

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**



IAEA

International Atomic Energy Agency

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

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INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2013

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FOREWORD

by Denis Flory
Deputy Director General
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In response to the accident at the Fukushima Daiichi nuclear power plant, IAEA Member States unanimously adopted the Action Plan on Nuclear Safety. Under this Action Plan, the IAEA Secretariat was asked to organize International Experts Meetings to analyse all relevant technical aspects and to learn lessons from the Fukushima Daiichi accident.

Emergency preparedness and response is an area that is represented in many of the main actions of the Action Plan. To allow in-depth discussions of different topics within this area, the IAEA Secretariat has organized topical technical meetings with Member States and international organizations, including the Sixth Meeting of the Representatives of 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, as well as other activities. These meetings have brought together leading experts from areas such as emergency preparedness and response, regulatory control, international cooperation, safety standards in emergency preparedness and response, assistance mechanisms in emergencies and communication with the public. The meetings and activities have given experts an opportunity to share the lessons learned in the light of the Fukushima Daiichi accident and other emergencies, as well as lessons identified from emergency response exercises, to identify relevant best practices and to discuss areas needing improvement.

This 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 is part of a series of reports from International Experts Meetings. It draws both on information provided and discussions at, as well the conclusions from, various IAEA meetings on emergency preparedness and response, and on insights from IAEA Secretariat activities undertaken since 2011 in this area with the aim of strengthening the international emergency preparedness and response framework.

I am grateful to the participants in all these meetings and activities who contributed their valuable input. I hope that this report will serve as a useful information tool and reference for governments, regulatory bodies, response organizations, the media and the general public, and that it will contribute to the further strengthening of emergency preparedness and response worldwide.

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1. INTRODUCTION

Following the accident at TEPCO's Fukushima Daiichi nuclear power plant (the Fukushima Daiichi accident), the IAEA Director General convened the IAEA Ministerial Conference on Nuclear Safety in June 2011 to strengthen nuclear safety, emergency preparedness and radiation protection of people and the environment worldwide. Subsequently, the Conference adopted a Ministerial Declaration on Nuclear Safety, which requested the Director General to prepare a draft Action Plan.¹ The draft Action Plan on Nuclear Safety (the Action Plan) was approved by the Board of Governors at its September 2011 meeting.² On 22 September 2011, the IAEA General Conference unanimously endorsed the Action Plan, which was intended to define a programme of work for strengthening global nuclear safety.

The Action Plan includes 12 main actions covering different aspects of nuclear safety. One of these actions is specifically dedicated to the area of emergency preparedness and response, while many other actions contain sub-actions that also address emergency preparedness and response.

In accordance with the Action Plan, the IAEA Secretariat organized five International Experts Meetings (IEMs) in 2012–2013, to share experience and lessons identified in the field of nuclear safety in the light of the Fukushima Daiichi accident. As aspects of preparedness for and response to a nuclear or radiological emergency were discussed at various IEMs³, or were part of other relevant activities undertaken in connection with the implementation of the Action Plan⁴ or of other IAEA programme activities, an IEM dedicated solely to the area of emergency preparedness and response was not organized. All these activities gave the representatives of Member States and relevant international and intergovernmental organizations (hereinafter 'international organizations'), opportunities to share experience and to discuss in depth many aspects of emergency preparedness and response.

¹ Declaration by the IAEA Ministerial Conference on Nuclear Safety in Vienna on 20 June 2011, INFCIRC/821, IAEA, Vienna (2011), para. 23.

² Draft IAEA Action Plan on Nuclear Safety, Report by the Director General, GOV/2011/59-GC(55)/14, IAEA, Vienna (2011).

³ For example, transparency and communication in a nuclear or radiological emergency was covered in the IEM on Enhancing Transparency and Communication Effectiveness in the Event of a Nuclear or Radiological Emergency, held from 18 to 22 June 2012 in Vienna.

⁴ Including activities such as: (i) the IAEA Ministerial Conference on Nuclear Safety, held from 20 to 24 June 2011 in Vienna; (ii) the Fukushima Ministerial Conference on Nuclear Safety, held from 15 to 17 December 2012 in Fukushima Prefecture, Japan; and (iii) the International Conference on Effective Nuclear Regulatory Systems, held from 8 to 12 April 2013 in Ottawa, Canada.

1.1. BACKGROUND

The Fukushima Daiichi accident highlighted the importance of having in place arrangements to effectively respond to a nuclear or radiological emergency irrespective of its cause, including emergencies that are beyond the design basis and those occurring in combination with conventional emergencies such as earthquakes and tsunamis. After the accident, various national and international organizations conducted a series of activities aimed at identifying the lessons to be learned from this accident and implemented actions in the field of emergency preparedness and response based on these lessons.

These activities included reviews of emergency arrangements at all levels (operator, local, national and international), as appropriate, with a specific focus on issues such as: (i) preparedness to respond to beyond design basis accidents in combination with conventional emergencies and to accidents affecting several facilities on a site, including availability of resources and operability of various emergency response facilities; (ii) command and control systems for an emergency response, including prompt decision making on protective actions and other response actions on-site and off-site; (iii) communication in an emergency to both the public and the international community, with particular emphasis on the importance of communicating the concept of ‘safe’ as it relates to radiation protection; (iv) protection of emergency workers and helpers in an emergency; (v) request for and receipt of assistance arrangements; (vi) radioactive waste management arrangements; (vii) arrangements for transition from an emergency to an existing exposure situation; and (viii) the importance of having in place a consistent set of criteria for use in a nuclear or radiological emergency.

1.2. OBJECTIVE AND SCOPE

The objective of this report is to highlight the lessons learned in the area of emergency preparedness and response in the light of the Fukushima Daiichi accident, and to identify the main actions needed for improvement of emergency preparedness and response at any level, that is, on-site and at the local, provincial and/or national, and international levels. This report was prepared by the IAEA Secretariat and is intended to serve as a reference for government officials, emergency planners, technical experts, diplomats, the media and the general public. It is expected that it will contribute to ongoing efforts to assist Member States in strengthening their emergency preparedness and response arrangements.

The report is an integral part of the implementation of the IAEA Action Plan on Nuclear Safety. It summarizes the following meetings and activities

undertaken in line with the Action Plan as well as the discussions and conclusions and/or recommendations from these meetings and activities:

- Regular meeting of the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE), 8–9 December 2011, Paris;
- Meeting of the Response and Assistance Network (RANET), 31 January–2 February 2012, Vienna;
- Sixth Meeting of the Representatives of Competent Authorities Identified under the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, 17–20 April 2012, Vienna;
- Workshop on sharing lessons identified from past responses and exercises, 23–27 April 2012, Vienna;
- Workshop on the highlights of and lessons learned from Emergency Preparedness Review (EPREV) missions, 25–29 June 2012, Vienna;
- Biennial meeting of the International Nuclear and Radiological Events Scale (INES) Officers, 16–20 July 2012, Vienna;
- Ad hoc meeting of IACRNE, 8–10 October 2012, Vienna;
- Technical meeting for review of the draft safety requirements in emergency preparedness and response, 12–16 November 2012, Vienna;
- Meeting of RANET, 4–8 February 2013, Vienna;
- Regular meeting of IACRNE, 22–24 May 2013, the Hague, the Netherlands;
- Workshop on the assessment of national emergency preparedness and response capabilities and implementation of EPREV, 3–7 June 2013, Vienna.

1.3. STRUCTURE

The report is structured as follows: Section 2 discusses the appraisal of national emergency preparedness and response capabilities, and Section 3 addresses international safety standards in emergency preparedness and response. Interagency coordination in emergency preparedness and response is discussed in Section 4. Notification and information exchange in an emergency are presented in Section 5, and Section 6 discusses the international assistance mechanism in an emergency. Section 7 discusses communication with the public in an emergency. Overall conclusions are presented in Section 8, and the main conclusions of major meetings are presented in Annexes A–C. In addition, Annex D presents the IAEA’s assessment and prognosis in response to an emergency at nuclear power plants, and Annex E lists the contents of the CD-ROM attached to this report.

2. APPRAISAL OF NATIONAL CAPABILITIES IN EMERGENCY PREPAREDNESS AND RESPONSE

Lessons learned: The Emergency Preparedness Review (EPREV) service plays an important role in helping to enhance national emergency preparedness and response arrangements and capabilities by identifying areas that need to be improved, as well as good practices.

2.1. BACKGROUND

One of the statutory functions of the IAEA is to establish or adopt standards of safety for the protection of health, life and property as well as to provide for the application of these standards. As part of providing for the application of safety standards, the IAEA, at the request of Member States, makes available appraisal services.

EPREV is the peer review or appraisal service offered by the IAEA Secretariat in the area of preparedness for and response to nuclear or radiological emergencies. EPREV covers preparedness for any nuclear or radiological emergency that may affect a Member State, irrespective of its cause. An EPREV peer review may provide an appraisal of all the arrangements and capabilities in a Member State to respond to an emergency at any level (i.e. on-site, local, provincial and/or national).

The Action Plan emphasizes that Member States should strengthen their emergency preparedness and response arrangements and encourages the conduct of a national review in the light of the Fukushima Daiichi accident. In addition, the Action Plan asks Member States to voluntarily host regular reviews of their emergency arrangements and capabilities, with the IAEA Secretariat providing support and assistance through EPREV missions. Furthermore, the Action Plan requires the IAEA Secretariat to assess and enhance, as necessary, the effectiveness of IAEA peer reviews, including EPREV.

2.2. OVERVIEW OF ACTIVITIES

Since 2011, several activities have been conducted by the IAEA Secretariat in close cooperation with Member States in relation to EPREV⁵, with the aim of assessing the effectiveness of the EPREV service and of enhancing the benefits and ensuring the quality of this service.

An analysis of findings from the EPREV missions conducted in the period 2004–2011 was carried out: (i) to identify those areas which require further attention in improving compliance with the IAEA safety standards in emergency preparedness and response; (ii) to identify good practices in those Member States that have hosted EPREV missions; and (iii) to promote the sharing of experience.

The following areas were commonly identified as needing further improvement:

- Identification and clear allocation of the functions and responsibilities of all stakeholders in the emergency preparedness and response system at the local, provincial and national levels;
- Development and maintenance of on-site, local and national plans (off-site), and of supporting procedures (in particular for initiation and implementation of the off-site response);
- Performance of hazard assessment for emergency preparedness and response purposes;
- Awareness of radiation issues among scrap metal dealers and national border control authorities, and an effective system of monitoring at national borders;
- Establishment of a systematic, effective and regular training programme for first responders;
- Availability of a sufficient number of trained personnel in response organizations;
- Provision of effective personal monitoring services, especially internal monitoring of all designated emergency workers;
- Establishment of generic and operational criteria for decision making on protective and other response actions;
- Establishment of national capabilities for effective medical management of exposed or contaminated individuals;

⁵ For example, a workshop on the highlights and lessons learned from EPREV missions was held in Vienna from 25 to 29 June 2012. This workshop was attended by 18 experts from 13 Member States that have hosted EPREV missions since 2004. A workshop on the assessment of national emergency preparedness and response capabilities and implementation of EPREV held in Vienna from 3 to 7 June 2013 was attended by ten experts from ten Member States.

- Development of a national policy and strategy for keeping the public informed and for communication with national and international organizations;
- Arrangements for mitigating the non-radiological consequences of a nuclear or radiological emergency.

The results of this analysis were used as input and support for effective planning of future EPREV missions.

EPREV related workshops conducted since 2011 have given participants an opportunity to share their experience of hosting EPREV missions and to elaborate on the actions taken in response to recommendations and suggestions made in the respective EPREV mission reports. The benefits gained from the EPREV mission and possible improvements in its preparation and conduct were discussed. In particular, the following specific issues were raised: (i) the adequacy of the EPREV process and of team composition to review and assess the established emergency arrangements for the broad spectrum of assessed hazards; and (ii) the need to improve EPREV mission reports in order to maximize their usefulness to host Member States and to facilitate implementation of the recommendations and suggestions made.

Areas that require specific attention in evaluating a Member State's preparedness to respond to a severe nuclear emergency were also analysed and discussed. These areas relate to: primary responsibility in ensuring public safety in an emergency; training of operating personnel in managing severe accident conditions; mobility and availability of resources (including human resources) for mitigating the consequences of an emergency; implementation of operational criteria (emergency action levels, operational intervention levels) and arrangements for their revision as the emergency evolves; implementation of emergency planning zones and arrangements for taking precautionary urgent protective actions and urgent protective actions within these zones; protection of emergency workers; exchange of information, particularly in the early phases of an emergency; operability of emergency response facilities under severe accident conditions; arrangements for requesting and receiving international assistance; and provision of correct and timely information to the public and the international community.

2.3. CONCLUSIONS

- The independent assessment of a Member State's emergency arrangements and capabilities provided by EPREV peer reviews has contributed to strengthening national emergency preparedness and response

arrangements as well as to enhancing the credibility of Member State emergency organizations.

- There is a need for continuous encouragement of Member States to request an EPREV peer review.
- Sharing of the information contained in EPREV mission reports (such as identified good practices) needs to be improved.
- The detailed elements subject to assessment in an EPREV mission in the light of the Fukushima Daiichi accident need to be formalized and incorporated, as appropriate, into EPREV guidelines and self-assessment tools.
- There is a need for a workable and sustainable funding mechanism to be developed for conducting EPREV missions.
- Preparatory and follow-up missions are core components of the EPREV service, with the follow-up mission being required within a given time frame.
- The EPREV performance indicator methodology needs to be reassessed to measure progress made towards achieving full compliance with IAEA safety requirements.
- A proper process needs to be developed to ensure continuous sharing of good practices in emergency preparedness and response.
- Training of EPREV team members needs to be carried out systematically.
- Each EPREV mission needs to be focused on a specific hazard category; for EPREV missions with a broader scope, the size of the team and/or duration of the mission need to be extended.

3. INTERNATIONAL SAFETY STANDARDS IN EMERGENCY PREPAREDNESS AND RESPONSE

Lessons learned: Implementation of the IAEA safety standards in the area of emergency preparedness and response — in particular, requirements and recommendations regarding the development of predefined generic and operational response criteria — improves harmonization of response actions among Member States.

3.1. BACKGROUND

The IAEA safety standards on preparedness for and response to a nuclear or radiological emergency currently comprise the IAEA Safety Requirements

on Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-R-2 (2002), and two supporting Safety Guides. The Safety Guide on Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1 (2007), provides recommendations on the implementation of the safety requirements established in IAEA GS-R-2. The Safety Guide on Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2 (2011), supports IAEA GS-R-2, providing guidance on the criteria for use in emergency preparedness and response. In addition, the IAEA Secretariat has also been developing guidance and technical tools covering in detail particular aspects of emergency preparedness and response, to support Member States and relevant international organizations in complying with the IAEA safety standards.

The Action Plan mandates the IAEA Secretariat to review and revise, as appropriate, the IAEA safety standards, including those on emergency preparedness and response. The Action Plan also calls on Member States to utilize, as broadly and effectively as possible, the IAEA safety standards in an open, timely and transparent manner, and on the IAEA Secretariat to continue providing support and assistance in the implementation of the IAEA safety standards.

3.2. OVERVIEW OF ACTIVITIES

In close cooperation with Member States and relevant international organizations, the IAEA Secretariat has continued its efforts in reviewing the IAEA safety standards in the area of emergency preparedness and for response in order to strengthen them. This includes regular review of the existing publications and identification of the need for their revision and for development of additional guidance and practical tools, as well as the provision of training in support of implementing the IAEA safety standards.

3.2.1. Review of IAEA safety requirements in emergency preparedness and response

IAEA GS-R-2, which was published in 2002, was jointly sponsored by seven international organizations.⁶ As the standard review cycle for IAEA Safety

⁶ Food and Agriculture Organization of the United Nations (FAO), International Atomic Energy Agency (IAEA), International Labour Organization (ILO), OECD Nuclear Energy Agency (OECD/NEA), Pan American Health Organization (PAHO), United Nations Office for the Coordination of Humanitarian Affairs (OCHA) and World Health Organization (WHO).

Requirements publications is about ten years, there was a need for a review and update of the requirements established in IAEA GS-R-2 in order to reflect experience and improvements since 2002.

A review of the requirements established in IAEA GS-R-2 was initiated in 2011, taking into account:

- The experience gained during response to emergencies that have occurred since 2002, including, but not limited to, the Fukushima Daiichi accident, as well as the lessons identified from exercises conducted during the same time period;
- The feedback obtained from Member States on implementing/applying the safety requirements established in IAEA GS-R-2;
- The latest recommendations of the International Commission on Radiological Protection (ICRP)⁷;
- The experience of relevant international organizations.

The review began with an analysis of responses to a questionnaire distributed to all Member States to gather feedback on implementation of the safety requirements established in IAEA GS-R-2. As this questionnaire was distributed after the Fukushima Daiichi accident, it also allowed for assessment of the applicability of the safety requirements established in IAEA GS-R-2 in response to that accident.

In addition, a review specifically aimed at identifying possible gaps and the need to strengthen the safety requirements was carried out in the light of the response to the Fukushima Daiichi accident. This review was augmented by the discussions at and conclusions from a workshop on sharing lessons identified from past responses and exercises.⁸ The workshop's objective was to share experience and lessons identified in the responses to nuclear and radiological emergencies that had occurred since 2002 (including the Fukushima Daiichi accident), as well as in emergency exercises conducted in this period. The main conclusions from the workshop are presented in Annex A to this report.

The overall conclusion of the workshop was that, if properly implemented, the IAEA safety requirements in the area of emergency preparedness and response provide a solid basis for protecting the public, property and the environment in a nuclear or radiological emergency. No gaps were identified in

⁷ INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, Application of the Commission's Recommendations for the Protection of People in Emergency Exposure Situations, ICRP Publication 109, Elsevier (2009).

⁸ Participants from 21 countries attended the workshop, held from 23 to 27 April 2012 in Vienna.

the requirements established in IAEA GS-R-2; however, there were areas that required further clarification and more detailed explanation.

The discussions at the technical meeting organized to review the draft of the revised safety requirements in emergency preparedness and response⁹ supported: (i) the overall conclusion regarding the requirements established in IAEA GS-R-2; (ii) the inclusion of generic criteria for use in response to a nuclear or radiological emergency to avoid severe deterministic effects and to reduce the risk of stochastic effects; (iii) the inclusion of guidance values for exposure of emergency workers; and (iv) the need to place the generic criteria in perspective in terms of the health hazard in a way that is easily understandable to the public.

Relevant international organizations, most of them members of IACRNE, expressed their views and provided feedback on the revised IAEA GS-R-2 requirements at the IACRNE meetings held in 2012 and 2013. The organizations were all invited to co-sponsor the revised requirements.

The review process and the revised draft requirements were also discussed at the Sixth Meeting of the Representatives of 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, held in April 2012.

The revision will be finalized with the further active participation of Member States and relevant international organizations. It is planned to have the revision process completed in 2014.

3.2.2. Development of IAEA guidance and practical tools

The Fukushima Daiichi accident showed that many Member States were not familiar with or did not fully understand the IAEA guidance and tools on emergency preparedness and response. Many Member States also were not fully aware of what to expect during a severe nuclear emergency at a reactor or spent fuel facility. Therefore, the IAEA Secretariat has initiated a programme to update and publicize its guidance and practical tools supporting implementation of the IAEA safety standards, to assist Member States in the event that they have to respond to a severe nuclear or radiological emergency.

The programme includes finalization of guidance and tools that provide off-site decision makers with an overview of what to expect in a severe nuclear

⁹ This meeting was held in Vienna from 12 to 16 November 2012. All IAEA Member States and international organizations that are members of IACRNE were invited to participate. One hundred and two representatives from 63 Member States and five international organizations attended the meeting.

emergency at a reactor or spent fuel facility, and of what actions they will need to take in order to protect the public, emergency workers and the environment. The programme also includes specific guidance and tools such as: (i) guidance on and tools for real-time assessment and projection of facility conditions; (ii) guidance on protective actions and other response actions that need to be taken before a release occurs (based on the results of the assessments and projections); (iii) operational intervention levels to enable prompt decision making on protective and other response actions on the basis of monitoring data; and (iv) guidance on and tools for placing into perspective the quantities reported during an emergency (e.g. sieverts, counts per second, becquerels) in terms of the potential radiation induced health effects, to enable effective communication with decision makers and the general public. As a result, the IAEA Secretariat developed and published the Actions to Protect the Public in an Emergency due to Severe Conditions at a Light Water Reactor (EPR-NPP Public Protective Actions 2013), which received positive feedback from Member States during pilot training on its application.¹⁰

To increase the pool of experts who can assist in building national and regional understanding and adequate capacities, a train the trainers approach is being used by the IAEA Secretariat. In addition, due consideration is being given to translation of the publications into all of the official United Nations languages, to increase their usefulness and applicability.

3.3. CONCLUSIONS

- A detailed review of the safety requirements established in IAEA GS-R-2 undertaken in the light of the response to the Fukushima Daiichi accident showed that there are no gaps and no need for substantial revision of the requirements therein. However, to further strengthen and/or place greater emphasis on particular safety requirements, additional clarifications are needed.
- Member State application of the IAEA safety standards in the area of emergency preparedness and response improves harmonization of response actions among Member States, which is of particular importance at the regional level.

¹⁰ Workshops on protective actions for severe reactor accidents were held from 12 to 16 March 2012 and from 11 to 15 February 2013, in Vienna. Representatives from countries covering 93% of the world's operable nuclear power plants attended these pilot workshops and provided valuable input on the topic.

- Emergency preparedness and response systems need to contain: (i) a consistent set of generic criteria for avoiding severe deterministic effects and for reducing the risk of stochastic effects; and (ii) a set of operational criteria based on the IAEA safety standards in the area of emergency preparedness and response.
- Relevant organizations in Member States need to implement the IAEA safety standards in the area of emergency preparedness and response, in particular the safety requirements regarding the development and implementation of predefined generic and operational criteria, such as abnormal facility conditions, observables on the scene and operational intervention levels.
- The response to the Fukushima Daiichi accident clearly demonstrated the need to place criteria for decision making, as well as any information provided to the public, into perspective in terms of the health hazards (i.e. the concept of ‘safe’ as it relates to radiation protection) in a way that is easily understandable to the public.¹¹
- In support of the implementation of the IAEA safety requirements in the area of emergency preparedness and response, IAEA Safety Guides on the following topics need to be developed: (i) public communication in a nuclear or radiological emergency, including placing the health hazard into perspective; and (ii) transition from an emergency to an existing exposure situation.

4. INTERAGENCY COORDINATION IN EMERGENCY PREPAREDNESS AND RESPONSE

Lessons learned: Interagency response coordination mechanisms such as the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE) and the Joint Radiation Emergency Management Plan of the International Organizations (JPLAN), which proved to be efficient in response to the Fukushima Daiichi accident, need continuous further enhancement through the development of additional procedures and bilateral protocols.

¹¹ This lesson was identified in past emergencies, and the response to the Fukushima Daiichi accident again highlighted its relevance.

4.1. BACKGROUND

Many international organizations, by virtue of their statutory functions or of related legal instruments, have general functions and responsibilities that encompass aspects of preparedness for and response to nuclear and radiological emergencies. Moreover, some regional organizations (e.g. the European Commission) are party to legally binding international treaties and have directives and regulations that bear on emergency response arrangements among their member countries.

IACRNE is a coordination mechanism among relevant international organizations for ensuring that coordinated and consistent arrangements and capabilities for preparedness for and response to nuclear or radiological emergencies are developed and maintained at the international level. IACRNE maintains the JPLAN, which describes the interagency framework for preparedness for and response to an actual, potential or perceived nuclear or radiological emergency, independent of whether it arises from an accident, natural disaster, negligence, nuclear security event or any other cause. The IAEA Secretariat, through the Incident and Emergency Centre (IEC), provides the secretariat for IACRNE and acts as the main coordinating body for the development, maintenance and implementation of the JPLAN. Currently, a total of 17 international organizations are IACRNE members.¹²

The Action Plan also sets out actions for relevant international organizations in relation to reviewing and strengthening the international emergency preparedness and response framework and assistance mechanisms, and encourages greater involvement of the relevant international organizations in IACRNE.

¹² IACRNE was established following the Chernobyl accident and currently includes the following members: Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO) Preparatory Commission, Euro-Atlantic Disaster Response Coordination Centre of the North Atlantic Treaty Organization (EADRCC), European Commission (EC), European Police Office (EUROPOL), Food and Agriculture Organization of the United Nations (FAO), International Atomic Energy Agency (IAEA), International Civil Aviation Organization (ICAO), International Criminal Police Organization-INTERPOL (ICPO-INTERPOL), International Maritime Organization (IMO), OECD Nuclear Energy Agency (OECD/NEA), Pan American Health Organization (PAHO), United Nations Environment Programme (UNEP), United Nations Office for the Coordination of Humanitarian Affairs (OCHA), United Nations Office for Outer Space Affairs (UNOOSA), United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), World Health Organization (WHO) and World Meteorological Organization (WMO).

4.2. OVERVIEW OF ACTIVITIES

The IAEA Secretariat coordinated the interagency response to the Fukushima Daiichi accident within IACRNE, which led to a consistent and harmonized response, in particular in the area of public communication. The central role of the IAEA Secretariat in coordination of this response was stressed at various forums, starting at the Ministerial Conference on Nuclear Safety in June 2011.

At its regular meeting in December 2011,¹³ IACRNE initiated an assessment of the interagency response to identify lessons to be learned for further enhancement of the response and coordination mechanism. At this meeting, international organizations discussed the following items extensively:

- Reports of international organizations on the response to the Fukushima Daiichi accident, as well as continuous activities undertaken by each organization in strengthening its emergency arrangements;
- The need to strengthen the procedures for cooperation and coordination in providing public information at the international level;
- The existing exercise regimes, including the Conventions Exercises (ConvEx) regime;
- The need to maintain awareness of the interagency coordination mechanism on the part of senior management of IACRNE member organizations;

¹³ Since 2011, there have been two regular meetings and one ad hoc meeting of IACRNE:

- The 22nd regular meeting was held in Paris from 8 to 9 December 2011, and hosted by OECD/NEA. Twenty representatives from 14 participating organizations that are IACRNE members participated in the meeting. In addition, 11 representatives from 8 organizations with observer status attended the meeting.
- The ad hoc meeting was held in Vienna from 8 to 10 October 2012. Seventeen representatives from 11 international organizations that are IACRNE members attended the meeting.
- The 23rd regular meeting was held in the Hague, the Netherlands, from 22 to 24 May 2013, and hosted by the EUROPOL. Twenty-one representatives from 15 participating organizations that are IACRNE members participated in the meeting. In addition, three representatives of three organizations with observer status attended the meeting.

- The need to establish an ad hoc working group on air and maritime transportation considering the experience gained in the inter-agency response to the Fukushima Daiichi accident;¹⁴
- The need to review and revise the JPLAN (2010 Edition).¹⁵

4.3. CONCLUSIONS

- Experience from the Fukushima Daiichi accident has clearly shown that IACRNE is a useful and effective coordination mechanism. The coordination role by the IAEA Secretariat should be maintained and further enhanced. Relevant organizations that are not yet members of IACRNE are encouraged to join it.
- The JPLAN, which was activated immediately after the onset of the Fukushima Daiichi accident, demonstrated its usefulness. However, additional operational procedures and bilateral protocols to support its implementation and to reduce the response times need to be developed, maintained and tested in emergency response exercises.
- Specific attention needs to be paid to public communication at the international level. IACRNE needs to develop templates of joint public statements and consistent individual statements. Public information officers of IACRNE member organizations have agreed to work together to prepare joint messages for various types of emergency scenario (as templates) in different official United Nations languages to facilitate an efficient and effective response to public information challenges in emergencies.
- It is expected that the ad hoc IACRNE Working Group on Air and Maritime Transportation will contribute to coordinated and consistent preparedness and response arrangements among concerned international organizations and international trade organizations for the event of a nuclear or radiological emergency that has, or is perceived to have, an impact on international air and/or maritime transportation.

¹⁴ The purpose of the working group would be to coordinate response among concerned international organizations and international trade organizations in a nuclear or radiological emergency that has, or is perceived to have, an impact on the international air and/or maritime transportation.

¹⁵ The JPLAN has since been revised, and the 2013 Edition came into effect on 1 July 2013.

- It is expected that the JPLAN (2013 Edition) will further ensure efficient coordination among relevant international organizations.¹⁶

5. NOTIFICATION AND INFORMATION EXCHANGE IN AN EMERGENCY

Lessons learned: Notification and information exchange in an emergency need to be timely as well as objective, clear and transparent, and arrangements and tools for notification and information exchange need to be enhanced. The role of the Incident and Emergency Centre (IEC) as an international hub for exchange of official information, provision of information to the public, coordination of the response of relevant international organizations, and facilitation of international assistance has proved its usefulness and needs to be maintained and further developed, and its effectiveness improved.

5.1. BACKGROUND

The international emergency preparedness and response framework for nuclear and radiological emergencies is defined by the Convention on Early Notification of a Nuclear Accident (the Early Notification Convention) and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (the Assistance Convention). This framework is supplemented by a number of mechanisms established by the IAEA's Policy-Making Organs and the meetings of competent authorities under the Early Notification and Assistance Conventions, and a number of practical arrangements established by the IAEA Secretariat through the IEC.

The IAEA has specific functions assigned to it under these Conventions. The arrangements provided among the IAEA Secretariat, its Member States and/or Parties to one or both Conventions, relevant international organizations and other States for facilitating the implementation of these Conventions — specifically concerning those articles that are operational in nature — were documented in the IAEA publication entitled *Emergency Notification and*

¹⁶ The JPLAN (2013 Edition) incorporates the following main changes: revised emergency classification, elaborated response actions, additional clarification of response arrangements and tasks, updated capabilities and contact details of participating organizations, and an updated list of publications and legal instruments of relevance to emergency preparedness and response.

Assistance Technical Operations Manual, 2007 Edition (EPR-ENATOM 2007). The Secretariat fulfils its roles through the IAEA's Incident and Emergency System (IES) and the IEC, which serves as the Secretariat's focal point for emergency preparedness and response and as the custodian of the IES.

Prior to the approval of the Action Plan in September 2011, the IAEA Secretariat's central response role under this framework included: prompt notification of the emergency to Member States and international organizations; exchange and/or provision of official (authenticated and verified) information to Member States and international organizations; coordination of international assistance, upon the request of the State concerned; coordination of the interagency response; and provision of timely, accurate, coordinated and appropriate public information.

The Action Plan expanded the Secretariat's response role to cover the need for the IAEA Secretariat:

“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.”¹⁷

In the light of the Fukushima Daiichi accident, the Action Plan requires the States Parties to the Early Notification and Assistance Conventions to explore mechanisms for enhancing the effective implementation of these Conventions, and encourages Member States to join and effectively implement them. The Action Plan also calls on “Member States, with the assistance of the IAEA Secretariat, to strengthen the emergency notification system, and reporting and information sharing arrangements and capabilities.”

5.2. OVERVIEW OF ACTIVITIES

Past emergencies, including the Fukushima Daiichi accident, have highlighted the need to reinforce implementation of emergency notification, reporting and information sharing. Proposals for improvements in the international notification arrangements were discussed in detail at the Sixth Meeting of the Representatives of Competent Authorities Identified under the

¹⁷ Draft IAEA Action Plan on Nuclear Safety, Report by the Director General, GOV/2011/59-GC(55)/14, IAEA, Vienna (2011).

Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.¹⁸ The meeting recognized the importance of enhancing implementation of the notification under the Early Notification Convention and the voluntary sharing of information on events that may be below the threshold contained in Article 1 of the Convention. The main conclusions of the meeting are presented in Annex C to this report.

The IAEA Secretariat worked on defining the objectives, process and limitations for the operational implementation of the IAEA's response role in an emergency at a nuclear power plant with regard to analysis of available information and prognosis of possible consequences and likely emergency scenarios, as defined in the IAEA Action Plan on Nuclear Safety (see Annex D for details).

5.2.1. Operations Manual for Incident and Emergency Communication (EPR-IEComm 2012)

In response to proposals to further strengthen the implementation of the Early Notification Convention, the IAEA Secretariat, in cooperation with Member States, revised EPR-ENATOM 2007, which became the Operations Manual for Incident and Emergency Communication (EPR-IEComm 2012).¹⁹ The manual contains enhanced communication protocols for contact points identified under the Early Notification and Assistance Conventions, as well as the latest developments in tools for information exchange such as the Unified System for Information Exchange in Incidents and Emergencies (USIE)²⁰, launched in July 2011.

The manual establishes specific expectations for the IAEA Secretariat and for States and international organizations regarding notification of, and information exchange during, a nuclear or radiological emergency by introducing

¹⁸ The meeting was held from 17 to 20 April 2012 in Vienna. All IAEA Member States and relevant international organizations were invited to participate in the meeting, with a particular focus on competent authorities identified under the Early Notification and Assistance Conventions as well as those identified for other operational purposes. One hundred and twenty two representatives of competent authorities from 67 States and nine representatives from five international organizations attended the meeting.

¹⁹ EPR-IEComm 2012 came into effect on 1 June 2012.

²⁰ USIE is an IAEA web portal for contact points of the States Parties to the Early Notification Convention and the Assistance Convention and of IAEA Member States, allowing the exchange of urgent information during nuclear and radiological incidents and emergencies, and for officially nominated National Officers of the International Nuclear and Radiological Event Scale (INES) to post information on events rated using INES.

specific response time objectives (consistent with IAEA safety standards) for the initial emergency notification and the provision of follow-up information. The event categorization and response procedures in emergencies have also been modified on the basis of experience from the past few years and the frequency of reported events.

As the manual is an operational tool for implementation of the Early Notification Convention, the IAEA Secretariat places specific emphasis on assisting in the manual's application through various events, including training²¹ and exercises that contribute to further strengthening the Convention's implementation.

5.2.2. Conventions Exercises (ConvEx)

Emergency response exercises are a key component of a good emergency preparedness programme and a powerful tool for verifying and improving the quality of emergency response arrangements and capabilities. Therefore, the IAEA Secretariat prepares and conducts regular communication drills and exercises, called Conventions Exercises (ConvEx), at three levels of complexity, mainly covering the response in the early phase of a severe nuclear or radiological emergency. Exercise evaluations are shared with all contact points.

Essentially, a ConvEx-1 exercise is a communication test for the contact points, in which the National Warning Points and the National Competent Authorities for an Emergency Abroad are required to respond within a specified time.²²

Since June 2012, exercises have been run according to a revised exercise regime, as documented in the IECComm manual (2012 Edition), which introduces a few changes, such as the revised response time objectives for contact points and the establishment of new, medium scale exercises.

The revised exercise regime introduces the following changes:

- An exercise designed to test the validity of the information on USIE administrators was added.
- An exercise with specific radiological emergency scenarios was added.²³

²¹ In total, 12 IECComm workshops have been organized since 2011, involving 73 Member States.

²² Two such exercises have been conducted since the beginning of 2011, in December 2011 and in August 2012.

²³ In the past, only nuclear emergencies were used for simulated exercise events, and thus Member States that do not own nuclear facilities could not act as an 'Accident State' and, therefore, could not practice notifying and reporting procedures.

- As some exercises were previously conducted only during the office hours of the IAEA Secretariat, only a small number of countries outside Vienna's time zone participated. To increase participation in other parts of the world, exercises are now conducted at different starting times in order to contact all contact points at out of office hours at least once in a series of communication tests, or the requirement to respond in real time is omitted.
- The detailed instructions for the ConvEx-1 exercises were modified to reflect the possibility of responding to communication tests using the USIE web site.

5.2.3. Unified System for Information Exchange in Incidents and Emergencies (USIE)

USIE was launched in July 2011, three months after the Fukushima Daiichi accident. It addressed the need to improve the system for emergency notification and information exchange through the IAEA Early Notification and Assistance Convention (ENAC) web site by increasing the system's reliability and security, improving its usability and providing an opportunity for Member States to report on a wider range of events. The following specific improvements were introduced:

- An enhanced subscription and alerting feature implemented through the use of diverse alert channels (fax, SMS, email);
- Increased usability of a large number of event associated documents through new and revised reporting forms, including the forms for requesting information and assistance;
- Joining of the reporting systems used by the competent authorities and by the INES National Officers into a single, unified reporting system;
- Improved access control through the use of the IAEA Nucleus user accounts registration system;
- The possibility to utilize the USIE in national and regional exercises.

To assist in the application of USIE, training materials were developed and made available through dedicated USIE exercise and USIE training web sites. These resources are regularly used in USIE training. Through continuous interaction with the official contact points in Member States, the IAEA

Secretariat is gathering feedback,²⁴ which will help in the further improvement of USIE.

The IAEA Secretariat is assisting Member States in registering their competent authorities in USIE through various means, including setting up ‘help desks’ for registration at relevant IAEA meetings, developing a ‘walk-through registration steps’ video, and setting up teleconferences with counterparts. Member States are being encouraged to register users in USIE, and the number of registered contact points in USIE has increased substantially. However, 56 Member States have not yet registered any user.

5.2.4. International Radiation Information Exchange (IRIX) standard

Among the sets of data to be reported in an emergency is the monitoring data set. During the Fukushima Daiichi accident, the lack of a common standard exchange data format for monitoring data at the international level slowed the processing of the data, and consequently slowed data exchange and analysis. It has been recognized that wider adoption of the International Radiation Information Exchange (IRIX) standard for the exchange of incident and emergency related information among Member States is necessary.

The IRIX standard is an information exchange format²⁵ designed to facilitate web based exchange of relevant emergency information and data among organizations that respond to nuclear and radiological incidents and emergencies, and in particular the exchange of emergency information among national authorities that have responsibilities assigned under the Early Notification Convention.

The IRIX standard (version 1.0), together with complete documentation, was issued in March 2013. The IRIX standard is currently used in the IAEA’s USIE system and in the web based European Community Urgent Radiological

²⁴ Member States are asked to provide feedback on the use of USIE in exercises and training, as well as through a specifically designed questionnaire.

²⁵ The IRIX information structure covers information such as basic information about the event (date/time, location, etc.), information about the source or facility, details about radioactive releases, information on protective actions taken and/or planned in a country, and radiological monitoring data. It includes information that is of immediate use to authorities in their decision making on protective actions for the public, but also more detailed information and data that can be used for improving the assessment of the emergency situation and the subsequent decision making. The format supports the exchange of information that has been identified to be of key importance in the initial notification as well as follow-up information that States Parties are obliged (and other States are expected) to provide under the terms of the Early Notification Convention. The use of the IRIX standard is not limited to the Early Notification Convention.

Information Exchange (WebECURIE) and European Union Radiological Data Exchange Platform (EURDEP) systems.

The IAEA Secretariat (though the IEC) must strengthen its efforts to promote wider use of the IRIX standard. Planned actions include increasing awareness of IRIX, improving the IRIX collaboration platform and developing simple IRIX tools such as format converters. Several Member States have started to develop support for the IRIX standard in the systems they use for exchanging emergency information and data with the IAEA Secretariat and other counterparts.

5.2.5. International Radiation Monitoring Information System (IRMIS)

While many Member States operate real-time radiation monitoring networks, monitoring data from those networks could not be exchanged readily during past nuclear or radiological emergencies because a common standard for data exchange was lacking.²⁶ The IAEA Secretariat is working to establish the International Radiation Monitoring Information System (IRMIS), which will serve as a global platform for collecting and displaying real-time radiation monitoring data from national and international monitoring systems. It is important to stress that IRMIS is not designed to be used as a ‘global early warning system’. IRMIS, which is built on EURDEP technology, will collect radiation monitoring data from national and international data providers using the IRIX standard, store the data safely in a database, and allow users to query the database, download the data or display them in various ways. Only data from official national and international data providers will be collected, to avoid the need for additional data validation.

In 2011–2013, the IAEA Secretariat conducted three consultants meetings where representatives of Member States were invited to present their radiation monitoring networks. The meeting participants supported the initiative with the suggestion that the results of the current testing phase — involving several Member States with their own monitoring networks — be discussed at a meeting of the competent authorities and that further developments be decided on at that time.

5.2.6. Fukushima Monitoring Database (FMD)

On 7 September 2012, the IAEA Secretariat (through the IEC) launched a database of radiation measurement results collected following the Fukushima

²⁶ This was also the case during the Fukushima Daiichi accident.

Daiichi accident called the Fukushima Monitoring Database (FMD). The FMD is available to all Member States and the public, and provides results of near and far field radiation measurements performed in 2011 (starting on 11 March and ending with the cold shutdown condition announced by the Government of Japan on 16 December 2011).²⁷ The database also contains radiological monitoring results from other Member States that provided them to the IAEA Secretariat (through the IEC). The FMD enables researchers to search and download results of measurements such as dose rate measurements and measurements of environmental samples, including leaves, water and soil.

5.3. CONCLUSIONS

- The operational arrangements in EPR-IEComm 2012 allow for enhanced implementation of notification under the Early Notification Convention and the voluntary sharing of information on events that may be below the threshold contained in Article 1 of the Convention.
- Member States and relevant international organizations are encouraged to fully utilize the existing operational arrangements and to test their use through training, as well as through national and ConvEx exercises, to identify areas requiring further improvements.
- Member States and relevant international organizations are strongly encouraged to register as users in the USIE; this will also enable them to receive alert messages through this system via diverse alert channels (fax, SMS, email).
- Wide implantation of the IRIX standard will facilitate real-time exchange and timely analysis of information in an emergency.
- Development of IRMIS is an important step in strengthening the international emergency preparedness and response tools. Member States and relevant international organizations are encouraged to consider joining IRMIS.

²⁷ Monitoring information was collected as part of the IAEA Secretariat's role in implementing the Early Notification Convention, under which Japan provided the IEC with the requested information.

6. INTERNATIONAL ASSISTANCE MECHANISM IN AN EMERGENCY

Lessons learned: Arrangements and capabilities for providing and receiving international assistance need to be an integral part of emergency preparedness.

6.1. BACKGROUND

The Assistance Convention requires the States Parties to cooperate among themselves and with the IAEA Secretariat to facilitate prompt assistance in the event of a nuclear accident or radiological emergency, to minimize its consequences and to protect life, property and the environment.

As part of the IAEA Secretariat's strategy for supporting the practical implementation of the Assistance Convention, the Response and Assistance Network (RANET) was established as an operational mechanism to provide assistance in different technical areas with the help of registered national capabilities.²⁸ RANET is a network of States Parties to the Assistance Convention. National Assistance Capabilities (NACs) in RANET consist of suitably qualified experts, teams and resources registered by the States Parties that can be made available, upon request, to provide a timely response — on a regional basis — to a nuclear or radiological emergency. These capabilities cover specific areas such as radiation survey, environmental sampling and analysis, assessment and advice, decontamination, medical support, dose assessment, source search and recovery, and advice on emergency response actions.

The Action Plan requires the IAEA Secretariat, Member States and relevant international organizations to strengthen the assistance mechanisms to ensure that necessary assistance is made available in a timely manner, with due consideration to enhancing and fully utilizing RANET, including expanding its rapid response capabilities. It also requests Member States to consider, on a voluntary basis, establishing national rapid response teams that could also be made available internationally through RANET.

²⁸ At the time it was established, RANET was called the Emergency Response Network (ERNET).

6.2. OVERVIEW OF ACTIVITIES

Although RANET was not used in the response to the Fukushima Daiichi accident, subsequent evaluation of the event identified areas where RANET could be enhanced, as well as ways to implement these enhancements.²⁹ Specific issues discussed with the Member States included:

- Ways of using the capabilities of the newly introduced RANET functional areas of ‘nuclear installation assessment and advice’;
- The process for regularly updating the database of registered national assistance capabilities;
- The programme of RANET review missions;
- Financial aspects of international assistance;
- Aspects of assistance compatibility;
- The review and revision of the IAEA Response and Assistance Network publication (EPR-RANET 2010).

The main conclusions of these discussions are presented in Annex B to this report. Discussions held at the meetings are reflected in the 2013 edition of the EPR-RANET publication, which came into effect on 1 September 2013. The main changes include:

- The addition of a new functional area to address on-site assistance and advice following emergencies at nuclear installations;
- Modifications to the concept of operations that build on and streamline the concept contained in EPR-RANET 2010;
- A description of RANET NAC review missions that elaborates on the concept introduced in EPR-RANET 2010;
- Changes to the registration form to reflect the recent developments in RANET.

²⁹ RANET was extensively discussed at the consultants meeting on the extension of RANET capabilities (held from 31 January to 2 February 2012 in Vienna), to which RANET registered Member States, as well as a number of States Parties to the Assistance Convention having nuclear power programmes, selected on the basis of regional distribution and the development of their programmes, were invited. A total of 36 participants from 20 Member States attended the meeting. RANET was also discussed at the sixth meeting of the competent authorities and at the technical meeting of RANET registered Member States held from 4 to 8 February 2013 in Vienna, with 43 participants from 22 Member States.

To provide Member States with information regarding the NACs registered in RANET, in January 2013 the IAEA Secretariat launched the RANET database on the USIE web site. The database features all of the information related to the NACs: Field Assistance Teams (FATs), External Based Support (EBS) and registered resources. This new feature is intended to make information on the assistance capabilities registered in RANET more easily accessible.

The compatibility of national capabilities among States is of real importance for improving the effectiveness of international assistance. Therefore, the IAEA Secretariat has begun developing compatibility guidelines. Discussions were held with Member States on compatibility issues that may exist when providing assistance in the areas of radiation monitoring, environmental sampling and analysis, and nuclear installation assessment and advice.

The IAEA Secretariat has continued to work with States Parties to the Assistance Convention to increase registration in RANET, resulting in the registration of NACs by Canada, Norway and the United Kingdom, and expansion of registered capabilities by Australia and the United States of America, since 2011.

6.2.1. ConvEx-2b exercises

Discussions held with Member States that registered their NACs in RANET highlighted in particular the need for States to ensure that they have effective mechanisms in place for requesting and receiving international assistance in order to achieve timely provision and use of assistance. In this regard, conduct of international exercises with an assistance component is of special importance. The ConvEx-2b exercises (part of the overall ConvEx regime) are conducted every year over a period of up to three days to provide Member States with the opportunity to test the national and international processes for requesting and receiving international assistance and/or for providing international assistance following a nuclear or radiological emergency. Two ConvEx-2b exercises were

conducted, the first in 2012³⁰ and the second in 2013³¹. Exercise scenarios were developed for each of the Requesting States based on an event designed to ensure that the national response capabilities of that State would be overwhelmed, thus requiring the State to request assistance.

These exercises are designed to test the following:

- National processes to request and provide international assistance following a nuclear or radiological emergency;
- The response of the IAEA Secretariat to a request for assistance;
- Coordination between a Requesting State, Assisting State(s) and the IAEA Secretariat;
- Provision of assistance under the new RANET functional area of ‘nuclear installation assessment and advice’;
- Use of the USIE exercise web site.

The exercises demonstrated that there are a large number of Member States that have capabilities they are willing to offer in response to a nuclear emergency, as was observed in the response to the Fukushima Daiichi accident. Several of the Member States that offered assistance are not yet registered in RANET or offered assistance in areas that they have not yet registered in RANET.

6.2.2. IAEA Response and Assistance Network (RANET) Capacity Building Centre in Fukushima

Practical arrangements were signed in December 2012 between the IAEA Secretariat and the Ministry of Foreign Affairs of Japan to establish the IAEA Response and Assistance Network (RANET) Capacity Building Centre. The opening ceremony for the Centre, which is funded by the Government of Japan and supported by Fukushima Prefecture, took place in Fukushima City in May 2013. The Centre is being used for training activities that are aimed at enhancing

³⁰ In this exercise, conducted from 30 July to 1 August 2012, ten Member States participated as a Requesting (‘Accident’) States (including one registered RANET member), while 26 Member States participated as Assisting States (including ten registered RANET members). One international organization also registered to participate in the exercise; two Member States requested to observe the exercise.

³¹ In this exercise, conducted from 11 to 12 June 2013, one Member State participated as the Requesting (‘Accident’) State (in accordance with the scenario there was no need for more than one such player), while 32 Member States participated as Assisting States. In addition, the Regional Specialized Meteorological Centres of the World Meteorological Organization provided atmospheric dispersion products to the IEC throughout the exercise.

nuclear emergency preparedness and response capacity at the regional and international levels.

In May 2013, the IAEA Secretariat organized its first workshop at the Centre³², focusing on capabilities in radiation survey and environmental sampling and analysis.

6.3. CONCLUSIONS

- Extension of RANET to include the functional area ‘nuclear installation assessment and advice’ further strengthened provisions for assistance in the case of emergencies at nuclear installations.
- It is important that Member States develop and maintain adequate national response capabilities and arrangements that are commensurate with identified hazards and that could be offered for international assistance. Member States are encouraged to register these capabilities in RANET.
- Member States need to establish and maintain arrangements for offering and delivering, as well as for requesting and receiving, international assistance. Preparedness for providing and receiving assistance need to be a part of the preparedness to respond to emergencies.
- The RANET mechanism does not, and will not at any time, replace national/State responsibility for emergency preparedness and response.
- Competent authorities need to ensure awareness of RANET within the national structures and promote its use and development.
- ConvEx-2b exercises offer an opportunity to test various aspects of assistance mechanisms at the national and international levels, and support the implementation of the Assistance Convention.
- Guidelines on minimum compatibility of preparedness and response capabilities will contribute to effective international assistance.
- Legal and liability issues related to the provision of assistance within the Assistance Convention will remain a challenge.

³² The workshop was held from 28 to 31 May 2013 in the IAEA Response and Assistance Network (RANET) Capacity Building Centre in Fukushima Prefecture, Japan, and was attended by 46 participants from 18 Member States. It provided the opportunity for the participants to work together in the field; to observe other teams performing monitoring activities and share their knowledge and expertise; to identify and resolve compatibility issues related to the provision of assistance; and to perform an inter-comparison of the results obtained throughout the exercise.

7. COMMUNICATION WITH THE PUBLIC IN AN EMERGENCY

Lessons learned: Provision of clear, objective and understandable information to the public in an emergency reduces public concern and contributes to the prevention and mitigation of consequences of an emergency. Public communication arrangements need to be made at the preparedness stage based on the IAEA safety standards.

7.1. BACKGROUND

Experience from past nuclear and radiological emergencies highlights public communication as one of the most important challenges in emergency management. Communicating effectively with the public about nuclear and radiological emergencies is a key to successful emergency response. Keeping the public informed during an emergency is one of the requirements established in IAEA GS-R-2. Being aware of the importance of transparent, clear and objective public communications, the IAEA Secretariat (through the IEC) has developed numerous guidelines and tools for effective public communication in an emergency.³³

The Action Plan calls for Member States, with the assistance of the IAEA Secretariat, to enhance the transparency and effectiveness of communication among operators, regulators and various international organizations, and to strengthen the IAEA Secretariat's coordinating role in this regard. In addition, the Action Plan requires a review of the application of INES as a communication tool in the light of the Fukushima Daiichi accident.

This section of the present report complements the IAEA Report on Enhancing Transparency and Communication Effectiveness in the Event of a Nuclear or Radiological Emergency, the report from an IEM held from 18 to 20 June 2012 in Vienna.

³³ See: INTERNATIONAL ATOMIC ENERGY AGENCY, Method for Developing Arrangements for Response to a Nuclear or Radiological Emergency: Updating IAEA-TECDOC-953 (EPR-Method 2003), IAEA, Vienna (2003); INTERNATIONAL ASSOCIATION OF FIRE AND RESCUE SERVICES, INTERNATIONAL ATOMIC ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, Manual for First Responders to a Radiological Emergency (EPR-First Responders 2006), IAEA, Vienna (2006); INTERNATIONAL ATOMIC ENERGY AGENCY, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GSG-2, IAEA, Vienna (2011).

7.2. OVERVIEW OF ACTIVITIES

A key lesson highlighted in the response to the Fukushima Daiichi accident — as in past emergencies — was the need for transparent, timely, objective, factual, relevant, accurate, clear and credible information. Furthermore, to ensure the effective dissemination of this information, procedures need to be agreed upon in advance with regard to approval for its dissemination. The accident also highlighted the need for communicators to take into account public perceptions and the specific psychological impacts that nuclear emergencies can have. Such psychological impacts can persist long after an emergency ends.

In 2012, the IAEA issued the publication *Communication with the Public in a Nuclear or Radiological Emergency (EPR-Public Communications 2012)*. The aim was to provide practical guidance to those responsible for keeping the public and media informed and for coordinating all sources of official information to ensure that a consistent message is provided to the public before, during and after an emergency. The IAEA has developed and published training materials on this topic. *EPR-Public Communications 2012* supports the existing safety standards on emergency preparedness and response in relation to public communication. The publication was developed with input from experts involved in communication with the public in past emergencies, including the Fukushima Daiichi accident. It fully addresses lessons from the response to the Fukushima Daiichi accident covering experience in the use of social media and addressing specific questions asked by members of the public in calls to telephone hotlines in Japan.

EPR-Public Communications 2012 is supplemented by training materials, which have been used since 2012 in various training events.³⁴ These events also provided opportunities for Member States to share their experience in emergency public communication, exchange ideas about arrangements and create the relationships that are key to being better prepared to coordinate information dissemination in an emergency.

Some of the major topics discussed at these training activities relate to coordination of information and to spokesperson selection and training. It has been identified that it is not only essential to ensure that information is transparent, timely, objective, factual, relevant, accurate, clear and credible, but also that it is consistent with information released by other authorities (for

³⁴ Since 2011, six training courses and workshops on public communication in an emergency have been delivered at the national, regional and interregional levels. Three additional training activities on public communication are scheduled for 2013 (Morocco, 23–27 September 2013; Brazil, 25–29 November 2013; and Bolivia, 9–13 December 2013).

example, with regard to protective actions). Inconsistencies in information released to the public have the potential to cause fear and unnecessary actions.

The selection and training of the spokesperson is a crucial element of emergency preparedness for public communication. A number of public information officers participating in the training courses on communication with the public in a nuclear or radiological emergency shared the experience of the head of their organization automatically taking on the role of the spokesperson despite having no prior media training or experience. Public speaking and empathy may come naturally to some people but not to others. The need to have several trained, trusted and qualified spokespeople capable of speaking to the media and the public cannot be underscored enough. While the head of an organization may be a very effective spokesperson, the public may trust other individuals as well: in some cases it might be a doctor, in others it might be a community leader, for example. It is a good practice to pay particular attention to the selection and training of spokespeople in order to support effective information dissemination, mitigate public fear and help to ensure the successful implementation of protective actions.

To respond to the frequent Member State requests for training on this topic and to make EPR-Public Communications 2012 as widely available as possible, efforts are being made to translate the publication and related training materials into all the official United Nations languages.³⁵ In addition, to make the materials easily accessible to the relevant audience (i.e. those responsible for communicating with the media and the public in a nuclear or radiological emergency), work has begun on converting the training materials into an e-learning tool.

Furthermore, to complement EPR-Public Communications 2012, the IAEA Secretariat is developing a template to assist Member States in drafting their national emergency public communications plan and strategy, in line with their national emergency response plans. The template and the e-learning tool are intended to complete the emergency public communication toolkit for public information officers to be made available to all Member States.

In 2013, the IAEA issued the publication *Actions to the Protect Public in an Emergency due to Severe Conditions at Light Water Reactor (EPR-NPP Public Protective Actions 2013)*, which addresses aspects of public communication in the case of an emergency at a nuclear power plant. In emergencies, various measured quantities such as dose rate (e.g. expressed in sieverts per hour), food concentrations (e.g. expressed in becquerels per kilogram) or calculated doses

³⁵ To date, EPR-Public Communications 2012 is available in English, French and Spanish.

(e.g. expressed in sieverts) are reported and often used to describe the situation to the public and decision makers. In many of these cases, the quantities and doses are: (i) used incorrectly (e.g. use of effective dose to assess health effects without considering those members of the public that are the most sensitive to radiation or all exposure pathways); and (ii) not put into perspective in terms of the possible health hazard.

The publication *EPR-NPP Public Protective Actions 2013* describes a system for putting into perspective the radiological health hazard from a measured quantity or calculated dose using a simple and understandable format. This publication defines the concept of ‘safe’³⁶ as it relates to radiation protection and describes circumstances in which possible health concerns may exist and in which a situation is dangerous to health.

7.2.1. International Nuclear and Radiological Event Scale (INES)

In 1990, in a joint effort by the IAEA and OECD/NEA, a tool, today known as the International Nuclear and Radiological Event Scale (INES), was developed for consistently communicating to the public the safety significance of nuclear events³⁷. The Fukushima Daiichi accident raised questions about the effectiveness of the scale as it was applied and showed that the frequent changes of the INES provisional rating confused the public. This accident revealed the need to provide the public with an early explanation of the purpose of INES in order to reduce any unjustified public expectations. Since 2011, many activities have been undertaken with the aim of contributing to improving application of INES as a communications tool in a nuclear or radiological emergency.

The latest developments related to INES and plans for its further improvement in the light of the Fukushima Daiichi accident were discussed at the technical meeting³⁸ of the INES National Officers in July 2012 and at two annual meetings of the INES Advisory Committee held in March 2012 and June 2013. Central to the discussions was the issue of timely provision of information to the public and the media using INES, while ensuring the provision of the most accurate assessment of the situation when faced with the challenge of limited availability of information. More specific discussions on the INES ratings of the Fukushima Daiichi accident, the consequences for the scale and the associated development of guidance on the use of INES in evolving severe accident

³⁶ ‘Safe’ in this context is understood to mean meeting international safety standards for which no protective or other response actions need to be taken.

³⁷ The INES rating was later broadened to include radiological events.

³⁸ The meeting, held in Vienna from 16 to 20 July 2012, was attended by 73 participants from 59 Member States and 2 international organizations.

situations contributed to establishing a way forward in the application of INES in evolving severe emergencies.

While it was concluded that there was no need to revise INES, it was agreed that there was a need for guidance on its use in evolving severe accident situations, and work on the guidance was initiated. This guidance is aimed at providing information both on the use of INES when communicating about events affecting multi-unit sites and on actions to prepare for its use in communication during an evolving emergency. The guidance also provides an explanation of why events with significantly different consequences may have the same INES rating, as well as a set of frequently asked questions and corresponding answers related to the use of INES as a communications tool. It is expected that this guidance will be published by the end of 2013.

Participants in the INES meetings also discussed: (i) the need to promote implementation and harmonized use of INES in Member States and the associated development and implementation of an INES training programme and training tools; (ii) the possibility of extending INES to other areas, for example, accidental medical overexposures of patients; and (iii) the recent developments related to INES, particularly its integration into USIE.

To promote the harmonized use of INES, an INES training programme and training tools were developed. An INES e-learning course (a web based training course) and the INES Event Rating Wizard are currently under development, with the aim of facilitating the understanding and application of the methodology for rating the safety significance of a nuclear or radiological event.

With regard to the possibility of extending the application of INES to additional areas, practical evaluation of the draft technical document on the use of INES for unplanned events affecting patients undergoing medical procedures has been initiated. Several Member States³⁹ are voluntarily participating in the practical evaluation, which is planned to be completed in June 2014.

7.3. CONCLUSIONS

- The public must be provided with transparent, timely, objective, factual, relevant, accurate, clear, consistent and credible information. Building the public's trust in the information provided and ensuring the credibility of the relevant authorities requires continuous efforts at the preparedness stage.

³⁹ Belgium, France, India, Luxembourg, Portugal, Spain, Sweden and Switzerland.

- The different quantities reported during a nuclear or radiological emergency (e.g. sieverts, counts per second, becquerels) can easily cause confusion among the public. Therefore, a system needs to be developed at the preparedness stage that puts these quantities into perspective in terms of the potential health hazard and explains to the public whether they are safe.
- Experience clearly shows that non-radiological consequences of an emergency and response can extend beyond the radiological consequences. Moreover, even a perceived emergency can cause concern among members of the public and create the need to provide the public with appropriate information. The spokespersons must take into account public perceptions and the specific psychological impacts that nuclear and radiological emergencies can have, and the fact that these impacts can persist long after an emergency ends.
- Effective preparedness for a nuclear or radiological emergency will improve the effectiveness of public communications during an emergency response and will contribute to the prompt implementation of response actions and to preventing inappropriate actions being taken by the public. Therefore, an emergency public communications plan and strategy need to be developed (and tested in exercises) in line with the overall emergency response plan.
- Preparedness for effective public communications should also cover arrangements for monitoring the news and media and for countering any misleading information that could lead to inappropriate actions being taken by the public.
- The selection and training of a spokesperson is a crucial element of emergency preparedness for public communications.
- There is no need to revise the basis of INES in the light of the Fukushima Daiichi accident. However:
 - Communication with the public and media on INES in the preparedness stage is essential in order to avoid unjustified expectations related to INES during the response phase.
 - In the response phase of a severe nuclear accident, INES should be used only as a support in communicating the event to the public. Nonetheless, providing the public with information on the emergency and the emergency response and associated instructions is essential.
 - Frequent changes of the provisional INES rating in an ‘evolving event’ can cause confusion among the public and require that an explanation be given to the public during the preparedness stage.

8. OVERALL CONCLUSIONS

The declaration by the IAEA Ministerial Conference on Nuclear Safety in June 2011 emphasized “the need to improve national, regional and international emergency preparedness and response to nuclear accidents”. Thus, the IAEA Action Plan on Nuclear Safety contains specific actions related to emergency preparedness and response.

Various activities conducted in connection with the Action Plan have contributed to: (i) an increase in Member State requests for EPREV missions; (ii) intensified review and self-assessment of national emergency preparedness and response systems; (iii) a critical review and further strengthening of the international emergency preparedness and response framework; (iv) enhancement of the notification and information exchange arrangements and tools; (v) upgrades of the IAEA Secretariat’s emergency preparedness and response arrangements and capabilities; (vi) intensified capacity building efforts at the national and international levels; and (vii) support of the development or enhancement of a national strategy for effective communication in emergencies.

The Statement by the Co-Presidents of the Fukushima Ministerial Conference on Nuclear Safety in December 2012 acknowledged the progress made in strengthening the emergency preparedness and response arrangements since the Ministerial Conference in June 2011 and again highlighted the “importance of strengthening emergency preparedness and response arrangements and capabilities at operator/licensee, local, national, regional and international levels, and cooperation in this regard”.⁴⁰

The President’s Summary of the International Conference on Effective Nuclear Regulatory Systems that took place in April 2013 recommended that:

“regulatory bodies...implement the relevant IAEA standards, especially requirements on the development and implementation of predefined generic and operational criteria (such as abnormal facility conditions, observables on the scene and operational intervention levels).”⁴¹

The conference also stressed the need to promote the harmonization of response measures at the regional level, to have in place national communication plans before an emergency occurs and to conduct exercises with the involvement of all the stakeholders.

⁴⁰ <http://www-pub.iaea.org/MTCD/Meetings/PDFplus/2012/20120216/OutcomeDocument.pdf>

⁴¹ http://gnssn.iaea.org/regnet/international_conferences/2013_ottawa/CN198_President's%20Report.pdf

It is important to stress that universal implementation of the IAEA safety standards on emergency preparedness and response at the national level improves preparedness and response, facilitates communication in an emergency and contributes to the harmonization of national criteria for protective and other actions.

A concerted effort is required by all Member States to ensure full implementation of the Action Plan. This challenging but achievable goal will provide for a strengthened and sustainable emergency preparedness and response framework implemented at the national, regional and international levels.

The Emergency Preparedness and Response Expert Group (EPREG),⁴² a standing advisory body of senior experts with high professional competence and demonstrated leadership in the field of preparedness for and response to nuclear or radiological emergencies, will provide advice to the IAEA Secretariat on actions and implementation strategies needed to ensure effective support to Member States, as well as continuous and coordinated enhancement of emergency preparedness and response.

The continuing challenge is to ensure that all States implement the IAEA safety standards and build and maintain a sustained, cost effective, state of the art baseline emergency preparedness and response system that:

- Uses a graded approach based on hazard assessments;
- Uses existing technologies, tools, systems, best practices and lessons learned;
- Is harmonized at the national, regional and international levels;
- Is adaptable and flexible;
- Is fully sustainable with optimal use of resources;
- Provides continuous feedback for improvements;
- Is coordinated and integrated to ensure a strong international commitment for success.

⁴² EPREG consists of 16 senior experts covering all geographical regions.

Annex A

MAIN CONCLUSIONS FROM THE WORKSHOP ON SHARING LESSONS IDENTIFIED FROM PAST RESPONSES AND EXERCISES, 23–27 APRIL 2012, VIENNA

GENERAL

- (1) It is essential to have a national coordinating function and mechanism for emergency preparedness and response, as well as clear command and control arrangements for preparedness and response.
- (2) International requirements for emergency preparedness and response must be reflected in national legislation and regulations, and described in the national emergency response plan and supporting operational procedures.
- (3) The national emergency response plan must have arrangements for response to a severe accident beyond the design basis.
- (4) The national emergency response plan must have arrangements for response to perceived emergencies receiving great media interest.
- (5) While modelling and assessment of the radiation exposure of the population are important elements in determining the radiological situation during emergencies, it is essential to validate predictions by measurements of internal and external doses to members of the public.
- (6) The national emergency response plan must have requirements for protection of emergency workers and arrangements for their implementation through the supporting procedures.

ORGANIZATION

- (7) Consideration is to be given to standardizing the results and reports from different laboratories and radiation monitoring teams to facilitate their use.
- (8) The operator must ensure technical and radiological support to first responders in an emergency. The operator needs to ensure appropriate access for first responders, other off-site emergency workers and any national responders supporting mitigatory actions on the site, and for necessary auxiliary equipment.
- (9) Emergency plans must contain provisions for continuous long term operation, efficient shift changes and provisions for ensuring fitness for duty of the staff.

- (10) Emergency plans need to contain provisions for on-site emergency centres to be resistant to all anticipated conditions (earthquake, fire, flood) and to ensure radiation protection.
- (11) Emergency plans need to contain provisions for multiple off-site back-up emergency centres and other relevant facilities needed for the response (e.g. hospitals, laboratories) that are resistant to earthquake, fire and flood, and that ensure radiation protection.
- (12) Emergency plans must contain provisions to ensure operation of the emergency response system even in the event that all regular communication lines fail.

NOTIFICATION AND ACTIVATION

- (13) Provision is to be made for identification/recognition of a radiation emergency by first responders and for prompt support to local officials in recognizing a radiation emergency.
- (14) Operational criteria (observables, measurables) that do not rely only on computer codes for prediction are to be established for prompt notification and activation.

EDUCATION, TRAINING AND EXERCISES

- (15) All arrangements must be realistically tested.
- (16) All decision makers must participate in regular exercises to test their capabilities to make informed decisions.
- (17) Arrangements are to be in place for appropriate training for all national and local responders (from national experts to security guards).
- (18) Provisions are to be made for educating and instructing the population within the emergency planning zones, as well as beyond these zones, to avoid confusion (e.g. in cases where the intervention zone is larger than the emergency planning zone).
- (19) Continuous education and training, including the involvement of stakeholders, are essential to creating and maintaining emergency preparedness and awareness.

TRANSITION AND REMEDIATION

- (20) The transition from an emergency situation to an existing situation usually is not a discrete event; rather, it is continuous.
- (21) Consideration of the implications of remediation of affected areas and subsequent management of residues is a necessary part of emergency planning.

COMMUNICATION

- (22) Provision is to be made for routinely communicating messages at the national and international levels (e.g. clear communication to the public and decision makers, use of templates and statements prepared in advance, arrangements for prompt release of information to the public).
- (23) Communication with other authorities and the international community must be through coordinated/consistent messages.
- (24) It is important to have diverse and redundant communication capabilities, to deal with unexpected interruptions to communication routes.
- (25) Direct communication with the 'Accident State' during an emergency is to be avoided; communication with the 'Accident State' needs to take place through other international mechanisms.¹
- (26) Arrangements are to be made for receiving inquiries and providing information about people and assets from other countries located in the 'Accident State'; these arrangements must not interfere with the overall national response.
- (27) Provision is to be made for on-site personnel to be kept well informed and regularly updated, to avoid disinformation through the use of social media as a source of information.
- (28) Communication with the public is to be timely, using coordinated/consistent messages that can be understood by the entire affected population (i.e. in local languages, not only official ones) so as to meet the public's concerns at each phase (e.g. notification of the emergency, sampling on private property, monitoring for possible contamination).
- (29) It is important for information about events involving radiation exposure to be shared internationally and for authoritative radiological assessments to be performed.

¹ This recommendation does not apply to neighbouring States.

- (30) In managing emergency situations, clarification of the quantities, units and dose values, and terminology in radiation protection would be useful; different quantities and values can be used in a misleading way and can cause confusion.

EMERGENCY PLANNING ZONES

- (31) An internationally agreed calculation methodology is needed for determining the optimal size of emergency planning zones. Emergency planning zones are to be redefined to take into account the experience from the accident at the Fukushima Daiichi nuclear power plant.
- (32) For special groups (e.g. children in schools, people in hospitals and nursing homes) within the emergency zones, arrangements are to be made for safely undertaking protective actions to ensure more benefit for these groups from the actions undertaken than the detriment caused by them (e.g. for some patients proper medical care will take priority over the evacuation).

OPERATIONAL CRITERIA

- (33) Arrangements are to be in place for developing operational criteria for undertaking protective and other response actions (before an emergency occurs), and for their review based on conditions, observables and measurables as the situation develops (during the emergency).
- (34) Operational intervention levels are essential as guides to decision making during emergencies, and more international guidance on them is required.
- (35) International standards need to be revised to create consistent and coherent radiological criteria for the free trade of consumer products.

DECONTAMINATION AND RADIOACTIVE WASTE MANAGEMENT

- (36) Arrangements for radioactive waste management in the case of an emergency must be addressed at the national level and are to be described in the national emergency response plan.

Annex B

MAIN CONCLUSIONS FROM THE MEETINGS OF THE RESPONSE AND ASSISTANCE NETWORK (RANET), 31 JANUARY–2 FEBRUARY 2012 AND 4–8 FEBRUARY 2013, VIENNA

- (1) The Response and Assistance Network (RANET) mechanism for providing international assistance has been, and will continue to be, used to facilitate the provision of assistance.
- (2) There is a need to ensure that RANET remains an effective tool for providing international assistance in a timely manner through continued improvements and enhancements.
- (3) There is a need to fully utilize RANET, as envisaged by the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (the Assistance Convention). The Incident and Emergency Centre (IEC) should consider including in RANET functional areas on assessment and advice to competent authorities on on-site response activities to mitigate the impact of emergencies at nuclear facilities.
- (4) The RANET mechanism does not, and will not at any time, replace national/State responsibility in emergency preparedness and response.
- (5) It is important that countries, in particular countries with nuclear power plants, develop and maintain national response capabilities and arrangements that are commensurate with identified hazards and that could be offered for international assistance.
- (6) Registration of National Assistance Capabilities is to take place only through the competent authority; capabilities and resources of private entities must be certified and registered through the competent authority.
- (7) States must establish and maintain arrangements for offering and delivering international assistance, as well as for requesting and receiving international assistance. Preparedness for providing and receiving assistance is a part of the preparedness to respond to emergencies.
- (8) It is important that the IEC continue to encourage registration in RANET through outreach and promotion of the network as a tool for the implementation of the Assistance Convention.
- (9) Member States need to ensure awareness of RANET within their national structures and promote its use and development.
- (10) The IEC needs to consider developing a concise operational guide to address various practical RANET issues (e.g. logistics, administration, deployment), to assist countries in preparing for efficient RANET response.
- (11) The IEC and States Parties need to continue to make improvements to RANET and ensure and maintain its rapid response capabilities.

- (12) The IEC should consider developing a RANET capabilities database and make it available to all contact points via the Unified System for Information Exchange in Incidents and Emergencies (USIE) protected web site. In addition, an overview of RANET capabilities could be made available on the public site of USIE.
- (13) It is important that the IEC and States Parties regularly test the RANET mechanism in exercises addressing different scenarios.
- (14) It is important that the IEC continue to facilitate the exchange of lessons learned from RANET experiences.

Annex C

MAIN CONCLUSIONS FROM THE SIXTH MEETING OF THE REPRESENTATIVES OF COMPETENT AUTHORITIES IDENTIFIED UNDER THE CONVENTION ON EARLY NOTIFICATION OF A NUCLEAR ACCIDENT AND THE CONVENTION ON ASSISTANCE IN THE CASE OF A NUCLEAR ACCIDENT OR RADIOLOGICAL EMERGENCY, 17–20 APRIL 2012, VIENNA

- (1) The meeting encouraged all States as well as all relevant international organizations to attend the Meetings of the Competent Authorities Identified under the Convention on Early Notification of a Nuclear Accident (the Early Notification Convention) and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (the Assistance Convention). The meeting urged the IAEA Secretariat to find mechanisms to facilitate broader participation by all competent authorities. The meeting recommended that the IAEA Secretariat, in cooperation with the States Parties, consider exploring proposals on mechanisms to improve and strengthen the Early Notification and Assistance Conventions.
- (2) The meeting recommended that the IAEA Secretariat consider expediting implementation of the strategy contained in the final report of the International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies (2004–2009), as identified in the IAEA Action Plan on Nuclear Safety and endorsed by the General Conference in 2011.
- (3) The meeting acknowledged the importance of developing minimum compatibility requirements for preparedness and response capabilities as a basis for effective emergency preparedness and response, and recommended that the Incident and Emergency Centre (IEC) consider taking action, in cooperation with States and relevant international organizations, to develop such requirements.
- (4) The meeting encouraged all States and relevant international organizations to increase their participation in the Conventions Exercises (ConvEx) regime.
- (5) The Meeting encouraged all States and all relevant international organizations to participate in the revision of the IAEA Safety Requirements on Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-R-2 (2002).
- (6) The meeting took note of the IEC's current effort in the development of guidance on the establishment of emergency planning zones for different facilities and reactor types.

- (7) The meeting recommended that the IAEA Secretariat consider developing, in cooperation with other relevant international organizations, guidance on the management of contaminated material, cargo and shipments (non-food items), including criteria for acceptable safe contamination levels.
- (8) The meeting acknowledged the importance of establishing minimum compatibility requirements for response capabilities as a basis for effective international assistance for both potential suppliers and potential receivers of assistance, and recommended that the IAEA Secretariat (through the IEC) consider taking action, in cooperation with States and relevant international organizations, to develop such requirements.
- (9) The meeting noted the importance of exercises to support the implementation of the Assistance Convention but suggested that, as much as possible, such exercises be optimized and built on existing national exercise programmes.
- (10) The meeting encouraged all States and relevant international organizations that have not yet done so to register with the Unified System for Information Exchange in Incidents and Emergencies.
- (11) The meeting recognized the importance of enhancing the implementation of notification under the Early Notification Convention and the voluntary sharing of information on events that may be below the threshold established in Article 1 of the Convention. Furthermore, the meeting recommended that the terms 'report' and 'reporting' be clarified to avoid possible confusion in some States and relevant international organizations where this term has formal regulatory or legal implications.

Annex D

IAEA ASSESSMENT AND PROGNOSIS IN RESPONSE TO AN EMERGENCY AT A NUCLEAR POWER PLANT

Prior to endorsement of the IAEA Action Plan on Nuclear Safety in September 2011, the IAEA Secretariat's central response role included: prompt notification of the emergency to Member States and international organizations; exchange and/or provision of official (authenticated and verified) information to Member States and international organizations; coordination of international assistance, upon the request of the State concerned; coordination of the interagency response; and provision and/or coordination of timely, accurate and appropriate public information.

The IAEA Secretariat fulfils its role through the IAEA's Incident and Emergency System (IES) and the Incident and Emergency Centre (IEC). The IEC serves as the IAEA Secretariat's focal point for emergency preparedness and response and as custodian of the IES.

The IAEA Action Plan on Nuclear Safety expanded the IAEA Secretariat's response role to cover the need for the IAEA Secretariat:

“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.”¹

The IAEA Secretariat has taken specific actions to incorporate into the IES the processes necessary to allow the IAEA Secretariat to fulfil its expanded response role. The IAEA Secretariat's arrangements and capabilities, including existing guidance, tools and expert human resources, will be used in conjunction with the capabilities of various Member States through the IAEA Response and Assistance Network (RANET) and/or other arrangements.

¹ <http://www.iaea.org/newscenter/focus/actionplan/>

ASSESSMENT AND PROGNOSIS OBJECTIVES AND LIMITATIONS

The principal objective of an assessment and prognosis during an emergency at a nuclear power plant is to determine where and what protective and/or other response actions need to be taken and to provide advice, if needed. To achieve this objective, the following tasks need to be performed:

- Development of a ‘reasonably’ bounding estimation of the potential progression and the associated pathways, based on available information, evidence and scientific knowledge;
- Evaluation of relevant information to determine if the public is safe and identification of protective and/or other response actions that should be considered;
- Evaluation of relevant information to determine if workers and emergency workers are safe and, if not, determination of additional actions that should be considered;
- Identification of actions that should be considered to protect international trade and interests;
- Assessment of protective and other response actions being implemented, recommended or discussed to determine if these are doing more good than harm and, if not, identification of actions that should be considered by Member States, international organizations and the IAEA Secretariat to address that situation;
- Active alerting of Member States in which response actions may need to be considered.²

To accomplish these tasks, the capabilities of the IAEA Secretariat and Member States through RANET and/or other agreements will be used. The IAEA Secretariat will, through its IEC, discuss the results of assessment and prognosis with the official contact point of the ‘Accident State’ to achieve a common understanding and consistent message for the public.

Assessed consequences and protective and other actions will be compared with the requirements and guidance in the IAEA safety standards³ to evaluate whether emergency workers and the public are safe and how this is forecasted to continue based on an ongoing event prognosis process.

Information provided by the ‘Accident State’ will play an essential role in the assessment and prognosis process. Arrangements for providing needed

² For example, response actions could include increased surveillance.

³ Requirements for and guidance on an overall response strategy, including the criteria for deciding on protective and other response actions, are well established.

information must be established by Member States at the preparedness stage and tested in exercises in cooperation with the IAEA Secretariat.

The IAEA Secretariat's assessment and prognosis process does not replace the responsibility of an 'Accident State' to make its own analyses.

In nuclear emergencies, the assessment and prognosis may be difficult and technically challenging. The methods and tools for assessment and prognosis that have been studied by many Member States and the IAEA Secretariat generate a variety of solutions. Therefore, there will be inherent limitations and uncertainties related to any assessment and/or prognosis of consequences and likely emergency progression.

Because of potential difficulties in gathering technical data during an emergency, the information required for the assessments and prognosis may be delayed and required data may even be unavailable in the initial stages of an emergency. These potential delays or unavailability of data needed to be taken into account in any assessments and in the prognosis process. Therefore, the bounding estimation of event progression needs to be carefully developed, with due consideration of these limitations.

Many of the technical parameters that are needed for a detailed technical assessment and prognosis are known in advance. The reactor operator, the designer and the Member State's nuclear safety regulator are in a position to have comprehensive engineering data concerning the nuclear facility. However, these data may not be readily available during an emergency. The IAEA Secretariat's assessment and prognosis process reflects this reality; it is based on the IAEA guidance and considers scenarios where a minimum of technical information is available. This process utilizes a broad examination of the emergency and its consequences for critical safety systems, and, using expert knowledge of event fault trees, places reasonable boundaries on the likely event progression.

Overall, the assessment and prognosis process will ensure that all reasonable measures will be taken to keep Member States and the public informed as required. The inherent limitations of any assessment and/or prognosis will also be communicated to Member States and the public as clearly as possible.

ASSESSMENT AND PROGNOSIS PROCESS

The assessment and prognosis process builds on the existing international emergency preparedness and response framework and is based on the IAEA Secretariat's capabilities complemented by Member State capabilities through RANET and/or other agreements.

In 2012, the IAEA Secretariat conducted an internal review of the existing capabilities that could contribute to or be used for emergency assessment or prognosis. Detailed gap analysis was performed based on the results of this review, which formed the basis for the continued development of capabilities within the IES. In addition, discussions with competent authorities are ongoing on national capabilities that could be used in the assessment and prognosis process.

The IAEA Secretariat will make its assessment and prognosis based on information received from the 'Accident State', using its own resources and capabilities augmented by pre-identified advanced assessment capabilities in Member States. The IAEA Secretariat will provide these Member States with input data received from the 'Accident State' requesting assessment of the situation and prognosis of likely progression. It is expected that Member States with pre-identified advanced assessment capabilities will register their capabilities in RANET⁴ at the preparedness stage.

To facilitate its assessment and prognosis process during the response, the IAEA Secretariat may use video conferencing to discuss either open issues or results of assessment and prognosis, to develop a 'joint' assessment report. The representatives of the 'Accident State' take part in these discussions.

When a 'joint' assessment report is agreed upon, the IAEA Secretariat provides the end results to Member States, international organizations and the public. If consensus on the 'joint' assessment report cannot be reached within a reasonable time, the IAEA Secretariat may have to take independent decisions, as appropriate, on next steps. The end results of assessment and prognosis will include public statements, short summaries with technical conclusions and visual imagery appropriate for immediate inclusion in presentations and/or video communications. It is through this process that the IAEA Secretariat will provide timely, clear, factually correct, objective and easily understandable information to Member States, international organizations and the public.

To ensure that this process is effective and transparent, the following are required: (i) provision to the IAEA Secretariat (in an emergency) of a critical set of technical parameters needed for the assessment and prognosis; (ii) consistent evaluation of evolving scientific understanding of emergency preparedness and response issues; (iii) continued enhancement of capabilities; (iv) regular exercises, both within the IAEA Secretariat and externally with Member States and relevant international organizations; and (v) informing of Member States as to the IAEA Secretariat's arrangements and capabilities.

⁴ A new RANET functional area has been established that directly addresses the provision of assistance and advice to support the IAEA Secretariat in its assessment and prognosis of a nuclear emergency.

Annex E

CONTENTS OF THE ATTACHED CD-ROM

The following documents, papers and presentations from meetings discussed in this report are available on the attached CD-ROM.

CONSULTANTS MEETING ON THE EXTENSION OF RANET CAPABILITIES UNDER THE NUCLEAR SAFETY ACTION PLAN, 31 JANUARY–2 FEBRUARY 2012, VIENNA

RELATED DOCUMENTS

Agenda for the Consultants Meeting on the Extension of RANET Capabilities under the Nuclear Safety Action Plan

Report of the Consultants Meeting on the Extension of RANET Capabilities under the Nuclear Safety Action Plan

PRESENTATIONS

RANET — Past, Present and Future

P. Kenny

Incident and Emergency Centre, IAEA

Assistance Offered by Member States through IAEA to Japan

P. Kenny

Incident and Emergency Centre, IAEA

Extension of National Emergency Response Capabilities in the IAEA RANET System

V.N. Ershov and S.V. Jarmiychuk

FSUE “Emergency Response Centre of Minatom of Russia”, RUSSIAN FEDERATION

UK Emergency Response: Domestic Assistance Capabilities

S. Swash

Department of Energy and Climate Change, UNITED KINGDOM

French Proposals to Enhance Emergency Preparedness and Response through IAEA Framework (I)

H. de Longevialle

Ministry of Foreign and European Affairs, FRANCE

RANET: IAEA Response and Assistance Network — Sweden's Capabilities in Giving and Receiving Assistance

L. Hubbard

Swedish Radiation Safety Authority, SWEDEN

A Brief Overview of Organization, Role and Activation under RANET

M. Ali

Pakistan Nuclear Regulatory Authority, PAKISTAN

French Proposals to Enhance Emergency Preparedness and Response through IAEA Framework (II)

D. Xicluna

French Nuclear Safety Authority, FRANCE

IEC Experience in Preparing Assistance Missions

F. Baci

Incident and Emergency Centre, IAEA

RANET

I. Steyn

South African Nuclear Energy Corporation, SOUTH AFRICA

SIXTH MEETING OF THE REPRESENTATIVES OF COMPETENT AUTHORITIES IDENTIFIED UNDER THE CONVENTION ON EARLY NOTIFICATION OF A NUCLEAR ACCIDENT AND THE CONVENTION ON ASSISTANCE IN THE CASE OF A NUCLEAR ACCIDENT OR RADIOLOGICAL EMERGENCY, 17–20 APRIL 2012, VIENNA

RELATED DOCUMENTS

Agenda for the Sixth Meeting of the Representatives of 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

Meeting Papers:

Report on Implementation of CA Meeting's Conclusions 2009
Relevant IEC Activities in the Period 2009–2011
Priorities in Emergency Preparedness and Response — 2012–2014
Unified System for Incidents and Emergencies (USIE) — Status Report
Response and Assistance Network — Progress Report
Presentation of the New European Community Early Notification System
WebECURIE
International Action Plan for Strengthening the International Preparedness
and Response System for Nuclear and Radiological Emergencies — Final
Report
IAEA Activities in Response to the Fukushima Accident

Report of the Sixth Meeting of the Representatives of 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

PRESENTATIONS

IEComm Arrangements: Incident and Emergency Communication Manual
(2012)

G. Winkler

Incident and Emergency Centre, IAEA

Findings of EPREV Missions

R. Salinas

Incident and Emergency Centre, IAEA

Cases of Assistance and Lessons Learned

F. Baciú

Incident and Emergency Centre, IAEA

WebECURIE

G. de Vries

Joint Research Centre, EUROPEAN COMMISSION

EU RANET Support — Support Programme for EU Authorities to Identify
Emergency Response Capabilities for Registration at the IAEA Response
Assistance Network

J.-K. Hohenberg

ENCONET Consulting Ges.m.b.H., AUSTRIA

Minimum Compatibility Requirements for International Assistance

F. Ugletveit

Norwegian Radiation Protection Authority, NORWAY

Establishment of a Regional Crisis Center for WANO-MC Nuclear Power Plants
with VVER Reactors

V.A. Yakimovets

JSC Concern Rosenergoatom, RUSSIAN FEDERATION

Operationalisation of EPZ: Splitting EPZ into Blocks (Like a Jigsaw Puzzle)

C. Vandecasteele

Federal Agency for Nuclear Control, BELGIUM

Report on WECA Activities

D. Xicluna

French Nuclear Safety Authority, FRANCE

Lessons in Inter-Agency Response to Fukushima Daiichi Accident

R. Martincic

Incident and Emergency Centre, IAEA

IAEA Lessons — Fukushima Daiichi NPP Accident

E. Buglova

Incident and Emergency Centre, IAEA

WORKSHOP ON SHARING LESSONS IDENTIFIED FROM PAST RESPONSES AND EXERCISES, 23–27 APRIL 2012, VIENNA

RELATED DOCUMENTS

Programme for the Workshop on Sharing Lessons Identified from Past Responses
and Exercises

PRESENTATIONS

Lessons Learned from the Fukushima Accident on Preparedness and Response for Severe Nuclear Emergency

T. Homma

Japan Atomic Energy Agency, JAPAN

International Initiatives to Improve the Emergency Preparedness and Response Capabilities Based on Lessons Learned from Fukushima: Is There a Need for Change?

W. Weiss

Federal Office for Radiation Protection, GERMANY

Past Emergencies: Slovenia

M. Tkavc

Slovenian Nuclear Safety Administration, SLOVENIA

Lessons Learned from Past Responses and Exercises at CEA

X. Pectorin and F. Mariotte

French Alternative Energies and Atomic Energy Commission, FRANCE

Lessons Identified from Response to TEPCO Fukushima Dai-ichi NPP Accident

H. Tatsuzaki

National Institute of Radiological Sciences, JAPAN

INES 3 Radiological Incident at IRE on 22/08/2008

C. Vandecasteele

Federal Agency for Nuclear Control, BELGIUM

Some Lessons Learned from Radiation Accidents Registered in Russia during Past 25 Years

A. Barabanova

Burnasyan FMBC FMBA, RUSSIAN FEDERATION

Importance of Lessons Learned: Experience of Georgian Regulatory Body in Recovering Orphan Sources

L. Chelidze

Ministry of Energy and Natural Resources, GEORGIA

Lessons Learned from Past Emergencies

A.J. González

Nuclear Regulatory Authority, ARGENTINA

Public Health Response to the Polonium-210 Incident in London, 2006

J. Croft

Health Protection Agency, UNITED KINGDOM

Lessons Identified from Past Responses and Exercises

D. Stefanova

Nuclear Regulatory Agency, BULGARIA

NECSA — Nuclear and Radiological Events and Exercises

I. Steyn

South African Nuclear Energy Corporation, SOUTH AFRICA

Sharing of Lessons Identified from Past Responses and Exercises

M.N. Hussain

Pakistan Nuclear Regulatory Authority, PAKISTAN

Management of Radiological Emergency in Republic of Moldova

I. Balan

National Agency for Regulation of Nuclear and Radiological Activity,
REPUBLIC OF MOLDOVA

Lessons Learned from Previous Emergencies/Incidents

L.D. Kifanga

Tanzania Atomic Energy Commission, TANZANIA

Lessons Identified from Past Responses and Exercises: Panama

E.E.S. Wiltshire

National Cancer Institute, PANAMA

WORKSHOP ON THE HIGHLIGHTS AND LESSONS LEARNED FROM EPREV MISSIONS, 25–29 JUNE 2012, VIENNA

RELATED DOCUMENTS

Programme for the Workshop on the Highlights and Lessons Learned from
EPREV Missions

Summary Report on the Workshop on the Highlights and Lessons Learned from EPREV Missions

PRESENTATIONS

Assessment of National Capabilities: Emergency Preparedness Review (EPREV)

P. Zombori

Incident and Emergency Center, IAEA

Findings and Lessons Learned from EPREV Missions in Europe

L. Rozdylouskaya

Consultant, BELARUS

Presentations on Countries' EPREV Experience — Achievements and Challenges:

L. Hakim

Nuclear Energy Regulatory Agency, INDONESIA

H.E. Ezzouch

Ministry for Public Health, TUNISIA

H. Mohd Ali

Ministry of Science, Technology & Innovation, MALAYSIA

A.C. Baci

National Commission for Nuclear Activities Control, ROMANIA

Kittiphong Saiyut

Office of Atoms for Peace, THAILAND

M.N. Hussain

Pakistan Nuclear Regulatory Authority, PAKISTAN

I. Valcic

State Office for Radiological and Nuclear Safety, CROATIA

Nguyen Hao Quang

Vietnam Agency for Radiation and Nuclear Safety, VIETNAM

BIENNIAL MEETING OF THE INTERNATIONAL NUCLEAR AND RADIOLOGICAL EVENTS SCALE (INES) OFFICERS, 16–20 JULY 2012, VIENNA

RELATED DOCUMENTS

Agenda for the Biennial Meeting of the International Nuclear and Radiological Events Scale (INES) Officers

PRESENTATIONS

Presentations on Countries' Experience Gained Regarding the Evaluation of and Communication on Events Using INES During the Period 2010–2012, the Latest Developments and Areas Requiring Further Improvement:

H. Graïne

Centre de Recherche Nucleaire de Birine, ALGERIA

W.A. Truppa

Nuclear Regulatory Authority, ARGENTINA

A. Melkumyan

Armenian Nuclear Regulatory Authority, ARMENIA

I. Salati

National Nuclear Energy Commission, BRAZIL

M. Larabie

Canadian Nuclear Safety Commission, CANADA

I. Valcic

State Office for Radiological and Nuclear Safety, CROATIA

S.M. Rashad Abd El Aziz

Nuclear and Radiological Regulatory Authority, EGYPT

A. Lorin

Nuclear Safety Authority, FRANCE

M. Maqua

Installation and Reactor Safety Company, GERMANY

D. Nyisztor

Hungarian Atomic Energy Authority, HUNGARY

T. Heryanto

Nuclear Energy Regulatory Agency, INDONESIA

Jeong Wan Kwon

Korea Institute of Nuclear Safety, REPUBLIC OF KOREA

P. Breuskin

Ministry of Health, LUXEMBOURG

Y. Mamani

National Commission on Nuclear Safety and Safeguards, MEXICO

S. Jovanovic

Centre for Nuclear Competence and Knowledge Management,
MONTENEGRO

I. Sambo

Nigerian Nuclear Regulatory Authority, NIGERIA

A. Rybarczyk and M. Skarżewski

National Atomic Energy Agency, POLAND

J. Oliveira Martins

Portuguese Environment Agency, PORTUGAL

C. Ciurea-Ercau

National Commission for Nuclear Activities Control, ROMANIA

E. Metke and A. Sokolikova

Nuclear Regulatory Authority of the Slovak Republic, SLOVAKIA

T. Nemec

Slovenian Nuclear Safety Administration, SLOVENIA

A. Muller

National Nuclear Regulator, SOUTH AFRICA

R. Isasia González
Nuclear Safety Council, SPAIN

G. Prohaska
Swiss Federal Nuclear Safety Inspectorate, SWITZERLAND

O. Özdere Gülol
Turkish Atomic Energy Authority, TURKEY

Nguyen Nhi Dien
Nuclear Research Institute, VIETNAM

TECHNICAL MEETING FOR REVIEW OF THE DRAFT SAFETY REQUIREMENTS IN EMERGENCY PREPAREDNESS AND RESPONSE, 12–16 NOVEMBER 2012, VIENNA

RELATED DOCUMENTS

Agenda for the Technical Meeting for Review of the Draft Safety Requirements in Emergency Preparedness and Response

Information on the Revision Process of the IAEA Safety Requirements Publication: Preparedness and Response for a Nuclear or Radiological Emergency No. GS-R-2

Summary Report of the Technical Meeting for Review of the Draft Safety Requirements in Emergency Preparedness and Response

PRESENTATIONS

Results from Member State Responses to the Questionnaire on the IAEA Safety Standards Series, Requirements No. GS-R-2 and Other Inputs for Revision

S. Nestoroska Madjunarova
Incident and Emergency Centre, IAEA

IAEA Safety Guide GSG-2 and New Generic Criteria
V. Kutkov

Incident and Emergency Centre, IAEA

Experience and Lessons Learned from the TEPCO's Fukushima Daiichi Nuclear Power Plant Accident on EPR

T. Homma

Japan Atomic Energy Agency, JAPAN

Ad Hoc IACRNE Meeting 2012: Discussions and Conclusions

R. Martincic

Incident and Emergency Centre, IAEA

Overview on DS457 and Major Revisions (Part I)

T. McKenna

Incident and Emergency Centre, IAEA

Overview on DS457 and Major Revisions (Part II)

T. McKenna

Incident and Emergency Centre, IAEA

Concept of Operations

T. McKenna and S. Nestoroska Madjunarova

Incident and Emergency Centre, IAEA

Current and Upcoming IAEA Publications in Emergency Preparedness and Response: EPR-Series

L. Berthelot

Incident and Emergency Centre, IAEA

Technical Documents and Proposed Safety Guides under Development

T. McKenna

Incident and Emergency Centre, IAEA

Operations Manual for Incident and Emergency Communication (IEComm)

G. Winkler

Incident and Emergency Centre, IAEA

