported on the national reviews of their regulatory body's focus, for example, on the regulatory framework, management systems and the availability of financial resources. Contracting Parties have also reported on the steps taken to strengthen the effective independence of their regulatory bodies through enlargement, restructuring and through changes to the legal framework. Some Contracting Parties reported on the development of new regulations in light of the Fukushima Daiichi accident, including the introduction of requirements for periodic safety reviews, emergency preparedness and response and severe accident management.

100. The RCF continued to be instrumental in highlighting the necessity of an independent and effective regulatory body, particularly for newcomer Member States and in providing coordinated support for the different stages of development of such a regulatory body. The RCF has continued to work with Jordan, Vietnam and Poland. The RCF is reaching out to Member States in order to ensure that they are aware of the Forum and its objectives, focusing in particular on those Member States that are committed to developing a nuclear power programme for the first time and those with smaller programmes considering expansion.

101. The International Conference on Effective Nuclear Regulatory Systems held in Ottawa, Canada in April 2013 was the first event to focus on the activities of regulatory bodies in the aftermath of the Fukushima Daiichi accident. The conference identified a number of action items for implementation and follow-up, such as the need to consider safety culture in regulatory processes and provided the framework for a number of activities, including an *IAEA report on Strengthening Nuclear Regulatory Effectiveness*. This report was based on the outcomes of the Ottawa Conference, the 2nd Extraordinary Meeting of the Contracting Parties to the CNS, the results of the Member States 'stress tests' and the findings of IRRS Missions held since the Fukushima Daiichi accident. The report highlights the importance of regulatory oversight, and its reliance on regulatory independence, competence, a strong legislative authority and adequate resources, and highlights the role of IRRS in supporting improvements to the regulatory framework.

102. The Secretariat extended the scope of the *Self-Assessment of Regulatory Infrastructure for Safety (SARIS)* and published the SARIS Guidelines in March 2014. The Guidelines describe the SARIS methodology and can be used by all regulatory bodies for self-assessment of their national safety framework in accordance with the relevant IAEA safety standards.

[22] The Management System for Facilities and Activities (IAEA Safety Standards Series No. GS-R-3)

103. In addition, the following documents relevant to Action 4 have also been published:

- *Managing Regulatory Body Competence (*Safety Reports Series No. 79, Vienna, 2013);
- *Development of a Regulatory Inspection Programme for a New Nuclear Power Plant Project (*Safety Reports Series No. 81, Vienna 2014)*;*
- *Methodology for the Systematic Assessment of the Regulatory Competence Needs (SARCoN) for Regulatory Bodies of Nuclear Installations (*IAEA-TECDOC-1757, Vienna, 2015);
- *Regulatory Oversight of Safety Culture in Nuclear Installations (*IAEA-TECDOC-1707, VIENNA, 2013);
- *Integrated Review of Infrastructure for Safety (IRIS) Guidelines 2014 Edition (*Services Series 28, Vienna, 2014); and
- *Integrated Regulatory Review Service (IRRS) Guidelines for the Preparation and Conduct of IRRS Missions (*Services Series 23, Vienna, 2013).

104. The reports of the Contracting Parties to the CNS and the information shared by Member States at IEMs and at other fora have shown the efforts undertaken in response to the Action Plan to strengthen the effectiveness of national regulatory bodies. The Secretariat continued to support Member States in strengthening the effectiveness of national regulatory bodies.

FUTURE ACTIVITIES

105. The activities carried out in response to Action 4 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue to enhance the IRRS peer review service;
- Continue to support Member States to strengthen the effectiveness of national regulatory bodies by conducting training and workshops;
- Continue to encourage Member States to host IRRS peer reviews and provide a summary of results on the IAEA website;
- Prepare a report on the results of the national reviews of regulatory bodies; and
- Continue to encourage Member States to host IRRS missions on a regular basis, emphasizing the importance of follow-up missions.

OPERATING ORGANIZATIONS

ACTION 5: *Strengthen the effectiveness of operating organizations with respect to nuclear safety*

GOALS

Strengthening the effectiveness of operating organizations

106. 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.

107. Each Member State with an NPP is encouraged to voluntarily host at least one IAEA OSART mission during the three years from the adoption of the Action Plan, with the initial focus on older NPPs. Thereafter, OSART missions to be voluntarily hosted on a regular basis.

Strengthen cooperation with WANO and other organizations

108. The Secretariat is required to strengthen cooperation with the World Association of Nuclear Operators (WANO) by amending the existing Memorandum of Understanding (MoU) 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.

BACKGROUND

109. The IAEA Fundamental Safety Principles 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 an NPP is ensured by means of proper site selection, design, construction and commissioning, an operating organization ensures that a high level of safety is achieved through the effective management and control of NPP operational activities.

110. During the period covered in this report, the Secretariat continued to support Member States in issues that may affect the safe operation of NPPs. This support includes facilitating review and discussion of different approached to operating NPPs, publishing reports on ageing management of NPPs and human and organizational factors in nuclear safety and the conduct of OSART missions. The Secretariat continued its efforts to cooperate with national and international organizations with the objective of strengthening the effectiveness of operating organizations.

ACHIEVEMENTS

111. In September 2014, during the 58th regular session of the General Conference, the Secretariat organized and conducted the fourth Nuclear Operator Organizations Cooperation Forum which was attended by 75 experts from 17 Member States and two international organizations. The objective of the Forum was to identify and share experiences, relevant factors and methods influencing safety during the construction of an NPP. The experts emphasized the need for a continuous quality assurance process throughout the construction of an NPP and a strong safety culture. Experts from Argentina, China, France and the United States of America provided their experiences on the construction of NPPs and the means for achieving effective management of safety during construction.

112. The Secretariat organized and conducted a national workshop in the Russian Federation in September-October 2014 to discuss the qualification of equipment that may be subjected to the harsh environmental conditions that may arise during design basis accidents (DBA's), beyond design basis

accidents (BDBA's) and seismic events. The workshop was attended by more than 45 participants from the Russian Federation. The workshop covered the approaches to preserving the qualification of equipment important to safety during the lifetime of an NPP, as well as experience with upgrading equipment at older NPPs to meet current safety standards. The outcome of the workshop will be an IAEA Technical Report that summarizes the assessment methodologies available for environmental conditions that may be encountered during severe accidents.

113. In October 2014, the Secretariat organized and conducted a Technical Meeting on Flexible (Non-Baseload) Operation for Load Following and Frequency Control in New NPPs, in Erlangen, Germany. The meeting was attended by 30 experts from 12 Member States and 2 International Organisations. The objective of the meeting was to establish a common understanding of all the relevant aspects of flexible design and operation of NPPs with a focus on frequency control and load following. The meeting provided participants with guidance on implementation and decision making related to flexible NPP operation in Member States that are planning and/or building new NPPs.

114. The Secretariat organized and conducted a workshop on Leadership and Safety Culture for Senior Managers in November 2014 in Vienna, Austria. The workshop was attended by 30 experts from 23 Member States with the objective of providing a forum for senior managers to share experience and improve understanding on safety culture and its continuous improvement. The workshop dealt with the concepts of leadership, management and culture for safety and the approaches to develop senior managers' competencies and skills in these areas. In December 2014, the Secretariat organised a Technical Meeting in Vienna, Austria, to share experiences and lessons learned from the application of different management system standards in the nuclear industry. The meeting was attended by 53 participants from 24 Member States and four International Organizations. The objective of the meeting was for the experts to exchange experience related to the challenges in implementing the requirements[23] together with the different standards that may apply in their respective organizations, and to discuss practical solutions to overcome these challenges.

115. The Secretariat organized and conducted a Technical Meeting in Vienna, Austria, in December 2014 on Foreign Material Management to improve the performance of NPPs, which was attended by 17 experts from 12 Member States. Foreign material management for NPPs is essential during both the construction and operation stages, as well as during major plant modifications, refuelling outages, or maintenance. Important NPP systems can be susceptible to foreign material intrusion while being built, transported, stored, installed, serviced, repaired, or inspected. The objective of the meeting was to establish a common understanding of all relevant aspects of foreign material management (FMM) and to introduce guidance developed by the Secretariat on the essential elements and implementation of FMM. The development of guidance was considered important by the experts given that foreign material intrusion events can have a significant impact on safety margins at NPPs.

116. In January 2015, the Secretariat organized and conducted a national workshop on Safety Culture for Senior Management at the Laguna Verde NPP in Mexico. The workshop was attended by 15 participants from Mexico, with the objective of providing an introduction to safety culture and safety culture self- assessment process and methods. The workshop provided the Laguna Verde NPP senior management with the necessary skills and understanding to enable continuous improvement of safety culture in their organization.

[23] The Management System for Facilities and Activities (IAEA Safety Standards No. GS-R-3)

117. In March 2015, the Secretariat organized and conducted a Technical Meeting in Vienna, Austria on Education and Training using E-learning Tools. Forty participants from 28 Member States attended the meeting with the objective of presenting feedback on the Secretariats e-learning materials, as well as exploring Member States' future needs in the area of e-learning and distance learning. The participants considered that the education and training materials developed by the Secretariat were useful and had an appropriate content. The participants made some recommendations for further improvements regarding the technical aspects of the e-learning modules.

118. The Secretariat organized and conducted a Technical Meeting in Espoo, Finland, in May 2015 on the Approaches to Economic Assessment of Plant Life Management for Long Term Operation (LTO) of NPPs. The meeting was attended by 31 experts from 16 Member States. The experts discussed the operating experience and lessons learned in relation to technical and economic aspects which have an impact on the LTO of NPPs. The meeting also facilitated an exchange of views on the scope of assessments and studies carried out in specific Member States to support the national decision-making process regarding LTO.

119. Two new publications were introduced to the Nuclear Energy Series of documents. A publication entitled *Accident Monitoring Systems for Nuclear Power Plants*[24] (IAEA Nuclear Energy Series No. NP-T-3.16, Vienna 2015) which addresses the need for a re-evaluation of instrumentation provided for accident monitoring at NPPs, and a publication entitled *Plant Life Management Models for Long Term Operation of Nuclear Power Plants*[25] (IAEA Nuclear Energy Series No. NP-T-3.18, Vienna 2015), which contains information related to the licensing practices for LTO in several Member States. The latter publication describes various plant life management models used to obtain LTO authorization and the associated lessons learned.

120. The Secretariat organized and conducted five SALTO workshops in the reporting period:

- Czech Republic in August 2014;
- Sweden in October 2014;
- South Africa in November 2014 and April 2015; and
- Mexico in June 2015.

121. The Secretariat organized and conducted an international conference on Operational Safety in Vienna, Austria in June 2015 attended by 190 experts from 44 Member States and five international organizations. The objective of the conference was to review the progress of operational safety improvements introduced in the light of the Fukushima Daiichi accident and to foster the exchange of information on operational safety performance and operating experience at NPPs. The conference highlighted the following issues important to operational safety at NPPs:

- The important role of operational safety peer reviews for confirming the commitment to safety improvements and for promoting the application of IAEA safety standards;
- The need for operating organizations to be receptive to constructive criticism such as through the peer reviews, in order to promote continuous improvement;
- The need for further development of the IAEA safety standards in order to continuously reflect the state of the art in operational safety;

[24] http://www-pub.iaea.org/MTCD/publications/PDF/Pub1676_web.pdf
[25] http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1655_web.pdf

- The importance of operational experience feedback and periodic safety reviews;
- The importance of safety culture and leadership for continuous improvements to safety;
- The responsibility of corporate management for safety improvements throughout the lifetime of an NPP; and
- The adequate management of LTO for NPPs, including ageing management, and any additional R&D needed to define the limiting factors for plant life extension.

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

122. The following paragraphs provide a summary of the major achievements from the implementation of activities under Action 5 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

123. Contracting Parties to the CNS reported on the importance given to the improvement of management systems in operating organizations. Human factors and safety culture in operating organizations is an area of increased focus by many Contracting Parties. Activities for continuously fostering a strong safety culture have also been reported.

124. The importance of establishing a strong safety culture was a recurrent theme in many conferences and meetings organized and conducted by the Secretariat including:

- A Technical Meeting in Vienna, Austria in June 2012 on Managing the Unexpected from the Perspective of the Interaction between Individuals, Technology and Organization;
- A Technical Meeting in South Africa in November 2012 on Safety Culture during Preoperational Phases of an NPP Programme; and
- An IEM in Vienna, Austria in April 2014 on Human and Organizational Factors in Nuclear Safety in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant (IEM 5).

125. The fifth IEM shared knowledge and experience gained in the light of the Fukushima Daiichi accident concerning human and organizational factors, particularly the interactions between individuals, technology and organizations (ITO) and their influence on nuclear safety. The IEM highlighted the need to complement the traditional approach to safety with an ITO systemic approach. It also emphasized that the process of learning from successful normal operations can be used to enhance resilient capabilities in an organization to be prepared for the unexpected. The importance of adequately addressing the interactions between individuals, technology and organizations and their influence on nuclear safety was recognised and highlighted. Adopting a holistic approach towards nuclear safety allows stakeholders to consider all factors that may have an impact on the vulnerability of an NPP, and the advantage of capitalizing on understanding the strengths as well as the vulnerabilities in all factors influencing nuclear safety.

126. The *IAEA Report on Human and Organizational Factors in Nuclear Safety in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant*[26] identifies key areas where human and organizational factors in nuclear safety can be strengthened and highlights best practices for achieving an integrated approach for nuclear safety. The report provides an overview of the concept of systemic safety, the interactions between individuals, technology and organizations and their influence on nuclear safety. The report highlights the need for nuclear operators and regulatory bodies to better

[26] https://www.iaea.org/sites/default/files/humanfactors0914.pdf

understand an integrated, or systemic, approach to safety that takes into account the interaction between all the individual, technical and organizational factors that may affect safety.

127. The Secretariat reviewed the different national practices in the area of NPP ageing management and the preparation for long term operation. This review was published in a TECDOC on *Approaches to Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)* (IAEA TECDOC Series No. 1736). The TECDOC provides a technical basis and practical guidance on the management of the ageing of mechanical, electrical and instrumentation and control components and civil structures of NPPs important to safety. The report summarises the approach taken by those Member States participating in the IGALL programme including the national regulatory requirements for ageing management and safe long term operation of NPPs, the management of physical ageing of NPPs and the review of ageing management for long term operation.

128. The Secretariat organized and conducted a number of technical meetings and workshops, addressing the need to strengthen the effectiveness of operating organizations. Issues discussed were NPP design, efficient and reliable NPP operation, instrumentation and control, fuel and reactivity management; the impact of flexible operations on ageing NPP structures, systems and components important to safety; the adaptation of systems to changing environments while ensuring safe management; long term operation as well as modernization; and the interaction of individuals, technology and organizations.

129. The Secretariat and WANO signed a Memorandum of Understanding (MoU) at the 56th regular session of the General Conference. As a result of this MoU, the two organizations enhanced their cooperation and adopted a more coordinated approach to their respective activities. For example, coordination of the timing of the Secretariats' OSART missions and WANO peer reviews, as well as arranging regular meetings of WANO and the Secretariat to discuss major safety-related activities. Both organizations are cooperating on their respective performance indicator programmes and working towards exchanging information and support in the event of an accident at an NPP or nuclear fuel cycle facility. In addition, the Secretariat and WANO are supporting each other's peer review teams, when appropriate, and regularly exchanging information relating to operating experience.

130. The following documents relevant to Action 5 have been published:

- *SALTO Peer Review Guidelines: Guidelines for Peer Review of Safety Aspects of Long Term Operation of Nuclear Power Plants* (IAEA Services Series No. 26, 2014);
- *Approaches to Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL) Final Report* (IAEA TECDOC Series No. 1736 2014);
- *SALTO Peer Review Guidelines: Guidelines for Peer Review of Safety Aspects of Long Term Operation of Nuclear Power Plants* (IAEA Services Series No. 26, 2014);
- *Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)* (Safety Reports Series No. 82, 2015); and
- *Safety Culture in Pre-operational Phases of Nuclear Power Plant Projects (*Safety Reports Series No. 74, 2012).

131. The reports of the Contracting Parties to the CNS and the information shared by Member States at the IEMs and other fora have presented the efforts undertaken in response to the Action Plan to strengthen the effectiveness of operating organizations. The Secretariat has supported Member

States in these efforts through the OSART peer review service, preparing relevant guidance and conducting relevant conferences, meetings, workshops and training activities.

FUTURE ACTIVITIES

132. The activities carried out in response to Action 5 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue to encourage Member States to regularly host OSART missions and emphasize the importance of follow-up missions;
- Continue to incorporate lessons learned into the OSART peer review service;
- Continue to strengthen its capability to provide support and assistance to Member States for strengthening the effectiveness of operating organizations;
- Continue to encourage Member States to conduct SALTO reviews addressing the IAEA safety standards on age management and long term operation; and
- Continue to promote Member States participation in the Nuclear Power Industry Cooperation Forum organized during the IAEA General Conference.

IAEA SAFETY STANDARDS

ACTION 6: *Review and strengthen IAEA Safety Standards and improve their implementation*

GOALS

Review and revise the relevant IAEA Safety Standards

133. The Secretariat and the Commission on Safety Standards (CSS) 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.

BACKGROUND

134. The status of the IAEA safety standards is derived from the IAEA Statute which authorizes the Agency "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 […]"[27].

135. 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 IAEA 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 from ionizing radiation.

136. During the period covered by this annual report, the Secretariat continued to strengthen the IAEA safety standards. The proposed revisions to the safety requirements relevant to nuclear and spent fuel safety have been reviewed by Member States and have been submitted to the Safety

[27] Article III.A.6. The Statute of the IAEA. http://www.iaea.org/About/statute.html

Standards Committees for approval. These safety requirements were presented to the Board of Governors for final approval at the March 2015 meeting.

ACHIEVEMENTS

137. The Secretariat completed the systematic review of the relevant Safety Requirements to take account of the lessons learned from the Fukushima Daiichi accident. Proposed draft amendments to the Safety Requirements applicable to NPPs and the storage of spent nuclear fuel along with the proposed revision to the Safety Requirements for emergency preparedness and response were endorsed by the CSS and submitted to the Board of Governors. In March 2015, the Board of Governors approved the following six Safety Requirements to be established as Agency safety standards:

- *Governmental, Legal and Regulatory Framework for Safety* (IAEA Safety Standards Series No. GSR Part 1 (Rev. 1));
- *Site Evaluation for Nuclear Installations* (IAEA Safety Standards Series No. NS-R-3 (Rev. 1));
- *Safety of Nuclear Power Plants: Design* (IAEA Safety Standards Series No. SSR-2/1 (Rev. 1));
- *Safety of Nuclear Power Plants: Commissioning and Operation* (IAEA Safety Standards Series No. SSR-2/2 (Rev. 1));
- *Safety Assessment for Facilities and Activities* (IAEA Safety Standards Series No. GSR Part 4 (Rev. 1)); and
- *Preparedness and Response for a Nuclear or Radiological Emergency* (IAEA Safety Standards Series No. GSR Part 7).

138. The amendments to GSR Part 1 included revisions related to:

- The prime responsibility for safety;
- The independence of the regulatory body;
- Emergency preparedness and response;
- International obligations and arrangements for international cooperation;
- Liaison between the regulatory body and authorized parties;
- Review and assessment of information relevant to safety; and
- Communication and consultation with interested parties.

139. The amendments to NS-R-3 included revisions related to:

- Consideration of potential combination of external events;
- Consideration of multiple facilities at one NPP site; and
- The monitoring of hazards and their periodic review.

140. The amendments to SSR-2/1 included revisions related to:

- Strengthening the prevention of unacceptable radiological consequences to the public and the environment;
- Strengthening severe accident mitigation measures;
- Prevention of the occurrence of severe accidents through strengthening the plant design;
- The independence of level four of defence-in-depth; and
- Consideration of external hazards and sufficient safety margins.

141. The amendments to SSR-2/2 included revisions related to:

- Periodic safety reviews;
- Emergency preparedness;
- Accident management; and
- Feedback from operating experience.

142. The amendments to GSR Part 4 addressed:

- The need for sufficient safety margins to withstand external events and avoid cliff-edge effects;
- The need for assessment of multiple facilities/activities at one NPP site including instances where resources are shared; and
- The need to take account of human factors under accident conditions.

143. The review and revision of the relevant Safety Guides are being performed in accordance with a prioritization process established by the Safety Standards Committees and the CSS. This prioritization process takes into account the request sent to the CSS by the Director General as a follow-up to the Vienna Declaration on Nuclear Safety adopted by the Contracting Parties to the CNS at the Diplomatic Conference on the CNS held in Vienna, Austria, in February 2015.

144. Work on the revision of the following Safety Guides is in progress:

- *A System for the Feedback of Experience from Events in Nuclear Installations* (IAEA Safety Standards Series No NS-G-2.11, Vienna 2006);
- *Design of the Reactor Coolant System and Associated Systems in Nuclear Power Plants* (IAEA Safety Standards Series No NS-G-1.9, Vienna 2004);
- *Design of Reactor Containment Systems for Nuclear Power Plants,* (IAEA Safety Standards Series No NS-G-1.10, Vienna 2004);
- *Severe Accident Management Programme for Nuclear Power Plants*, (IAEA Safety Standards Series No NS-G-2.15, Vienna 2009);
- *Ageing Management for Nuclear Power Plants,* (IAEA Safety Standards Series No NS-G-2.12, Vienna 2009);
- *Design of Fuel Handling and Storage Systems for Nuclear Power Plants, (*IAEA Safety Standards Series No NS-G-1.4, Vienna 2003);

- *Storage of Spent Nuclear Fuel,* (IAEA Safety Standards Series No SSG-15, Vienna 2012);
- *Seismic Design and Qualification for Nuclear Power Plants,* (IAEA Safety Standards Series No NS-G-1.6, Vienna 2003); and
- *Deterministic Safety Analysis for Nuclear Power Plants* (IAEA Safety Standards Series No SSG-2, Vienna 2009).

145. Additionally the review of the following Safety Guides was initiated by the CSS to determine whether they will also need to be revised:

- *Periodic Safety Review for Nuclear Power Plants* (IAEA Safety Standards Series No SSG-25, Vienna 2013);
- *External Events Excluding Earthquakes in the Design of Nuclear Power Plants* (IAEA Safety Standards Series No NS-G-1.5, Vienna 2003);
- *Protection against Internal Fires and Explosions in the Design of Nuclear Power Plants* (IAEA Safety Standards Series No NS-G-1.7, Vienna 2004);
- *Protection against Internal Hazards other than Fires and Explosions in the Design of Nuclear Power Plants* (IAEA Safety Standards Series No NS-G-1.11, Vienna 2004);
- *Modifications to Nuclear Power Plants* (IAEA Safety Standards Series No NS-G-2.3, Vienna 2001); and
- *Maintenance, Surveillance and In-service Inspection in Nuclear Power Plants* (IAEA Safety Standards Series No NS-G-2.6, Vienna 2002).

146. In June 2015, the Board of Governors was informed[28] of the establishment of the new Emergency Preparedness and Response Standards Committee (EPReSC) under the CSS which will ensure the involvement of a sufficient number of senior EPR subject matter experts in the process of establishing Agency safety standards and will be open to all Member States.

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

147. The following paragraphs provide a summary of the major achievements from the implementation of activities under Action 6 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

148. Contracting Parties to the CNS reported on the use of the IAEA safety standards as the basis for their national regulations and requirements. The safety standards highlighted by the Contracting Parties were those for management systems, safety assessment, site evaluation, design, construction and decommissioning. Most Contracting Parties reported on their participation in the formulation of the IAEA safety standards.

149. Following the Fukushima Daiichi accident, 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 from the Fukushima Daiichi accident. The review focused, as a priority, on the set of Safety Requirements applicable to

[28] GOV/INF/2015/9 (20 May 2015)

NPPs and to the storage of spent fuel. This included all the General Safety Requirements and the Specific Safety Requirements that relate to site evaluation for nuclear installations, and design, commissioning and operation of NPPs.

150. The review found the overarching Safety Requirements to be adequate. No gaps or deficiencies were identified in the 450 overarching requirements reviewed. Nevertheless, it was proposed that 20 of the existing 'associated requirements' would be strengthened and a further 31 new associated requirements would be added. The areas for further improvement or guidance included provisions to cope with situations involving the loss of off-site power or the ultimate heat sink, consideration of properly identified potential external hazards, and the need to ensure that information on safety parameters remains available under severe accident conditions.

151. The Secretariat has completed the review and revision of the relevant IAEA Safety Requirements. The utilization of the IAEA safety standards by Member States has been reported by the Contracting Parties to the CNS and shared at the IEMs and other fora.

FUTURE ACTIVITIES

152. The activities carried out in response to Action 6 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue reviewing and revising as necessary, the relevant IAEA safety standards using the existing process;
- Finalize the revision of Safety Requirements and Safety Guides in light of the lessons learned from the Fukushima Daiichi accident; and
- Continue providing support and assistance, upon request, in the application and implementation of the IAEA safety standards.

INTERNATIONAL LEGAL FRAMEWORK

ACTION 7: ***Improve the effectiveness of the international legal framework***

GOALS

Enhance the effective implementation of the Conventions

153. States Parties are requested to explore mechanisms to enhance the effective implementation of the CNS, 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

154. In addition, States Parties are to consider proposals that may be made to amend the CNS and the Convention on the Early Notification of a Nuclear Accident. Member States to join and effectively implement these Conventions.

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

Establishing a global nuclear liability regime

156. 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.

BACKGROUND

157. 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.

158. The CNS aims 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 NPPs under a Contracting Parties 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 NPP. Parties to the CNS are required to submit for peer review a report on the measures they have taken to implement each of the obligations of the Convention.

159. One of the objectives of the Joint Convention is 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 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 described above.

160. 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 on health, property and the environment in such cases.

161. In the area of 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 regimes follow the same basic principles.

162. 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.

ACHIEVEMENTS

163. Following the decision taken by the Contracting Parties to the Convention on Nuclear Safety (CNS) during their Sixth Review Meeting held in March/April 2014, the IAEA Director General convened a Diplomatic Conference, to consider a proposal by Switzerland to amend Article 18 of the Convention addressing the design and the construction of both existing and new nuclear power plants (the Swiss Proposal). A consultation meeting open to all Contracting Parties was held in October 2014 to exchange views on the Swiss Proposal and prepare for the adoption of the rules of procedure for the Diplomatic Conference.

164. In addition, five meetings of an Informal Working Group of Contracting Parties to the CNS (IWG) were held in Vienna to facilitate preparations for the Conference (October 2014, December 2014, January 2015, and two in February 2015).

165. The Diplomatic Conference, organised on 9 February 2015, was attended by 71 Contracting Parties. The Contracting Parties thoroughly considered the Swiss proposal and concluded that it would not be possible to reach consensus on the proposed amendment. Instead, in order to reach the same objective, Contracting Parties unanimously adopted the "Vienna Declaration on Nuclear Safety" including principles for the implementation of the Convention to prevent accidents and mitigate radiological consequences should they occur:

- New NPPs are to be designed, sited, and constructed, consistent with the objective of preventing accidents in the commissioning and operation and, should an accident occur, mitigating possible releases of radionuclides causing long-term off site contamination and avoiding early radioactive releases or radioactive releases large enough to require long-term protective measures and actions;
- Comprehensive and systematic safety assessments are to be carried out periodically and regularly for existing installations throughout their lifetime in order to identify safety improvements that are oriented to meet the above objective. Reasonably practicable or achievable safety improvements are to be implemented in a timely manner;
- National requirements and regulations for addressing this objective throughout the lifetime of nuclear power plants are to take into account the relevant IAEA safety standards and, as appropriate, other good practices as identified inter alia in the Review Meetings of the CNS.

166. This Declaration is part of an ongoing international effort to strengthen nuclear safety in the wake of the Fukushima Daiichi accident.

167. The Secretariat provided support to the Fifth Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management held in May 2015. The Contracting Parties discussed in particular the progress made since the Fourth Review Meeting with regard to the management of disused sealed sources, the safety implications of very long storage periods and delayed disposal of spent fuel and radioactive waste,

and international cooperation in finding solutions for the long term management and disposal of different types of radioactive waste and/or spent fuel. They also identified some overarching issues, including: staffing, staff development, funding and other human resources areas; maintaining and increasing public involvement and engagement on waste management to provide public confidence and acceptance; management of disused sealed sources; developing and implementing a holistic and sustainable management strategy for radioactive waste and spent fuel at an early stage.

168. A Topical Session on "Progress on Lessons Learnt from the Fukushima Daiichi Accident" was also organised during the Review Meeting, focusing on spent fuel and radioactive waste management but also on related issues such as the relevance of the Fukushima Daiichi accident for non-nuclear power Contracting Parties, the management of large volumes of accident waste and lessons learnt from decontamination following a radiological accident.

169. At the 5th Review Meeting, the Contracting Parties decided on a number of actions with a view to, inter alia, encourage adherence to the Joint Convention, encourage active participation in the peer review process, and to increase the effectiveness of the review process for Contracting Parties without a nuclear power programme. An Extraordinary Meeting will be held in 2017 prior to the Organisational Meeting for the Sixth Review Meeting to address some of these issues. Also, following a decision taken by CNS Contracting Parties at their 6th Review Meeting two consultancy meetings consisting of a small group of senior experts were organised in Vienna in March and June 2015 to , review INFCIRC/572, Part III.C "Reporting article by article" taking into account the relevant IAEA Safety Standards, in particular Safety Fundamentals and Safety Requirements. The group of experts produced a template which refers to the relevant IAEA Safety Requirements to support the drafting of National Reports in compliance with the CNS guidelines INFCIRC/572. This template aims, inter alia, to improve the effectiveness of a "self-assessment" of each Contracting Party when writing their national report; and help in the cross-cutting reading of the national reports.

170. The fourth IAEA Treaty Event took place during the 58th regular session of the IAEA General Conference, and provided Member States with a further opportunity to deposit their instruments of ratification, acceptance or approval of, or accession to, the treaties deposited with the Director General, notably those related to nuclear safety, security and civil liability for nuclear damage. The special focus of this Treaty Event was the 2005 Amendment to the Convention on the Physical Protection of Nuclear Material (CPPNM). During the event, Singapore deposited its instruments to join the Convention on the Physical Protection of Nuclear Material (CPPNM) and its 2005 Amendment. The Dominican Republic and Ireland likewise deposited their respective instruments to join the 2005 Amendment to the CPPNM. Venezuela also deposited its instrument to join the Convention on Early Notification of a Nuclear Accident.

171. In order to further encourage Member States to join and effectively implement the Conventions, the Secretariat has continued to undertake activities to highlight their importance. An awareness mission was dispatched to Mongolia in June 2014, aimed at raising the awareness of national policymakers about the importance of adhering to relevant international legal instruments adopted under the Agency's auspices.

172. The Secretariat also continued to support Member States under its legislative assistance programme, in particular by assisting 20 Member States in reviewing their draft national nuclear legislation and by training scientific visitors. Legislative assistance missions were also dispatched to Costa Rica in May 2015 and Guatemala in June 2015.

173. The fourth session of the Nuclear Law Institute was organized in Baden, Austria, in October 2014. This comprehensive two-week course is designed to help meet the increasing demand by IAEA Member States for legislative assistance and to enable participants to acquire a solid understanding of

all aspects of nuclear law, as well as to draft, amend or review their national nuclear legislation. Sixty representatives from IAEA Member States participated. Using modern teaching methods based on interaction and practice, all areas of nuclear law were comprehensively addressed.

174. A workshop on nuclear law for Member States in the Latin American region was organized in Santo Domingo, Dominican Republic in December 2014. Twenty seven participants from 16 Member States attended the workshop. The workshop created a forum for an exchange of views on topics relating to the international legal instruments and allowed for the planning of future legislative assistance activities in participating Member States based on an assessment of their needs.

175. The Secretariat also organized a workshop on nuclear law in Vienna in June 2015. The workshop, which was attended by 67 participants from 43 Member States, provided diplomats and technical experts from Permanent Missions with a broad understanding of all aspects of nuclear law. It included presentations on the key international legal instruments relating to nuclear safety, nuclear security, safeguards and civil liability for nuclear damage, as well as an overview of the IAEA's legislative assistance programme.

176. The Secretariat continued enhancing its outreach capabilities through, inter alia, the development of new online training material and a third volume of the Handbook on Nuclear Law, which will cover various areas of nuclear law beyond the regulatory matters covered in the previous two volumes.

177. In November 2014, the Board of Governors adopted a resolution establishing new maximum limits for the exclusion of small quantities of nuclear material from the application of the Vienna Conventions on nuclear liability in line with the latest edition (2012) of the Agency's Regulations for the Safe Transport of Radioactive Material.

178. In the area of civil liability for nuclear damage, the Secretariat organized the Fourth Workshop on Civil Liability for Nuclear Damage in Vienna in April 2015. The workshop, which was attended by 65 participants from 38 Member States, provided participants with an introduction to the subject, and included a roundtable discussion on topical issues of nuclear liability, moderated by legal experts from the IAEA and the International Expert Group on Nuclear Liability (INLEX). It covered, among others, the Convention on Supplementary Compensation for Nuclear Damage, civil liability for nuclear damage from the perspective of coastal States, the role of insurance, and the IAEA's legislative assistance programme available to Member States.

179. The 15th Meeting of INLEX was held in Vienna in April 2015. The Group was briefed, inter alia, about recent developments in nuclear law in the various Member States, and discussed whether there is a need to establish a special liability regime covering radioactive sources; the implications of the entry into force of the Convention on Supplementary Compensation for Nuclear Damage; the proposal to revise the paper adopted in 2013 on "Benefits of joining the international nuclear liability regime and corresponding key messages"; the revision of the model provisions on nuclear liability in the Handbook on Nuclear Law Vol. II; and IAEA/INLEX outreach activities.

180. A Sub-regional Workshop on Civil Liability for Nuclear Damage was held in Panama in June 2015 which provided participants with information on the existing international nuclear liability regime and advised them on the development of national implementing legislation. The workshop was attended by 31 participants from 14 States.

181. In addition, a joint IAEA/INLEX mission was held in Mexico in June 2015 in order to raise awareness among policy-makers on the international legal instruments relevant for achieving a global

nuclear liability regime. Preparations are also underway for the conduct of similar missions in interested Member States in the following months.

182. During the period covered by this report, Japan accepted and Montenegro acceded to the Convention on Supplementary Compensation for Nuclear Damage. With the acceptance by Japan, the Convention entered into force on 15 April 2015[29].

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

183. The following provides a summary of some of the major achievements from the implementation of activities under Action 7 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

184. To encourage Member States to join and effectively implement the Conventions, the Secretariat continued to undertake activities to highlight their importance. The Secretariat carried out dedicated awareness missions to Member States to encourage, inform and raise awareness of national policymakers about the importance of adhering to international legal instruments adopted under IAEA auspices. Further, since 2011, the Secretariat has been organizing an annual Treaty Event at the side lines of the General Conference in order to provide Member States with a further opportunity to deposit their instruments of ratification, acceptance or approval of, or accession to, the treaties deposited with the Director General.

185. Since the adoption of the Action Plan in September 2011:

- Four Member States deposited their respective instruments to join the Convention on Nuclear Safety;
- Nine 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;
- Nine Member States deposited their respective instruments to join the Convention on Early Notification of a Nuclear Accident;
- Seven Member States deposited their respective instruments to join the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

186. The Secretariat actively supported the States Parties to the various conventions in their efforts to review the processes and procedures to strengthen the effective implementation of these Conventions. The Secretariat provided support to:

- 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 in April 2012;
- 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;
- The Second Extraordinary Meeting of the Contracting Parties to the CNS in August 2012;

[29] As of 16 July 2015, the Convention will count seven Contracting Parties, namely Argentina, Japan, Montenegro, Morocco, Romania, United Arab Emirates and United States of America.

- The Sixth Review Meeting of the Contracting Parties to the CNS held in March-April 2014;
- The Second Extraordinary Meeting of the Contracting Parties to the Joint Convention, in May 2014;
- The CNS Diplomatic Conference in February 2015;
- The Fifth Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management in May 2015.

187. At the Second Extraordinary Meeting and at the Sixth Review Meeting, the CNS Contracting Parties agreed by consensus on a number of changes to the CNS Rules of Procedure and Guidelines to provide clearer guidance on actions to be taken by the Contracting Parties to meet the objectives of the Convention and enhance preparation of National Reports. These changes also provide improvements to the review process, enhancement of international cooperation and more transparency towards the public. At the CNS Sixth Review Meeting, the Contracting Parties also decided, by a two-thirds majority, to submit a proposal by Switzerland to amend Article 18 of the Convention to a Diplomatic Conference.

188. During the CNS Diplomatic Conference convened by the Director General at IAEA Headquarters in Vienna on 9 February 2015, Contracting Parties unanimously adopted the "Vienna Declaration on Nuclear Safety" which includes principles for the implementation of the objective of the Convention to prevent accidents and mitigate radiological consequences should they occur.

189. During the Second Extraordinary Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, the Contracting Parties agreed on a number of changes to the Joint Convention Rules of Procedure and Guidelines to improve the implementation of the Convention and of its review mechanisms. Also, during the Fifth Review Meeting, the Joint Convention Contracting Parties decided on a number of actions with a view to, inter alia, encourage adherence to the Joint Convention, for active participation in the peer review process, and increase the effectiveness of the review process for Contracting Parties without a nuclear power programme.

190. The Secretariat has continued to support Member States under its Legislative Assistance Programme by reviewing and providing advice in drafting national nuclear legislation to Member States and by providing training in nuclear law. Since 2011, the Secretariat has been organizing the annual session of the Nuclear Law Institute (in November-December 2011, September-October 2012, September-October 2013 and October 2014). This comprehensive two-week course, which is held every year, is helping to meet the increasing demand by Member States for legislative assistance and to enable participants to acquire a solid understanding of all aspects of nuclear law, as well as to draft, amend or review their national nuclear legislation. Using modern teaching methods based on interaction and practice, all areas of nuclear law are comprehensively addressed.

191. In the area of civil liability for nuclear damage, the International Expert Group on Nuclear Liability (INLEX) held regular meetings in Vienna, in May-Jun 2012, May 2013, May 2014 and April 2015. 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; making presentations on nuclear liability at various Agency and other meetings during 2012; and organizing a workshop on nuclear liability[30] at IAEA Headquarters for diplomats and experts from Member States. INLEX also held preliminary discussions on specific recommendations to facilitate the achievement of a global nuclear liability regime. At the 12th regular meeting of INLEX, which was held at IAEA Headquarters from 30 May to 1 June 2012, INLEX further discussed and finalized its recommendations [31] on how to facilitate the achievement of a global nuclear liability regime, as requested by the Action Plan.

192. As regards outreach activities, IAEA/INLEX missions were conducted to Member States in order to raise awareness of the international legal instruments relevant for achieving a global nuclear liability regime. In addition, two sub-regional workshops on civil liability for nuclear damage were held in Vietnam (March 2014) and Panama (June 2015).

193. Since the adoption of the Action Plan in September 2011:

- Two Member States deposited their respective instruments to join the Vienna Convention on Civil Liability for Nuclear Damage;
- Three Member States deposited their respective instruments to join the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage;
- Two Member States deposited their respective instruments to join the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention;
- Three Member States signed, and three Member States deposited their respective instruments to join, the Convention on Supplementary Compensation for Nuclear Damage.

194. The Convention on Supplementary Compensation for Nuclear Damage entered into force on 15 April 2015, following Japan's signature and deposit of an instrument of acceptance of the Convention on 15 January 2015.

195. Finally, in November 2014, the Board of Governors adopted a resolution establishing new maximum limits for the exclusion of small quantities of nuclear material from the application of the Vienna Conventions on nuclear liability in line with the latest edition (2012) of the Agency's Regulations for the Safe Transport of Radioactive Material.

FUTURE ACTIVITIES

196. The activities carried out in response to Action 7 that will continue as part of the regular activities of the relevant Department include:

- Continue to assist States Parties in their efforts to strengthen the review processes and for the effective implementation of the Conventions;
- Continue to encourage Member States to join and effectively implement the Conventions, by carrying out dedicated awareness missions for policy makers and

[30] Four workshops on civil liability for nuclear damage for diplomats and experts from Member States have been held annually since 2012.
[31] The INLEX Recommendations on how to facilitate the achievement of a global nuclear liability regime, as requested by the IAEA Action Plan on Nuclear Safety, is available on http://ola.iaea.org/ola/documents/ActionPlan.pdf .

organising treaty events to promote adherence to the relevant international legal instruments;

- Continue to provide bilateral legislative assistance, upon request, to support Member States in drafting the required national nuclear legislation;
- Continue to organize and conduct workshops and briefings for Member States on nuclear law, including specific workshops on civil liability for nuclear damage;
- Continue to encourage Member States to give due consideration to adhering to the relevant nuclear liability conventions.

MEMBER STATES PLANNING TO EMBARK ON A NUCLEAR POWER PROGRAMME

ACTION 8: *Facilitate the development of the infrastructure necessary for Member States embarking on a nuclear power programme*

GOALS

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

197. 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)

198. 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 NPP.

BACKGROUND

199. 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.

200. During the period covered by this annual report, the Secretariat continued to support Member States in their activities to develop the infrastructure necessary to support the introduction of a nuclear power programme. The Secretariat organized and conducted a number of regional and national workshops and training events for Member States embarking on a nuclear power programme. The Secretariat developed and made available to Member States a new set of e-learning modules aimed at improving newcomers' understanding of the infrastructure requirements and is developing packages of exemplary material for workshops aimed at strengthening the technical and managerial competences of Member States regulatory body staff.

ACHIEVEMENTS

201. The Secretariat and the newcomer Member States have been applying the concept of an Integrated Work Plan (IWP) for several years. The IWP is designed to translate the milestones[32] of a successful nuclear power programme into an implementation plan customized to meet the needs of the Member State. The IWP is the final product of an extensive technical review and dialogue with the Member State across all infrastructure issues and all related legal, technical, safety and security recommendations/guidelines applicable to each infrastructure issue. Experience with the preparation of IWPs has demonstrated that the integration of efforts of all the relevant IAEA departments is essential for the assessment of the Member States national action plan which is the basis for determining the support by the IAEA. The Secretariat now provides comprehensive guidance on the development of the IWP. The IWP for Belarus, Egypt, Jordan, Kenya, Turkey and the United Arab Emirates have been updated.

202. In August 2014, the Secretariat organized and conducted a consultancy meeting in Vienna, Austria, attended by three experts from three Member States, to evaluate the guidance for INIR Phase 3 Missions. The main objective of an INIR mission in Phase 3 is to assist the national government by providing a final review of the overall nuclear power infrastructure before the commissioning of the first nuclear power plant. The experts recommended that the Phase 3 INIR mission should be offered to newcomer Member States one year before commencing the commissioning of an NPP. A follow-up mission should be performed after commissioning of the NPP but before the start of commercial operation. Guidelines and a methodology for the INIR Phase 3 missions are under development and will cover all the 19 infrastructure issues of the IAEA Milestones approach and will use the results of other relevant IAEA review services.

203. The Secretariat conducted an INIR mission to Jordan in August 2014. The mission found that notable progress has been made in nuclear infrastructure development. An INIR follow-up mission was conducted in Viet Nam in November 2014 to evaluate the activities and progress of Viet Nam in implementing the recommendations and suggestions from the INIR mission conducted in December 2012. In October 2014, the Secretariat supported Morocco in the preparation of a self-evaluation report which is a prerequisite for hosting an INIR mission.

204. The Secretariat organized and conducted a Technical Meeting in December 2014 in Paris and Poitiers, France, on the Roles and Responsibilities of the Future Owner/Operator in New Nuclear Power Programmes. The meeting provided an opportunity for the 27 participants from 15 Member States to exchange information and experience with the objective of identifying and discussing the challenges involved in setting up an operation organization for a new nuclear power programme with regard to its responsibilities in relation to other stakeholders. Among other things, the participants emphasized that leadership for safety must be a focus from the very beginning of a nuclear power programme and highlighted the new operating organization's role in managing interfaces with the other stakeholders.

205. At a side event at the 58th regular session of the General Conference in September 2014 considering Member States' experiences of making the best use of the peer review services to support the development of their national nuclear power infrastructures, representatives from Kenya, Malaysia and Turkey presented the current status and future plans for their nuclear power programmes and emphasized the importance of building a sustainable nuclear power infrastructure. The Secretariat has updated the document *Milestones in the Development of a National Nuclear Infrastructure for*

[32] *Milestones in the Development of a National Infrastructure for Nuclear Power*, (IAEA Nuclear Energy Series No. NG-G-3.1, Vienna 2007)

Nuclear Power (IAEA Nuclear Energy Series, No. NG-G-3.1). The revision takes into account lessons learned from the Fukushima Daiichi accident, the implementation of the Action Plan and the results of past INIR missions. The document has been finalized and is planned for publication by the end of 2015.

206. The Secretariat has also updated the document *Evaluation of the Status of National Nuclear Infrastructure Development*, which is used for the preparation of the self-evaluation reports by Member States and for the conduct of INIR missions. The revision of the Specific Safety Guide SSG-16 *Establishing the Safety Infrastructure for a Nuclear Power Programme*[33], based on the lessons learned identified to date in the regulatory area in light of the Fukushima Daiichi accident, has been initiated.

207. The Secretariat has standardized the process for preparing the Self Evaluation Report (SER) as a preparatory activity for an INIR mission. During this reporting period the Secretariat assisted Kenya, Morocco and Saudi Arabia in understanding the information needs against each of the 19 infrastructure issues in the self-evaluation methodology and reviewed their respective draft SERs.

208. The Secretariat is developing a document entitled *Building a National Position for a New Nuclear Power Programme.* The objective of the document is to provide guidance to Member States on the introduction or reestablishment of a nuclear power programme and supports the achievement of Milestone 1[34]. The document will provide direction to political decision makers, energy experts, and other relevant institutions and stakeholders about the process for establishing a national position when Member States are preparing their national nuclear energy policy. The document will be finalized by the end of 2015.

209. The Annual Technical Meeting on Topical Issues in the Development of Nuclear Power Infrastructure was held in Vienna, Austria in February 2015. Around 90 participants from 34 Member States attended. The participants emphasized the important role of the Secretariat in providing a forum for the exchange of knowledge and experience on nuclear power. The discussions indicated that the Milestones document and the more detailed guides are widely used by all newcomer Member States and have become an international de-facto standard for the development of nuclear power infrastructure. The importance of INIR missions was highlighted in assisting Member States preparation for a nuclear power programme and providing useful recommendations and suggestions for the development of the national action plan.

210. The Secretariat developed and made available to Member States a new set of e-learning modules[35] aimed at improving newcomer Member States understanding of the infrastructure requirements for a nuclear power programme. The Modules are based on the Agency's Milestones approach and other relevant publications. The modules published to date are:

- Implementing a Nuclear Power Programme;
- Developing Human Resource Strategy;
- Stakeholder Involvement;
- Management of a Nuclear power Programme;

[33] Establishing the Safety Infrastructure for a Nuclear Power Programme (IAEA Safety Standards Series No. SSG-16, Vienna 2011)
[34] Milestone 1 - Ready to make a knowledgeable commitment to a nuclear programme.
[35] http://www.iaea.org/NuclearPower/Infrastructure/elearning/

- Construction Management;
- Systematic Approach to Training ;
- Feasibility Study;
- Management Systems;
- Safety Infrastructure;
- Emergency Preparedness and Response; and
- Introduction to Safeguards.

211. The e-learning module for Management of Spent Fuel and Radioactive Waste has been finalized and three new modules are under development, namely, Siting, Legislative Framework, and Pre-Feasibility Study.

212. The Secretariat organized and conducted a workshop in Turkey in May 2015 on the Challenges Faced by Newcomer Countries Regarding the Establishment of an Effective National Safety Infrastructure. The objective of the workshop was to identify challenges and issues faced when establishing a national safety infrastructure, particularly an effective regulatory framework. Senior representatives from Bangladesh, Indonesia, Jordan, Kazakhstan, Kenya, Malaysia, Nigeria, Poland, Turkey and Viet Nam attended the workshop. These representatives provided information on the legal framework, the regulatory framework, leadership and management for safety, human resources development and external support organizations and contractors. The workshop elicited participants' expectations regarding the type of assistance that they may wish to receive from the IAEA in this area. As a result of the workshop, a report was produced and the material presented was uploaded on the RegNet Portal. The participants recommended the workshop should be held on a regular basis.

213. The dedicated Embarking Countries Portal[36] continued to serve as a source of information and knowledge-sharing between the Secretariat and Member States embarking on a nuclear power programme. The portal allows Member States to access results of the Secretariats activities relevant to embarking countries and supports the strengthening of international cooperation.

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

214. The following paragraphs provide a summary of the major achievements from the implementation of activities under Action 8 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

215. Contracting Parties to the CNS planning to embark on a nuclear power programme reported on the importance of the Agency safety standards for the establishment or improvement of regulations and requirements for authorization of a new NPP. These Contracting Parties also reported on the benefits of hosting IAEA INIR missions and other missions that cover the infrastructure development needs for a nuclear power programme.

216. The Secretariat continued supporting Member States embarking on nuclear power programmes in their efforts to acquire the necessary knowledge and expertise and establish an adequate infrastructure. The Secretariat launched a comprehensive catalogue of services in September 2013 designed to support nuclear infrastructure development in Member States. The Catalogue helps

[36] http://gnssn.iaea.org/regnet/embarking/Pages/default.aspx

Member States to identify the assistance needs for the different stages in the development or expansion of a nuclear power programme. The catalogue was updated in April 2014 and is structured according to the 3 phases of the Agency's Milestones approach to infrastructure development and the needs of Member States and is available on the Agency's website[37]. The catalogue is aimed at those bodies that are typically involved in the development of a nuclear power programme, such as the government, the regulatory body and the owner/operator. The services available within the catalogue include workshops, training courses, expert missions, advisory services, review missions, peer reviews and training tools and networks.

217. The Secretariat developed and made available to Member States a new set of e-learning modules aimed at improving newcomers' understanding of the infrastructure requirements for a nuclear power programme. The 11 modules currently available are based on the Agency's Milestones approach and other relevant publications and include, Safety Infrastructure, Management Systems and Developing a Human Resource Strategy.

218. The Secretariat is reviewing and updating the Milestones approach to incorporate the latest experience in infrastructure development in Member States. The review has highlighted a need to emphasize the importance of establishing a licensing system and an independent regulatory body as early as Phase 2[38] . The regulatory body will need to define siting requirements for an NPP and determine criteria for approving construction of an NPP prior to definition of specifications to potential vendors. The regulatory body staff needs to be well trained in order to be able to perform assessment of the design of an NPP and this training could be provided by the regulatory body of the NPP vendor country.

219. The Secretariat published the document *Establishing the Safety Infrastructure for a Nuclear Power Programme;* relevant guidelines were reviewed in the light of the lessons learned from the Fukushima Daiichi accident, such as the guidance documents *Evaluation of the Status of National Nuclear Infrastructure Development and Milestones in the Development of a National Infrastructure for Nuclear Power*, as well as the guidance on *Building a National Position for a Nuclear Power Programme*.

220. The Secretariat has conducted workshops and meetings on nuclear power infrastructure, which allowed Member States to share information and experiences in building the necessary infrastructure and incorporating the lessons learned from the Fukushima Daiichi accident into planning processes, as well as to discuss challenges and key issues. The discussions have shown that challenges are similar across embarking Member States with regard to setting up an appropriate legislative and regulatory infrastructure, particularly the need for clearly defined roles and responsibilities among government, the regulatory body and the owner and future operator. Member States face challenges with maintaining competencies and transferring knowledge to new staff and have introduced education and training programmes, knowledge management systems, human resources performance improvement programs and systematic analysis for future human resource needs.

221. The following documents relevant to Action 8 have been published:

- *Evaluation of the Status of National Nuclear Infrastructure Development* (IAEA Nuclear Energy Series No. NG-T-3.2); and

[37] https://www.iaea.org/NuclearPower/Infrastructure/catalogue.html
[38] Phase 2 - Preparatory work for the construction of a nuclear power plant after a policy decision has been taken.

- *Milestones in the Development of a National Infrastructure for Nuclear Power* (IAEA Nuclear Energy Series No. NG-G-3.1).

222. The reports of the Contracting Parties to the CNS and the information shared by Member States at the IEMs and other fora have presented the efforts undertaken in response to the Action Plan to create an appropriate nuclear infrastructure based on IAEA safety standards and other relevant guidance.

FUTURE ACTIVITIES

223. The activities carried out in response to Action 8 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue to encourage embarking Member States to provide to the IAEA their national plans for developing a nuclear infrastructure;
- Continue to respond to Member States requests for support in nuclear infrastructure development;
- Continue to respond to requests for support and assistance for performing self-assessment of nuclear infrastructure; produce and make available to Member States a report on highlights of the results of the national self-assessments;
- Continue to hold workshops and trainings on topics and issues relating to nuclear infrastructure; and
- Continue to encourage Member States embarking on nuclear power programmes to participate in the Regulatory Cooperation Forum.

CAPACITY BUILDING

ACTION 9: *Strengthen and Maintain Capacity Building*

GOALS

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

224. 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.

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

BACKGROUND

226. 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.

227. During the period covered by this annual report, the Secretariat continued to support capacity building activities at the national and regional levels through technical meetings, regional network activities and the production of training material and guidance.

ACHIEVEMENTS

228. The Secretariat continued to support Member States embarking and planning to embark on a nuclear power programme to establish an appropriate national infrastructure including developing the capabilities of operating organizations, regulatory bodies and other relevant organizations.

229. The Secretariat published a report on *Capacity Building for Nuclear Safety*[39], which highlights the lessons learned from the Fukushima Daiichi accident relevant for the strengthening of capacity building in Member States. The report is based on the insights from the discussions at the IAEA International Conference on Human Resource Development for Nuclear Power Programmes held in May 2014, the experience gained from the IAEA peer review services, as well as discussions at the relevant IEMs. The report addresses the development of national strategies to deal with issues associated with education and training, human resource development, as well as knowledge management and networks. Addressing these issues is an important priority for ensuring the safe, secure and sustainable nuclear power programmes. These issues also require continuous dedicated programmes on global, national and organizational levels.

230. The Secretariat organized and conducted a workshop in Vienna, Austria in September 2014 on the SARCON Methodology for Developing a Training Programme and Knowledge Management System. The workshop was attended by 30 participants from 19 Member States and provided the opportunity to understand the tools and training resources available to support the building of national safety competence and human resources development, including specific training on the SARCON software tool.

231. The Secretariat organized and conducted the following capacity building activities:

- An inter-regional training course in August 2014 in the United States of America on Leadership and Management for Introducing and Expanding Nuclear Power Programmes;
- A national workshop in September–October 2014 in Turkey, on the regulatory framework and regulatory approaches regarding regulatory supervision of NPPS; and
- A regional workshop in November 2014 in Egypt, on governmental and regulatory infrastructure of an NPP and national policy and strategy for safety including the role of coordination.

232. The Secretariat organized and conducted a Technical Meeting in February 2015 in Vienna, Austria, to support the preparation of Guidance Documents for Capacity Building. The meeting was attended by 37 participants representing 18 Member States from Member States embarking on, and expanding nuclear power programmes. The participants represented regulatory bodies, R&D organizations, operating organizations, academia as well as organizations from the nuclear industry supply chain. The participants reviewed the draft guidance on Capacity Building in the area of Knowledge Management and provided recommendations for further development.

233. The Secretariat published the *Methodology for the Systematic Assessment of the Regulatory Competence Needs (SARCoN) for Regulatory Bodies of Nuclear Installation* (IAEA-TECDOC

[39] https://www.iaea.org/newscenter/focus/nuclear-safety-action-plan

1757)[40] in March 2015. This publication provides a step-based procedure and guidance for regulators to conduct systematic and detailed assessment of regulatory competence needs. The publication includes comprehensive questionnaires for self-assessment. In addition, a TECDOC publication is being prepared on the Member States experience of using SARCoN.

234. The Steering Committee on Regulatory Capacity Building and Knowledge Management was formed to advise the Secretariat on initiating a programme for nuclear safety knowledge management for regulatory bodies. The Steering Committee requested the Secretariat to develop guidance on knowledge management for regulatory bodies that would complement the existing guidance[41] on competence management. The Secretariat is preparing a Safety Series Report on *Knowledge Management for Regulators and Technical Support Organizations*. The objective of the publication will be to provide guidance to Member States on how to plan, establish and maintain an effective safety knowledge management programme in regulatory bodies. This report is planned to be published by the end of 2016.

235. The Secretariat produced a new version of the Education & Training Catalogue and is available at the IAEA website[42]. The Catalogue includes information on all training materials available to support Member States in the areas of nuclear installation safety. The Secretariat completed a set of video lectures on the IAEA Safety Requirements for nuclear installation safety which are available on DVD and on the IAEA website[43].

236. The Secretariat organized and conducted a regional workshop for European Member States in Vienna in April 2015 to promote and explain the Education and Training Review Service (ETReS) programme. The workshop was attended by 13 participants from nine EU Member States. The participants were able to familiarize themselves with the ETReS methodology for conducting self-assessment of education and training at the national level. The participants were also able to apply the ETReS Guidelines to their organisations and gain a further insight into the methodology and its capabilities.

237. In April 2015, the Secretariat organized a national seminar on capacity building in the United Arab Emirates attended by 11 participants from the national regulatory body, the operating organization and academia. The Secretariat's Capacity Building Self-Assessment Methodology was introduced and a 'table-top' assessment exercise was conducted to improve the participants understanding of the process. The seminar was useful in identifying potential gaps in the capacity building activities.

238. The Secretariat conducted regional and national workshops on knowledge safety networks in Belarus and China, in January 2105 and March 2015, respectively, to assist in the development of the National Nuclear Safety Knowledge Management Platforms under the GNSSN. The National Platforms serve as interfaces among national stakeholders and the international nuclear safety and security community at large as well as provide for harmonization mechanisms for national, regional and global nuclear safety and security knowledge management.

239. The Basic Professional Training Course (BPTC) has been reviewed and revised to present the training materials in "plain language" with necessary reference to the IAEA safety standards. The updated materials, including an e-book and a trainer's package which has been uploaded to a sharepoint site within the IAEA's Global Nuclear Safety and Security Network. Tunisia hosted a

[40] http://www-pub.iaea.org/MTCD/Publications/PDF/TE-1757_web.pdf
[41] http://www-pub.iaea.org/MTCD/publications/PDF/Pub1635_web.pdf
[42] http://www-ns.iaea.org/downloads/ni/training/eandt-brochure_finalcorrected3_red.pdf
[43] http://www-ns.iaea.org//training/ni/train-on-sr1.asp

BPTC on Nuclear Safety for members of the Forum of Nuclear Regulatory Bodies in Africa (FNRBA) and the Arab Network of Nuclear Regulators (ANNuR) in May 2015 in collaboration with the Korea Institute of Nuclear Safety (KINS). The BPTC was organized for these regions for the first time.

240. In order to support the capacity building efforts of ANNuR and the FNRBA Member States, 26 regional and national activities including workshops and training courses are to be conducted during 2015, involving over 40 participating Member States. The activities implemented during this reporting period include introducing Member States to a number of IAEA methodologies of self-assessment as well as shared their experiences and lessons learned in the implementation of national activities.

241. The joint IAEA – FORO[44] project on regulatory capacity building has been completed which consists of a guide for building and developing competence of regulators of nuclear reactors. The guide presents the strategies and specific elements of a programme to strengthen regulatory competence, and it is designed to maximize the use of resources of the Ibero-American region. The guide applies IAEA's SARCoN methodology to produce a harmonized regulatory competence framework and detailed competence profiles for FORO regulatory bodies.

242. The revision of the publication *Regulatory Control of Nuclear Power Plants* (Training Course Series No. 15, IAEA Vienna, 2002) is in the final stages. The revised version will focus on three levels: the global nuclear safety network; organisation and management of the regulatory body; and operational regulation. The purpose of the publication is to support IAEA training courses and workshops in the field of regulatory control of NPPs as well as to support the regulatory bodies in their own training activities.

243. The sixth Global Nuclear Safety and Security Network (GNSSN) Steering Committee meeting was held in Vienna, Austria in May 2015. The Steering Committee discussed the importance of revising the global nuclear safety and security framework and to include capacity building as the mechanism to facilitate its implementation. The Secretariat presented the National Nuclear Safety Knowledge Management Platforms concept to the Committee. The aim of the concept is to facilitate the centralization and selective sharing of national nuclear safety information. The Secretariat is helping Member States create knowledge repositories under the internet-based GNSSN. Six Member States have fully developed their national platforms. Belarus, Bulgaria, Germany, the Russian Federation, Ukraine and the United States of America have developed their national knowledge platforms with areas that can be accessed by counterparts in other Member States. These accessible areas provide specific national information about:

- Radiation and nuclear facilities and activities;
- Responsibilities and functions of the government;
- Responsibilities and functions of the regulatory body;
- General country information;
- Review missions;
- International legal instruments;
- Event reporting and feedback;

[44] Ibero-American Forum of Radiological and Nuclear Regulatory Agencies

- Stakeholder information;
- Global nuclear safety and security regime; and
- National collaboration.

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

244. The following paragraphs provide a summary of the major achievements from the implementation of activities under Action 9 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

245. Contracting Parties to the CNS reported on challenges associated with human resources, such as maintaining competencies and transferring knowledge to new staff. Measures taken by Contracting Parties to maintain adequate resources in the regulatory body and operating organization, including the introduction of education and training programmes, knowledge management systems, human resources performance improvement programs and systematic analysis for future human resource needs.

246. The Secretariat has developed guidance and a self-assessment methodology for capacity building activities in Member States. *The Methodology for Self -assessment of Capacity Building in Member States with Nuclear Power Programme and Those Planning to Embark on Such a Programme* was presented to Member States during a Technical Meeting in October 2012 and is available of the IAEA website.

247. The Secretariat has developed a *Strategic Approach to Education and Training in Nuclear Safety 2013–2020*[45]. This strategic approach supports capacity building activities and may be used by Member States in developing their national education and training strategies. The Secretariat has also 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 practice.

248. The Secretariat organized and conducted an International Conference on Human Resource Development for Nuclear Power Programmes: Building and Sustaining Capacity in Vienna, Austria in May 2014. The Conference focused on the global challenges of capacity building with the objectives of reviewing developments in human resource development, sharing key elements and best practices from those Member States introducing, operating or expanding nuclear power programmes and emphasizing the role of nuclear knowledge management for knowledge transfer. Building on this Conference and other activities, an *IAEA Report on Capacity Building for Nuclear Safety* was published.

249. The Secretariat continued to promote the knowledge safety networks under the GNSSN as an effective tool to share the findings and lessons learned from the peer review services and other activities. The GNSSN Strategic Plan was published in 2014 with the goal of further strengthening nuclear safety and security in the Member States by supporting capacity building activities. The Strategic Plan builds on the Secretariat's evaluation of the needs for the management of scientific and technical information. The Secretariat continued to assist in the development of the National Nuclear Regulatory Portals (NNRP) under the GNSSN through conducting regional workshops. NNRPs are the interfaces between national stakeholders and the international nuclear safety and security community at large and are considered as valuable mechanisms for harmonization of national, regional and global nuclear safety and security knowledge management.

[45] http://www-ns.iaea.org/downloads/ni/training/strategy2013-2020.pdf

250. The Secretariat continued the development of the Cyber Learning Platform[46] (CLP4NET) which is currently used in Asian, Latin-American, and African Regions. CLP4NET offers developing countries access to the IAEA e-learning training and education tools via the Internet. Video lectures continued to be produced to provide Member States with guidance and training including:

- Capacity Building;
  http://www-ns.iaea.org/downloads/video/ni/capacity-building/index.htm.
- The Strategic Approach to Education and Training in Nuclear Safety 2013-2020;
  http://www-ns.iaea.org/downloads/video/ni/strategy-on-training/index.htm.
- Managing the Unexpected – From the perspective of the interaction between Individuals, Technology and Organization ;
  http://www-ns.iaea.org/training/ni/train-on-mtu.asp ; and
- Policy on Human Resources Development for Safety Infrastructure
  http://www-ns.iaea.org/training/ni/train-on-hrd.asp?l=106.

251. In addition the following documents relevant to Action 9 have also been published:

- *Self-assessment of the Regulatory Infrastructure for Safety (SARIS) guidelines 2014 edition* (IAEA Services Series No. 27 IAEA Vienna, 2014); and
- *The Methodology for the Systematic Assessment of the Regulatory Competence Needs (SARCoN)* March 2015.

252. The reports of the Contracting Parties to the CNS and the information shared by Member States at the IEMs and other fora have presented the efforts undertaken in response to the Action Plan to strengthen and maintain capacity building. The Secretariat continued to support these efforts.

FUTURE ACTIVITIES

253. The activities carried out in response to Action 9 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue to respond to requests by Member States for assistance in self-assessments and for developing and implementing their capacity building programmes, including human resources, education and training, knowledge management and networks;
- Continue to encourage Member States to share their measures to develop, maintain and strengthen cooperation for capacity building at the regional and international levels; and
- Continue to respond to requests from Member States for assistance in identifying and implementing necessary improvements in their capacity building programmes in the areas of regulatory framework, operating organizations and national nuclear power infrastructure, with a view to incorporating lessons learned from the accident.

[46] https://www.iaea.org/nuclearenergy/nuclearknowledge/CLP/

PROTECTION OF PEOPLE AND THE ENVIRONMENT FROM IONIZING RADIATION

ACTION 10: *Ensure the on-going protection of people and the environment from ionizing radiation following a nuclear emergency*

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

254. 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.

255. 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

256. 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.

BACKGROUND

257. 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.

258. During the period covered by this annual report, the Secretariat continued to provide support to Japan to develop radiation contour maps of the Fukushima Prefecture and in the performance of the marine monitoring programme.

ACHIEVEMENTS

259. The Secretariat organized and conducted a Technical Meeting in Vienna, Austria in September 2014 on the Harmonization of Reference Levels for Foodstuffs and Drinking Water Contaminated Following a Nuclear Accident. The meeting was attended by 45 experts from 37 Member States along with observers from the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO). The purpose of the meeting was to provide guidance on the development of an IAEA TECDOC on the control of foodstuffs and drinking water contaminated as a result of a nuclear or radiological emergency. The TECDOC will cover reference levels for radionuclide concentrations in foodstuffs and drinking water that may be applied when an emergency has been declared. The objective of the reference levels is to ensure that food and drinking water consumed in the area affected by a nuclear or radiological emergency and food exported from the affected area are suitable for public consumption. The TECDOC will be published by the end of 2015.

260. In September 2014, the Secretariat published the report entitled *Experiences and Lessons Learned Worldwide in the Cleanup and Decommissioning of Nuclear Facilities in the Aftermath of Accidents*[47] (IAEA Nuclear Energy Series No. NW-T-2.7). This publication reviews Member States' activities in the clean-up and decommissioning of nuclear facilities in the aftermath of accidents and reports on the experiences and lessons learned.

261. The Secretariat organized and conducted a Technical Meeting on Surface Water and Groundwater Contamination following the Accident at the Fukushima Daiichi Nuclear Power Plant in September 2014 in Vienna. The meeting was attended by 16 participants from 5 Member States with the objective of discussing the nature of groundwater and surface water contamination on and off the Fukushima Daiichi NPP site. The experience on this topic in the Ukraine, the United Kingdom, and the United States of America was discussed, including the hydrogeological factors controlling the occurrence and distribution of contaminants, countermeasures that were undertaken to respond to emergency situations, and issues in the assessment and control of contamination in groundwater and surface water over the longer term. The meeting considered further support for Japan through international fact-finding missions on field survey and reviews of the modelling of groundwater and a workshop covering overall groundwater issues both on-site and off-site.

262. The Secretariat organized and conducted the second and third meetings in a series of consultancy meetings in Vienna, on the development of a specific training package for medical radiation physicists who may be called on to provide support in a nuclear or radiological emergency. The second meeting was attended by ten experts from five Member States and was held in October 2014. The third meeting was attended by two experts from two Member States and was held in November 2014. The experts shared their experience on the involvement of medical physicists in nuclear or radiological emergencies and discussed the skills and competencies that need to be acquired to support these situations. A detailed schedule of a workshop on this topic to be held at the Fukushima Medical University (FMU) in June 2015 was prepared.

263. The Secretariat organized and conducted the third Technical Meeting for MODARIA (Modelling and Data for Radiological Impact Assessments) in November 2014 in Vienna. The meeting was attended by around 150 participants from over 40 Member States. The participants discussed the progress made in the different areas covered by the programme, to enable interactions between the individual working groups, and to define the work to be accomplished before the programme's planned completion by the end of 2015.

264. In December 2014, the Secretariat organized and conducted a consultancy meeting at the FMU, Japan on radiation, health and radiation accident issues. The meeting was attended by ten experts from five Member States who reviewed the efforts of the Secretariat and the FMU related to strengthening cooperation in radiation accident activities. The experts identified further activities to support the FMU including supporting training courses, organization of international conference and publication of a handbook titled *Health in Disasters: A Science and Technology Studies Practicum for* Medical Students and Health Professionals in English and Japanese.

265. The international project on Decommissioning and Remediation of Damaged Nuclear Facilities (the DAROD Project) was launched by the Secretariat in January 2015. The aim of the project is to learn lessons from the decommissioning and remediation of accident damaged nuclear facilities and to identify gaps and needs for additional guidance to address issues related to strategic planning, as well as technical and regulatory aspects. The scope of the project covers the time period when the emergency at a nuclear facility is declared over and until decommissioning and remediation

[47] http://www-pub.iaea.org/MTCD/Publications/PDF/Pub1644_web.pdf

of the facility is completed. The project will focus on the physical infrastructure and radioactively contaminated areas within a licensed nuclear site boundary.

266. The Secretariat organized and conducted the third international peer review mission on the Mid-and-Long-Term Roadmap towards the Decommissioning of TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4 in February 2015. The review team focussed on the safety and technological aspects of decommissioning, management of radioactive waste, control of underground water and accumulation of contaminated water at the site. The planning and implementation of pre-decommissioning and decommissioning activities was also covered, including removal of spent and damaged fuel. The mission reviewed the progress made since two earlier review missions were carried out in April 2013 and November-December 2013. The review team considered that Japan has achieved good progress in improving its strategy and the associated plans, as well as in allocating the necessary resources towards the safe decommissioning of TEPCO's Fukushima Daiichi NPS Units 1-4. The review team offered a number of advisory points where current practices could be improved, taking into account both international standards and the experience of decommissioning programmes in other Member States. The report was presented to the Government of Japan in April 2015 and is available on the Agency's website[48] .

267. The Secretariat continued to support the marine monitoring programme conducted by the authorities in Japan to confirm that the programme is performed in an internationally recognized, transparent and reliable manner. The programme is being evaluated through proficiency tests and Interlaboratory Comparison (ILC) exercises conducted in Japan and elsewhere. Two ILC exercises were organised for radionuclides in seawater in September and November 2014. Two experts from the Secretariats' marine environmental laboratories in Monaco participated together with Japanese experts in the routine collection of seawater samples offshore the Fukushima Daiichi NPP. Samples were collected from each of five locations and were shared between Japanese and Agency participants. Identical samples are measured independently in Japanese and IAEA Monaco laboratories and the results are compared. The results obtained so far for Cs-134 and Cs-137 from the September ILC show a high degree of agreement.

268. The Secretariat is preparing two reports dealing with the aftermath of a nuclear or radiological accident. The first report will cover decommissioning related issues and will deal with on-site aspects. The second report will cover environmental remediation aspects focusing on off-site issues. Both reports will be finalized by the end of 2015.

269. The Secretariat has developed a series of technical documents related to the management of radioactive waste after a nuclear or radiological emergency. The issues addressed by these documents cover environmental safety as well as waste technology. The 'umbrella' document on *Management of Large Volumes of Radioactive Waste arising from Nuclear or Radiological Emergencies* focuses on strategic planning and preparedness of waste management, including predisposal and disposal activities, licensing issues, and safety-related matters. The document addresses the entire spectrum of waste management activities that will be needed after such an emergency. Supporting technical documents are being developed to provide detailed and practical guidance on addressing these issues such as the document on *Disposal of Radioactive Waste Resulting from Nuclear or Radiological Emergencies*. This document focuses on disposal, it also refers to remediation and waste pre-disposal issues as decisions made in early stages after an emergency can have significant implications for the volumes and characteristics of the waste that needs disposal. Both documents are being reviewed for finalization by the end of 2015.

[48] https://www.iaea.org/sites/default/files/missionreport130515.pdf

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

270. The following paragraphs provide a summary of the major achievements from the implementation of activities under Action 10 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

271. Many Contracting Parties to the CNS with nuclear power programmes have enhanced and expanded their environmental radiation monitoring and measuring capabilities, including extending environmental monitoring network with mobile and fixed radiological and meteorological stations and automated real-time boundary radiation monitoring. Resources for technical expert support and equipment have been increased and improved source term estimation and decision support systems for responding to a nuclear or radiological emergency have been enhanced. Many Contracting Parties to the CNS reported on actions to strengthen international cooperation regionally or with neighbouring countries on this topic.

272. In January 2013, the Secretariat organized and conducted an IEM on Decommissioning and Remediation after a Nuclear Accident. The aim of this IEM was to contribute to enhancing the safety and effectiveness of future remediation and decommissioning activities worldwide. The Secretariat subsequently published an *IAEA Report on Decommissioning and Remediation after a Nuclear Accident*[49]. The report highlighted the lessons learned on decommissioning, remediation and radioactive waste management in the light of the Fukushima Daiichi accident and also from previous nuclear and radiological accidents, as well as from the management of nuclear legacy sites. The report emphasized the need for relevant authorities to develop a national strategy in advance of an accident to support the recovery phase of a potential accident. The relevant authorities should also develop decommissioning, remediation and waste management plans to support such a strategy. These plans should include an appropriate level of stakeholder participation in the decision making process and take account of sustainability principles, the balance of risks and benefits, and experience from previous accidents. Furthermore, following a nuclear or radiological emergency, key decisions on post-accident recovery activities may have to be made based on incomplete information. Appropriate programmes are therefore necessary to characterize and monitor, for example, damaged nuclear fuel and radioactive waste generated by an accident.

273. The Secretariat organized and conducted the sixth in the series of IEMs, in Vienna in February 2014 on the topic of Radiation Protection after the Fukushima Daiichi Accident: Promoting Confidence and Understanding. The IEM considered the challenges to radiation protection raised by the Fukushima Daiichi accident and how these need to be addressed effectively at the national and international levels. The IEM focussed on the complex technical, societal, environmental and other issues in radiation protection that have broad application and may need to be addressed during remediation and long term recovery operations following a nuclear or radiological accident. The IEM formed the basis of an *IAEA Report on Radiation Protection after the Fukushima Daiichi Accident: Promoting Confidence and Understandi*ng[50].

274. The Secretariat continued to support the Fukushima Prefecture in Japan under Practical Arrangements between the IAEA and Fukushima Prefecture on Cooperation in the area of Radiation Monitoring and Remediation. In particular, in the use of radiation monitoring data to develop maps on the presentation and interpretation of this data. The Secretariat is also supporting the Fukushima Prefecture in the management of radioactive waste arising from remediation activities. The Secretariat

[49] https://www.iaea.org/sites/default/files/decommissioning0913.pdf
[50] https://www.iaea.org/sites/default/files/radprotection0914.pdf

under a practical arrangement with the FMU undertook collaborative activities in the area of radiation effects on human health and radiation risk management in the Fukushima Prefecture.

275. The Secretariat, in cooperation with the World Health Organization (WHO) and the Food and Agriculture Organization (FAO), as well as other relevant international organizations, is undertaking a review of the generic criteria for radioactive material in food, animal feed and drinking water. The review will identify ways to clarify, harmonize and update, if appropriate, the existing guidance documents on contamination levels in food, animal feed and drinking water after nuclear or radiological incidents.

276. At the request of the Government of Japan, the Secretariat organized a fact finding mission to support the remediation of the radioactively contaminated land areas outside the Fukushima Daiichi NPP site in October 2011. 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.

277. The Secretariat organized and conducted a Follow-up International Mission on Remediation of Large Contaminated Areas Off-site the Fukushima Daiichi Nuclear Power Plant in October 2013. This mission highlighted the important progress made since the first mission and provided advice on several points where current practices in Japan could be further improved. The mission team recognized the huge effort and enormous resources being devoted to remediation strategies and the activities aimed at improving living conditions for people affected by the nuclear accident. Good progress has been made in the remediation activities and in the coordination of remediation activities with reconstruction and revitalization efforts. The final report highlighted 13 areas of progress and eight advisory points on further strengthening the remediation programme. Both reports are available of the Agency's website[51,52].

278. In response to a request from the Government of Japan, the Secretariat organized and conducted three international peer reviews of the Mid-and-Long-Term Roadmap towards the Decommissioning of the TEPCO's Fukushima Daiichi Nuclear Power Station Units 1-4. The objective of the peer reviews was to provide an independent assessment of the activities associated with the planning and implementation of decommissioning the Fukushima Daiichi NPP. The reports of these peer reviews are available on the Agency's website[53,54,55].

279. The first mission was conducted in April 2013, where several specific short-term issues and recent challenges were also examined, such as the current condition of the reactors, management of waste, protection of employees and the structural integrity of reactor buildings and other structures. The peer review concluded that relatively stable cooling of the fuel and fuel debris in the reactors and spent fuel pools has been achieved and is adequate to remove the decay heat. However, the review identified several challenges to achieve a sustainable situation over the period of the next 10-20 years.

280. The second mission was conducted in November-December 2013 and concluded that the Government of Japan and TEPCO had adopted a more proactive attitude and approach towards addressing the many challenges for decommissioning. The mission team noted the complexity of the

[51] https://www.iaea.org/sites/default/files/reportonfukushima2011.pdf
[52] https://www.iaea.org/sites/default/files/final_report230114.pdf
[53] https://www.iaea.org/sites/default/files/missionreport220513.pdf
[54] https://www.iaea.org/sites/default/files/missionreport041213.pdf
[55] https://www.iaea.org/sites/default/files/missionreport130515.pdf

situation with a number of challenges to resolve to achieve the plant's long-term stability. Good progress was considered to have been made in improving the decommissioning strategy and associated plans, as well as in allocating the necessary resources for the safe decommissioning of TEPCO's Fukushima Daiichi NPP.

281. The third Mission took place in February 2015 and the review team considered that Japan has achieved good progress in improving its strategy and the associated plans, as well as in allocating the necessary resources towards the safe decommissioning of TEPCO's Fukushima Daiichi NPS Units 1-4. The review team offered a number of advisory points where current practices could be improved, taking into account both international standards and the experience of decommissioning programmes in other Member States.

282. In addition, the following documents relevant to Action 10 have also been published:

- *Experiences and Lessons Learned Worldwide in Clean-up and Decommissioning of Nuclear Facilities in the Aftermath of Accidents* (IAEA Nuclear Energy Series No. NW-T-2.7);
- *Lessons Learned from Environmental Remediation Programmes* (IAEA Nuclear Energy Series No. NW-T-3.6);
- *Communication and Stakeholder Involvement in Environmental Remediation Projects* (IAEA Nuclear Energy Series No. NW-T-3.5); and
- *Safety Assessment for Decommissioning Safety (*IAEA Safety Reports Series No. 77, Vienna 2013).

283. The reports of the Contracting Parties to the CNS and the information shared by Member States at the IEMs and other fora have presented the efforts undertaken in response to the Action Plan to ensure the on-going protection of people and the environment from ionizing radiation following a nuclear emergency. The Secretariat continued to support Member States in these efforts and also continued to support the Government of Japan and the Fukushima Prefecture in dealing with the aftermath of the Fukushima Daiichi accident.

FUTURE ACTIVITIES

284. The activities carried out in response to Action 10 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue to facilitating the use of available information, expertise and techniques for monitoring, decontamination and remediation both on and off nuclear sites;
- Continue to consider strategies and programmes to improve knowledge and strengthen capabilities in the above areas, and continue supporting Member States in developing their competencies in the selection and use of technologies for characterization and remediation of sites affected by nuclear and radiological accidents;
- Continue to support the establishment of a network of biological dosimetry laboratories which could act in case of accidental overexposures;
- Review, revise and update 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; and

- Continue to encourage Member States to provide to IAEA information regarding the assessment of radiation doses and associated impacts on people and the environment and to participate in the MODARIA project.

COMMUNICATION AND INFORMATION DISSEMINATION

ACTION 11: *Enhance transparency and effectiveness of communication and improve dissemination of information*

GOALS

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

285. 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

286. 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

287. 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.

Organize international experts meetings

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

Assessment of the Fukushima Daiichi Accident

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

The application of the INES scale as a communication tool

290. 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.

BACKGROUND

291. Effective, easily understandable and transparent communication during incidents and emergencies is crucial in relation to the public's and media's perception of emergency management of an event and its consequences. In the case of the Fukushima Daiichi accident, the Secretariat served as a useful point of reference. Prior to the adoption of the Action Plan, the Secretariat's role in an emergency was largely limited to distributing information validated by the country concerned to all Member States and relevant international organizations. A broader role was called for in response to nuclear incidents and emergencies to provide Member States, international organizations and the general public with timely, clear, factually correct, objective and easily understandable information

during a nuclear emergency on its potential consequences, including analysis of available information and prognosis of possible scenarios.

ACHIEVEMENTS

292. The Secretariat finalized the report on the Fukushima Daiichi accident for release at the 59th regular session of the General Conference. The report is the result of an extensive international collaborative effort involving five working groups with about 180 experts from 42 Member States, with and without nuclear power programmes, and several international bodies. The Board of Governors took note of the Report by the Director General[56] which draws on five detailed technical volumes prepared by international experts and on the contributions of the many experts and international bodies involved.

293. The report provides a description of the accident and its causes, evolution and consequences, based on the evaluation of data and information from many sources available up to March 2015, including the results of the work carried out in implementing the Action Plan, and it highlights the main observations and lessons. Significant amounts of data were provided by the Government of Japan and other organizations in Japan.

294. The Secretariat continued to disseminate information and lessons learned from the Fukushima Daiichi accident. The Secretariat made available the following reports on the Agency's website[57]:

- *IAEA Report on Severe Accident Management in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant;*
- *IAEA Report on Strengthening Research and Development Effectiveness in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant;*
- *IAEA Report on Assessment and Prognosis in Response to a Nuclear or Radiological Emergency;* and
- *IAEA Report on Capacity Building for Nuclear Safety.*

295. In April 2015, the Secretariat organized and conducted an IEM on Assessment and Prognosis in Response to a Nuclear or Radiological Emergency. The IEM was attended by 200 participants from 64 Member States and four International Organizations. A particular focus of the IEM was the expanded role of the Secretariat in assessment and prognosis during nuclear or radiological emergencies. Prior to 2011, the role of the Secretariat covered four aspects of response: (1) notification and exchange of official information through officially designated contact points; (2) provision of timely, clear and understandable public information; (3) provision and facilitation of international assistance upon request; and (4) coordination of interagency response. The role did not include the provision to Member States, international organizations and the general public of timely, clear, factually correct, objective and easily understandable information during a nuclear emergency on its potential consequences, including analysis of available information and prognosis of possible scenarios.

296. The IEM focused on the nuclear or radiological emergencies resulting from a nuclear safety or security event, the environmental modelling and monitoring of radioactive material during emergencies, the assessment of the impact of radioactivity on food, feed, drinking water and agricultural products, and the provision and management of technical data to support such assessment

[56] GOV/2015/26 (14 May 2015)
[57] https://www.iaea.org/newscenter/focus/nuclear-safety-action-plan

and prognosis. The meeting highlighted the necessity to use the capabilities of Member States to support the Secretariat's assessment process and the critical need to share static and dynamic technical data during the preparedness and response phases of an emergency. Discussions among the experts included how best to support harmonization of messages to the public during an incident or emergency and how the Secretariat could support such a process at the international level. The significant outcomes of the meeting are included in the report on this topic.

297. The Secretariat further developed and tested the assessment procedures for nuclear and radiological emergencies in training activities and exercises. A Reactor Assessment Tool was developed and successfully tested in November 2014. Bilateral exercises were carried out with a number of Member States operating NPPs (including Finland, Hungary, Slovakia, Slovenia, and the United States of America) and further methods to improve cooperation on assessment and prognosis were identified.

298. The Secretariat continued to enhance the transparency of information regarding EPR arrangements in Member States through the development of the Emergency Preparedness and Response Information Management System (EPRIMS). This system will allow Member States to share information with Member States, exchange information on national arrangements and discuss aspects related to emergency preparedness and response with other Member States.

299. The Secretariat continued to encourage the Unified System for Information Exchange in Incidents and Emergencies (USIE) contact points to register a sufficient number of users on USIE and has contacted all USIE administrators to confirm all registered users. The Secretariat encouraged a proper level of registration in USIE by Member States through the workshops held on the Operations Manual for Incident and Emergency Communication (IEComm). All trainees in the IEComm workshops are registered on the USIE training site and are encouraged to demonstrate the USIE features and functionality to response staff in their organisations.

300. The Secretariat has reviewed and identified a list of priorities for enhancing the secure USIE website for reporting nuclear or radiological incidents and emergencies. A new version of the web site was released in September 2014. A web service for automatic exchange of incident or emergency communication between the Secretariat and the European Commission is currently being tested. This web service is based on the International Radiological Information Exchange (IRIX) standard data set and data format for the exchange of information during nuclear or radiological incidents and emergencies.

301. The Secretariat published *The Use of INES for Event Communications: Guidelines and Good Practices for Setting up a National Framework on the Effective Use of INES for Event Communications*[58]. This publication is intended to assist Member States in establishing or improving their national framework to effectively use INES as an integral part of their communication strategy. The publication also aims to provide examples to illustrate the breadth of approaches that can be adopted to effectively and consistently communicate the safety significance of a nuclear or radiological event.

302. The Technical Meeting of the INES National Officers was held in October 2014 in Vienna. The meeting was attended by 68 participants from 44 Member States. Representatives presented their national experience in using INES for rating of nuclear and radiological events and in particular their national arrangements for event communication. The meeting recommended the endorsement of the updated strategy and execution of envisaged activities, subject to the availability of human and

[58] http://www-pub.iaea.org/MTCD/Publications/PDF/INES_web.pdf

financial resources. The Use of INES for Event Communications document was revised at the consultancy meeting in September 2013 and published just before this meeting. The meeting recommended that Member States review their national processes against the guidance provided in the publication, and where appropriate, implement the guidance. The document relating to the use of INES for events arising from medical applications is being revised by the Secretariat. The meeting recommended that, once finalized, it is made available to the Member States to use it on voluntary basis in order to obtain further experience.

303. The INES Rating Interactive Learning Tool[59] aimed to help understand the methodology for INES rating of events was posted on the IAEA webpage and is accessible to the public. The INES Strategy was updated at the annual meeting of the INES Advisory Committee in October 2014 in Vienna. The strategy was approved by INES National Officers at the Technical Meeting held in October 2014 in Vienna, Austria.

304. The Secretariat organized and conducted five workshops on the IAEA Operations Manual for Incident and Emergency Communication (IEComm). The first workshop was held in Kenya in September 2014, the second workshop was held in Japan in November 2014, the third in the United Arab Emirates in December 2014, the fourth in Oman in February 2015 and the fifth in Austria in April 2015.

305. In March 2015, the Secretariat organized and conducted a consultancy meeting to collect and review the comments received from Member States concerning the draft Safety Guide on *Communication and Consultation with Interested Parties by the Regulatory Body*. The new draft Safety Guide was submitted to all IAEA safety standards review committees in June 2015.

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

306. The following paragraphs provide a summary of some of the major achievements from the implementation of activities under Action 11 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

307. Many Contracting Parties to the CNS reported improvements in transparency and effectiveness of communication and the progress made towards openness and transparency in public communications. Many Contracting Parties are issuing the results of regulatory decisions, the outcomes of periodic safety reviews and safety assessments and other relevant documentation on their respective web sites. In addition, some Contracting Parties reported initiatives to further enhance their communication strategies through social media channels, public hearings, and through outreach programs with communities around NPPs. Regarding communication in the event of an emergency, Member States have developed national action plans to enhance existing on-site and off-site emergency control centres for protection against extreme external events and improvements to secure access to vital information in case of a prolonged loss of electrical power.

308. The Secretariat organized the following IEMs:

- Reactor and Spent Fuel Safety in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant, March 2012;
- Enhancing Transparency and Communication Effectiveness in the Event of a Nuclear or Radiological Emergency, June 2012;

[59] https://iec.iaea.org/inesrilt/

- Protection against Extreme Earthquakes and Tsunamis in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant, September 2012;
- Decommissioning and Remediation after a Nuclear Accident, January 2013;
- Human and Organizational Factors in Nuclear Safety in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant, May 2013.
- Radiation Protection After Fukushima Daiichi Accident: Promoting Confidence and Understanding, February 2014;
- Severe Accident Management in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant, March 2014;
- Strengthening Research and Development Effectiveness in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant, February 2015; and
- Assessment and Prognosis in Response to a Nuclear or Radiological Emergency, April 2015.

309. The Secretariat upgraded and enhanced the secure Unified System for Information Exchange in Incidents and Emergencies (USIE) website for reporting nuclear or radiological incidents and emergencies. The new version of the USIE takes into account Member States feedback and has features such as connectivity with European WebECURIE system, the ability to view latest RANET registration data, and an enhanced alerting service. The Secretariat continued to encourage Member States to register as users of USIE.

310. The Secretariat distributed the *IAEA Operations Manual for Incident and Emergency Communications* (EPR-IEComm 2012) to all its contact points. The manual places expectations on the Secretariat and on the Member States/international organizations regarding notification of and information exchange in the nuclear or radiological emergencies by introducing specific response time objectives for the initial emergency notification and the provision of follow-up information. The manual represents an operational tool for implementation of the Convention on Early Notification of a Nuclear Accident. The Secretariat places specific emphasis on promoting the application of the operations manual through various events, including training.

311. The Action Plan expanded the Secretariat's response role in an emergency at an NPP to cover the need to provide Member States, international organizations and the general public with timely, clear, factually correct, objective and easily understandable information during a nuclear emergency on its potential consequences, including analysis of available information and prognosis of possible scenarios based on evidence, scientific knowledge and the capabilities of Member States. In 2013, a process for assessment and prognosis in response to an emergency at a nuclear power plant was developed. This role was also discussed at IEM 9 as reported above in the Achievements for this Action.

312. The Secretariat organized and conducted an IEM on Enhancing Transparency and Communication Effectiveness in the Event of a Nuclear or Radiological Emergency in Vienna in 2013. The objective of this IEM 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 Daiichi accident.

313. 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. One important conclusion of the IEM related to public trust. Organizational credibility is the basis for public trust and 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.

314. The review of the application of the INES as a communication tool has been 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 Secretariat has completed a publication for the use of the International Nuclear and Radiological Event Scale (INES) which is currently under the Agency's publication process. The Secretariat upgraded the INES e-learning tool based on the comments of the INES Advisory Committee.

315. The reports of the Contracting Parties to the CNS and the information shared by Member States at the IEMs and other fora have presented the efforts undertaken in response to the Action Plan to enhance transparency and effectiveness of communication and improve dissemination of information. The Secretariat has supported Member States in these efforts through organizing and conducting IEMs to learn and share the lessons from the Fukushima Daiichi accident. The Secretariat has also taken steps to develop its assessment and prognosis capability to provide Member States, international organizations and the general public with timely, clear, factually correct, objective and easily understandable information during a nuclear or radiological emergency.

FUTURE ACTIVITIES

316. The activities carried out in response to Action 11 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue to strengthen the emergency notification system, and reporting and information sharing arrangements and capabilities;
- Continue to encourage the registration of Member States in the Unified System for Information Exchange in Incidents and Emergencies (USIE);
- Continue to conduct regular emergency response exercises that include communications among national authorities, international organizations and media and to encourage Member States to take part in these exercises;
- Continue to enhance the transparency and effectiveness of communication among operators, regulators and various international organizations;
- Continue the development and implementation of the assessment and prognosis process, including encouraging Member States to provide information on appropriate national capabilities for use in a nuclear or radiological emergency; and
- Consider the recommendations and lessons learned from the IEMs and to continue sharing with Member States assessments of the Fukushima Daiichi accident.

RESEARCH AND DEVELOPMENT

ACTION 12: *Effectively utilize Research and Development*

GOALS

Conduct necessary research and development

317. Relevant stakeholders are requested to conduct necessary research and development (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

318. 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.

BACKGROUND

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

320. In the light of the Fukushima Daiichi accident, R&D has 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.

ACHIEVEMENTS

321. The Secretariat organized and conducted an international conference in October 2014 in Beijing, China, on the Challenges Faced by Technical Support Organizations (TSOs) in Enhancing Nuclear Safety and Security. The Conference was attended by around 240 participants from 42 Member States and 5 international organizations. The objectives of the conference were to assess and review the effectiveness of TSOs taking into account lessons learned from the Fukushima Daiichi accident. The Conference participants recognized that regulatory decision-making needs to have a sound basis in science and it is important that national regulatory bodies have access to independent technical and scientific expertise. The participants considered that further guidance on the performance of the TSO function is needed and the IRRS service does not currently provide sufficient review of the TSO function. The participants also recognized that TSOs play a crucial role for the newcomer Member States and adequate and sustainable resources need to be available to maintain the TSO capacities.

322. The Central Institute for Continuing Education & Training (CICE&T) of Rosatom organized in cooperation with the IAEA the 2nd International School on Spent Nuclear Fuel Management in September 2014, in St. Petersburg, Russian Federation. The School was attended by 19 students from Argentina, Lithuania and the Russian Federation. The third International School on Power Reactor Spent Fuel Management organized will also be held in St. Petersburg, the Russian Federation in September 2015.

323. In October 2014, the third research coordination meeting on Qualification, Condition Monitoring and Management of Ageing of Low Voltage Cables in NPPs was held in Shanghai, China. The objective of the meeting was to discuss benchmark baseline test results and prepare a draft report

on condition monitoring techniques for electrical cable ageing management associated with the long term operation of NPPs. 56 experts from 13 Member States participated in the meeting and shared the results of their research on monitoring and ageing management of low voltage cables.

324. The Secretariat developed the severe accident management guideline development (SAMG-D) toolkit which provides a description of basic elements required for the development of severe accident management guides (SAMGs) for NPPs. The toolkit addresses capacity building in Member States in the area of severe accident management, and is designed to provide education and training on the transition from emergency operating procedures to severe accident management procedures. In particular the SAMG-D toolkit can help NPP operators to develop and select an appropriate set of SAMGs for their NPP. The SAMG-D toolkit can be used for capacity building in newcomer Member States but also as a refresher training tool for Member States with an established NPP programme. In September 2014, the Secretariat organized and conducted a second consultancy meeting on the development of a Severe Accident Management Toolkit (SAMT) in NPPs. The meeting was attended by six experts from five Member States who reviewed previous developments to the SAMT and discussed the harmonization of its content, structure and functionality. The contributions from the participants supported the completion of SAMT. The Secretariat will be hosting a workshop on the development of SAMGs using the SAMG-D toolkit in October 2015.

325. The Secretariat organized the first research coordination meeting for a Coordinated Research Project (CRP) entitled Fuel Modelling in Accident Conditions, in November 2014 in Karlsruhe, Germany, with 30 participating organizations from 20 Member States. In addition a new CRP on improving the accident tolerance of nuclear fuels, entitled Analysis of Options and Experimental Examination of Fuels for Light Water Reactors with Increased Accident Tolerant Fuel was approved in May 2015.

326. The Secretariat finalized a draft IAEA TECDOC on *Considerations to Enhance the Performance of Engineered Safety Features in Small Modular Reactors in Coping with the Extreme External Events*. The main objective of the TECDOC is to present considerations for enhancing the performance of engineered safety features in small modular reactors (SMRs) to cope with extreme external events. Indicative requirements to prevent a severe accident from occurring will also be provided for embarking Member States planning to deploy SMRs. Experts from Argentina, China, India, Japan, Indonesia, Italy, Pakistan, the Republic of Korea, the Russian Federation and the United States of America participated in the development of the TECDOC.

327. The Secretariat organized and conducted a consultancy meeting in December 2014 in Vienna, Austria, on the mitigation of severe accidents. The meeting was attended by nine experts from five member states with knowledge of the design and operation of containment cooling systems and filtered containment venting systems. The meeting examined the current international experience in designing and testing containment cooling and venting systems including the modernization of NPPs to provide filtered discharge from the containment for a DBA and BDBA. The meeting also examined the engineering test programs to validate and address specific interests of member states embarking on nuclear power programmes by documenting approaches taken by advanced NPP designs to protect the containment under BDBA conditions. The meeting also initiated preparation for a Technical Meeting scheduled to take place in Vienna, Austria, in September 2015, organized in coordination with Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), WANO and the World Nuclear Association. The Secretariat will also prepare a Nuclear Energy Series publication on this topic which will take into account the results of the Technical Meeting and also the outcome of the IEM on severe accident management held in 2014.

328. In February 2015, the Secretariat, in cooperation with the OECD/NEA, organised an IEM on Strengthening Research and Development Effectiveness in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant. This was the 8th in the series of IEMs organized by the Secretariat and was attended by approximately 150 experts from 35 Member States and five international organizations. The meeting provided a forum for experts to share information and experience related to R&D activities undertaken in the light of the Fukushima Daiichi accident, with a view to assisting Member States in planning and implementing R&D activities in nuclear safety, technology and engineering for existing NPPs and in the design of new NPPs.

329. The experts discussed the R&D strategies in Member States following the Fukushima Daiichi accident, including those associated with severe accident analysis, technologies to prevent or mitigate severe accidents, emergency preparedness and response and post-accident recovery. The IEM re-emphasised the importance of R&D and the contribution it can make in enhancing nuclear safety, and highlighted the need to widely disseminate R&D information for the benefit of all Member States. The main conclusions of the IEM included the emphasis on the Secretariat's key role in assisting Member States by continuing to provide a forum for discussion and information exchange on R&D related issues and activities. The need for increased collaboration in long-term R&D programmes between research organisations, regulators, utilities and other stakeholders was also emphasized. The experts concluded that although there are no major gaps in current R&D programmes that require immediate international attention, there are many areas where more R&D would be desirable in light of the Fukushima Daiichi accident, where lessons learned need to be effectively integrated.

330. The Seventh Steering Committee Meeting of the Technical and Scientific Support Organization Forum was held in March 2015, in Vienna. The meeting was attended by 24 experts from 15 Member States. The Steering Committee discussed the conclusions of the IEM on Strengthening Research and Development Effectiveness in Light of the Accident at the Fukushima Daiichi Nuclear Power Plant and addressed progress made on key aspects identified in the previous meeting, including the role of TSOs during emergency situations as well as the interface between safety and security.

331. The Secretariat organized and conducted a consultancy meeting in June 2015 in Vienna, Austria, on the Analysis of Design Basis Scenarios for Spent Fuel Storage Facilities with the participation of five experts from five Member States. The objectives of this meeting were to propose mitigation measures for wet and dry spent fuel storage facilities, within and beyond the current design basis and to prepare for the organization of a Technical Meeting in 2016 on this topic. The Technical Meeting is planned to involve the participation of the designers, developers, suppliers and operators of wet and dry spent fuel storage facilities. The fourth Consultancy Meeting on "Collection, Analysing and Assembling Relevant Data from the Fukushima Daiichi Spent Fuel Storage" was held in July 2015 in Vienna, Austria. The meeting was attended by five experts from five Member States with the objective of preparing a report on the status of the spent fuel storage pools in Member States.

SUMMARY OF IMPLEMENTATION SINCE THE ADOPTION OF THE ACTION PLAN

332. The following paragraphs provide a summary of some of the major achievements from the implementation of activities under Action 12 since the adoption of the Action Plan in 2011. The summary draws on information provided in this report and from previous annual reports.

333. Most Contracting Parties to the CNS with nuclear power programme have reported on the R&D activities carried out or sponsored by their regulatory bodies, operating organizations and TSOs. Many Contracting Parties have bilateral and multilateral agreements for cooperation in R&D in place for NPP safety. International organizations as the IAEA, OECD/NEA and WANO, among others act as hub for international research and information sharing. Contracting Parties reported on the ongoing

and new R&D programmes on, for example, the integrity of structures systems and components important to safety, fuel behaviour during severe accidents, fire protection measures, human and organisational factors and safety culture, lifetime management of NPPs and the evaluation of external hazards.

334. The Secretariat organized and conducted a series of consultancy meetings to develop a Symptom-Based Accident Management Toolkit (SAMT) in NPPs comprising three modules on dealing with the fundamentals of nuclear safety, the challenges for severe accident mitigation strategies and guidelines for the development of SAMGs along with examples. Training workshops are being developed and will be conducted.

335. The Secretariat, in cooperation with the Russian Federation, initiated a project on Reliable Containment Cooling and Filtered Venting (RCCFV). The objective of this project is to assimilate and publish information related to the analysis of systems by which an NPP containment can be safely cooled and depressurised through a filtered vent system. A Technical Report will be prepared containing the current approaches for a reliable containment cooling and filtered venting with suggested enhancements to address the NPP vulnerabilities identified during the Fukushima Daiichi accident.

336. The reports of the Contracting Parties to the CNS and the information shared by Member States at the IEMs and other fora have presented the efforts undertaken in response to the Action Plan to effectively utilize R&D. The Secretariat has supported relevant stakeholders in conduct R&D and sharing the results to the benefit of all Member States.

FUTURE ACTIVITIES

337. The activities carried out in response to Action 12 that will continue as part of the regular activities of the relevant Secretariat Department include:

- Continue to identify the relevant stakeholders to carry out R&D in nuclear safety, technology and engineering, including R&D related to existing and new NPP design-specific aspects;
- Continue to support the Technical Support Organizations Forum; and
- Continue to strengthen existing mechanisms to effectively share the results of R&D in consultation with the Member States.

ANNEX I: IMPLEMENTATION OF ACTION PLAN EXTRABUDGETARY PROJECTS BEYOND 2015 BY DEPARTMENT

Department of Nuclear Safety and Security

- Guidance on the establishment of radioactive waste and spent fuel management strategy following emergency situations taking into account existing experience.
- Assistance to the Fukushima Prefecture in long term remediation, decontamination, waste management and radiation monitoring integrated approach.
- Enhancements to sharing information with Member States and the Public regarding TEPCO's Fukushima Daiichi Accident.
- External Event Safety Assessment of Multi-Unit Site.
- Designation of an IAEA RANET Capacity Building Centre (CBC), the Fukushima Prefecture.
- Preparation, Conduct and Evaluation of a RANET Joint Assistance Team (JAT) field exercise.
- Development of the IRIX standards and implementation of the standard.
- Remediation and Decontamination in Fukushima Prefecture.
- Management of Radioactive Waste from Remediation Activities.
- Guidance for the implementation of integrated strategies to reduce radiological impacts to the population subsequent to deposition of radionuclides on inhabited and agricultural areas.
- Strengthening capabilities for radiation protection of workers in emergency situation and occupational radiation protection appraisal services.
- Assistance in the use of radiation monitoring data to develop maps to be made available to the public.
- Development of a TECDOC on "Criteria for Food and Drinking (Potable) Water Contaminated as a Result of a Nuclear or Radiological Emergency - a Synthesis of the Current Situation.

Department of Nuclear Energy

- Analyses on issues and trends for (Post-) Accident Monitoring (PAM) Systems in Nuclear Power Plants (based on lessons learned from the Fukushima Daiichi accident.
- Decommissioning and environmental remediation after a nuclear or radiological accident: Approaches, techniques, tools and equipment.

Department of Nuclear Sciences and Applications

- Assessment of Freshwater Systems (Groundwater, Rivers, Ponds, Lakes).

- Application of Environmental Mapping Technology making use of unmanned aerial vehicles.
- Enhancing radiation medicine education by building capacity of health professionals and medical students.
- Strengthening research cooperation in radiation disaster medicine including post-traumatic stress disorders.
- Development of a specific training package for medical radiation physicists in support to nuclear or radiological emergency situations.
- Science and Technology Studies (STS) Perspectives on Nuclear Science, Radiation and Human Health: The View from Asia.
- Marine Monitoring Confidence Building and Data Quality Assurance.

ANNEX II: ACTION PLAN ON NUCLEAR SAFETY EXPENDITURES

A total of €40.17 million of expenditure for the Nuclear Safety Action Plan (NSAP) has been incurred by the Agency since the closure of the Emergency Response in 2011 and the inception of the NSAP in the same year, through to 10 July 2015. The following table (Table 1) provides the breakdown of expenditure by Major Programme[60].

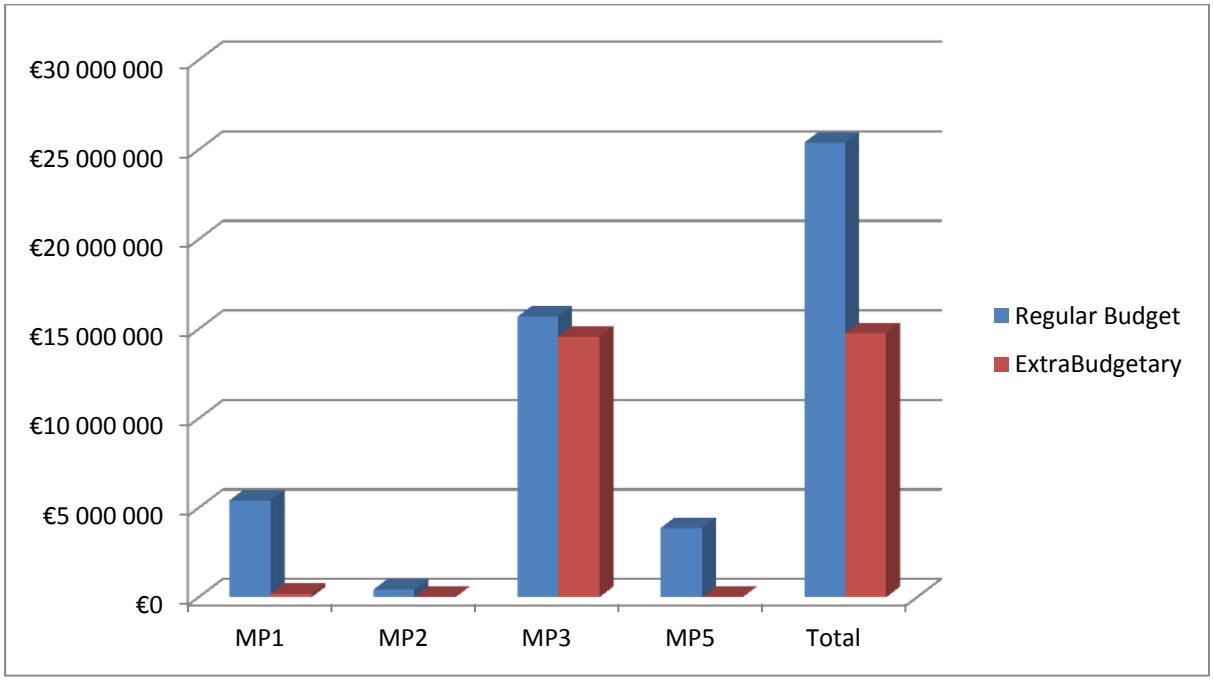
Table 1. Total expenditures for the Nuclear Safety Action Plan

(in € millions, from 1 January 2012 to 10 July 2015)

Major Programmes	Regular Budget	Extra Budgetary	Total
MP1	€5 417 153	€198 114	€5 615 267
MP2	€422 158	€0	€422 158
MP3	€15 680 172	€14 575 658	€30 255 830
MP5	€3 879 430	€0	€3 879 430
Total	**€25 398 912**	**€14 773 772**	**€40 172 684**

Fig.1. Total 2015 expenditures for the Nuclear Safety Action Plan

(in € millions, from 1 January 2012 to 10 July 2015)



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

ANNEX III NEW EXTRABUDGETARY FUNDED PROJECTS

During the period covered by this report, work has commenced on 10 extra budgetary projects related to significant key areas of the Action Plan. The duration of the projects may include the period 2015-2016 and beyond.

- Technical Meeting on Methodology of Equipment Qualification for Harsh Environment and Seismic Impacts.
- Severe Accident Mitigation through Improvements of Reliable Containment Cooling & Filtered Venting for a DBA and BDBA.
- On-site Accident Management Strategies Programmes and Emergency Operating Procedures.
- Further Enhancement of Nuclear Power Plant (NPP) Safety by Developing and Applying PSA-Based Methods for Complementary Assessment of NPPs' Robustness against the Impact of Extreme Events.
- Technical Meeting on Lessons learned from Kashiwazaki-Kariwa, Fukushima, Onagawa and North Anna NPP seismic cases.
- Assistance to the Fukushima Prefecture in long term remediation, decontamination, waste management and radiation monitoring integrated approach.
- Assessment of Freshwater Systems (Groundwater, Rivers, Ponds, Lakes, etc.).
- Preparation, Conduct and Evaluation of a RANET Joint Assistance Team (JAT) field exercise.
- Strengthening research cooperation in radiation disaster medicine including post-traumatic stress disorders.
- Conduct and organize the International Experts Meeting (IEMs) on Assessment and Prognosis in Response to a Nuclear or Radiological Emergency.