EPR–RANET

2013

EMERGENCY PREPAREDNESS AND RESPONSE

IAEA Response and Assistance Network

DATE EFFECTIVE: 1 SEPTEMBER 2013

IAEA
International Atomic Energy Agency

IAEA SAFETY STANDARDS AND RELATED PUBLICATIONS

IAEA SAFETY STANDARDS

Under the terms of Article III of its Statute, the IAEA is authorized to establish or adopt standards of safety for protection of health and minimization of danger to life and property, and to provide for the application of these standards.

The publications by means of which the IAEA establishes standards are issued in the **IAEA Safety Standards Series**. This series covers nuclear safety, radiation safety, transport safety and waste safety. The publication categories in the series are **Safety Fundamentals**, **Safety Requirements** and **Safety Guides**.

Information on the IAEA's safety standards programme is available at the IAEA Internet site

http://www-ns.iaea.org/standards/

The site provides the texts in English of published and draft safety standards. The texts of safety standards issued in Arabic, Chinese, French, Russian and Spanish, the IAEA Safety Glossary and a status report for safety standards under development are also available. For further information, please contact the IAEA at PO Box 100, 1400 Vienna, Austria.

All users of IAEA safety standards are invited to inform the IAEA of experience in their use (e.g. as a basis for national regulations, for safety reviews and for training courses) for the purpose of ensuring that they continue to meet users' needs. Information may be provided via the IAEA Internet site or by post, as above, or by email to Official.Mail@iaea.org.

RELATED PUBLICATIONS

The IAEA provides for the application of the standards and, under the terms of Articles III and VIII.C of its Statute, makes available and fosters the exchange of information relating to peaceful nuclear activities and serves as an intermediary among its Member States for this purpose.

Reports on safety and protection in nuclear activities are issued as **Safety Reports**, which provide practical examples and detailed methods that can be used in support of the safety standards.

Other safety related IAEA publications are issued as **Radiological Assessment Reports**, the International Nuclear Safety Group's **INSAG Reports**, **Technical Reports** and **TECDOCs**. The IAEA also issues reports on radiological accidents, training manuals and practical manuals, and other special safety related publications.

Security related publications are issued in the **IAEA Nuclear Security Series**.

The **IAEA Nuclear Energy Series** comprises informational publications to encourage and assist research on, and the development and practical application of, nuclear energy for peaceful purposes. It includes reports and guides on the status of and advances in technology, and on experience, good practices and practical examples in the areas of nuclear power, the nuclear fuel cycle, radioactive waste management and decommissioning.

EPR–RANET 2013

Emergency Preparedness and Response

IAEA Response and Assistance Network

DATE EFFECTIVE: 1 SEPTEMBER 2013

This publication has been prepared by the:

Incident and Emergency Centre
International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 Vienna, Austria

IAEA RESPONSE AND ASSISTANCE NETWORK
IAEA, VIENNA, 2013
EPR-RANET 2013

Printed by the IAEA in Austria
August 2013

Foreword

The Parties to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (the 'Assistance Convention') have undertaken to cooperate between themselves and with the IAEA to facilitate the timely provision of assistance in the case of a nuclear accident or radiological emergency, in order to mitigate its consequences.

In September 2000, the General Conference of the IAEA, in resolution GC(44)/RES/16, encouraged Member States "to implement instruments for improving their response, in particular their contribution to international response, to nuclear and radiological emergencies" as well as "to participate actively in the process of strengthening international, national and regional capabilities for responding to nuclear and radiological emergencies and to make those capabilities more consistent and coherent".

As part of the IAEA's strategy for supporting the practical implementation of the Assistance Convention, in 2000 the IAEA Secretariat established a global Emergency Response Network (ERNET) of teams suitably qualified to respond to nuclear or radiological emergencies rapidly and, in principle, on a regional basis. The IAEA Secretariat published IAEA Emergency Response Network — ERNET (EPR-ERNET) in 2000, which set out the criteria and requirements to be met by members of the network. An updated edition was published in 2002.

The Second 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 Vienna in June 2003, recommended that the IAEA Secretariat convene a Technical Meeting to formulate recommendations aimed at improving participation in the network. Participants in a Technical Meeting held in March 2004 developed a new concept for the network and a completely new draft of the publication. In July 2005, the Third Meeting of Competent Authorities accepted the new draft as resolving the critical issues that had been hindering participation. To reflect the new concept of the network, it was decided to change the name of the network to Response Assistance Network (RANET), and EPR-RANET 2006 was issued as the third edition of the assistance network publication.

The 2010 edition of EPR-RANET contained minor changes in the concept of the network. The functional areas of assistance were restructured to facilitate easier registration, the name of the network was changed to Response and Assistance Network, and the responsibilities and duties of the Assistance Mission Leader were added. EPR-RANET 2010 no longer had attachments, as all three of the previous RANET attachments were incorporated into the main body of the text.

As was reflected in the editions of EPR-RANET up to and including the 2010 edition, RANET had primarily focused on providing assistance to manage the consequences following a nuclear or radiological incident or emergency and had not focused on the on-site assessment and management of emergencies at nuclear installations. Although assistance under the Assistance Convention was not requested and RANET was not used in response to the accident at TEPCO's Fukushima Daiichi Nuclear Power Station in March 2011, subsequent evaluation of the event identified areas where RANET could be enhanced. These were captured in the IAEA Action Plan on Nuclear Safety (GOV/2011/59-GC(55)/14), which was endorsed by the General Conference of the IAEA in September 2011.

In January 2012, the IAEA Secretariat convened a consultancy meeting on the extension of RANET capabilities under the IAEA's Action Plan on Nuclear Safety. The purpose of the consultancy was to discuss the enhancement of RANET pursuant to the Action Plan, to agree on the methods to implement these enhancements, and to continue to encourage States to register their National Assistance Capabilities under RANET.

The meeting concluded that "There is a need to fully utilize RANET, as envisaged by the Assistance Convention. The IEC should consider including, in the functional areas of RANET, assessment and advice to requesting States on on-site response activities to mitigate the impact of emergencies at nuclear facilities."

The IAEA Action Plan on Nuclear Safety tasks the IAEA Secretariat with providing:

> "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".

The IAEA Secretariat has concluded that the RANET mechanism can be used to assist in the implementation of this task.

The present publication is a revised version of EPR-RANET 2010 and is worded based on the assumption that the relevant Competent Authority or Authorities of a State will be authorized to make and receive requests for, and to accept offers of, assistance in the event of a nuclear or radiological incident or emergency.

This publication is primarily intended for the relevant Competent Authority or Authorities of a State and for organizations that have response capabilities that could be made available for international assistance. Guidance on the actions to be performed by States requesting international assistance is also provided. The Competent Authorities need to review this publication and apply the guidelines, taking into account time, resource and any other constraints. All States Parties to the Assistance Convention are invited to join RANET.

The IAEA officer responsible for this publication was P. Kenny of the IAEA's Incident and Emergency Centre.

EDITORIAL NOTE

The views expressed do not necessarily reflect those of the governments of States that are IAEA Member States and/or Parties to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, or of other relevant international intergovernmental organizations, or of the governments of other States.

Although great care has been taken to maintain the accuracy of information contained in this publication, neither the IAEA nor its Member States assume any responsibility for consequences that may arise from its use.

NOTES FOR THE USER

This publication enters into effect on 1 September 2013. It supersedes all previous versions of the EPR-RANET publication. All copies of previous editions of EPR-RANET should be removed from operational response systems and either archived or destroyed.

This edition contains changes to reflect recent developments in RANET. The 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 which builds on and streamlines the version in EPR-RANET 2010;
- Description of the RANET database available on USIE;
- Description of RANET NAC Review which elaborates on concept introduced in EPR-RANET 2010;
- Changes to the registration form to reflect the recent developments in RANET; and
- Revision of Appendix G to include task lists to support Assistance Mission Leaders.

The EPR-RANET 2013 has no attachments.

The IAEA's Incident and Emergency Centre is ready to provide any clarification on the implementation of the arrangements described here.

Contents

Section 1

1. INTRODUCTION

1.1. Objectives

This publication is a tool for:

- Facilitating the provision of international assistance in the event of a nuclear or radiological incident or emergency;
- Cooperation between States, their Competent Authorities and the IAEA; and
- Harmonization of response capabilities of States offering assistance under the Response and Assistance Network (RANET).

The publication may also assist Competent Authorities and other response organizations in their efforts to establish and/or maintain their own response capabilities.

1.2. Scope

This publication is issued under the authority of the Director General of the IAEA:

(1) Under the auspices of the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (the Assistance Convention) [1], to promote, facilitate and support cooperation between State Parties to coordinate the provision of assistance to a Requesting State; and
(2) In the case of a nuclear or radiological incident or emergency, as statutory functions, to act, upon request by a State, as an intermediary for the purposes of securing the performance of services or the supplying of materials, equipment or facilities by one Member State for another.

The publication sets out the following:

- The RANET concept and the mechanism for requesting and providing assistance;
- The responsibilities and activities within RANET;
- The basic arrangements for international assistance;
- The roles and responsibilities of a Member State requesting assistance;
- The roles and responsibilities of a State Party providing assistance;
- RANET preparedness and response arrangements;

- The prerequisites for RANET membership, conditions and instructions for registration; and
- The technical guidelines for internationally compatible assistance.

The basic arrangements for international assistance through the operation of the RANET mechanism may also be used for the provision of assistance in situations where the assistance requested is not of the type of National Assistance Capabilities defined within this publication.

The publication does not contain procedures for RANET Functional Areas, such as those for technical methods used when providing assistance following a nuclear or radiological incident or emergency; however, it gives specification of expected outputs/products of assistance.

1.3. Structure

This publication is divided into six sections. After the introduction in Section 1, the RANET concept, objectives, scope and responsibilities are described in Section 2. Section 3 presents the concept of operations of RANET. Section 4 describes the National Assistance Capabilities as well as the registration process and preparedness arrangements. Section 5 describes the content of an Assistance Action Plan (AAP) and Section 6 presents technical guidelines for each RANET Functional Area.

EPR-RANET 2013 has also seven supporting appendences:

A Instructions how to register National Assistance Capabilities in RANET with the Registration Form;
B A sample of an Assistance Action Plan;
C An example list of suggested RANET documentation;
D An indicative list of medical resources;
E Minimum equipment specifications;
F Guidance on assistance outputs/products; and
G A list of responsibilities and tasks for Team Leaders.

1.4. Explanation of terms as used in this publication[1]

Accident — Any unintended event, including operating errors, equipment failures and other mishaps, the consequences or potential consequences of which are not negligible from the point of view of protection or safety.

Assessment Mission — An Assessment Mission (e.g. fact-finding mission) is an initial mission deployed to collect and assess information; to perform an initial evaluation of the situation and to recommend whether activation of a RANET Assistance Mission is necessary.

Assistance Mission — An Assistance Mission is performed by a group of qualified experts and can be a FAT, an EBS performed function(s) or a JAT comprising of a combination of FAT and/or EBS to address nuclear or radiological incidents or emergencies providing advice, assessment, medical support, monitoring or other specialized assistance under RANET.

Assisting State — A State that has agreed to provide assistance to a requesting State or to the IAEA Secretariat.

Assistance Mission Leader — The individual identified and agreed upon by all parties to the Assistance Action Plan to head an Assistance Mission. He/she manages the on-scene international assistance within the context of RANET and coordinates its implementation with the requesting State. In the case of a JAT, the Assistance Mission Leader performs the role of the Chairperson of the JAT Command.

Assistance Action Plan - AAP — A plan for the provision of assistance, including all financial, diplomatic, organizational and logistical aspects, formulated and proposed by the IAEA in coordination with the requesting State, States providing assistance and relevant international organizations as appropriate.

Competent Authority — A State Party's authorized representative to make and receive requests for and to accept offers of assistance.

Emergency — A non-routine situation that necessitates prompt action, primarily to mitigate a hazard or adverse consequences for human health and safety, quality of life, property or the environment. This includes nuclear and radiological emergencies and conventional emergencies such as fires, release of hazardous chemicals, storms or earthquakes. It includes situations for which prompt action is warranted to mitigate the effects of a perceived hazard.

Exercise — Any practical implementation of response plans and procedures in a simulated situation. This includes drills, tabletop exercises, partial and full-scale exercises as well as field exercises. The preparation and conduct of each varies in complexity, scope and objectives.

[1] The definitions included within this document are without prejudice to the Assistance Convention

External Based Support – EBS	Technical advice and analytical expertise to address nuclear or radiological events provided from home offices or other offsite locations. This support is not deployed to the event scene.
EBS Leader	The individual or role identified in the AAP as the official leader/liaison of an External Based Support providing assistance.
Field Assistance Team – FAT	A group of technically qualified and equipped personnel that may be called upon to provide in situ assistance in a requesting State.
FAT Leader	The individual that is identified in the AAP as the leader of a Field Assistance Team.
Incident	Any unintended event, including operating errors, equipment failures, initiating events, accident precursors, near misses or other mishaps, or criminal or other unauthorized acts, the consequences or potential consequences of which are not negligible from the point of view of protection or safety.
Intercomparison exercise	Measurement campaign organized to check the quality of different monitoring teams or laboratories.
Joint Assistance Team – JAT	An Assistance Mission composed of more than one Field Assistance Team.
Joint Assistance Team Command	The coordinating body on scene composed of all Field Assistance Team leaders. The Assistance Mission Leader is the Chairperson of the JAT Command.
National Assistance Capability – NAC	A State's identified experts, equipment and materials that can be made available by a State either by deployment to the event scene (FAT) or reach-back resource made available from home offices or other offsite location (EBS).
NAC coordinator	An individual appointed or role assigned by the State to coordinate preparedness and assistance activities of its NAC as defined in RANET.
National Warning Point	A point of contact that is continuously available for promptly responding to, or initiating a response to, an incoming notification, advisory message, request for assistance or request for verification of a message as appropriate, from the IAEA.
Relevant international organization	An international intergovernmental organization that, according to the information provided to the IAEA, has a significant legal or statutory role and/or capability to provide advice or assistance in the event of a nuclear or radiological incident or emergency. Member of the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE).
Requesting State	A State that has requested assistance.

1.5. Abbreviations

AAAR	After Action Assistance Report
AAP	Assistance Action Plan
AMS	Accelerator Mass Spectrometry
BWR	Boiling Water Reactor
CA	Competent Authority
ConvEx	A regime of emergency exercises organized by the IAEA in cooperation with Member States to verify the arrangements for responding under the Early Notification and/or Assistance Conventions.
EBS	External Based Support
FBR	Fast Breeder Reactor
GCR	Gas Cooled Reactor
IEComm	IAEA Operations Manual for Incident and Emergency Communication
EPR	According to context, Electron Paramagnetic Resonance or the IAEA's Emergency Preparedness and Response series of documents, of which this document is one.
ESR	Electron Spin Resonance
FAT	Field Assistance Team
FISH	Fluorescence in situ hybridization
GPS	Global Positioning System
IAEA	International Atomic Energy Agency
ICP-MS	Inductively coupled plasma mass spectrometry
ICRP	International Commission on Radiological Protection
IEC	IAEA's Incident and Emergency Centre
IND	Improvised Nuclear Device
JAT	Joint Assistance Team
LWGR	Light Water Cooled Graphite Moderated Reactor
NAC	National Assistance Capabilities

NI	Nuclear Installation
NWP	National Warning Point
OSL	Optically Stimulated Luminescence
PC	Personal Computer
PHWR	Pressurized Heavy Water Reactor
PWR	Pressurized Water Reactor
RANET	IAEA Response and Assistance Network
RBE	Relative Biological Effectiveness
RBMK	Reaktor Bolshoy Moshchnosti Kanalniy
RFA	Request For Assistance
RR	Research Reactor
TIMS	Thermal ionization mass spectrometry
USIE	Unified System for Information Exchange in Incidents and Emergencies
UTC	Coordinated Universal Time
VVER	Vodo-Vodyanoi Energetichesky Reactor
XRF	X-ray fluorescence spectrometry

Section 2

2. RESPONSE AND ASSISTANCE NETWORK

The Assistance Convention states "... *if a State Party needs assistance in the event of a nuclear accident or radiological emergency, whether or not such accident or emergency originates within its territory, jurisdiction or control, it may call for such assistance from any other State Party, directly or through the Agency, and from the Agency* …";

and

"*Each State Party shall make known to the Agency and to other State Parties, directly or through the Agency, its Competent Authorities and point of contact authorized to make and receive requests for assistance and to accept offers of assistance.*"

2.1. Background

The international emergency preparedness and response system is based on:

- The legal framework provided by the Early Notification and Assistance Conventions [1];
- The Statute of the IAEA [2];
- Arrangements and agreements made by and between Member States, the Secretariat and by and between relevant international organizations to improve the system;
- Arrangements for the exchange of information and resources for identifying, assessing, and responding to a nuclear or radiological emergency – among States Parties, non-Party IAEA Member States, relevant international organizations and the Secretariat [3]; and
- Preparedness arrangements to maintain the capability to respond to any nuclear and/or radiological emergency [4–7].

Assistance provided in the past included:

- Provision, by the IAEA, of official information to requesting States about a nuclear or radiological incident or emergency;
- Provision, by States and the IAEA, of technical advice on emergency preparedness and response;

- Provision, by States and the IAEA, of means to facilitate the implementation of: a) radiological surveys; b) source recovery; and c) in-situ verification of radiological conditions and the respective technical advice;
- Provision, by States and the IAEA, of dose reconstruction following the exposure of individuals to sources ionizing radiation; and
- Provision, by States and the IAEA, of medical advice and assistance in cases of a confirmed or unconfirmed radiation exposure.

In order to meet States Parties' obligations under the Assistance Convention and the IAEA functions in relation to the Assistance Convention and its Statute it has been recognised that appropriate mechanisms need to be organized. RANET is intended, inter alia, to strengthen the worldwide capability to provide assistance and advice and/or to coordinate the provision of assistance as specified within the framework of the Assistance Convention for nuclear accidents and radiological emergencies, or in case of other nuclear or radiological incidents.

2.2. Objectives of RANET

The aim of RANET is to facilitate:

- The provision of requested international assistance;
- The harmonization of emergency assistance capabilities; and
- The exchange of relevant information and feedback of experience related to the provision of international assistance.

In addition, RANET complements other IAEA initiatives to promote emergency preparedness and response among its Member States.

2.3. Concept of RANET

RANET provides a compatible and integrated system for the provision of international assistance to minimize the actual or potential radiological consequences of a nuclear or radiological incident or emergency for health[2], environment and property. It also facilitates the provision of advice and assistance to the requesting State on on-scene response activities to mitigate the impact of emergencies.

RANET facilitates response to specific requests for assistance in accordance with the Assistance Convention and also applies to other nuclear and radiological incidents.

RANET does not affect the cooperation defined in any bilateral and/or multilateral agreements between States.

[2] The in-depth diagnosis, treatment, rehabilitation and follow-up of overexposed persons are addressed within the framework of the World Health Organization, which has established the network of collaborating centres for radiation emergency medical preparedness and assistance (REMPAN).

2.4. Scope of RANET

RANET is a network for providing international assistance, upon request from a State, following a nuclear or radiological incident or emergency. RANET is applicable for:

- Nuclear accidents or radiological emergencies[3] in the context of the Early Notification and Assistance Conventions;
- Other nuclear or radiological incidents; and
- Radiological consequences that exceed a State's response capabilities.

RANET is not a network for preparedness, except as defined in the Assistance Convention Article 5b.

The RANET mechanism does not and will not at any time replace national/State responsibility in emergency preparedness and response.

2.5. Responsibilities

2.5.1. Requesting State

It is important that States develop and maintain national response capabilities and arrangements, commensurate with identified hazards.

States shall make known to the Agency and to other States, directly or through the Agency, its Competent Authorities (CAs) authorized to make requests for and to accept offers of assistance and it's 24 hour point of contact (i.e. National Warning Point) for continuous availability.

States are responsible for identifying, evaluating and responding to nuclear accidents and radiological emergencies or other nuclear or radiological events whether or not they originate in their terrotory juristriction or control. If the response to the event exceeds the State's capabilities it may submit a request for assistance.

The Competent Authority is authorized to make and receive requests for and to accept offers of assistance. The Permanent Mission to the IAEA may also make requests for assistance and receive offers of assistance.

A State requesting assistance is responsible for specifying the scope and type of assistance required and, where practicable, providing the IAEA with such information as may be necessary for assisting party/parties to determine the extent to which it is able to meet the request. In the event that it is not practicable for the requesting State to specify the scope and type of assistance required, the requesting State, as appropriate consults with the assisting party/parties and the IAEA to decide upon the scope and type of assistance required.

[3] Related to any nuclear reactor wherever it is located; any nuclear fuel cycle facility; any radioactive waste management facility; the transport and storage of nuclear fuels or radioactive wastes; the manufacture, use, storage, disposal and transport of radioisotopes for agricultural, industrial, medical and related scientific and research purposes; and the use of radioisotopes for power generation in space objects.

States need to develop procedures for requesting and receiving international assistance as a part of their emergency preparedness and response plans.

States should strive to achieve compatible arrangements to ensure effective international arrangements.

Once a State has requested assistance, the following actions are envisaged to be taken by that State, without prejudice to the Assistance Convention where applicable:

- Participating in the development of the Assistance Action Plan (AAP) for the requested assistance and finalizing the proposed AAP for implementation in a timely manner;
- The overall direction, control, coordination and supervision of any assistance within its territory;
- Ensuring that the implementation of the AAP will be conducted in a safe and secure manner;
- Providing, to the extent of its capabilities, local facilities and services for the proper and effective provision of the assistance;
- Ensuring the protection of personnel, equipment and materials brought into its territory by or on behalf of the assisting party for such purpose;
- Providing, as necessary, technical, financial[4], diplomatic, organizational, and logistical support as designated in the AAP for the requested assistance;
- Declaring the termination of assistance in consultation with all parties to the AAP; and
- Providing relevant medium and long term information related to the status of the situation addressed during the Assistance Mission (e.g. follow-up).

2.5.2. Assisting States

State Parties participating or wishing to register in RANET are responsible for identifying qualified experts, equipment, and materials that could be made available to assist another State in a nuclear or radiological incident or emergency. These experts, equipment, and materials comprise the State's National Assistance Capabilities (NAC) that can be activated to provide assistance either by deploying or from an external base.

State Parties shall make known to the Agency and to other States, directly or through the Agency, its Competent Authorities (CAs) authorized to receive requests for and to make offers of assistance and it's 24 hour point of contact (i.e. National Warning Point) for continuous availability.

State Parties wishing to register the capabilities and resources of private entities in RANET need to certify and register the capabilities and resources through the Competent Authority.

[4] Article 7 of the Assistance Convention cites that States may be required to wholly or partly reimburse the costs incurred for any assistance that they request.

The Competent Authority and Permanent Mission to the IAEA are authorized to offer and authorise the provision of requested assistance.

The States that have registered in RANET are responsible for:

- Designating a NAC coordinator;
- Ensuring National Warning Point (NWP) and CA have appropriate procedures for responding to a request for assistance;
- Maintaining NAC resources registered in RANET;
- Conducting periodic reviews on continued availability of NAC resources, and updating registration at a minimum frequency of once every two years, or if resources or areas of expertise undergo significant changes;
- Participating, as appropriate, in IAEA meetings concerning RANET;
- Ensuring awareness of RANET within their national structures and promoting its use and development;
- Placing NAC resources on standby, if requested;
- Identifying the individual(s) who have the delegated responsibility to sign the AAP in a timely manner;
- Identifying any terms, especially financial, for the provision of assistance in the AAP;
- Be prepared to participate in the development and approval of the AAP in a timely manner. This includes the identification of an Assistance Mission Leader, as appropriate, in coordination with all parties;
- Identifying and activating/deploying NAC;
- Providing on-scene and/or external based assistance according to the AAP;
- Ensuring coordination with the requesting State, Assisting State(s) the IEC, and any deployed or external based assistance; and
- Demobilizing NAC resources upon termination.

2.5.3. The International Atomic Energy Agency

The IAEA Secretariat through its IEC upon receipt of request for assistance is responsible for performing the following tasks:

- Evaluating the situation, determining if assistance is feasible and, if necessary, deploy an Assessment Mission to the requesting State to further assess the emergency/event;
- Recommending specific RANET capabilities, if appropriate;
- Alerting appropriate NWP(s) and requesting coordination with the CAs/NAC coordinator(s);
- Reviewing offers of assistance and forwarding the offers to the requesting State as appropriate;
- Ensuring timely development of an AAP including identification of an Assistance Mission Leader, as appropriate, in coordination with all parties;
- Liaising with the requesting State and States providing assistance to reach agreement on the AAP and coordinating any proposed changes;
- Establishing and maintains communication links with the Assistance Mission and States providing assistance, as appropriate;

- Providing financial, organizational and logistical support, as appropriate;
- Declaring the official termination of an Assistance Mission; and
- Establishing follow-up activities if deemed appropriate.

The IAEA's IEC maintains the RANET system by:

- Promoting RANET and reporting annually on RANET's status and activities;
- Reviewing NAC and other resources submitted for registration in RANET;
- Documenting and registering NAC and other resources of State Parties;
- Maintaining the RANET database of registered capabilities, resources and expertise;
- Biennially requesting certification of continued NAC resource availability;
- Facilitating the conduct of exercises, where practicable within existing national, regional and international exercise regimes;
- Gathering and reviewing information on registered NAC, for example through liaising with the NAC coordinator, observation of NAC during national or international exercises, participation in Assistance Missions and/or the conduct of RANET Review missions;
- Conducting RANET workshops and meetings; and
- Facilitating the exchange of lessons identified in Assistance Missions.

In addition the IAEA's Secretariat fulfils the Agency's obligations under Article 5 of the Assistance Convention by providing assistance, upon request, in the following preparedness activities:

- Preparing emergency plans;
- Developing appropriate training programmes;
- Developing radiation monitoring programmes[5], procedures and standards; and
- Advising on radiation monitoring assistance.

[5] The IEC assists Member States in the development of emergency response capabilities for their national purposes. This must not be interpreted that the IEC develops RANET capabilities in Member States.

Section 3

3. CONCEPT OF OPERATIONS

RANET is a network of State Parties to the Assistance Convention that are capable and willing to provide, upon request, specialized assistance by appropriately trained, equipped and qualified personnel with the ability to respond in a timely and effective manner to nuclear or radiological incidents and emergencies.

If a State needs assistance in the event of a nuclear or radiological incident or emergency, whether or not such an event originates on its territory or is under its jurisdiction or control, it may request assistance from or through the IAEA.

The Permanent Mission, or the Competent Authority, is the Government representative that is expected to request assistance. To facilitate the effective provision of assistance, it is expected that a State will request assistance through one of the following channels, listed by preference:

(1) Submitting the Request For Assistance (RFA) form on USIE;
(2) Fax to the IEC; or
(3) Telephone to the IEC.

The request for assistance needs to include the scope and type of assistance required as follows:

(a) Information about the incident or emergency: nature of the event, location, time of its occurrence (UTC and local time), name and full address of organization in charge of response actions, and name and contact details of person assigned to liaise with the IEC.
(b) Type(s) of emergency assistance required: radiation survey, environmental sampling and analysis, source search and recovery, assessment and advice, decontamination, medical support, dose assessment, and other(s), need to be specified.

3.1. Operations

Upon receiving an official assistance request, the IAEA through its IEC becomes the focal point for the facilitation and coordination of international assistance. The IEC assesses the request and provides initial advice to the requesting State.

The IEC may deploy an Assessment Mission (e.g. fact-finding mission) as an initial mission deployed to collect and assess information; to perform an initial evaluation of the situation; to provide immediate advice as needed; and to recommend whether activation of a RANET Assistance Mission is necessary.

The RANET Assistance Mission response will be tailored to the specific situation e.g. it may include deployment of assets as well as provision of advice or assistance from an external base.

If the activation of NAC resources is recommended, the IEC will alert the appropriate National Warning Point(s) and request coordination with relevant Competent Authorities/NAC coordinator(s)[6]. The Competent Authorities/NAC coordinator(s) will inform the IEC regarding the availability of their resources for assistance and, if required, the resources will be placed on standby. This concept is outlined in Figure 1.

In circumstances where the IAEA Secretariat needs to request the assistance of NAC resources in support of its own operations, the IEC will follow the same process of alerting the appropriate National Warning Point(s) and request coordination with relevant Competent Authorities/NAC coordinator.

[6] A NAC Coordinator as appointed by the State or international organization is the IAEA's Incident and Emergency Centre's (IEC) single official RANET contact point.

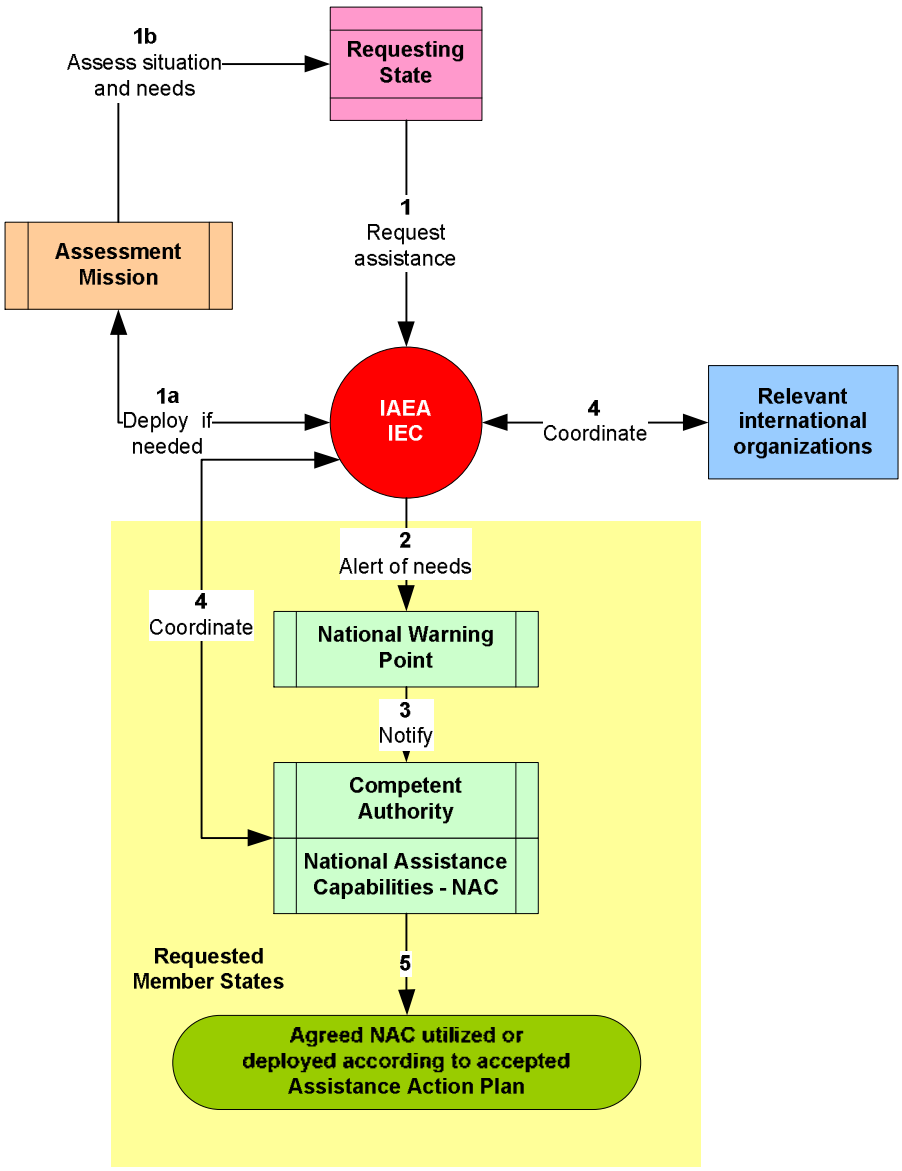


Figure 1: Outline of the RANET concept. State sends request for assistance to the IEC (1). The IEC may directly request assets or deploy an Assessment Mission (1a) to assess situation and needs (1b). If activation of RANET assets is deemed necessary the IEC alerts National Warning Point(s) (2), which notify Competent Authorities (3). Competent Authorities/NAC Coordinator(s) then coordinate provision of assistance with the IEC (4). Available assistance capabilities are utilized or deployed according to the accepted Assistance Action Plan (5).

3.2. Assistance Mission

An Assistance Mission is performed by a group of qualified experts and can be a FAT, an EBS or a JAT comprising of a combination of FAT and/or EBS to provide advice, assessment, medical support, monitoring or other specialized assistance following nuclear or radiological incidents or emergencies.

An Assessment Mission, if previously deployed, is incorporated into the Assistance Mission.

Depending on the objectives and scope of the Assistance Mission, the exact nature and title of the mission will be specified in the Assistance Action Plan (AAP) developed and agreed upon for that mission.

Team Leaders (Assistance Mission Leader, FAT Leader(s) and/or EBS Leader(s)) will be identified and agreed upon by all parties to the AAP. The Team Leader(s) will be responsible for all assistance activities and ensures coordination with the requesting State, Assisting State, the IEC and any External Based Support[7].

Where an Assistance Mission is implemented as a JAT, the JAT Command, composed of all FAT Leaders including a Secretariat representative, manages all on-scene JAT assistance and ensures coordination with the requesting and assisting State, the IEC and the External Based Support(s).

Identified Team Leader(s) must have the necessary technical and managerial experience to support and assist the requesting State. The Team Leader(s) also must have the expertise to oversee the operation and the ability to communicate within the given command structure. He/she has to:

- Lead and manage the Assistance Mission, FAT or EBS and ensure that all technical tasks are performed according to the AAP;
- Ensure safety of the team members;
- Provide support needed to achieve the mission's objectives; and
- Liaise with and regularly contact respective Team Leader(s), IEC and identified State representatives.

3.3. Assistance Action Plan

An Assistance Action Plan (AAP) for the requested assistance will be developed by the IEC in coordination with the requesting State, State(s) providing assistance and relevant international organization(s), as appropriate. This plan will specify the responses needed and whether the assistance will be deployed and/or provided from an external base. The AAP includes all technical, financial, diplomatic, organizational and logistical aspects of the assistance to be provided.

When developing the AAP, the composition of the Assistance Mission may consider specialized techniques, existing agreements and arrangements/collaboration between the States.

The AAP will also include the composition of the team(s) performing the mission including the Assistance Mission leader, EBS Leader and FAT Team Leaders. The IEC will nominate an Assistance Mission Leader for consideration, taking into account the mission objectives, composition of the team(s) and based on proposals made by the Assisting Parties. The Assistance Mission Leader will be agreed on, before deployment, by all parties by signing the AAP.

[7] See Appendix G for details.

Upon acceptance of the AAP by the requesting State, the IEC will notify the assisting States' CAs/NAC coordinators and request activation of NAC resources. Changes to the AAP must be coordinated with all Parties before the changes are implemented.

Details of the AAP are described in Section 5 and an example of an AAP is presented in the Appendix B.

3.4. NAC activation

NAC activation will be in accordance with the AAP for an Assistance Mission.

An Assistance Mission could be performed by a Field Assistance Team (FAT), an External Based Support (EBS) or a Joint Assistance Team (JAT) comprising of different FAT and/or EBS.

Upon activation the identified Team Leader will initiate the development of a mission plan to ensure that the team is able to perform its assigned AAP tasks. Mission planning needs to identify/address:

- The problem;
- The assistance task(s) assigned;
- Known constraints (e.g. safety, security, logistical, etc.);
- The equipment needs;
- Personnel needs;
- Other resources (FAT and/or EBS); and
- Resource support needs (e.g. aircraft, vehicles, base location, power, etc.).

In the case of a JAT, all mission plans are incorporated into the overall JAT mission plan.

Mission planning is a process that will need to continue throughout the mission until all assigned tasks are completed.

The concept of an Assistance Mission is outlined in Figure 2.

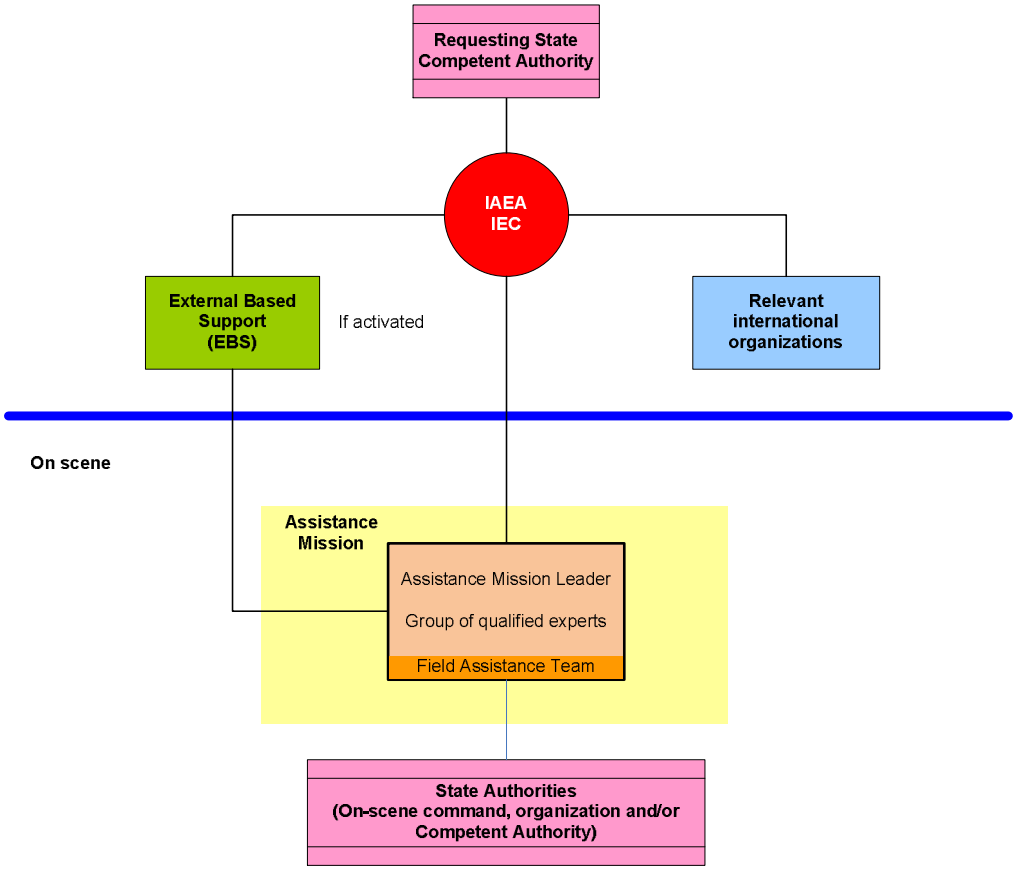


Figure 2: The concept of an Assistance Mission.

3.4.1. Field Assistance Team (FAT)

A FAT is a group of technically qualified and equipped experts deployed to provide the requested assistance.

A FAT Leader will be identified in the AAP.

3.4.2. External Based Support (EBS)

External Based Support provides any reach-back or off-scene capabilities to a requesting State, FAT or JAT. Such support can be expert advice on assessment, monitoring, analytical methods, and medical support or other specialized emergency response function. This support is not deployed to the event scene but is provided from another location, such as the assisting Party offices, laboratories or other locations.

An EBS Leader will be identified for each activated EBS.

3.4.3. Joint Assistance Team (JAT)

In more complex situations a Joint Assistance Team is formed. The exact nature of the JAT will be specified in the AAP developed and agreed upon for that mission. The JAT consists of all deployed FAT(s) and/or EBS(s).

The coordination of the RANET assistance on-scene is performed by the JAT Command which is composed of all FAT Leaders. The Assistance Mission Leader, who is identified and agreed upon by all parties to the AAP, performs the role of Chairperson of the JAT Command[8]. The Secretariat assists the Assistance Mission Leader in fulfilment of duties including technical support to deployed assets, liaison with local counterparts, liaison with the IEC and, if appropriate, provides IAEA media expertise in support of the mission.

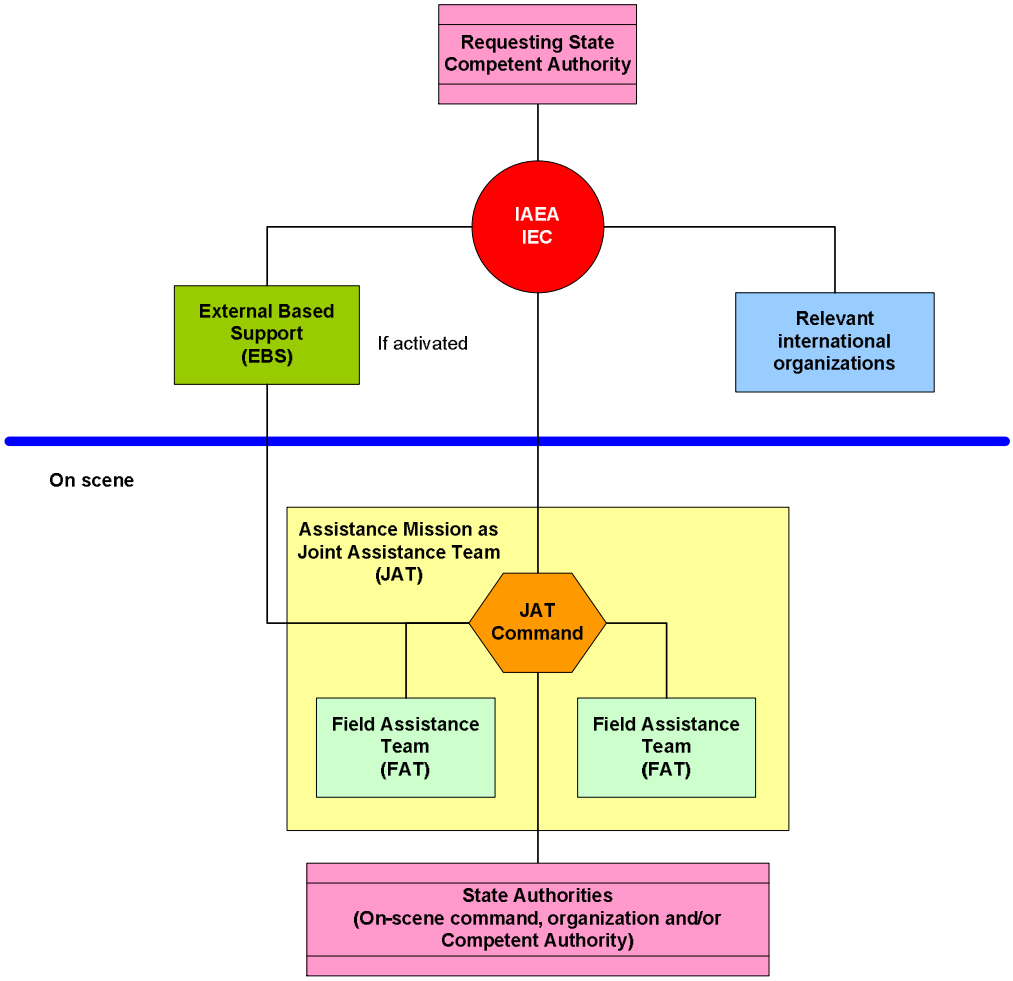


Figure 3: The concept of an Assistance Mission as a Joint Assistance Team.

[8] See Appendix G for his/her responsibilities and duties.

3.5. Field operational safety and security

The Assistance Mission Leader or the JAT Command implements the activities set by the AAP. They are responsible to ensure that all activities are performed in a safe and secure manner by following procedures, which at a minimum meets the appropriate IAEA Safety Standards [8].

In an emergency response, priority will be placed on the safety and security of personnel and members of the public. Unsafe/unsecure or possible unsafe/unsecure conditions operations and/or activities will not be conducted. Where any such situations are identified, the JAT Command or the Assistance Mission Leader shall coordinate with the appropriate authorities and entities to identify an acceptable, safe/secure solution for the conduct of the identified activities.

3.6. Assistance termination

The requesting State or any of the assisting Parties may at any time, after appropriate consultations and by notification in writing, request termination of assistance received or provided. Once such a request has been made, the involved Parties consult to make arrangements for the proper conclusion of the assistance.

The termination of assistance could be through any of the following:

(a) All AAP tasks are certified as completed as per the AAP.
(b) The requesting State may declare at any time the end of the requested assistance.
(c) An assisting State may terminate or withdraw its assistance at any time.
(d) The IEC may declare at any time the end of assistance due to failure to resolve unsafe or unsecured conditions or practices, or the failure of the requesting State to comply with the AAP.
(e) Partial demobilization of resources can occur as the individual AAP tasks are completed.

Upon termination of the assistance the NAC resources will be demobilized.

3.7. Assistance reports

Upon completion of any assistance, up to two reports may be required: *After Action Assistance Report,* and *Assistance Report*. For smaller missions, the IEC may determine in consultation with the requesting State that, only the *Assistance Report* may be required.

3.7.1. After Action Assistance Report

The Assistance Mission Leader or the JAT Chairperson and the responsible person(s) for the external based support prepare *After Action Assistance Report(s) (AAAR)*. The *AAAR(s)* will contain a description of the event, actions taken, recommendations and conclusions. In most instances, the *AAAR(s)* will be submitted within one week of the termination of the assistance. However, the one week timeline may be extended in major incident and emergencies as agreed by all parties. The *AAAR(s)* will be submitted to the IAEA for distribution to the requesting State and States providing assistance.

The *AAAR(s)* will be released upon agreement by involved parties and the IAEA's IEC. The *AAAR(s)* will be distributed to all Parties to the AAP.

3.7.2. Assistance Report

Within 60 days the IAEA will produce a final assistance report in coordination with the requesting State and all involved parties to fully describe the event history, response actions taken, resolution of the situation, recommendations for future actions (if any) and lessons identified. The IEC will distribute the report to the requesting State and to all assisting parties (States, international organizations).

Where it has been determined that only the *Assistance Report* is required, the IEC will agree on a shorter issuance timeframe between the requesting and assisting State(s).

The *Assistance Report* will be further distributed upon agreement by involved parties and the IAEA's IEC. The *Assistance Report* will be distributed to all parties to the AAP.

The IEC will, with the consent of the requesting and assisting States, make the *Assistance Report* available, in confidence, to other members of RANET. The shared version of the *Assistance Report* may be modified to remove any private or sensitive material as may be required.

The IEC may, with the consent of the requesting and assisting States, make a public version of the *Assistance Report* available.

3.8. Financial arrangements

The financial principles of the response operations to a nuclear accident or radiological emergency must be in accordance with Article 7 of the Assistance Convention, and it is expected that these principles will also be applied in the response to nuclear or radiological incidents.

Some financial support for RANET assistance activities may be provided through the IAEA's regular budget or from other IAEA resources. The IAEA may cover the expenses for the initial mobilization and deployment of the Assessment and/or Assistance Mission. If the IAEA cannot cover these initial expenses (for reasons of timing, for example) the States may cover the expenses, which may be reimbursed at a later stage.

States that are members of RANET are responsible for maintaining the NAC registered under RANET. States are also responsible for maintaining insurance, or otherwise assume financial liability, for responders and equipment that they deploy.

The IAEA assumes no liability for personnel or equipment of States providing assistance.

Section 4

4. NATIONAL ASSISTANCE CAPABILITIES

The Assistance Convention places specific legal obligations on the Parties. Article 2, Paragraph 4 of the Assistance Convention states: "*States Parties shall, within the limits of their capabilities, identify and notify the Agency of experts, equipment and materials which could be made available for the provision of assistance to other States Parties in the event of a nuclear accident or radiological emergency as well as the terms, especially financial, under which such assistance could be provided.*"

State Parties can fulfil this obligation under the Assistance Convention by identifying the National Assistance Capabilities (NAC) that could be made available to assist another State and registering them in RANET. NAC consist of qualified experts, equipment, materials and other resources that can be activated to provide assistance either by deployment to the event scene or from an external base such as assisting State offices, hospitals, laboratories or other locations. State Parties who register their NAC in RANET may also register additional resources that could be made available to another State.

Registration of NAC is done only through the relevant Competent Authority. Capabilities and resources of private entities being registered in RANET need to be certified and registered through this Competent Authority.

Registration of capabilities in RANET does not automatically obligate the registered State to provide assistance. When requested, the relevant Competent Authority will decide on the availability of its assets and ability to assist.

4.1. NAC activities and functional areas

To ensure effective assistance, whether by advice, external based support, and/or deployed assets, NAC may be called upon to:

- Assess, advise on and assist in the on-site response activities to mitigate impact of emergencies at nuclear facilities;
- Detect, locate, identify and characterize radioactive material and contamination;
- Assess and evaluate radiological consequences of an incident or emergency;
- Provide modelling and prognosis capability;
- Provide technical advice and recommendations;
- Initiate stabilization activities, including, where appropriate, decontamination;

- Provide medical advice and/or consultation, medical assistance as necessary and advice on public health; and
- Provide sampling, measurements and analysis.

The technical guidelines in Section 6 define the basis for the development of a compatible and integrated National Assistance Capabilities system. Guidelines are given for the following NAC functional areas:

- Nuclear Installation Assessment and Advice (NAA);
- Source Search and Recovery (SSR);
- Radiation Survey (RS);
- Environmental Sampling and Analysis (ESA);
- Radiological Assessment and Advice (RAA);
- Decontamination (DE);
- Medical Support (MS); and
- Dose Assessment (DA).

The relevant Competent Authority needs to review the guidelines to help identify the available expertise and resources that they possess as a NAC.

4.2. NAC expertise, resources and preparedness

States registering in RANET identify and register the expertise that they possess as part of their NAC, which could be made available to provide assistance following a nuclear or radiological incident or emergency. The Competent Authority ensures that the identified expert(s) is suitably qualified and experienced along with appropriate NAC preparedness so as to be able to provide international assistance, as part of a field deployment and/or EBS.

4.2.1. NAC expertise and resources

Examples of the expertise may be grouped into, but not limited to, the following:

- Nuclear installation safety;
- Radiation safety;
- Measurement techniques;
- Internal and external dosimetry;
- Radiation medicine;
- Evaluation and assessment; and the
- Operation of specialized technology.

The NAC expertise is complemented by suitable equipment and materials that are necessary for the delivery of the requested assistance. It is recommended that these resources are identified and registered as part of the NAC.

States are also encouraged to identify and register the resources that they may be able to provide to a requesting State, as well as the terms under which these resources may be obtained (e.g. through donation, loan or procurement).

These may include, but are not limited to:

- Radiation survey instruments;
- Personal dosimetry (active and passive);
- Medical equipment and supplies;
- Measurement systems;
- Personal protective equipment;
- Electrical generators and supplies;
- Cooling and purification systems;
- Criticality control materials;
- Ventilation systems;
- Specialized resources (e.g. robotics, aircraft, shielding); and
- General supplies to support field activities.

Where States register resources that may be offered to other States, they are encouraged to provide the necessary details, specifications, method of transportation and estimated quantities of these resources so that a requesting State and/or the IEC can assess the suitability of these resources depending on the nature of the event and the resources that may be required. This additional information can be provided as attachments to the RANET registration form or, once registered, entered directly into the RANET database.

4.2.2. NAC preparedness

The organization(s) providing assistance need to ensure that all the deployable personnel are/have:

- Fit for duty;
- Valid passports;
- Current immunizations[9];
- Medically approved physical condition for field operations;
- Pre-approved travel orders (if required by the CA);
- Pertinent responder information (blood type, emergency contact, allergies, languages spoken, dosimetry records); and
- A signed statement indicating willingness to respond.

The assisting organization is expected to provide, if necessary (indicative list):

- Communications equipment;
- Electrical generators to operate the field equipment;
- Food and water for the first 72 hours[10];
- Personal protective equipment for the first 72 hours;

[9] Necessary immunizations vary between countries. It is beneficial that the NAC know what immunizations each of their experts have so to assess, at the time, their suitability to participate in an Assistance Mission or JAT.

[10] Only in cases when infrastructure in stricken area is non-existent/destroyed.

- Tents, sleeping bags, and clothing for bad weather; and
- Digital camera with capability to record video.

Competent Authority and/or designated NAC Coordinator are also responsible for ensuring that the organizations providing assistance have quality control programmes in place. Documented instructions are recommended for all registered capabilities under RANET. All procedures, manuals, and reference data relevant to the work of the NAC need to be maintained up to date and be readily available for use. The following is an indicative list of procedures to be maintained as part of the preparedness programme for the NAC:

- Notification and recall rosters and procedures — to include the process of notification, and the telephone/pager numbers of the potential responder personnel;
- Personnel and equipment deployment procedures — to include administrative approvals, financing of travel, insurance, the process of transporting personnel, and packaging the equipment and transporting it to the assistance location;
- List of deployable equipment — to include shipping information for hazardous material, customs forms and other security related requirements as necessary;
- Procedures for all field response operations — to include the processes that each deployable asset will follow to perform the assigned tasks;
- Emergency Operation Document/Home Team Procedures (however named) for field deployment — to include the process of coordinating and supporting the deployment both logistically and technically[11];
- Redeployment of personnel and equipment procedures — to include the process of coordinating the transportation of personnel and equipment from the event site to their home base; and
- Procedures to ensure adequate protection of the personnel against ionizing radiation.

The assisting organizations and Competent Authority are also expected to identify, in advance, suitable processes through which the NAC can promptly ship equipment and resources between States. NAC who have registered as FAT and/or that have registered resources that could be deployed to provide assistance are encouraged to obtain a Carnet for all resources that may be deployed. A Carnet is an international customs and export-import document that is used to clear customs, in Carnet participating countries, without paying duties and import taxes on the deployed resources. The Carnet system is administered by the World Customs Organization and is needed to export/import equipment when leaving and returning to the Assisting State as well as entering and leaving the Requesting State.

A list of documentation examples is provided in Appendix C and examples of pre-deployment tasks are provided in Appendix G.

[11] Technical support may include providing technical advice, relaying messages and providing technical data as required.

4.3. NAC readiness

Each RANET State is responsible for ensuring that NAC responding personnel are qualified, trained and equipped to perform the functions for which they have registered.

NAC must use appropriate methods and procedures for the registered competencies and where possible, methods selected are to be consistent with publications [9–16].

When possible and appropriate NAC will participate in the international exercises such as ConvEx or intercomparison exercises.

NAC coordinators will report to the IEC on the effectiveness of the RANET system and on recommendations for improvements. The IEC will distribute this information with envisaged corrective actions to all RANET members.

4.4. Registration of private entity resources

RANET is a tool to implement the Assistance Convention in which Parties are governments or International Organizations. State Parties are therefore encouraged to identify and register the resources that they may be able to provide to a requesting State, as well as the terms under which these resources may be obtained (e.g. through donation, loan or procurement). These resources may include those of private entities, however Competent Authorities must certify the suitability of all resources before registering them in RANET.

Examples of the resources that may be registered are, but not limited to, the following:

- Radiation survey instruments;
- Personal dosimetry (active and passive);
- Medical equipment and supplies;
- Measurement systems;
- Personal protective equipment;
- Electrical generators and supplies;
- Cooling and purification systems;
- Criticality control materials;
- Ventilation systems;
- Specialized resources (e.g. robotics, aircraft, shielding); and
- General supplies to support field activities.

Where States register resources that may be offered to other States, they are encouraged to provide the necessary details, specifications, method of transportation and estimated quantities of these resources so that a requesting State and/or the IEC can assess the suitability of these resources depending on the nature of the event and the resources that may be required. This additional information can be provided as attachments to the RANET registration form or, once registered, entered directly into the RANET database.

4.5. NAC registration

4.5.1. Prerequisites for registration

The following are prerequisites for registration in RANET:

(a) The State must be a Party to the Assistance Convention;
(b) The Competent Authority authorized to make and receive requests for and to accept offers of assistance must submit a completed registration form; and
(c) NAC maintenance, preparedness and response are the responsibility of the State, in accordance with this publication.

4.5.2. Registration

The applying Competent Authority provides the following information:

(a) An application signed by the Competent Authority authorized to make and receive requests for and to accept offers of assistance;
(b) Information on National Assistance Capabilities (including description of the expertise and resources) in accordance with the technical guidelines in Section 6; and
(c) A list of the organizations contributing to the NAC, including contact details, so that the IAEA may recognize their contribution to RANET.

Details of RANET registration and instructions on how to register are presented in Appendix A.

The initial application for the registration needs to be sent to the IEC through Foreign Ministries and Permanent Missions[12].

4.5.3. Registration acceptance

The IEC will review the application in accordance with specifications within this document. If it is deemed that the registration meets the specifications then the IEC will provisionally register the proposed National Assistance Capabilities in RANET.

If the application is not complete, the IEC will request the Competent Authority or the international organization to submit missing information. If the IEC determines that the NAC proposed for RANET cannot be registered, a letter stating the reasons will be provided to the applying Competent Authority.

Once the proposed NAC have been verified, for example, through observation in exercises and/or hosting of a RANET Review Mission, the registration will be completed.

4.5.4. RANET registry database

The IEC maintains a database of RANET registered NAC, expertise and resources that could be provided to requesting States and the IAEA Secretariat. The information

[12]The Competent Authority is encouraged to send an advanced copy of registration directly to the IEC.

related to the registered NAC, expertise and resources is available through the USIE website.

4.5.5. Registration update

Once registered, States have the responsibility to notify the IAEA's IEC if resources and areas of expertise undergo significant changes or become unavailable. Also, any changes regarding the NAC coordinator are to be reported in a timely manner to the IAEA's IEC. This may be done directly online through the RANET database on USIE.

State that wishes to discontinue membership in RANET notifies the IEC through the official channels.

4.6. RANET NAC Review

The IEC maintains the RANET system by reviewing NAC identified for registration and/or their continued availability. The objectives of the RANET NAC reviews are to:

- Gather relevant information regarding the NAC so as to best utilize available RANET assets following a request for assistance;
- Review the current level of preparedness to provide international assistance;
- Harmonize international assistance by identifying and sharing examples of good practice; and
- Identify improvements for States to enhance the NAC and Competent Authority preparedness to provide international assistance.

In addition RANET NAC Review may help States to identify NAC that they can register in RANET.

The review may be performed through observation of the NAC during the conduct of exercises, the provision of assistance, through the conduct of RANET Review Missions or a combination thereof. RANET Review Missions may be requested by countries that have registered in RANET or are preparing the final stages of registration. Mission teams consist of representatives from the Secretariat and peers from other States that have registered in RANET.

In circumstances where the review determines that a registered NAC may not currently be at a suitable level of preparedness to provide international assistance the IEC will decertify the capabilities from RANET. The IEC will help identify actions through which the NAC may ensure they are sufficiently capable and prepared for recertification.

The NAC are response capabilities that exist within a State, primarily as part of its national emergency preparedness and response system. It is the responsibility of the relevant organization(s) and the Competent Authorities to implement any remedial actions, including financial actions.

Section 5

5. RANET ASSISTANCE ACTION PLAN

An Assistance Action Plan (AAP) is required for an Assistance Mission, Joint Assistance Team (JAT) and External Based Support (EBS). The AAP is not required for the provision of information or advice.

The AAP will be developed by the IEC in coordination with the requesting State and the Competent Authorities/NAC coordinator(s) providing assistance. The AAP will be agreed upon by all involved Parties.

Upon acceptance of the AAP by the requesting State, the IEC will notify the assisting States' Competent Authorities/NAC coordinator(s) and request the activation of NAC resources.

Changes to the AAP will be coordinated with all parties before the changes are implemented.

The instructions for preparing an AAP are set out below. A sample of an AAP is given in Appendix B.

5.1. Cover page

This page will include:

- A title, indicating the name of the State requesting assistance;
- A subtitle, describing briefly the event for which assistance was requested;
- The date on which the plan was prepared;
- The date on which the plan became effective; and
- The version number.

5.2. Relevant officials page

This page will include:

- The names and signatures of the IAEA-IEC officials who prepared the AAP;
- The names, States, organizations and signatures of the assisting State officials who agreed to the terms of the AAP;

- The names, organizations and signatures of the representatives of assisting international organizations who agreed to the terms of the AAP;
- The name, State, organization and signature of the Assistance Mission Leader who agreed to the terms of the AAP; and
- The name, organization and signature of the requesting State official who accepted the AAP.

5.3. Background

This section will include:

- The names of the State and organization requesting assistance;
- The date on which the IAEA's IEC received the request;
- The date, location and type of event for which assistance was requested; and
- A description of what is known to date including an assessment of severity.

5.4. Objective and scope

This section will include:

- A description of and justification for the type of assistance to be rendered;
- The expected starting and ending dates of the assistance;
- The scope of the assistance; and
- Based on initial information, a potential list of activities to be performed; actual tasks, activities and priorities will be determined by on-scene assessments and continued updating of information.

5.5. Parties

This section will include:

- The names of the State and organization (Requesting Authority) requesting assistance;
- A list of persons and organizations in the requesting State with whom the team expects to interact.
- The names of the States and organizations providing assistance; and
- The names of the international organizations providing assistance.

5.6. Assistance Teams

This section will include:

- A list of the components of the assistance, including the States and organization from which they are sent;
- A description of the assistance chain-of-command;
- A description of the mechanism by which the Assistance Mission Leader was chosen; and

- The names, functions, States and organizations of persons assigned to the assistance teams.

5.7. Assistance deployment

This section will include:

- The dates, times and locations of the respective planned departures of each component of the assistance; and
- The dates, times and locations of the respective planned arrivals of each component of the assistance.

5.8. Responsibilities

This section will include the respective responsibilities of the requesting State, the assistance team and the IAEA's IEC, as detailed in the EPR-RANET publication.

The requesting State will, without prejudice to the Assistance Convention where applicable:

- Ensure that the AAP will be implemented in a safe and secure manner;
- Provide, as necessary, technical, financial, diplomatic, organizational and logistical support as designated in the AAP for the requested assistance; and
- Grant the assistance teams unfettered access to all persons, locations, facilities and information necessary for the successful implementation of the AAP.

The assistance teams will:

- Accomplish the objectives and conduct the activities (overall work plan) set by this AAP; and
- Provide the IAEA with an authoritative and factual overview of the emergency, and make recommendations for any further action by the requesting State and the IAEA.

The IAEA's IEC will:

- Serve as the focal point for the provision of this international assistance, providing the necessary coordination, administration and support to all parties.

5.9. Other

The AAP will also set out arrangements concerning:

- Reporting (including the timelines for assistance reports);
- Confidentiality of information and materials related to assistance;
- Public information;
- Field operational safety and security;
- Assistance termination;
- Financial arrangements; and

- Overall work plan reflecting an on-scene assessment to include:

    - A list of activities, categorized according to function (e.g., monitoring, sampling, etc.);
    - Proposed dates of when each activity will be conducted;
    - Proposed location at which each activity will be conducted; and
    - The component of the assistance team responsible for conducting the activity in question.

Section 6

6. TECHNICAL GUIDELINES

National Assistance Capabilities are divided into functional areas. Each functional area is further divided into specific assistance capabilities. For each capability the following specifications are given:

- Functions;
- Expertise;
- Resources; and
- Examples of Products (expected results).

An indicative list of specific medical resources and the minimum equipment specifications are given in Appendices D and E respectively. To ensure compatible and consistent results of assistance, expected results of assistance are specified in Appendix F.

6.1. Functional Area: Nuclear Installation Assessment and Advice

Following a nuclear incident or emergency at a nuclear installation, assistance may be provided to assess the nature of the event, the plant status, the possible evolution, and to provide advice to assist in the mitigation on-site. The use of specialized equipment and technology, such as robotics and unmanned aerial vehicles may be required to perform some on-site mitigation tasks in areas that may be uninhabitable by man (e.g. high dose rates, high temperatures and unstable environments).

The specific type(s) of expertise need to be identified in Section 5 of the RANET Registration Form. For example: PWR, BWR, GCR, PHWR, LWGR, FBR, VVER, Research Reactor, fuel fabrication and/or fuel processing.

FAT	primary or supporting function
EBS	primary or supporting function

	Capability NAA-1: Nuclear Power Reactor Design Advice
Functions	To assess the known conditions at a nuclear power reactor facility following an incident or emergency and provide advice, from a design perspective, regarding the status of the plant, prognosis of possible evolution, capabilities of available systems and possible design options for mitigating the situation and maintaining/regaining control of the installation.
Expertise	The FAT and EBS staff have sufficient competence and experience in the following design areas: reactor/plant design, reactor physics, power and electrical systems, instrumentation and control, thermodynamics and cooling, thermo hydraulics, materials behaviour, and chemistry/chemical engineering. The EBS staff may also have sufficient competence and expertise in core and reactor accident modelling.
Resources	Information directly from the installation site and/or from various sources which may include: plant design details and analysis, piping and instrumentation diagrams, instrument and equipment specifications and environmental qualifications, electrical schematics, technical drawings, design basis calculations and plant safety analysis report. Modelling software and systems to assist in the analysis and assessment of the plant status and different design options considered for mitigation.
Products	A list of key products includes: – Assessment of plant status; – Assessment of accident evolution; – Advice on design options for mitigating the situation and maintaining/regaining control of the installation; and – Advice on status of systems if design basis is exceeded.

	Capability NAA-2: Nuclear Power Reactor Operations Advice
Functions	To assess the known conditions at a nuclear power reactor facility following an incident or emergency and provide advice, from an operations perspective, regarding the status of the plant, interpretation of plant data and parameters, status of safety related equipment, operability of available systems, prognosis of possible evolution and operational considerations for mitigating the situation and maintaining/regaining control of the installation
Expertise	The FAT and EBS staff have sufficient competence and experience in the operation of the specific type of nuclear power reactor in the following operational areas: reactor/plant operation, reactor physics, radiation protection, plant and equipment maintenance, instrumentation and control, thermodynamics and cooling, thermo hydraulics, and chemistry/chemical engineering. The EBS staff may also have sufficient competence in the programming and operation of plant simulators under different accident conditions.
Resources	Information directly from the nuclear power reactor site and/or from various sources which might include: Plant status, data and parameters, plant operation manuals, emergency action levels, severe accident management guidelines, plant design details, piping and instrumentation diagrams, instrument and equipment specifications and environmental qualifications, and electrical schematics. Simulators specific to the design of the nuclear installation.
Products	A list of key products includes: – Assessment of plant status, operability of available systems, and status of safety related systems; – Assessment of accident evolution; and – Advice on operational considerations for mitigating the situation and maintaining/regaining control of the installation.

Capability NAA-3: Nuclear Power Reactor Accident Analysis

Functions

To perform accident analysis at a nuclear installation based on the known plant status following an incident or emergency to determine the potential accident progression, assess potential actions for mitigating the situation and maintaining/regaining control of the installation and perform source term estimations.

Expertise

The FAT and EBS staff have sufficient competence and experience in performing safety and accident analysis for nuclear installations, the development of and application of severe accident management guidelines and the calculation of source terms for different accident conditions at nuclear installations.

Resources

Information directly from the incident site and/or from various sources which might include: Plant status, data and parameters, Assessments from NAA-1 and NAA-2 capabilities, design basis analysis, beyond design basis analysis, probabilistic safety analysis and success paths, safety analysis report, severe accident management guidelines and emergency plans.

Modelling and analysis software and plant simulators specific to design of the nuclear installation.

Products

A list of key products includes:

- Determination of potential success paths based on safety analysis and severe accident management guidelines;
- Calculation of source terms for potential or actual accident evolution scenarios; and
- Assessment of potential actions for mitigating the situation and maintaining/regaining control of the installation.

	Capability NAA-4: Research Reactor Assessment and Advice
Functions	To assess the known conditions at a research reactor following an incident or emergency and provide advice regarding the status of the plant, prognosis of possible accident evolution, capabilities of available systems and possible options for mitigating the situation and maintaining/regaining control of the installation based on the design of the research reactor.
Expertise	The FAT and EBS staff have sufficient competence and experience in the following areas: research reactor design, reactor physics, power systems, instrumentation and control, thermodynamics and cooling, thermo hydraulics, materials behaviour, and chemistry/chemical engineering. The EBS staff may also have sufficient competence and expertise in core and reactor modelling.
Resources	Information directly from the research reactor facility which might include: reactor design details and analysis, instrumentation and control diagrams, equipment specifications and environmental qualifications. Modelling software and systems to assist in the analysis and assessment of the reactor status and different design options considered for mitigation.
Products	A list of key products includes: – Assessment of reactor status; – Assessment of accident evolution; and – Advice on design options for mitigating the situation and maintaining/regaining control of the reactor.

Capability NAA-5: Fuel Fabrication Facility Assessment and Advice

Functions

To assess and advise on the likely condition of nuclear material during an accident involving the fuel fabrication process including: criticality hazard analysis, chemical and radiological hazard assessment, advice related to the handling UF_6 during an emergency, and suitable mitigation actions that may be required to maintain / regain control of a situation or protect the local population.

Expertise

The FAT and EBS have sufficient competence and experience in the design of fuel assemblies, processes involved in fuel fabrication, UF_6 management, fuel fabrication techniques/processes and criticality accident analysis

Resources

Information directly from the incident site and/or from various sources which might include: design drawings of fuel handling/fabrication facilities, design drawings of fuel assemblies and storage facilities, inventory of fresh fuel or related fabrication material and details regarding the specific technologies used at that facility.

Software systems for performing calculations of source terms and criticality analysis.

Products

A list of key products includes:

- Assessment of fuel conditions during fabrication;
- Advice on fuel fabrication material behaviour and management;
- Criticality calculations;
- Chemical toxicity vs. radiological toxicity calculations;
- Advice on handling UF_6;
- Source term calculations; and
- Advice on mitigating the situation and maintaining/regaining control of the installation.

Capability NAA-6: Spent Fuel Storage Assessment and Advice

Functions

To assess and advise on the likely condition of nuclear material during an accident with spent nuclear fuel in wet or dry storage including determining potential release terms, thermal output, proper handling of material during an emergency and suitable mitigation actions that may be required to maintain/regain control of a situation.

Expertise

The FAT and EBS have sufficient competence and experience in the design of fuel assemblies, design of wet and dry storage containers and facilities, calculation of thermal loads and requisite countermeasures, handling techniques/processes and criticality accident analysis

Resources

Information directly from the incident site and/or from various sources which might include: design drawings of fuel handling equipment, design drawings of fuel assemblies and storage facilities, inventory of fresh and spent fuel, thermal output and thermal management capabilities.

Software systems for performing calculations of source terms, criticality analysis and thermal evaluation

Products

A list of key products includes:

- Assessment of fuel conditions during storage (wet or dry);
- Assessment of thermal output and required cooling capability;
- Assessment of container structure condition after physical event (such as a building collapse or damage from a vehicle);
- Criticality calculations;
- Chemical toxicity vs. radiological toxicity calculations;
- Source term calculations; and
- Advice on mitigating the situation and maintaining/regaining control of a storage installation.

Capability NAA-7: Spent Fuel Reprocessing Assessment and Advice

Functions

To assess and advise on the likely conditions at a spent fuel reprocessing facility during an accident including: criticality hazard analysis, chemical and radiological hazard assessment, advice related to the handling of chemicals used in reprocessing process during an emergency, and suitable mitigation actions that may be required to maintain / regain control of a situation or protect the local population.

Expertise

The FAT and EBS have sufficient competence and experience in the design of spent fuel reprocessing facilities, the chemical processes used in reprocessing, equipment involved in reprocessing, determining requisite countermeasures for accident scenarios, and handling techniques for materials at different stages in the reprocessing process.

Resources

Information directly from the incident site and/or from various sources which may include facility layout, technical elements of the reprocessing process employed and readings from chemical management control systems.

Software systems for performing calculations of source terms, criticality analysis and thermal evaluation.

Products

A list of key products includes:

- Assessment of fuel/material conditions during different stages of reprocessing process;
- Advice on material behaviour and management;
- Criticality calculations;
- Chemical toxicity vs. radiological toxicity calculations;
- Source term calculations; and
- Advice on mitigating the situation and maintaining/regaining control of the installation.

Capability NAA-8: Operation of specialized technology

Functions

To provide assistance through the operation of specialized equipment and technology, such as robotics and unmanned aerial vehicles may be required to perform some on-site mitigation tasks in areas that may be uninhabitable by man (e.g. high dose rates, high temperatures and unstable environments).

Note: the use of this capability may also be applied to high activity source recover operations.

Expertise

The FAT staff have the necessary competence and experience in the programming and/or operation of specialized technology such as remote controlled equipment, robotics and unmanned aerial vehicles. Operators of robotics have the necessary training and ability to perform detailed manipulations through the use of remote control stations and cameras. The FAT expertise may also include design engineers and maintenance staff who may be required to perform on-site maintenance and/or modifications to the equipment as per the needs of the incident or emergency.

The EBS would involve support staff and designers who could provide support to the FAT with respect to the utilization and operation of the equipment.

Resources

The FAT will require the specialized technology such as remote controlled equipment, robotics and unmanned aerial vehicles. The exact nature of this equipment will be dependent upon the resources of the registered NAC and the actual requirements of the requesting State.

In general, the ground based resources need to be capable of operating in extreme conditions such as high radiation, high and low temperatures and high humidity. It is recommended that the equipment have the capability to be remotely controlled and fitted with cameras that are capable of operating in very high dose rate environments, so that the operators may view the surrounding areas and perform the required tasks.

FAT staff working in areas of elevated radiation will also require personal dosimetry and appropriate personal protective equipment.

Products

A list of key products includes:

- Operation of specialized technology to remotely perform tasks to assist in the on-site mitigation following a nuclear or radiological incident or emergency.

6.2. Functional Area: Source Search and Recovery

Search and recovery of lost or stolen radioactive sources, sources out of regulatory control, or screening areas for sources that may have been placed with malevolent intent; provision of advice and/or assistance in source recovery, transportation and safe and secure storage of the source including organizing and/or conducting source recovery operations, if requested.

FAT	primary function
EBS	supporting function (optional)

Capability SSR-1: Foot/manual/ground based search

Functions

To search or screen by walking through areas or buildings with appropriate portable radiation detection/survey instruments in order to detect, locate and identify radioactive source(s) or material and estimate the activity.

Expertise

The FAT need to have sufficient competence and experience within the following areas: use of equipment for the detection and identification of radioactive sources, data mapping, contamination assessment, intervention in areas with high dose rates, radiation protection and health physics, and contamination monitoring for personnel and equipment.

The EBS need to have sufficient expertise for providing technical and operational advice and support in developing the search plan and evaluation of the search, including interpretation of spectrometric results.

Resources

The actual equipment and staffing of the FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for foot/manual/ground based source search and screening:

Radiation survey instruments	multipurpose gamma/beta survey monitor, telescopic gamma probe, alpha/beta contamination monitor, personal contamination monitor, personal dosimetry, neutron dose rate meter, hand-held radionuclide identifier, neutron fission meter
Specialized equipment	None
General equipment and supplies	communication equipment (portable radio, phone), GPS, binoculars, personal protection equipment, maps

Products

A list of key products includes:

- Source location or confirmation of the absence of a source;
- Data mapping;
- Source identification and estimated activity;
- Confirmation of the presence or absence of contamination; and
- Recommendations on follow-up actions.

	Capability SSR-2: Vehicle based search
Functions	To search or screen an extended area using vehicle borne radiation detection/survey instruments in order to detect, locate and/or identify radioactive source(s) or material and estimate the activity.
Expertise	The FAT need to have sufficient competence and experience within the following areas: use of portable and vehicle based equipment for the detection and identification of radioactive sources and material, data mapping, contamination assessment, radiation protection and health physics, and contamination monitoring for personnel and equipment. The EBS need to have sufficient expertise for providing technical and operational advice and support in developing the search plan and evaluation of the search, including interpretation of spectrometric results.
Resources	The actual equipment and staffing of the FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for vehicle based source search and screening:
Radiation survey instruments	a vehicle-borne gamma dose rate and/or spectrometric survey system, a multipurpose gamma/beta survey monitor, personal dosimetry, a neutron dose rate meter, a hand-held radionuclide identifier
Specialized equipment	suitable vehicle
General equipment and supplies	communication equipment (a portable radio, phone), a GPS, a computer, a GPS mapping capability; an automatic data transfer capability
Products	A list of key products includes: – Source location or confirmation of the absence of a source; – Data mapping; – Source identification and estimated activity; – Confirmation of the presence or absence of contamination; and – Advice on follow-up actions.

	Capability SSR-3: Aerial search
Functions	To search or screen a wide area using airborne (rotary or fixed wing aircraft, including unmanned aircraft) radiation detection/survey instruments in order to detect, locate and/or identify radioactive source(s) and estimate the activity.
Expertise	The FAT need to have sufficient competence and experience within the following areas: airborne gamma spectrometry, airborne dose rate monitoring, data mapping, adapting the measuring technique to the aircraft, operating systems under flying conditions, contamination assessment, basic radiation protection and health physics. The EBS need to have sufficient expertise for providing technical and operational advice and support in developing the search plan and evaluation of the search, including interpretation of spectrometric results.
Resources	The actual equipment and staffing of the FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for airborne based source search and screening:
Radiation survey instruments	an airborne gamma dose rate and/or spectrometric survey system (high sensitivity detectors). Detection equipment needs to be capable of compensating for cosmic radiation.
Specialized equipment	a fixed wing aircraft and/or a rotary wing aircraft or unmanned aircraft (if appropriate) with proper qualified/certified pilot(s)/operator(s)
General equipment and supplies	a computer, a GPS mapping capability; a capability for the evaluation and analysis of measurement data; an automatic data transfer capability, a video camera facing down synchronized with monitoring equipment
Products	A list of key products includes: – Source location or confirmation of the absence of a source; – Data mapping; – Source identification and estimated activity; – Confirmation of the presence or absence of contamination; and – Advice on follow-up actions.

	Capability SSR-4: Maritime search
Functions	To search or screen a vessel including its cargo, either in a port or at sea, lakes, rivers, etc., using radiation detection/survey equipment in order to detect, locate and identify radioactive source(s) and material and estimate the activity.
Expertise	The FAT need to have sufficient competence and experience within the following areas: use of equipment for the detection and identification of radioactive sources, data mapping, contamination assessment, radiation protection and health physics, intervention in areas with high dose rates, contamination monitoring for personnel and equipment, and shipboard safety measures. The EBS need to have sufficient expertise for providing technical and operational advice and support in developing the search plan and evaluation of the search, including interpretation of spectrometric results.
Resources	The actual equipment and staffing of the FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for maritime source search and screening:
Radiation survey instruments	a multipurpose gamma/beta survey monitor, a telescopic gamma probe, an alpha/beta contamination monitor, a personal contamination monitor, personal dosimetry, a neutron dose rate meter, a hand-held radionuclide identifier; a neutron fission meter
Specialized equipment	None
General equipment and supplies	communication equipment (a portable radio, phone), a computer, personal protection equipment, a plan of the vessel
Products	A list of key products includes: – Source location or confirmation of the absence of a source; – Data mapping; – Source identification and estimated activity; – Confirmation of the presence or absence of contamination; and – Advice on follow-up actions.

Capability SSR-5: Source recovery

Functions

To advise and/or assist in source recovery, transportation and safe and secure storage and/or conduct source recovery operations.

Expertise

The FAT need to have sufficient competence and experience within the following areas: dose rate monitoring, contamination monitoring (including personnel and equipment), design and use of industrial and medical sources, intervention in areas with high dose rates, radiation protection and health physics, recovery techniques including shielding, handling and transportation of radioactive sources and nuclear/radioactive material.

The EBS need to have sufficient expertise for providing technical and operational advice and support in developing the recovery plan and to recommend specialized equipment.

Resources

The actual equipment and staffing of the FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for source recovery:

Radiation survey instruments	a multipurpose gamma/beta survey monitor, a telescopic gamma probe, an alpha/beta contamination monitor, a personal contamination monitor, personal dosimetry, a neutron dose rate meter, a hand-held radionuclide identifier
Specialized equipment	telescopic manipulators, source shielding containers, a simple robot with remote control
General equipment and supplies	communication equipment (a portable radio, phone), binoculars, personal protection equipment

Products

A list of key products includes:

- A source recovery plan;
- Safe and secure source transportation and storage plan;
- Safely recovered source;
- Confirmation of the presence or absence of contamination; and
- Advice on follow-up actions.

6.3. Functional Area: Radiation Survey

Monitoring and screening of areas, buildings, equipment, objects and/or persons for radioactive contamination in order to identify the need for and the extent of protective and other actions. Specifically radiation survey includes: measurements of dose rates, radiological screening, measurements of contamination levels, identification of radionuclides, and quantification of activity concentrations.

FAT	primary function
EBS	supporting function (optional)

Capability RS-1: Foot/manual/ground based survey

Functions

To detect, locate and demarcate contaminated area(s) or area(s) with elevated dose rates; to screen for radionuclides in support of major public events; to identify radionuclides; to survey persons, equipment and other objects for radioactive contamination.

Expertise

The FAT need to have sufficient competence and experience within the following areas: radiation monitoring techniques, contamination monitoring techniques, mapping of radioactive contamination, identification of radionuclides, screening strategies for radionuclides in support of major public events, radiation/nuclear forensic operational and technical requirements, contamination control, basic radiation protection and health physics.

The EBS need to have sufficient expertise for providing technical and operational advice on survey strategies; interpretation of the monitoring results including interpretation of spectrometric results; recommendations on protective and other actions.

Resources

The actual equipment and staffing of the FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for foot/manual/ground based survey:

Radiation survey instruments	an energy compensated gamma dose rate meter, a multipurpose gamma/beta survey monitor, an alpha/beta contamination monitor, a personal contamination monitor, personal dosimetry, a neutron dose rate meter, a hand-held radionuclide identifier, a neutron fission meter
Specialized equipment	None
General equipment and supplies	communication equipment (a portable radio, phone), a GPS, personal protection equipment, maps, GIS software, camera

Products

A list of key products includes:

- Dose rate map(s);
- Contamination map(s);
- Location, level and type of surface contamination on persons, equipment and/or objects; and
- Advice on follow-up actions.

Capability RS-2: In-situ gamma spectrometry

Functions

To identify and quantify gamma-emitting radionuclides in the environment.

Expertise

The FAT need to have sufficient competence and experience within the following areas: in-situ gamma spectrometry, radiation monitoring techniques, contamination monitoring techniques, contamination control, basic radiation protection and health physics.

The EBS need to have sufficient expertise for providing technical and operational advice on survey strategies; interpretation of the monitoring results including interpretation of spectrometric results including in-situ gamma spectrometry results; recommendations on protective and other actions.

Resources

The actual equipment and staffing of a FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for undertaking in-situ gamma spectrometry:

Radiation survey instruments	an in-situ gamma spectrometry system, a multipurpose gamma/beta survey monitor, an alpha/beta contamination monitor, a personal contamination monitor, personal dosimetry
Specialized equipment	liquid nitrogen if necessary
General equipment and supplies	communication equipment (portable radio, phone), a GPS, a computer, personal protection equipment, maps, evaluation software for contamination

Products

A list of key products includes:

- Radionuclides identified in ground deposition;
- Ground deposition of specific radionuclides at selected location(s);
- Contamination map(s); and
- Advice on follow-up actions.

Capability RS-3: Vehicle based survey

Functions

To detect, locate and demarcate extended contaminated area(s) or area(s) with elevated dose rates using vehicle borne radiation detection/survey instruments; to screen and identify radionuclides in the environment.

Expertise

The FAT need to have sufficient competence and experience within the following areas: portable and vehicle based radiation monitoring techniques, contamination monitoring techniques, contamination mapping, contamination control, identification of radionuclides, basic radiation protection and health physics.

The EBS need to have sufficient expertise for providing technical and operational advice on survey strategies; interpretation of the monitoring results including interpretation of spectrometric results, contamination maps, recommendations on protective and other actions.

Resources

The actual equipment and staffing of the FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for a vehicle based survey:

Radiation survey instruments	a vehicle -borne gamma dose rate and/or a spectrometric survey system, a multipurpose gamma/beta survey monitor, a neutron dose rate meter, a hand-held radionuclide identifier, personal dosimetry
Specialized equipment	a suitable vehicle
General equipment and supplies	communication equipment (a portable radio, phone), a GPS, a computer, a GPS mapping capability; a data transfer capability

Products

A list of key products includes:

- Dose rate map(s);
- Contamination map(s);
- Ground deposition of specific radionuclides; and
- Advice on follow-up actions.

Capability RS-4: Aerial based survey

Functions

To detect, locate and demarcate wide contaminated area(s) or area(s) with elevated dose rates using rotary or fixed wing aircraft (including unmanned aircraft) and airborne radiation detection/survey instruments; to screen and identify radionuclides in the environment.

Expertise

The FAT need to have sufficient competence and experience within the following areas: airborne gamma spectrometry, airborne dose rate monitoring, dose rate and/or contamination mapping; contamination assessment, basic radiation protection and health physics.

The EBS need to have sufficient expertise for providing technical and operational advice on survey strategies, interpretation of the monitoring results including spectral analysis and evaluation, contamination maps, recommendations on protective and other actions.

Resources

The actual equipment and staffing of the FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for an airborne survey:

Radiation survey instruments	an airborne gamma dose rate and/or a spectrometric survey system (suitable sensitivity detectors)
Specialized equipment	a fixed wing aircraft and/or a rotary wing aircraft or unmanned aircraft (if appropriate) with proper qualified/certified pilot(s)/operator(s)
General equipment and supplies	a notebook, a GPS mapping capability; a capability for the evaluation and analysis of measurement data; data transfer capability, a video camera facing down synchronized with monitoring equipment

Products

A list of key products includes:

- Dose rate map(s);
- Contamination map(s);
- Ground deposition of specific radionuclides; and
- Advice on follow-up actions.

6.4. Functional Area: Environmental Sampling and Analysis

Sampling of environmental media such as air, soil, water, sediments, dietary products and other human food and pasture for analysis in fixed or mobile laboratories; identification and quantification of specific radionuclides in the environment; sample preparation, measurements and analysis performed in a fixed or mobile laboratory.

FAT	primary function
EBS	supporting function (optional)

	Capability ESA-1: Environmental sampling
Functions	To gather environmental samples for subsequent laboratory measurements and analysis.
Expertise	The FAT need to have sufficient competence and experience within the following areas: sampling strategies, sampling techniques, sample types, sampling locations, sample handling and sample transportation, contamination control, basic radiation protection and health physics. The EBS need to have sufficient expertise for providing technical and operational advice on sampling strategies, sampling techniques, sample types, sampling locations, sample handling and sample transportation.
Resources	The actual equipment and staffing of FAT when deployed will depend on the assistance requested. The following is an indicative list of equipment for environmental sampling:
Radiation survey instruments	a multipurpose gamma/beta survey monitor, an alpha/beta contamination monitor, a personal contamination monitor, personal dosimetry
Specialized equipment	sampling equipment
General equipment and supplies	communication equipment (a portable radio, phone), a GPS, a GPS mapping capability, maps, packaging for sample material, labels, transportation if needed to be sent to another location
Products	A key product is: – Environmental samples properly packaged and labelled.

	Capability ESA-2:	**Gamma spectrometry**
Functions	To prepare samples for measurements and measure concentrations of gamma-emitting radionuclides in the environmental samples using fixed or mobile radiation laboratory(ies).	
Expertise	The EBS and/or FAT need to have sufficient competence and experience within the following areas: sample preparation techniques for gamma spectrometry, laboratory gamma spectrometry, contamination control, basic radiation protection.	
Resources	The actual equipment and staffing will depend on the assistance requested. The following is an indicative list of equipment for gamma spectrometry:	
Radiation survey instruments	gamma spectrometers (mobile or fixed)	
Specialized equipment	spectrometer shielding, sample preparation equipment, analysing and evaluation software, reference gamma point sources, liquid nitrogen	
General equipment and supplies	PCs, an internet connection	
Products	A key product is: – Gamma emitting radionuclide concentrations in the environmental samples.	

	Capability ESA-3:	**Alpha spectrometry**
Functions	To prepare samples for measurements and determine concentrations of alpha-emitting radionuclides in the environmental samples using fixed or mobile radiation laboratory(ies).	
Expertise	The EBS and/or FAT need to have sufficient competence and experience within the following areas: sample preparation techniques for alpha spectrometry, radiochemistry techniques, alpha spectrometry, contamination control, basic radiation protection.	
Resources	The actual equipment and staffing will depend on the assistance requested. The following is an indicative list of equipment for alpha spectrometry:	
Radiation survey instruments	alpha spectrometers	
Specialized equipment	spectrometer shielding, sample preparation equipment, analysing and evaluation software, reference alpha sources	
General equipment and supplies	PCs, an internet connection	
Products	A key product is: – Alpha emitting radionuclide concentrations in the environmental samples.	

	Capability ESA-4: Beta counting
Functions	To prepare samples for measurements and determine concentrations of beta-emitting radionuclides in the environmental samples using fixed or mobile radiation laboratory(ies).
Expertise	The EBS and/or FAT need to have sufficient competence and experience within the following areas: sample preparation techniques for beta counting, radiochemistry techniques, beta counting, contamination control, basic radiation protection.
Resources	The actual equipment and staffing of EBS and FAT will depend on the assistance requested. The following is an indicative list of equipment for beta counting:
Radiation survey instruments	gross alpha/beta proportional counters, liquid scintillation counters
Specialized equipment	shielding, sample preparation equipment, analysing and evaluation software, reference beta sources
General equipment and supplies	PCs, an internet connection
Products	A key product is: – Beta emitting radionuclide concentrations in the environmental samples.

6.5. Functional Area: Radiological Assessment and Advice

Assessment and evaluation of radiological consequences of a perceived threat or actual incident/emergency and its possible evolution and advice on protective and other actions needed to minimize the consequences and/or to return to normality. Information required to perform assessment and advice can be obtained from various sources including the products of other functional areas such as radiation survey, environmental sampling and analysis, etc.

FAT	optional function
EBS	primary function

	Capability RAA-1: Atmospheric dispersion
Functions	To model atmospheric dispersion and deposition of radioactive material released into the atmosphere.
Expertise	The EBS need to have sufficient competence and experience in the atmospheric dispersion modelling at local, regional and/or global scales.
Resources	The following is an indicative list of resources: – 24h/7d access to established operational systems; – A capability to respond to events at any location; – A capability to perform atmospheric dispersion modelling on local, regional and/or global scales; and – The means to deliver key products in an efficient way.
Products	A list of key products includes: – Trajectories; – Plume arrival time; – Airborne radionuclide concentrations; – Time-integrated airborne radionuclide concentrations; – Total ground deposition; and – Precipitation.

	Capability RAA-2: Hydrospheric dispersion
Functions	To model hydrospheric dispersion and sedimentation of radioactive material released into various water bodies.
Expertise	The EBS need to have sufficient competence and experience in hydrospheric dispersion modelling of various water bodies.
Resources	The EBS need to have sufficient competence and experience in hydrospheric dispersion modelling of various water bodies
Products	A list of key products includes: – Radionuclide concentrations in water and on sediments; and – Time-integrated waterborne radionuclide concentrations.

Capability RAA-3: Radioecological models

Functions

To model the transport of radioactive material between different compartments of the environment.

Expertise

The EBS need to have sufficient experience in modelling radionuclide transport of radioactive material between different compartments of the environment.

Resources

The following is an indicative list of resources:

- Access to established operational systems;
- A capability to respond to events at any location;
- A capability to perform radioecological modelling; and
- The means to deliver key products in an efficient way.

Products

A key product is:

- Estimated time dependent activity concentrations in environmental media.

Capability RAA-4: Dose predictions

Functions

To model and predict doses in order to evaluate potential health and other impacts.

Expertise

The EBS need to have sufficient competence and experience in the field of dispersion modelling, health physics, environmental measurements, nuclear safety and radiation protection.

Resources

The following is an indicative list of resources and means:

- 24h/7d access to established operational systems;
- A capability to respond to events at any location;
- A capability to predict doses by modelling; and
- The means to deliver key products in an efficient way.

Products

A key product is:

- Estimated time dependent exposures to the public such as: external dose (cloud and ground shine dose), inhalation dose, ingestion dose, thyroid dose (age specific), total effective dose and collective dose.

	Capability RAA-5: Public health protection
Functions	To provide advice and recommend protective actions and guidance for preventing or reducing radiation exposure to the affected population.
Expertise	The EBS and/or FAT need to have knowledge of assessing radiological consequences and recommending protective actions, both urgent and long term, and other appropriate guidance including follow-up actions.
Resources	Information directly from the incident site and/or from various sources which might include the products of other functional areas such as radiation survey, environmental sampling and analysis, dose prediction and mitigation, etc.
Products	A list of key products includes: – Advice on public health protection (e.g., sheltering, evacuation, potassium iodide distribution, food/water restriction); – Advice on radiation risk issues and related public health matters to relevant organizations and the media; and – Advice on suitable follow-up actions (e.g., long term health surveillance, changes in land use, agriculture, limited access to some areas, epidemiological studies, etc.).

	Capability RAA-6: Remediation and recovery
Functions	To provide advice on the remediation of contaminated areas and recovery operation.
Expertise	The EBS and/or FAT need to have sufficient competence and experience in recovery operations, management of radioactive waste remediation actions and health physics.
Resources	Information directly from the incident site and/or from various sources which might include the products of other functional areas such as radiation survey, environmental sampling and analysis, dose prediction and mitigation, etc.
Products	A key product is: – Advice on remediation and recovery operations.

6.6. Functional Area: Decontamination

Advice on decontamination of areas, land (urban and rural), buildings, equipment, objects and persons, advice on decontamination techniques and/or operational support; operational support in decontamination

FAT	primary or supporting function
EBS	primary or supporting function

Capability DE-1: Expertise in decontamination

Functions

To advise on decontamination of areas, land (urban and rural), buildings, equipment, objects, persons or animals.

Expertise

The EBS and/or FAT need to have sufficient competence and experience in techniques for decontamination of areas, land (urban and rural), buildings, equipment, objects, persons and animals, on decontamination equipment and reagents, and on management of radioactive waste.

Resources

Information directly from the incident site and/or from various sources which might include the products of other functional areas such as radiation survey, environmental sampling and analysis, etc.

Products

A list of key products includes:

- Advice on decontamination;
- Decontamination plans including techniques, equipment, substances, reagents, and procedures.

Capability DE-2: Support in decontamination

Functions

To provide operational support on decontamination of areas, land (urban and rural), buildings, equipment, objects, persons or animals.

Expertise

The FAT need to have sufficient competence and experience in techniques for decontamination of areas, land (urban and rural), buildings, equipment, objects, persons and animals, on decontamination equipment and reagents, and on management of radioactive waste.

Resources

The actual equipment and staffing of the FAT will depend on the assistance requested. The following is an indicative list of resources and means:

- Information directly from the incident site and/or from various sources, which might include the products of other functional areas such as radiation survey, environmental sampling and analysis, etc.;
- Decontamination equipment and reagents.

Products

A list of key products includes:

- Decontamination plans including techniques, equipment, substances, reagents, and procedures;
- Operational support in decontamination; and
- Provision of decontamination equipment and agents.

6.7. Functional Area: Medical Support

Advice on the optimum medical management of casualties, recommendations on their necessary treatment, treatment in specialized centres and advice on and/or psychological support to casualties, their families, first responders, care takers and the general public.

FAT	primary or supporting function
EBS	primary or supporting function

	Capability MS-1: Medical triage[13]
Functions	To collect and interpret all information needed for triage (including assessment of local resources) in order to evaluate the medical consequences; to coordinate and organize the specialist multidisciplinary medical team; to provide advice and consultation on the management of overexposed and/or contaminated/potentially contaminated patients and of bioassay procedures/collection of appropriate samples; to provide feedback information to the media spokesperson.
Expertise	The FAT needs to have competence and experience in radiation medicine, emergency medicine, disaster medicine (e.g. mass casualties) and in other related areas e.g. haematology, burn treatment, physical and biological dosimetry and bioassay. The EBS may provide (1) advice on monitoring and recording of prodromal signs and symptoms; (2) consultation in relevant medical specialties e.g. haematology, burn treatment, surgery, nuclear medicine, radiotherapy, and psychology; (3) advice on sampling procedures (e.g. repeated blood cell counts, biodosimetry, bioassay).
Resources	The FAT[14] consists of medical doctors, paramedical support staff, health physicists, and/or dosimetrists. It is expected that basic material and facilities for physical examination and sampling will be available locally. The following additional resources might be useful: – Mobile decontamination facilities; – Portable lung, thyroid, wound and whole body monitors; – Thermography equipment; – Ultrasound equipment.
Products	A list of key products includes: – Patients grouped in medical triage categories; – The anticipation of likely requirements for managing patients; and – Advice on collection and management of appropriate samples.

[13] Rapid method utilizing simple procedures to sort persons into groups based on their injury and/or disease for the purpose of expediting clinical care and maximizing the use of the available clinical services and facilities.

[14] The FAT composition will depend on the scenario; no precise figures can be specified here. Members of the FAT and EBS are encouraged to use the IAEA patient reporting forms (EPR-Medical 2005).

Capability MS-2: Support in treatment

Functions

To advise on the necessary treatment, in support of the local health services and/or recommend treatment of patient(s) in specialized institutions; to provide access to specific drugs (e.g. cytokines, decorporation and blocking agents, solution for broncho-pulmonary lavage, etc.)

Expertise

The EBS and FAT staff need to have competence and experience in radiation medicine, emergency medicine and in other related areas e.g. haematology, burn treatment, physical and biological dosimetry and bioassay, use of decorporation agents, thermography and ultrasound.

The EBS may provide (1) advice on the acquisition of the most appropriate data for diagnosis and treatment, (2) consultation in relevant medical specialties e.g. haematology, burn treatment, surgery, radiation medicine, (3) advice on optimum treatments, and (4) access to specific drug stockpiles.

Resources

A multidisciplinary, well-experienced team of experts e.g. haematologists, burn treatment specialists, radiation medicine experts, plastic and other surgeons and gastroenterologists.

Products

A list of key products includes:

- Advice on the acquisition of the most appropriate data for diagnosis and treatment;
- Advice on optimum treatment strategies; and
- The provision of specific drugs not locally available.

Capability MS-3: Emergency treatment

Functions

To treat selected patient(s) in a specialized centre.

Expertise

The EBS staff need to have competence and experience in radiation medicine, emergency medicine, disaster medicine (e.g. mass casualties) and in other related areas e.g. haematology, burn treatment, physical and biological dosimetry and bioassay, use of decorporation/blocking agents, thermography and ultrasound.

Resources

A specialized hospital treatment centre; a multidisciplinary team of experts e.g. haematologists, burn treatment specialists, radiation medicine specialists, plastic and other surgeons and gastroenterologists.

Products

A key product is:

- Optimally managed patient(s).

	Capability MS-4: Psychological support
Functions	To provide psychological support to the patients, their families, first responders, care providers, medical professionals, and guidance to the government authorities on support for the public in order to minimize psychosocial effects arising from anxiety and uncertainties associated with the radiation emergencies.
Expertise	The EBS and FAT staff need to have competence and experience in psychosocial support following mass casualty events and individual traumas.
Resources	Experts knowledgeable in psychosocial support; ideally experts need to be familiar with the local language and culture and be able to provide guidance to local risk communicators.
Products	A list of key products includes: – Consultations with patients, patient's families, and their physicians to ensure the acceptance of optimal treatment and to minimize the psychosocial stress associated with such events; – Guidance to local medical professionals and government authorities; and – Minimized stress level within the affected population.

6.8. Functional Area: Dose Assessment

The assessment of doses following an external and/or internal exposure to ionizing radiation using in vivo and/or in vitro bioassay and tools (e.g., dose assessment tables and software): cytogenetics-based biodosimetry, Electron Paramagnetic Resonance (EPR), also known as Electron Spin Resonance, Optically Stimulated Luminescence (OSL) and/or Activation Analysis; assessing the level and location of internal contamination, amount of intake; assessing the committed dose due to internal exposure.

FAT	primary or supporting function
EBS	primary or supporting function

	Capability DA-1: Cytogenetics–based biodosimetry
Functions	To determine whole/partial body dose using the dicentric and/or micronucleus assays on peripheral blood lymphocytes[15] and other cytogenetic techniques (e.g., Premature Chromosome Condensation, FISH translocation).
Expertise	The EBS personnel need to have competence and experience in human radiation cytogenetics, basic radiation protection, sampling techniques and sample management for blood, fixed cells and slides. The FAT (skilled technical staff) may be deployed to participate in sample collection, initial processing and dispatch to the EBS laboratories.
Resources	An established biodosimetry laboratory[16].
Products	A key product is: – Dose estimates for external exposure (whole/partial body dose) and under some circumstances for internal exposure to radionuclide (e.g., for ^{3}H, ^{137}Cs) specified as absorbed dose and/or RBE weighted absorbed dose.

[15] The dicentric assay also can be used in triage mode.

[16] Laboratory needs to have a quality control programme in place.

Capability DA-2: Electron Paramagnetic Resonance

Functions

To determine partial body dose (local dose) using Electron Paramagnetic Resonance (EPR) in tooth, bone and/or nail samples; *in vivo* assays may be used for triage applications if available.

Expertise

The EBS personnel need to have competence and experience in sampling techniques and sample management, EPR counting instrumentation, measurement and evaluation of spectra.

The FAT (skilled technical staff) may be deployed to participate in sample collection and dispatch to the EBS laboratories.

Resources

An established laboratory[16].

Products

A key product is:

- Dose estimates for exposure to head (teeth), extremities (nail) or other localized sites (bone) in terms of absorbed dose/RBE weighted absorbed dose.

Capability DA-3: Optically Stimulated Luminescence/EPR

Functions

To determine partial body dose (local dose) using Optically Stimulated Luminescence (OSL) or EPR using samples of personal items (electronic chips, buttons, jewellery, pharmaceuticals, etc.).

Expertise

The EBS personnel need to have competence and experience in sampling techniques and sample management, OSL/EPR counting instrumentation and measurement techniques and the interpretation and evaluation of measurements.

The FAT (skilled technical staff) may be deployed to participate in sample collection and dispatch to the EBS laboratories. Some other capabilities may be field deployable.

Resources

An established laboratory[16].

Products

A key product is:

- Dose estimates for external exposure (partial body dose) in terms of absorbed dose/RBE weighted absorbed dose.

Capability DA-4: Activation Analysis

Functions

To determine either whole body or local neutron dose using gamma spectrum analysis of activated elements e.g. sodium in blood or gold (for example in jewellery and teeth).

Expertise

The EBS personnel need to have competence and experience in sampling techniques and sample management, neutron activation analysis and interpretation and evaluation of measurements.

The FAT (skilled technical staff) may be deployed to participate in sample collection and dispatch to the EBS laboratories.

Resources

An established laboratory for neutron activation analysis[16].

Products

A key product is:

- Neutron dose in terms of absorbed dose/RBE weighted absorbed dose.

Capability DA-5: *In vivo* bioassay

Functions

To determine the nature, activity, location or retention of radionuclides in the body using fixed and/or mobile body/organ monitoring; to determine external and/or wound contamination by alpha, beta and gamma counting techniques.

Expertise

The EBS and/or FAT staff need to have competence and experience in using whole body counter(s), organ counter(s), and wound counter(s), analysis of spectra and intake assessment including the quantification of intake amount.

The EBS may provide whole body counting capabilities and interpretation of measured spectra.

Resources

The following is an indicative list of equipment for *in vivo* bioassay:

Gamma emitters	Whole body counters, mobile NaI, CsI or HPGe detector systems, thyroid counters
Beta emitters	Phoswich and/or broad-energy spectral detector systems (bremsstrahlung)
Wound monitoring	Wound monitoring equipment for the detection of alpha, beta and gamma emitters

Products

A list of key products includes:

- Confirmation of radionuclide(s) intake;
- Amount of radionuclide intake(s) (whole body, specific organs, wounds).

Capability DA-6: *In vitro* bioassay

Functions

To identify and determine concentrations of specific radionuclides in excreta and in other biological samples such as blood, nasal mucus, saliva, exhaled breath or post-mortem tissue samples.

Expertise

The EBS and/or FAT staff need to have competence and experience in bioassay sampling and sample management, in alpha, beta and/or gamma spectrometry and other counting techniques. The EBS may provide laboratory measurements, analysis and intake assessment.

Resources

The following is an indicative list of equipment for *in vitro* bioassay:

Mobile

Liquid Scintillation Counters for measurement of radionuclide activity in urine samples and swabs; XRF to determine low specific activity radionuclides; gamma spectrometers (e.g., NaI, CsI, HPGe detector systems)

Laboratory

Chemical treatment capabilities to determine radionuclides in biological samples; gross-alpha, gross-beta/gamma counting equipment, alpha, beta and gamma spectrometers; capabilities to determine radionuclides in samples using mass-spectrometry (i.e., ICP-MS, TIMS, AMS); high resolution XRF; tissue oxidisers and freeze drying equipment for tritium determination

Products

A list of key products includes:

- Confirmation of radionuclide(s) intake;
- Concentrations of radionuclide(s) in biological samples.

Capability DA-7: Internal dose calculations

Functions

To estimate (calculate) the dose from internal exposure based on radionuclide intake data.

Expertise

The EBS and/or FAT staff need to have competence and experience within the following areas: interpretation of bioassay data, biokinetic modelling, dose assessment methods; and determination of organ and committed dose.

The EBS may provide analysis of data, dose calculations and interpretation.

Resources

Capabilities for dose calculations using validated biokinetic and dosimetric models.

Products

A list of key products includes:

- Estimates of committed dose from internal exposure; and
- Dose distribution within the body.

	Capability DA-8:	**Dose reconstruction**
Functions	To collect information (monitoring, bioassay, modelling) needed for dose reconstruction; and to assess dose based on available information, data and models.	
Expertise	The FAT must have competence and experience in assessing doses taking into account all available information, data and realistic models. Dose reconstruction may be provided by EBS.	
Resources	Given that all information for dose reconstruction need to be available no specific resources, other than appropriate computer codes and tables, are needed except in cases where simulation of an event is envisaged (event specific resources may be needed).	
Products	A list of key products includes: – Identification of potentially exposed individuals; – Estimates of radionuclide(s) intake; and – Dose estimates, reported as committed effective dose.	

APPENDIX A: REGISTRATION FORM

How to register

Parties wishing to register their National Assistance Capabilities (NAC) in the Response and Assistance Network (RANET) need to identify the capabilities including the expertise and resources that they possess and include this information in the registration form.

The registration form is available for download on the protected emergency web site of the IAEA's Incident and Emergency Centre – USIE at iec.iaea.org/usie.

Completing the Registration Form

The form is composed of 3 parts:

Part A: General Information. Enter the information regarding the State or International Organization who is registering, the responsible Competent Authority and the nominated NAC coordinator.

Part B: National Assistance Capabilities. Enter the relevant information regarding the NAC that are being registered as a Field Assistance Team (FAT) and/or External Based Support (EBS). Information also needs to be included about the available expertise and resources related to the registered NAC.

Part C: Signatures. By signing the final section and agreeing with the statements provided, the registering Party/International Organization agree to register the identified NAC and its associated expertise and resources in RANET.

Submitting RANET Registration Forms

The application for registration must be sent through the official channels: Ministry of Foreign Affairs or the Permanent Mission to the IAEA. However, the Competent Authorities are encouraged to send an advanced copy of registration directly to Incident and Emergency Centre.

The formal application for registration of NAC resources in RANET must be sent to the following address:

Incident and Emergency Centre (IEC)

International Atomic Energy Agency
Vienna International Centre
PO Box 100
1400 Vienna, Austria

For further details regarding registration in RANET, contact the IEC:

Tel: +43 1 2600 21418

Fax: +43 1 2600 7 29309

Email: iec3@iaea.org

REGISTRATION OF NAC RESOURCES

IN THE RESPONSE AND ASSISTANCE NETWORK – RANET

PART A: GENERAL INFORMATION

1. Applying State/International Organization

Name: _____

2. Competent Authority

Name: _____

Address: _____

_____

Telephone: _____ Fax: _____

Email: _____ Web site: _____ *(optional)*

3. NAC coordinator

Name: _____

Org: _____

Address: _____

_____

Telephone: _____ Fax: _____

Email: _____ _____

PART B: NATIONAL ASSISTANCE CAPABILITIES

4. NAC to be registered

For each NAC being registered please check the function and include a description of the expertise and resources. The attached checklists should be completed to provide additional information about available expertise and resources. Text descriptions of the specific capabilities should be attached.

		RS -	Radiation Survey
	FAT	RS-1	Foot/manual/ground based survey
	EBS		
	FAT	RS-2	In-situ gamma spectrometry
	EBS		
	FAT	RS-3	Vehicle based survey
	EBS		
	FAT	RS-4	Aerial based survey
	EBS		
		SSR	Source Search and Recovery
	FAT	SSR-1	Foot/manual/ground based search
	EBS		
	FAT	SSR-2	Vehicle based search
	EBS		
	FAT	SSR-3	Aerial search
	EBS		
	FAT	SSR-4	Maritime search
	EBS		
	FAT	SSR-5	Source recovery
	EBS		
		RAA	Radiological Assessment and Advice
	FAT	RAA-1	Atmospheric dispersion
	EBS		
	FAT	RAA-2	Hydrospheric dispersion
	EBS		
	FAT	RAA-3	Radioecological models
	EBS		
	FAT	RAA-4	Dose predictions
	EBS		
	FAT	RAA-5	Public health protection
	EBS		
	FAT	RAA-6	Remediation and recovery
	EBS		
		DE	Decontamination
	FAT	DE-1	Expertise in decontamination
	EBS		
	FAT	DE-2	Support in decontamination
	EBS		

		ESA	Environmental Sampling and Analysis
	FAT	ESA-1	Environmental sampling
	EBS		
	FAT	ESA-2	Gamma spectrometry
	EBS		
	FAT	ESA-3	Alpha spectrometry
	EBS		
	FAT	ESA-4	Beta counting
	EBS		
		MS	Medical Support
	FAT	MS-1	Medical triage
	EBS		
	FAT	MS-2	Support in treatment
	EBS		
	FAT	MS-3	Emergency treatment
	EBS		
	FAT	MS-4	Psychological support
	EBS		
		DA	Dose Assessment
	FAT	DA-1	Cytogenetics-based biodosimetry
	EBS		
	FAT	DA-2	EPR/ESR
	EBS		
	FAT	DA-3	Optical Stimulated Luminescence
	EBS		
	FAT	DA-4	Activation Analysis
	EBS		
	FAT	DA-5	In vivo/direct bioassay
	EBS		
	FAT	DA-6	In vitro/indirect bioassay
	EBS		
	FAT	DA-7	Internal dose calculation
	EBS		
	FAT	DA-8	Dose Reconstruction
	EBS		

FAT – Field Assistance Team EBS – External Based Support

PART B: NATIONAL ASSISTANCE CAPABILITIES

		NAA	NI Assessment and Advice	Please indicate the nuclear installations and/or fuel types							
				PWR	BWR	GCR	PHWR	LWGR	FBR	RBMK	VVER
	FAT EBS	NAA-1	Nuclear Power Reactor Design Advice								
	FAT EBS	NAA-2	Nuclear Power Reactor Operations Advice								
	FAT EBS	NAA-3	Nuclear Power Reactor Accident Analysis								
	FAT EBS	NAA-4	Research Reactor Assessment and Advice								
	FAT EBS	NAA-5	Fuel Fabrication Facility Assessment and Advice								
	FAT EBS	NAA-6	Spent Fuel Storage Assessment and Advice								
	FAT EBS	NAA-7	Spent Fuel Reprocessing Assessment and Advice								
	FAT EBS	NAA-8	Operation of specialized technology								

FAT – Field Assistance Team EBS – External Based Support

5. Expertise

	Nuclear installation safety	Please specify type(s) of Nuclear Installations or fuel type as appropriate								
		PWR	BWR	GCR	PHWR	LWGR	FBR	RBMK	VVER	RR
	Accident analysis									
	Chemistry/chemical engineering									
	Cooling systems									
	Design									
	Fuel design and behaviour									
	Fuel management									
	Instrumentation and control									
	Operation									
	Plant and equipment maintenance									
	Power and electrical systems									
	Radiation protection expertise									
	Reactor physics									
	Severe accident management									
	Source term calculation									
	Thermo hydraulics									
	Thermodynamics									
	Criticality analysis									
	Fuel enrichment and fabrication									
	Materials behaviour									
	Spent fuel reprocessing									

	Measurement techniques
	Airborne dose rate monitoring
	Airborne gamma spectrometry
	Alpha spectrometry
	Contamination monitoring (ground, surface, personal)
	Environmental monitoring
	Gamma dose rate monitoring
	Gamma spectrometry
	Gross alpha/beta measurements
	In-situ gamma spectrometry
	Plutonium analysis
	Sample preparation techniques
	Sampling techniques (environ., biological samples)
	Tritium analysis
	Source monitoring
	Strontium analysis

	Evaluation and assessment
	Atmospheric dispersion modelling
	Biokinetic modelling
	Dose assessment predictions
	Dose reconstruction techniques
	External dose assessment
	Gamma mapping
	Ground contamination assessment
	Health impact assessment
	Internal dose assessment

	Operation of specialized technology
	Operation of robots
	Operation of remote controlled equipment
	Operation of unmanned aerial vehicles

	Radiation safety
	Decontamination techniques
	Design and operation of radiation devices
	Design and use of sources (industrial, medical)
	Emergency management
	Intervention in high dose rate area
	Radiation protection
	Radioecology
	Sampling strategies
	Shielding
	Source recovery techniques
	Waste management

	Radiation medicine
	Collection and dispatch of biological samples
	Decorporation therapy
	Haematology
	Management of acute radiation syndrome
	Management of local radiation injury
	Prevention of long-term radiation effects
	Public health issues

	Dosimetry
	Biological dosimetry
	In vitro bioassay
	In vivo bioassay
	Organ monitoring (thyroid)
	Personal dosimetry - external
	Whole body monitoring

	Other
	Communication technology

Remark: If the expertise to be registered is not in the list, please add under 'Other'.

6. Resources

Identify the resources that are available to the NAC by marking **X** in column **A** next to the resource description.

Where other resources may be made available to a requesting State (e.g. through donation, loan or procurement) mark **X** in column **D** next to the resource description.
Registering States are encouraged to provide the necessary details, specifications and method of transportation and estimated quantities of these resources as attachments to the registration form.

A	D	Measuring systems
		Airborne gamma dose/count rate monitoring system
		Airborne gamma ray spectrometry system
		Alpha spectrometry system
		Car-borne gamma dose/count rate monitoring system
		Gamma spectrometry system (HpGe)
		Gamma spectrometry system (NaI)
		In-situ gamma spectrometry system (HpGe)
		In-situ gamma spectrometry system (NaI)
		Liquid scintillation counter system
		Mobile radiation laboratory
		Navigation system
		Whole body counter
		Ultrasonic level sensors
		Post Accident Monitoring systems

A	D	Medical equipment
		Basic medical examination equipment
		Biopsy instruments
		Blood cell counter
		Blood collection kit
		Blood transfusion and IV equipment
		Decontamination kit
		Defibrillator
		Diagnostic medical test kits (urine glucose, etc.)
		First aid kit
		Microscope
		PO2 monitor
		Surgical instruments

A	D	Radiation survey instruments
		Alpha/beta contamination monitor
		Gamma emitting radionuclide identifier
		Gamma/beta survey monitor
		Gross alpha/beta proportional counter
		Neutron dose rate meter
		Organ counter (thyroid)
		Personal contamination monitor
		Telescopic gamma probe
		Wound counter

A	D	Specialized resources
		Fixed wing aircraft
		Helicopter
		Mobile laboratory
		Robots (surveillance, source recovery, etc.)
		Source containers
		Specialized hospital treatment centre
		Telescopic manipulators
		Unmanned aerial survey systems
		Remote cameras for high radiation fields

A	D	Personal protection equipment
		Electronic Personal Dosimeter (EPD)
		Full face-piece self-contained breathing apparatus
		Passive Personal dosimeter
		Personal protection supplies
		Self-reading (electronic) dosimeter
		Totally-encapsulating chemical-protective suit
		Personal air samplers
		Personal air filters
		Disposable suits
		Disposable gloves
		Overshoes

A	D	Software
		3D modelling software and models of installations
		Computer Aided Design
		Criticality analysis
		Data presentation system
		Dose assessment software
		Environmental dose assessment models
		Geographic Information System
		Plume dispersion modelling
		Reactor physics modelling (e.g. MCNP, Origen)
		Source term modelling software
		Thermal load calculation software
		Thermodynamic modelling software

6. Resources

Identify the resources that are available to the NAC by marking **X** in column **A** next to the resource description.

Where other resources may be made available to a requesting State (e.g. through donation, loan or procurement) mark **X** in column **D** next to the resource description.

States are encouraged to provide the necessary details, specifications and method of transportation and estimated quantities of these resources as attachments to the registration form.

A	D	Electrical Supply
		Diesel Pumps
		AC power sources
		DC power sources
		Chargers/batteries
		Filtration for equipment inlets
		Misc. equipment (cables, connectors, spare parts)

A	D	Shielding and encapsulation
		Steel plates
		Lead shielding
		Concrete
		Shielded transport containers
		Spent fuel casks
		Liquid glass
		Fixing/coating agents

A	D	Sampling and sample preparation
		Cool pack
		Portable air sampler
		Sample container – biological samples
		Sample preparation equipment – high activity
		Sample preparation equipment – low activity
		Sampling equipment (soil, water, sediment, etc.)
		Remote sampling equipment for high radiation fields

A	D	Ventilation
		Air compressors
		Air compressors with oil filtration for breathing air
		Charcoal filtration system
		Portable HEPA filtration systems
		Portable hydrogen recombiner

A	D	Communication equipment
		Cellular phone
		Fixed video conference capabilities (for EBS)
		Mobile internet modem/hotspots
		Portable video conference capabilities (for FAT)
		Radio phone
		Satellite phone

A	D	Water cooling and purification
		Emergency core cooling sized pumps
		High power fire pumps
		Water tanks/reservoirs
		Light water
		Portable heat exchangers
		Piping (flexible, metal, PVC)
		Giraffe system for delivering water from heights
		Ion exchangers
		Ion exchange resin
		Zeolite
		Hydrozine

A	D	Criticality control
		Boric acid
		Control Rods
		Safety Rods

A	D	General supplies
		Personal computer (PC)
		Power supply
		Tent (different sizes)

A	D	Other

Remark: If the resources to be registered are not in the list, please add under 'Other'.

7. Comments *(if any)*

PART C: SIGNATURES

8. Compliance with the requirements/conditions

a) By submitting this application for registration, the State agrees to comply with the RANET requirements as stated in the EPR-RANET publication.
b) These requirements will not supersede any national requirements/regulations of the Party providing assistance.
c) Financing NAC maintenance and preparedness is the responsibility of the State.
d) Financial assistance to a response will be specified in the AAP.

Place: _____ Date: _____

Name: _____ Signature: _____
(Responsible person)

.

Appendix B

APPENDIX B: RANET ASSISTANCE ACTION PLAN

An Assistance Action Plan (AAP) for the requested assistance will be developed by the IEC in coordination with the requesting State, State(s) providing assistance and relevant international organization(s), as appropriate.

An AAP is required for all Assistance Missions, whether it is in the form of a(n):

- Assistance Mission;
- Joint Assistance Team (JAT); and/or
- External Based Support (EBS).

The AAP is not required for the provision of information or advice, except in the case of detailed assessment and advice.

A sample plan is provided below. The sample plan is an example of a case where assistance is provided under the Assistance Convention. However in some instances, whether under the Assistance Convention or not, some parts may or may not be applicable. All names used in this example are fictitious and do not denote actual States, places or persons.

Assistance Action Plan

Radioactive Contamination and Public Exposure in Township

Date effective: 1 April 2013

Version No.: Final

Date prepared: 30 March 2013

INTERNATIONAL ATOMIC ENERGY AGENCY

Incident and Emergency Centre

Prepared by:			
IAEA's IEC Head-IEC	Name: Signature:	E. Boss	Date: 29 March
Cleared by:			
Assistance Mission Leader	Name: Organization: State: Signature:	J. Doe National Regulatory Authority State A	 Date: 31 March
Agreed by:			
Assisting State Officials	Name: Organization: State: Signature:	A. Goody National Regulatory Authority State A	 Date: 29 March
	Name: Organization: State: Signature:	B. Smarty Atomic Energy Commission State B	 Date: 29 March
	Name: Organization: State: Signature:	C. Homey Nuclear Safety Administration State C	 Date: 29 March
Assisting International Organizations	Name: Organization: Signature:	D. Foodie FAO	 Date: 29 March
	Name: Organization: Signature:	E. Healthy WHO	 Date: 30 March
IAEA Emergency Response Manager	Name: Signature:	F. Ready	 Date: 30 March
Accepted by:			
Requesting State	Name: Organization: Signature:	R. Confirm Atomic Authority of State E	 Date: 31 March

1. Background

On 29 March 2013, the IAEA's Incident and Emergency Centre (IEC) received a request for assistance from the Atomic Authority of State E under the auspices of the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention) regarding radioactive contamination and public overexposure in Township, State E. The Atomic Authority of State E reported a ruptured 40 TBq Cs-137 source and to date has identified 75 residents of Township that require immediate medical attention. State E has requested that the IAEA provide assistance to respond to what the Atomic Authority classifies as a serious threat to public health and safety.

Objective and Scope

The overall objective is to assist the Government of State E to protect public health and safety and the environment in relation to the radiological emergency in Township.

Based on available information provided by the Government of State E and the assistance it requested, an Assistance Mission consisting of a Joint Assessment Team (JAT) and External Based Support will be provided. The goal is to assess, monitor and mitigate the short-term effects of the event on public health and safety. The expected duration of the on-scene assistance is approximately 9 days.

Based on initial information the following list of activities to be performed has been identified. The tasks will be specified, continuously updated and prioritized based on the on-scene assessments.

1. Assess the current situation;
2. Assess the radiological impact in terms of doses and levels of contamination;
3. Assess the threat to public health and safety;
4. Predict the possible evolution of the radiological conditions;
5. Advise the Government of State E on immediate steps to be taken in responding to the event and provide technical advice on countermeasures and source recovery;
6. Provide medical advice, undertake a medical evaluation of overexposed persons and collect blood samples;
7. Recommend additional actions to be taken by the IAEA in assisting State E in responding to the event;
8. Review the accident history to identify lessons to be learned and gather, record and evaluate information on the event and compile appropriate records for a formal accident report.

External Based Support will perform the following:

9. Provide laboratory analysis of samples;
10. Perform biodosimetry on blood samples.

Parties

The following are the parties to this Assistance Action Plan (AAP):

Requesting State:	State E
Requesting Authority:	Atomic Authority of State E

Assisting States:		Organization:
	State A	National Regulatory Authority (NRA) National Clinical Centre (NCC)
	State B	Institute for Safety and Security (ISS)
	State C	Radiation Protection and Nuclear Safety Authority (RPNA)
	State D	State D National Laboratory (HNL) Biodosimetry Institute (BI)

The following are organizations and officials in State E with whom the assistance team expects to interact:

Atomic Authority:	A. Rich
Ministry of Health:	B. Poor
Ministry for Food and Agriculture:	C. Land

Assistance Teams

The Assistance Mission will consist of the following:

#	Team	Organization	Country
1.	Field Assistance Team (FAT-1)	National Regulatory Authority	State A
2.	Field Assistance Team (FAT-2)	Institute for Safety and Security	State B
3.	Field Assistance Team (FAT-3)	Radiation Protection and Nuclear Safety Authority	State C
4.	External Based Support (EBS-1)	State D National Laboratory	State D
5.	External Based Support (EBS-2)	Biodosimetry Institute	State D

The JAT Command composed of all Field Assistance Team leaders will manage all on-scene JAT assistance and will ensure coordination with State E, the IEC and External Based Support in State D.

Mr. J. Doe from the Nuclear Regulatory Authority, State A as the Assistance Mission leader will head the JAT Command (Chairperson). J. Doe was nominated by the IAEA's IEC and agreed to by all parties.

The JAT will be composed of the following members:

#	Field Team	Name	Team Function	Country/Organization
1.	Assistance Mission Leader	J. Doe	Assistance Mission Leader	State A/NRA
2.	**FAT-1**	**L. Frank**	**FAT Leader**	**State A/NRA**
3.		E. Choco	Radiological Assessor 1	State A/NRA
4.		G. Alfred	Radiological Assessor 2	State A/NRA
5.		R. Laden	Expert in evaluation of radiation injuries	State A/NCC
6.		T. Carlos	Support Officer	State A/NRA
7.	**FAT-2**	**C. Peter**	**FAT Leader**	**State B/ISS**
8.		F. Rodolfo	Radiological Assessor	State B/ISS
9.		R. Robert	Expert in source recovery/transportation	State B/ISS
10.		H. Bruno	Support Officer	State B/ISS
11.	**FAT-3**	**P. Michael**	**FAT Leader**	**State C/RPNA**
12.		A. Paul	Radiological Assessor	State C/RPNA
13.		K. Mary	Public Health Expert	State C/RPNA
14.		D. Boil	Food countermeasure Expert	State C/RPNA
15.		S. Neo	Support Officer	State C/RPNA
16.		I. Tea	Public Information Officer	State C/RPNA

Field Assistance Teams Deployment

The provisional deployment of teams is planned as follows:

Field Team	Departure			Arrival		
	Place	**Date**	**Time (UTC)**	**Place**	**Date**	**Time (UTC)**
Assistance Mission Leader	Capital	2013-04-02	07:30	Township	2013-04-02	15:15
FAT-1	Capital	2013-04-02	07:30	Township	2013-04-02	15:15
FAT-2	Small Town	2013-04-03	11:00	Township	2013-04-03	14:00
FAT-3	Capital	2013-04-02	09:00	Township	2013-04-02	14:30

The detailed schedule of arrivals in Township will be sent to the Atomic Authority of State E separately.

Responsibilities

Requesting State

The Government of State E will apply the terms of the Assistance Convention and in particular will:

- Provide, to the extent of its capabilities, local facilities and services for the proper and effective administration of the assistance;

- Provide all persons, locations, facilities and information necessary for the successful execution of this Plan;

- Ensure the protection and security of personnel, equipment and materials brought into its territory by or on behalf of the assistance teams;

- Afford the necessary privileges, immunities and facilities for the performance of the assistance functions;

- Provide focal point for media and public relations;
- Facilitate the entry into, stay in and departure from its national territory of personnel, equipment and property involved in the assistance;
- Ensure the safe and secure control of the sources during and after the assistance mission regardless of what recovery actions are taken during the assistance mission; and
- Facilitate the transit through its territory of duly notified personnel, equipment and property involved in the assistance.

The State E Competent Authority, during the duration of the Assistance Mission, will, without prejudice to the Assistance Convention where applicable, provide or arrange (free of charge) for:

- hotel accommodation;
- transport in the country;
- an English speaking counterpart or translator;
- access to required facilities and/or premises;
- interviews with involved workers, first responders and overexposed persons;
- workrooms for JAT members; and
- access to international telephone lines, Internet and e-mail, PC, projector, printer and copier.

Assistance Mission Team

The Assistance Mission, as a JAT, will propose and conduct activities to accomplish the objectives set by this Assistance Action Plan. The Assistance Mission will subsequently provide the IAEA with an authoritative and factual overview of the emergency, and offer recommendations for further consideration by the State E authorities and the IAEA.

External Based Support in State C

The External Based Support (EBS) in State D, State D National Laboratory and Biodosimetry Institute, will accomplish the objectives and conduct the activities set by this AAP. The EBS will provide the IAEA's IEC, JAT command or FAT Leader with the results of the gamma spectrometry analysis and the dose estimates obtained through cytogenetic-based biodosimetry.

IAEA's Incident and Emergency Centre

The IAEA's IEC will be the focal point for the provision of this international assistance, providing necessary coordination and/or administration and support to all parties.

Reporting

The Assistance Mission Leader and the EBS Leader will prepare an *After Action Assistance Report* for submission to the IAEA for distribution to the requesting State and its Permanent Mission to the IAEA and to assisting parties within 1 week after completion of assistance. The *After Action Assistance Report* will contain background, actions taken, actions recommended and conclusions.

Within 60 days the IAEA's IEC will produce a final *Assistance Report* in coordination with all involved parties to fully describe the event history, response actions taken, collected data, measurement results, resolution of the situation, recommendations for future actions (if any) and lessons identified. The IEC will distribute the report to the requesting State and to all involved parties.

Confidentiality

All involved parties will treat all acquired information and assistance reports as restricted until such time as deemed appropriate by all parties to release them.

Confidential information provided under the terms of the Assistance Convention will not be made available to any Party other than the Government of State E and will not be included in the assistance reports.

Public Information

Members of either the Joint Assistance Team or External Based Support, participating in the Assistance Mission, will not give any public interviews or information to the media before, during or after the assistance without prior agreement of the State E authorities, the relevant authorities of the assisting parties and consultation with the IAEA's IEC.

Field Operational Safety and Security

In response to the emergency, priority will be given to the safety of personnel and members of the public. Unsafe/insecure or possible unsafe/insecure conditions, operations and/or activities will not be conducted. The JAT Command, in cooperation with the Atomic Authority of State E, will ensure that all operations are conducted in a safe and secure manner.

Assistance Termination

Either the Atomic Authority of State E or the assisting Party may declare assistance termination at any time, after appropriate consultations and by notification in writing, to request termination of assistance. Once such a request has been made, the parties involved would consult each other to make arrangements for the proper conclusion of the assistance.

Unless otherwise terminated, assistance termination will occur when:

1. All AAP activities are certified as completed by the parties.
2. The Atomic Authority of State E may declare at any time the end of the requested IAEA assistance.
3. The IEC may declare at any time the end of assistance due to failure to resolve unsafe or unsecured conditions or practices, or the failure of the requesting Authority to comply with the AAP, or the JAT Command/NAC has completed all AAP activities.
4. JAT Command can release certain assets as AAP activities are completed.

Upon termination of assistance the NAC resources will be demobilized. Partial demobilization of resources may occur as the individual AAP activities are completed.

Financial Arrangements

All financial arrangements relating to the response operations will be in accordance with Article 7 of the Assistance Convention.

The IAEA will cover the expenses for the mobilization and deployment of the Assistance Mission. If the IAEA cannot cover these expenses[17], the assisting parties may cover the expenses, which may be reimbursed by the IAEA at a later stage.

Assisting States are responsible for maintaining basic insurance, or otherwise assuming financial liability, for their members of the Field Assistance Team and for items of equipment that are deployed. The IAEA assumes no liability for the personnel or equipment of assisting States.

Overall Work Plan

#	Activity	Who	Proposed date	Proposed location
Start				
1.	JAT team meeting	JAT	04-03	Hotel
2.	Introductory meeting with the AAE	JAT, AAE	04-04	AAE premises
3.	Start of mission activities	JAT	04-04	
Radiation monitoring				
4.	Detect, locate and demarcate contaminated area(s)	FAT-1	04-04/5	Township
5.	Measure ground contamination	FAT-2	04-04/5	Cordoned area
6.	Measure dose rates	FAT-3	04-04/5	Township
7.	Monitor personnel, equipment and other objects for external contamination	FAT-3	04-04/08	Check-point
Sampling				
8.	Obtain blood samples for biodosimetry	FAT-1	04-06	Hospital
9.	Obtain environmental samples	FAT-1	04-06/7	Cordoned area
10.	Manage the collection of samples	FAT-3	04-06/7	AAE
Measurements/analysis				
11.	Measure concentration of radionuclide in samples	EBS	04-10/12	State D
12.	Conduct cytogenetic-based biodosimetry	EBS	04-10/20	State D

[17] For reasons of timing, for example.

#	Activity	Who	Proposed date	Proposed location
Assessment/evaluation				
13.	Collect all information needed for analysis of consequences	FAT-3	04-04/08	AAE
14.	Collect information needed for dose reconstruction	FAT-3	04-04/08	AAE
15.	Assess the threat to the public	FAT-3	04-05	AAE
16.	Assess possible evolution of an emergency/situation	FAT-3	04-04	AAE
17.	Assess and evaluate radiological consequences of an emergency/situation	FAT-3	04-04/06	AAE
18.	Assess the doses to victims/emergency workers/public	FAT-1	04-06	AAE
19.	Undertake medical evaluation of patient(s)	FAT-1	04-04/08	Hospital
20.	Assess the level of internal contamination	FAT-1	04-05	AAE
Stabilization activities/recovery				
21.	Plan source recovery operations	FAT-2	04-04/08	AAE
22.	Plan the transfer of the patient(s) to a specialized centre(s) (if required)	FAT-2	04-08	AAE
23.	Provide medical treatment (if required)	EBS	ASAP	State D
24.	Deal with public concerns and media attention	FAT-3	04-04/08	AAE
Advisory				
25.	Provide advice on collection of adequate samples	FAT-3	04-04	AAE
26.	Provide advice on source transportation and secure/safe storage	FAT-2	04-06	AAE
27.	Provide medical advice/consultation	FAT-1	04-04/08	Hospital
28.	Provide advice on public health	FAT-3	04-04/08	AAE
29.	Provide advice on protective actions	FAT-3	04-04/5	AAE
End				
30.	End of mission activities	JAT	04-08	
31.	Drafting mission's conclusions and recommendations	JAT Command	04-09	Hotel
32.	Exit meeting with the AAE	JAT, AAE	04-10	AAE
33.	Departure from Township	JAT	04-11	

The actual work plan will be determined by the on-scene assessment and continuously updated based on the results and other available information.

Appendix C

APPENDIX C: EXAMPLE LIST OF RANET DOCUMENTATION

When developing the response/assistance capabilities consider to:

- Have quality plans;
- Have controls, processes and skills for achieving the right quality;
- Ensure that all elements of the work process are compatible;
- Update quality control and testing techniques;
- Develop capability in taking measurements;
- Identify what checks need to be made;
- Identify acceptable work standards; and
- Keep quality records.

The following is an indicative list of examples of types of documentation that is suggested to be developed when establishing response/assistance capabilities.

Code	Document or procedure title
Organizational procedures	
RANET-01	Response Plan (NAC Emergency Operation Document)
RANET-02	Annual Programme of Drills and Exercises
RANET-03	Team Communicating Instructions – Communication Protocol
RANET-04	Notifying and Alerting RANET Field Assistance Teams
RANET-05	Activation and Deployment of RANET NAC and Equipment
RANET-06	FAT Leader procedure
RANET-07	FAT Equipment and Vehicle Arrangements for Intervention
QA procedures	
QA-01	Procedure Development and Procedure Management
QA-02	Internal Audits and Management Review
QA-03	NAC Staff Qualification and Training Requirements
QA-04	Management of Complaints and Nonconformity
QC procedures	
QC-01	Calibration of Proportional Counter for Air Filters
QC-02	Calibration of Proportional Counter for Water Samples
QC-03	Proportional Counter Quality Control Checks
QC-04	Calibration of Liquid Scintillation Counter
QC-05	Liquid Scintillation Counter Quality Control Checks
QC-06	Energy Calibration of Ge Spectrometers
QC-07	Efficiency Calibration of Ge Spectrometers
QC-08	Gamma Spectrometers Quality Control Checks

Code	Document or procedure title
QC-09	Calibration of Radiation Monitors
QC-10	Radiation Monitors Quality Control Checks
QC-11	Assuring Quality of Measuring Results
QC-12	Sample Handling
QC-14	Equipment Control and Maintenance
QC-15	Data Recording System
QC-16	Intercomparison Measurements
Sampling procedures	
SA-01	Emergency Sampling of Air, Soil, Milk, Food, Pasture and Water
SA-02	In-vitro Bioassay Sampling
SA-03	Sampling for Cytogenetic Dosimetry
SA-04	Preparation for In-vivo Bioassay
Sample preparation procedures	
PR-01	Sample Preparation for Laboratory Gamma Spectrometry
PR-02	High Activity Sample Preparation for Laboratory Gamma Spectrometry
PR-03	Emergency Sample Preparation for Gamma Spectrometry
PR-04	Sample Preparation for Tritium Analysis
PR-05	Sample Preparation for Alpha Spectrometry
PR-06	Sample Preparation for Beta Spectrometry
Survey and measuring procedures	
ME-01	Emergency Worker Personal Protection Guide
ME-02	Personal Dosimetry
ME-03	Radiological Survey of Victim(s) on-scene
ME-04	Gross Alpha and Beta in Air and Water Samples
ME-05	Detection, Location and Identification of Lost or Orphan Source
ME-06	Source Monitoring
ME-07	Source Monitoring by Aerial Survey
ME-08	Surface Contamination Survey
ME-09	Contamination Monitoring by Aerial Survey
ME-10	On Route Monitoring
ME-11	Plume Survey
ME-12	Gamma Spectrometry in Mobile Radiological Laboratory
ME-13	In-situ Gamma Spectrometry
ME-14	Rapid Thyroid Monitoring
ME-15	Tritium Analysis
ME-16	Alpha Spectrometry
ME-17	Beta Spectrometry
ME-18	Source Recovery/Removal of Radioactive Material
ME-19	Personal Contamination Monitoring
ME-20	Basic Instructions for Personal, Equipment and Vehicle Decontamination
Assessment procedures	
AS-01	External Dose Assessment
AS-02	Internal Dose Assessment
AS-03	Assessment of Exposed and/or Contaminated Patient(s)
AS-04	Mapping
AS-05	Plume Modelling
AS-06	Measurement Accuracy Assessment
Equipment checklists	
EQ-01	Common FAT Equipment
EQ-02	Arial Survey/Search
EQ-03	Vehicle Based Survey/Search
EQ-04	Radiation Monitoring
EQ-05	Environmental Measurements
EQ-06	Source Search/Recovery

Appendix D

APPENDIX D: INDICATIVE LIST OF MEDICAL RESOURCES

This appendix presents an indicative list of medical equipment and other general supplies suggested for immediate medical response to nuclear or radiological emergencies and a list of possible drugs for the treatment of internal contamination (radionuclide intakes).

Medical tools

Instrumentation

- Set of standard surgical instruments
- Equipment for blood transfusion
- Disposable syringes
- Catheters
- Blood cell counter
- Microscope
- Equipment for preparing blood smears
- Containers for collecting biological samples
- Phlebotomy kits
- Ventilation bag and mask
- Defibrillator, batteries and charger
- Portable surface contamination monitors
- Computers with validated dosimetry software

Personal protection kit

- Self-reading dosimeter
- Permanent dosimeter
- Disposable protective overalls and caps
- Overshoes
- Cotton gloves, vinyl gloves, rubber gloves
- Masks
- Eye protection equipment
- Stable iodine for thyroid blocking
- Vinyl apron

Medical first aid kit

- Analgesics, including eye drops
- Local anaesthetics
- Sedative drugs
- Acute cardiac care drugs
- Antihypotensive and antihypertensive drugs
- Antiemetics
- Antibiotic, antiviral and antifungal drugs
- Diuretics

- Topical antibiotic cream
- Rehydration salts
- Corticosteroids
- Cytokines (probably would need to be supplied by EBS)

Decontamination kit

- Soap and soft brush, detergents, shampoo
- 5% sodium hypochlorite solution $nahclo_3$
- Hydrogen peroxide solution H_2O_2 for oral cavity care
- Saturated solution of potassium permanganate $kmno_4$
- Physiological saline solution
- Sterile water or solution for wound irrigation
- Sterile eyewash solution, surgical cotton rolls
- Cotton nasal swabs
- Masking tape
- Indelible felt pens for marking contaminated spots
- Nail brushes
- Sterile wound dressings
- Swabs
- Nasal catheters
- Hair clippers

Biological sampling*

- 24-hour urine containers
- Faecal collection pots
- Lithium heparin blood tubes (for cytogenetics)
- EDTA blood tubes (for differential cell counts)
- 25-ml plastic scintillation vials (for swabs)

General supplies

- Communication equipment (e.g. Cellular phone, satellite phone, portable radio with adjustable frequencies, etc.)
- Computer
- Spare batteries
- Critical spare parts
- Plastic sheets, tapes, bags (different size)
- Surgical clothing
- Sheets and blankets
- Portable stretchers
- Tags and adhesive labels
- Medical information forms
- Radiation emergency patient form
- Scissors
  Drapes (waterproof material recommended)
- Waste bags
- Administrative supplies
- Cases for shipment
- Torch

* Samples sent for analysis in an EBS laboratory should be transported according to the United Nations packaging and labelling requirements for diagnostic specimens; they may also be required to conform to regulations for the transportation of radioactive material.

Drugs for treatment of internal contamination

The following is a complete list of all decorporation/blocking agents that might be required. However, this list includes some agents for which clinical experience is still limited. The preferred treatment is indicated in the third column. The status of approval of these drugs differs among countries (e.g., some of them are approved by FDA for other purposes or just for adults, other drugs are not approved by FDA but they are commercially available in other countries). Most of these drugs are in off-label use even if they are approved.

Major references for this table include [17–26] and clinical experience at REAC/TS. There is limited clinical experience with many of these recommendations. See individual drug labels for detailed guidance on these drugs.

Radionuclide	Possible therapeutic agents	Preferred treatment
Americium	DTPA[a]	DTPA
Arsenic	BAL, Penicillamine, DMPS, DMSA	BAL
Barium	Barium, calcium therapy (see strontium)	See strontium
Bismuth	DMPS, DMSA, BAL, Penicillamine	DMPS
Californium	DTPA	DTPA
Calcium	Calcium therapy (see strontium), Barium,	See strontium
Carbon	Consider hydration and stable carbon	Hydration and stable carbon
Cerium	DTPA	DTPA
Caesium	Prussian blue	Prussian blue
Chromium	DTPA, EDTA, Penicillamine, NAC	DTPA
Cobalt	DTPA, Penicillamine, DMSA, EDTA, NAC	DTPA, Penicillamine
Copper	Penicillamine, DMSA, DMPS, trientine	Penicillamine
Fission products (mixed)	Management depends on predominant radionuclides present at the time (*e.g.*, early: iodine; late: strontium, caesium, and others)	
Fluorine	Aluminium hydroxide	Aluminium hydroxide
Gallium	Consider Penicillamine, DFOA	Penicillamine
Gold	BAL, Penicillamine, DMPS	Penicillamine, BAL
Iodine	KI, Propylthiouracil, Methimazole or Potassiumiodate	KI
Iridium	Consider DTPA, EDTA	Consider DTPA
Iron	DFOA, Deferasirox, DFOA and DTPA together	DFOA
Lead	DMSA, EDTA, EDTA with BAL	DMSA
Manganese	Ca-DTPA, EDTA	Ca-DTPA
Magnesium	Consider strontium therapy (see strontium)	Consider strontium therapy
Mercury	BAL, DMPS, DMSA, EDTA, Penicillamine	BAL, DMPS, DMSA
Molybdenum	Limited clinical experience	
Neptunium	Consider DFOA and/or DTPA, DMPS	Consider DFOA and/or DTPA
Nickel	DDTC, BAL, DTPA, EDTA	DDTC, BAL, DTPA
Phosphorus	Hydration, oral sodium or potassium phosphate, aluminium hydroxide/aluminium phosphate, calcium	Hydration, oral sodium or potassium phosphate
Plutonium	DTPA, DFOA, EDTA, DTPA and DFOA together	DTPA
Polonium	DMPS, BAL, DMSA, Penicillamine	DMPS, BAL
Potassium	Diuretics	Diuretics
Promethium	DTPA	DTPA
Radium	Radium, Strontium therapy	Strontium therapy
Rubidium	Prussian blue	Prussian blue
Ruthenium	DTPA, EDTA	DTPA
Silver	No specific therapy	
Sodium	Diuretic and isotopic dilution with 0.9 % NaCl	Diuretic and isotopic dilution with 0.9 % NaCl
Strontium	Aluminium hydroxide, Barium sulphate, Sodium alginate, Calcium phosphate, Stable Strontium (as a diluting agent)	Aluminium hydroxide, Barium sulphate
Sulphur	Consider sodium thiosulfate	Consider thiosulfate
Technetium	Potassium perchlorate	Potassium perchlorate
Thallium	Prussian blue	Prussian blue
Thorium	Consider DTPA	Consider DTPA
Tritium	Force fluids	Water diuresis
Uranium	Bicarbonate to alkalinize the urine; consider dialysis	Bicarbonate
Yttrium	DTPA, EDTA	DTPA
Zinc	DTPA, EDTA, Zinc sulphate as a diluting agent	DTPA
Zirconium	DTPA, EDTA	DTPA

[a] DTPA comes in two forms: calcium (Ca-DTPA) and zinc (Zn-DTPA). Both forms work by tightly chelating plutonium, americium, and curium. When given within the first day after internal contamination has occurred, Ca-DTPA is about 10 times more effective than Zn-DTPA at chelating plutonium, americium, and curium. After 24 hours have passed, Ca-DTPA and Zn-DTPA are equally effective in chelating these radioactive materials[18]. However, Ca-DTPA is more effective than Zn-DTPA at chelating manganese and Zn-DTPA is not used for chelating Zinc. When specified, Ca-DTPA should be used.

DDTC	Sodium diethylcarbodtithioate
DFOA	Deferoxamine
Dimercaprol	British Anti-Lewisite
DMPS	2,3-dimercaptopropane-1- sulfonate
DMSA	Meso-2,3-dimercaptosuccinic acid
DTPA	Diethylenetriaminepentaacidic acid
EDTA	Ethylenediaminetetraacetic acid
KI	Potassium iodide
NAC	N-acetyl-L-cysteine
Prussian blue	insoluble ferric hexacyanoferrate (II)

[18] "CDC Radiation Emergency"; see http://www.bt.cdc.gov/radiation/pdf/dtpa.pdf

Appendix E

APPENDIX E: MINIMUM EQUIPMENT SPECIFICATIONS

Some measurements will be performed in the field while others may be performed in the laboratories on samples collected in the field. In either situation the procedures used in the fieldwork must be performed correctly if the measurements are to produce valid results.

Radiation measurement instruments can be characterized as installed, portable, personal and laboratory equipment. The equipment specifications and characteristics that are needed to perform certain assistance tasks will vary according to the circumstances under which they may be used (field, area, laboratory conditions) and according to their purpose (radiation survey, contamination monitoring, or personal monitoring). In any case the products of the measurements need to be in a form and a format allowing those being assisted to easily make use of them. This implies the need to establish guidelines for the minimum compatibility of assistance products.

This appendix provides guidance for the minimum specifications for measuring instrumentation, software and other equipment.

Measuring instrumentation

Type of instrument	Physical quantity measured	Unit[a]	MDA[b] or range	Remarks
Airborne gamma spectrometric survey system	Surface activity concentration	Bq/m²	1 to 5 kBq/m², Cs-137[c]	Radionuclide-specific; linked to navigation system
Airborne dose rate survey system	Dose rate	Sv/h	0.1 μSv/h	Linked to navigation system
Vehicle-borne gamma spec. survey system	Surface activity concentration	Bq/m²	0.1 to 0.5 kBq/m² , Cs-137[d]	Radionuclide-specific; linked to navigation system
Vehicle-borne gamma dose rate survey system	Dose rate	Sv/h or cps	0.05 μSv/h – 1 Sv/h[e]	Linked to navigation system
Alpha/beta contamination monitor	Surface activity concentration	Bq/m², cps	Beta: 1, alpha: 0.1 Bq/cm²	Sensitive area: ≥ 100 cm²
Personal contamination monitor	Surface activity concentration	Bq/m², cps	Beta/gamma: 1 Bq/cm²	Earphones option
Multipurpose gamma/beta survey monitor	Dose rate	Sv/h	0.1 μSv/h – 1 Sv/h	Window option
Multipurpose gamma/beta survey monitor	Dose rate	Sv/h	0.05 μSv/h – 100 mSv/h	Window option
Telescopic gamma probe	Dose rate	Sv/h	0.1 μSv/h – 10 Sv/h	
Neutron dose rate meter	Neutron dose rate	Sv/h, cps	1 μSv/h	Energy: thermal to 14 MeV
Neutron fission meter	Neutron multiplicity	cps, Y2F	Radionuclide specific	Deviation from normal distribution of multiplicity
Hand-held radionuclide identifier	Radionuclide	NA	Radionuclide specific	Identify radioisotopes
Self-reading dosimeter	External gamma dose	Sv or Gy	1 μSv – 10 Sv	Alarm function available
	Gamma dose rate	Sv/h	5 μSv/h – 1 Sv/h	
Personal dosimeter	External gamma dose	Sv or Gy	10 μSv – 10 Sv	TLD, film badge, glass dosimeter, OSL dosimeter
HPGe in-situ gamma ray spectrometry system	Surface activity concentration	Bq/m²	1 kBq/m² of Cs-137	Calibrated also for samples
Mobile laboratory gamma spectrometry system	Activity concentration	Bq/L, Bq/kg	Radionuclide specific	Portable; with shielding
Gross alpha/beta proportional counter	Activity concentration	Bq/m³, Bq/kg	1 Bq alpha, 2 Bq beta	Portable; with shielding
Liquid scintillation counter	Activity concentration	Bq/L, Bq/kg	Radionuclide specific	Portable
Area monitor	Gamma dose rate	Sv/h	0.1 μSv/h – 100 mSv/h	Portable
In vivo counting equipment (portable)	Activity (in the body)	Bq	Cs-137: 0.4 kBq	Calibrated: for the age of 1 year old to adult
NaI(Tl) spectrometer (portable)	Activity concentration	Bq/L, Bq/kg	Cs-137: 4 Bq/L	In vitro laboratory; energy range 100–3000 keV
Gamma/beta surface contamination monitor	Surface activity concentration	Bq/m², cps	Beta/gamma: 1 Bq/cm²	

[a] or equivalent; units to be reported
[b] minimum detectable activity
[c] with NaI detector (16 L), altitude 40 m, speed 70 km/h, acquisition time 2 seconds, uniform surface contamination
[d] with Ge detector (20%), at 40 to 50 km/h, acquisition time 5 to 10 seconds, uniform surface contamination
[e] at 40 to 50 km/h

Calibration period: annual
Quality control checks: prior and following the use
Maintenance period: biannual

Software

All software used is recommended to be either commercially available (with validation declared by the provider/producer) or validated.

Other equipment

Item	Criteria
Personal protection supplies	Needs to be standard field protective clothing and respiratory protective devices suitable for the hazard level presented. All supplies must be within manufacturer's expiry date in a quantity suitable for the limits of the mission as indicated by the IAEA, but not less than for three days.
Sampling and sample preparation equipment	Needs to be suitable for emergency sampling and sample preparation.
Medicaments and substances	Needs to be within manufactures expiry date for the whole expected duration of the usage.
Specialized equipment	No specific criteria
General supplies	Needs to be within manufacturer's expiry date and in a quantity suitable for the limits of the mission as indicated by the IAEA, but not less than for three days

Appendix F

APPENDIX F: ASSISTANCE PRODUCTS SPECIFICATION

Nuclear and radiological emergencies can have serious consequences over wide geographical areas. Authorities in States have the responsibility to decide upon and to take appropriate response actions and to ensure that resources are available for mitigating the consequences. However, an effective response to a nuclear or radiological emergency, including a situation in which a prompt response is warranted to mitigate the effects of a hazard, can easily require resources that exceed the capabilities of individual States. It is therefore important for States to cooperate in response to such emergencies and situations. This can be effectively achieved only if emergency preparedness arrangements are in place to ensure a timely, managed, coordinated and effective response at the scene and at the local, regional, national and international levels.

States have developed national arrangements to respond to a nuclear or radiological incident or emergency within their own borders, however these may vary from State to State. The IAEA Safety Standards provide the framework for a harmonized approach to nuclear or radiological emergency preparedness and response. However, the types of response teams, technical products, equipment, training and methods of operation may differ between States, resulting in significant challenges in providing effective assistance to one another.

Confidence in the accuracy and appropriateness of field monitoring and of laboratory measurements is seen as vital.

There is a need for greater compatibility of assistance capabilities and for greater harmonization of the outputs or products of the international assistance. These products need to be in a form and a format allowing those being assisted to easily make use of them. This implies that for each functional area guidelines for minimum compatibility need to be established. If complied with by the provider and receiver of the assistance, a sound basis for the efficient international assistance will be achieved.

RANET products may be the results of measurements, modelling or other information gathering (radiation monitoring products, material products, dispersion products, dose prediction and dose assessment products).

RANET products may also be in the form of expert advice, recommendations, suggestions or guides based on the evaluation of existing detailed information (e.g. NPP and other facility designs).

This appendix contains example guidelines for the minimum compatibility of some RANET assistance products.

RANET products

General products

Location

The location expressed by the latitude and longitude.

Location: a point on the earth's surface expressed by a recognized coordinate system.

Latitude: the angular distance, in degrees, minutes, and seconds of a point north or south of the Equator. Lines of latitude are often referred to as parallels.

Longitude: the angular distance, in degrees, minutes, and seconds, of a point east or west of the Prime (*Greenwich*) Meridian. Lines of longitude are often referred to as meridians.

GPS (Global Positioning System): a global satellite-based system for determining precise location on Earth.

Datum: A math model which depicts a part of the surface of the earth. Latitude and longitude lines on a paper map are referenced to a specific map datum. The map datum selected on a GPS receiver needs to match the datum listed on the corresponding paper map in order for position readings to match.

Radiation Monitoring Products

Source activity

The activity of a radioactive source/radionuclide; the unit is Bq.

Radionuclide concentration

The activity of a radionuclide per unit mass or per unit volume of a material (solid or liquid); the unit is Bq/kg or Bq/m^3 or Bq/L.

Ground deposition

Radioactive material deposited on the ground (or within few cm of the surface of the ground); the activity of a radionuclide per unit ground (surface) area; the unit is Bq/m^2.

Surface contamination

The activity of a radionuclide per unit surface area of an object or person; the unit is Bq/cm^2.

Reports or plans

A document containing the outlines of a mission, results of measurements, recommendations or advice for example the decontamination plans, operational plans, recovery plan, etc.

Radionuclide identification

The identification of individual radionuclides by using spectrometric data and/or software.

Data maps

Graphical representation of measurement data on a map for example ground deposition, dose rate, etc.

Environmental sampling

Process of collecting samples from environmental media (air, soil, water, sediments, dietary products and other human food, pasture, biota).

Material products

Decontamination equipment and reagents

Equipment and chemical substances used in the processes of decontamination of areas, land (urban and rural) buildings, equipment, objects and persons.

Dispersion products

Despite the considerable progress made in the field of atmospheric dispersion modelling, different numerical models used in different operational centres will not lead to identical predictions. Variance in the dispersion predictions may arise from differences in the driving numerical weather analysis and forecast systems, different approaches to modelling physical processes, and differences in numerical algorithms, as well as from the use of the model. It is also recognized that several countries world-wide have invested considerable resources in the development of atmospheric dispersion prediction capabilities. Most of these capabilities are limited to regional coverage, but several have global coverage.

Trajectories

A trajectory is the path of a single particle released at a specific height through space. Calculated trajectories start from 10m, 500m, 1500m and 3000m above ground level. If release time is not known but release will probably occur in the near future, trajectory calculations need to be carried out by using suitable starting times of H, H+3, H+6, H+9 up to H+24 hours, where H is the first synoptic hour prior to the receipt of the request (synoptic hours are 00 UTC, 03 h UTC, 06 h UTC, …, 21 h UTC). This will result in a set of nine trajectories (each set will have trajectories for 8 or 9 vertical levels). The end of each calculation needs to be 72 hours from the starting time. Points along the trajectories need to be marked with the main synoptic hours at either 3 or 6 hourly intervals (06 h, 12 h, 18 h, 24 h UTC).

Plume arrival time

The time needed for the airborne 'cloud' of radioactive material that has been released to the environment to arrive at a specific location given in geographical coordinates. Plume arrival time prediction is a result of dispersion calculations. In the case of a unit release, the arrival of the plume is indicated as soon as the contour value of the airborne concentration of a representative nuclide exceeds a nominal threshold value of 10^{-10} Bq.m^{-3}.

Airborne radionuclide concentrations

Airborne concentration using as a default a continuous release of 6 hours duration with 1 Bq of Xe-133; the unit is Bq.m^{-3}.

Time-integrated airborne and waterborne radionuclide concentrations

Time-integrated airborne/waterborne concentrations using as a default a continuous release of 6 hours duration with 1 Bq of Xe-133; the unit is $Bq.h.m^{-3}$.

Total ground deposition

Total deposition by using as a default a continuous release of 6 hours duration with 1 Bq of Cs-137; the unit is $Bq.m^{-2}$. The separate determination of both wet and dry deposition is recommended.

Precipitation

Any product of the condensation of atmospheric water vapour that is deposited on the Earth's surface.

Estimated time dependent concentration in environmental media

Time integrated activity of radionuclide per unit mass or unit volume of environmental media; the unit Bq/kg or Bq/L, or Bq/m^3.

Dose prediction products

Early dose predictions are necessary to evaluate the potential health consequences and other impacts of an airborne radioactive release. Despite the considerable progress made in the field of atmospheric dispersion modelling, different numerical models used in different operational centres may not lead to the same predictions.

External dose

Dose resulting from external exposure to gamma radiation from radioactive material deposited on the ground (ground shine) and from radioactive materials in an airborne plume (cloud shine); the unit is Sv.

Inhalation dose

Committed effective dose resulting from inhalation of radioactive materials and subsequent deposition of radionuclides in body tissues; the unit is Sv.

Ingestion dose

Committed effective dose resulting from ingestion of radioactive materials and subsequent deposition of radionuclides in body tissues; the unit is Sv.

Thyroid dose

Committed dose resulting from inhalation or ingestion of radioactive iodine and subsequent deposition of iodine in the thyroid, the unit is Sv.

Total dose

Sum of the external, inhalation and ingestion doses; the unit is Sv.

Dose assessment products

In a radiation incident or emergency, exposure of an individual may be external and/or internal and may be incurred by various pathways. External exposure may be due to direct irradiation from the source, airborne radionuclides (immersion or exposure to an overhead plume), radionuclides deposited onto the ground and onto person's clothing and skin. Internal exposure follows from the inhalation of radioactive material either directly from a plume or re-suspended from contaminated surfaces, from the ingestion

of contaminated food and water or through contaminated wounds or absorption through intact skin.

Dose assessment products will use the dosimetry system specified in [26–28]. Doses calculated will be expressed as absorbed dose (Gy), equivalent dose (Sv), committed effective dose (Sv) or as RBE-weighted absorbed dose (Gy).

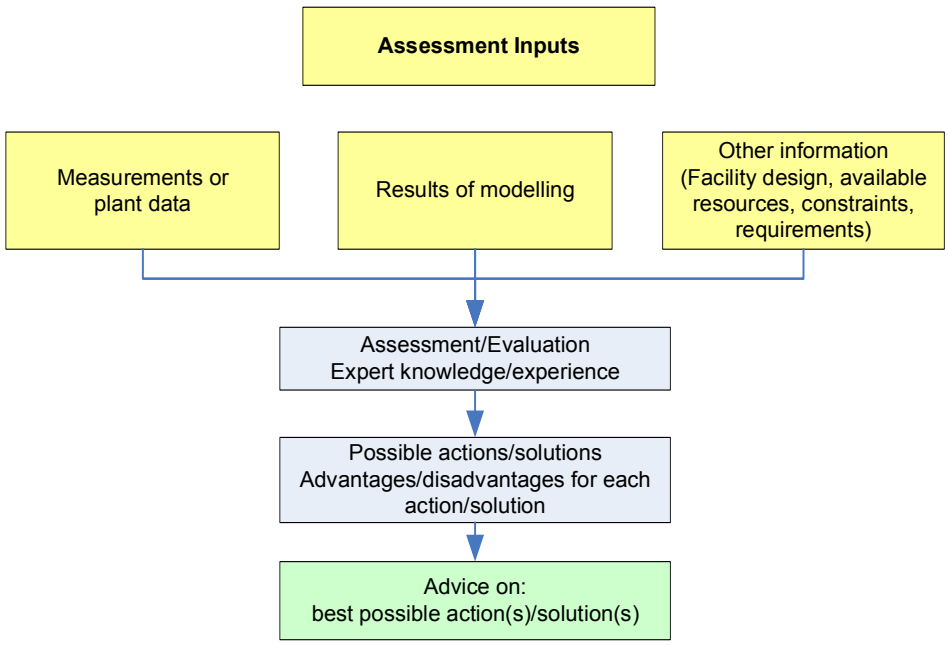
General assessment and advice products

Advice

Advice/recommendation/suggestion is a proposal for an appropriate course of action.

Before giving advice:

- Thoroughly assess the situation based on available information (e.g. facility design, plant status, measurement data, modelling results etc.), and any relevant constraints and considerations;
- List relevant options for possible actions/solutions;
- List advantages/disadvantages for each action/solution; and
- Suggest specific action(s) or solution(s) and give an explanation for why this is your recommendation.



Medical consultation

Two or more health professionals discuss the diagnosis, prognosis, and treatment of a particular case.

Appendix G

APPENDIX G: RESPONSIBILITIES AND DUTIES OF TEAM LEADERS

Team Leader(s), e.g. Assistance Mission Leader and FAT Leader(s) are identified and agreed upon before deployment by all parties. Where an Assistance Mission involves the utilization of External Based Support(s) then EBS Leader(s) are also identified and agreed upon by all parties.

The following are expected responsibilities and duties of a Team Leader.

Responsibilities

A Team Leader leads and manages the mission and ensures coordination with the requesting State, assisting State(s), the IEC and other Team Leaders as appropriate. He/she:

(a) Ensures that mission tasks are performed according to the AAP;
(b) Coordinates the mission tasks with the requesting State/Competent Authority;
(c) Ensures radiological safety and security of the team members;
(d) Ensures liaison with the responsible person identified by the requesting State/Competent Authority, local UN representative (if appropriate) and other relevant authorities;
(e) Ensures that sufficient support is provided to achieve the mission objectives;
(f) Liaises with the media (if required), in consultation with the IEC and jointly with the requesting and assisting State/Competent Authority; provides clear explanation of the situation and risks;
(g) Ensures regular contact with the IEC and briefings on the progress of the mission including the results achieved and an issues identified; and
(h) Ensures that the respective FAT Leaders, or Assistance Mission members regularly contact their Competent Authority (of Assisting States) to brief on the progress of the mission.

Task Lists

Tasks lists are provided below to assist the Assistance Mission Leader in the fulfilling their responsibilities. The tasks listed are generic and need to be reviewed and, if needed, amended as may be required depending on the scope of the Assistance Mission and their role as defined in the AAP.

TASK LIST

ASSISTANCE MISSION LEADER

Objective: To provide a list of the basic tasks to be performed by an Assistance Mission Team.

Note: This guide is supported by additional guides to provide more detail for some specific actions listed within this guide.

Pre-deployment Tasks

- Obtain a briefing from the IEC on the situation and review/clear AAP.
- Ensure that all members of an Assistance Mission or FAT Leaders (if appropriate) clearly understand the situation, mission objectives, responsibilities and tasks.
- Identify, in consultation with the IEC and all team members or FAT Leaders, what resources are required to perform the assistance tasks described in the AAP and who will be providing the resources.
- Obtain a security briefing.
- Ensure all team members or FAT Leaders receive security briefing and relevant information prior to departure.
- Ensure all team members or FAT Leaders receive from the local counterpart and/or the IEC any relevant information that may be relevant to the conduct of the mission. For example:
    - AC power supply for the country (voltage, frequency and plug type);
    - Local communication protocols (e.g. mobile phone bands/frequency, shortwave radio regulations;
    - Expected climate;
    - Local currency; and
    - Religious protocols, local customs, public holidays/traditions.
- Confirm that all logistical arrangements for the deployment of team members and/or FAT have been addressed. This needs to include:
    - Travel to the requesting State;
    - Visas for entry into the requesting State, and any transit States (if applicable);
    - Local ground transport within the requesting State; and
    - Accommodation within the requesting State.
- Obtain from the IEC the contact details for:
    - Local counterpart (s) within the requesting State;
    - IEC;
    - Assistance Mission team members or FAT Leaders;
    - Local UN representative; and
    - Any other relevant authorities.
- Make arrangements for introductory briefing at the mission destination location.

Initial Tasks on Arrival in requesting State

- Conduct meeting/briefing with the requesting State/Competent Authority or concerned organization to obtain current status on the situation.
- Conduct meeting/briefing with the requesting State responsible Incident Commanders upon arrival at the site to obtain current status on the situation.
- Conduct situation briefing with all team members, FAT or EBS Leaders and IEC.
- Ensure that all resources have arrived in the requesting State and that the deployed equipment is operational.
- Establish contact with the assisting State authorities.
- Establish contact with the local UN representative (if appropriate).

Recurring Tasks throughout Deployment

- Manage and coordinates implementation of the AAP in close coordination with:
  - The requesting State/Competent Authority or concerned organization;
  - The IEC; and
  - External Based Support (if applicable).

CAUTION

Do not make any assessment or recommendations concerning areas that are not within the scope of the AAP.
Do not give any media interview without approval of the requesting state, assisting State, NAC coordinator and in consultation with the IEC.

- Ensure that all response work is performed according to the IAEA Safety Standards and requirements or States requirements, whichever is more restrictive.
- Ensure that the tasks assigned to the team members/FATs are implemented.
- Identify to the IEC the need for any additional experts, FAT or EBS.
- Ensure continuous interaction with the:
  - Team members;
  - FAT and/or EBS Leaders;
  - Requesting State/Competent Authority;
  - The IEC (on a minimum frequency of once per day);
  - Assisting States responsible Competent Authority and other relevant authorities; and
  - Any other relevant authorities.
- Identify any issues, in consultation with team members/FAT Leaders, on which the IAEA could offer to provide and/or coordinate additional assistance.
- Approve all reports prior to their submission to the requesting State and/or the IEC.
- Ensure the coordination of any media issues in the field with the IEC and the requesting State/Competent Authority and assisting States.
- Ensure that the mission is properly documented through:

- Mission logbook updates;
- Maintaining copies of all final assistance products collected and reported throughout the mission (note: the retention of raw data is the responsibility of the team members, individual FAT Leaders or EBS);
- Meetings minutes; and
- Obtaining photographic or video records (if appropriate).

Actions prior to departure from the requesting State (Assistance Mission Leader)

- Ensure that all results, reports, findings, logbooks, maps, minutes and completed forms are collected and maintained.
- Confirm the conclusion of the mission and preparation for departure as well as any relevant mission information with the IEC.
- Conduct an exit meeting with requesting Competent Authority or concerned organization. The meeting includes:
  - Briefing on findings/results of the mission/assistance; and
  - Preliminary conclusions and recommendations.
- Ensure that logistical arrangements are in place for departure from the requesting State:
  - Return travel of team members (ground, air and visas);
  - Shipping of non-consumed resources back to original locations.
- Ensure that the IEC contacts the assisting States relevant Competent Authority and confirm the conclusion of the mission and preparation for departure.
- Ensure that the IEC contacts the local UN representative has been contacted and informed about the departure.

Post Mission Actions

- Discuss the mission's recommendations to the requesting Government/Competent Authority with the IEC.
- Prepare and conduct mission's debrief in coordination with the IEC (if applicable).
- Ensure that all mission documents, results, photographic and video material, completed forms, logbooks, etc.,[19] are submitted to the IEC.
- Prepare the *After Action Assistance Report* to the requesting State within 1 week of the termination of the assistance and submit it to the IEC.[20]

[19] Based on lessons identified, the Assistance Team leader also considers preparing recommendations for improvements of the assistance process.

[20] The IEC formalizes and distributes the report.

- Assist the IEC in preparing a comprehensive *Assistance Report* including:
    - Fully described event history;
    - Response actions taken;
    - Resolution of the situation;
    - Results of the assistance; and
    - Conclusions and recommendations for future actions (if any).

TASK LIST

BRIEFINGS TO THE IEC BY THE ASSISTANCE MISSION LEADER

Objective: To provide a generic list of items for the Assistance Mission Leader and the IEC to discuss during briefings to the IEC.

- Provide an event SITREP based on the most recent information provided by the local counterpart, including any problems being encountered.
- Provide a report on the progression of the mission, including (as appropriate):
    - Progress and expected completion time of the task(s);
    - Summary of findings from conduct of task(s);
    - Potential deviations to the scope and tasks;
    - Safety and security issues;
    - Relevant reports of radiological exposures, contaminations or injuries;
    - Any media issues that may have occurred or may be anticipated;
    - Any political issues that may have occurred or that may be anticipated; and
    - Any additional resources or support that may be required during the conduct of the mission.
- The IEC will provide information regarding the IAEA's actions related to the event:
    - Progress and results of tasks being performed by the IEC;
    - Information being provided that would be of benefit to the Assistance Mission such as data being provided by neighbouring States;
    - Replacement or additional NAC resources to be deployed;
    - Other offers of assistance received by the IEC;
    - Media and political items that may impact on the conduct of the mission; and
    - Other missions in which the IAEA may be participating.
- Agree on the time of the next briefing

References

[1] INTERNATIONAL ATOMIC ENERGY AGENCY, Convention on Early Notification of a Nuclear Accident and Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, Legal Series No. 14, IAEA, Vienna (1987).

[2] INTERNATIONAL ATOMIC ENERGY AGENCY, Statute, December 1989.

[3] INTERNATIONAL ATOMIC ENERGY AGENCY, Operations Manual for Incidents and Emergency Communication, EPR-IEComm 2012, IAEA, Vienna (2012).

[4] INTERNATIONAL ATOMIC ENERGY AGENCY, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UN OFFICE FOR THE CO-ORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION, Preparedness and Response for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-R-2, IAEA, Vienna (2002).

[5] INTERNATIONAL ATOMIC ENERGY AGENCY, Method for Developing Arrangements for Response to a Nuclear or Radiological Emergency, EPR-METHOD 2003, IAEA, Vienna (2003).

[6] INTERNATIONAL ATOMIC ENERGY AGENCY, Arrangements for Preparedness for a Nuclear or Radiological Emergency, IAEA Safety Standards Series No. GS-G-2.1, IAEA, Vienna (2007).

[7] INTERNATIONAL ATOMIC ENERGY AGENCY, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL LABOUR ORGANIZATION, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, Criteria for Use in Preparedness and Response for a Nuclear or Radiological Emergency, IAEA General Safety Guide No. GSG-2, IAEA, Vienna (2011).

[8] INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards - Interim Edition General Safety Requirements Part 3, IAEA Safety Standards Series No. GSR Part 3 (Interim), IAEA, Vienna (2011).

[9] INTERNATIONAL ATOMIC ENERGY AGENCY, Generic Assessment Procedures for Determining Protective Actions during a Reactor Accident, IAEA-TECDOC-955, IAEA, Vienna (1997).

[10] INTERNATIONAL ATOMIC ENERGY AGENCY, Generic Procedures for Assessment and Response during a Radiological Emergency, IAEA-TECDOC-1162, IAEA, Vienna (2000).

[11] INTERNATIONAL ATOMIC ENERGY AGENCY, Generic Procedures for Monitoring in a Nuclear or Radiological Emergency, IAEA-TECDOC-1092, IAEA, Vienna (1999).

[12] INTERNATIONAL ATOMIC ENERGY AGENCY, Generic procedures for medical response during a nuclear or radiological emergency, EPR-Medical 2005, IAEA, Vienna (2005).

[13] INTERNATIONAL ATOMIC ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, WORLD HEALTH ORGANIZATION, Cytogenetic Dosimetry: Applications in Preparedness for and Response to Radiation Emergencies, EPR-BIODOSIMETRY 2011, IAEA, Vienna (2011).

[14] INTERNATIONAL ATOMIC ENERGY AGENCY, Use of Electron Paramagnetic Resonance Dosimetry with Tooth Enamel for Retrospective Dose Assessment, IAEA TECDOC Series No. 1331, IAEA, Vienna (2002).

[15] INTERNATIONAL ORGANIZATION FOR STANDARDIZATION, Radiation protection -- Performance criteria for service laboratories performing biological dosimetry by cytogenetics, ISO 19238, ISO, Geneva (2004).
[16] INTERNATIONAL ATOMIC ENERGY AGENCY, Radiation Protection Programmes for the Transport of Radioactive Material, IAEA Safety Standards Series No. TS-G-1.3, IAEA, Vienna (2007).
[17] EUROPEAN COMMISSION, Triage, monitoring and treatment of people exposed to ionising radiation following a malevolent act, TMT Handbook, NRPA, Østerås (2009).
[18] WORLD HEALTH ORGANIZATION, Guidance and Regulations for the Transport of Infectious Substances 2009-2010, WHO, Geneva (2008).
[19] NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS, Management of Persons Contaminated with Radionuclides, NCRP Report No. 161, Bethesda, MD 2010.
[20] HENGE-NAPOLI, M. H. ,STRADLING, G.N. , TAYLOR, D.M. (Eds), Decorporation of Radionuclides from the Human Body, Nuclear Technology Publishing, Ashford, (2000).
[21] CECIL, R.L. BENNETT, J.C., GOLDMAN, L., Cecil Textbook of Medicine, 21st Edition, 1999.
[22] BHATTACHARYYA, M.H., et al., in "Guidebook for the treatment of accidental internal radionuclide contamination of workers," GERBER, G.B. THOMAS, R.G., Eds, Radiat. Prot. Dosim. 41(1), 1–49 (1992).
[23] HENGE-NAPOLI, M.H., STRADLING, G.N., TAYLOR, D.M. (Eds) "Decorporation of radionuclides from the human body: Decorporation of the actinides, caesium and cobalt and a general medical overview," Radiat. Prot. Dosim. 87(1), 9–56.
[24] MAJA BLANUSA M., VARNAI, V.M., MARTINA PIASEK M., KOSTIAL, K., Chelators as Antidotes of Metal Toxicity: Therapeutic and Experimental Aspects, Current Medicinal Chemistry, 2005, 12, 2771-2794.
[25] POISINDEX System, Thomson MICROMEDEX Health Care Series (monograph on CD-ROM), Vol. 122, 2004.
[26] INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION, ICRP Publication 103: Recommendations of the ICRP, Annals of the ICRP Volume 37/2-4, ICRP, Elsevier, Oxford (2007).
[27] INTERNATIONAL COMMISSION ON RADIOLOGICAL PROTECTION. Relative Biological Effectiveness (RBE), Quality Factor (Q) and Radiation Weighting Factor (w_R). ICRP Publication 92, Ann. ICRP Vol. 33 No.4, Elsevier, Oxford (2003).
[28] INTERNATIONAL COMMISSION ON RADIATION UNITS AND MEASUREMENTS, Quantities and Units in Radiation Protection Dosimetry, ICRU Report 51, ICRU, Bethesda, MD (1993).

Contributors to drafting and review of this edition

Akasaka, N.	Ministry of Education, Culture, Sports, Science and Technology, Japan
Aleshchenkov, S.	Situation and Crisis Centre, Russian Federation
Andreeva-Andrievskaya, L.	State Atomic Energy ROSATOM, Russian Federation
Asakura, M.	Ministry of Foreign Affairs, Japan
Baciu, F.	International Atomic Energy Agency
Bano, A.	Pakistan Nuclear Regulatory Authority, Pakistan
Barbuceanu, M. I.	National Commission for Nuclear Activities Control, Romania
Bodova, M.	State Office for Nuclear Safety, Czech Republic
Bogdanova, L.	Federal Medical Biological Agency, Russian Federation
Bouchard, C.	Health Canada, Canada
Buglova, E.	International Atomic Energy Agency
Bus, J.	Australian Nuclear Science and Technology Organisation, Australia
Cort és, A.	Nuclear Safety and Safeguards National Commission, Mexico
Chaput, J.	International Atomic Energy Agency
Demirel, H.	Turkish Atomic Energy Authority, Turkey
Dumont, P.	Health Canada, Canada
Dupin, E.	Autorité de sûreté nucléaire, France
Ershov, V.	State Corporation ROSATOM, Russian Federation
Gafvert, T.	Norwegian Radiation Protection Authority, Norway
Heinrich, A.	US Department of Energy, United States Of America
Ibrahim, M.	Nuclear and Radiation Regulatory Authority, Egypt
Ichii, N.	Nuclear Regulation Authority, Japan
Isnard, O.	Institut de Radioprotection et de Sûreté Nucléaire, France
Ivanova, N.	Rosenergoatom Concern OJSC, Russian Federation
Jayalath, A.	Atomic Energy Authority, Sri Lanka
Karlsson, S.	Swedish Radiation Protection Authority, Sweden
Kenagy, W. D.	US Department of State, United States Of America
Kenny, P.	International Atomic Energy Agency
Kudo, T.	National Institute of Radiological Sciences, Japan
Kuusi, A.	Radiation and Nuclear Safety Authority, Finland
Lavery, C.	Permanent Mission of the United Kingdom of Great Britain and Northern Ireland to the IAEA, United Kingdom
Macsuga, G.	Hungarian Atomic Energy Authority, Hungary

Martincic, R.	International Atomic Energy Agency
McClelland, V.	US Department of Energy, United States Of America
Naganuma, Z.	Ministry of Foreign Affairs, Japan
Östlund, K.	Lund University, Sweden
Sambo, I.	Nigerian Nuclear Regulatory Authority, Nigeria
Snytnikov, A.	Situation and Crisis Centre, Russian Federation
Tazmini, K.	Norwegian Radiation Protection Authority, Norway
Tkavc, M.	Slovenian Nuclear Safety Administration, Republic of Slovenia
Tominaga, T.	National Institute of Radiological Sciences, Japan
Trofimov, N.	State Atomic Energy ROSATOM, Russian Federation
Ugletveit, F.	Norwegian Radiation Protection Authority, Norway

IAEA
International Atomic Energy Agency

Where to order IAEA publications

In the following countries IAEA publications may be purchased from the sources listed below, or from major local booksellers. Payment may be made in local currency or with UNESCO coupons.

AUSTRALIA
DA Information Services, 648 Whitehorse Road, MITCHAM 3132
Telephone: +61 3 9210 7777 • Fax: +61 3 9210 7788
Email: service@dadirect.com.au • Web site: http://www.dadirect.com.au

BELGIUM
Jean de Lannoy, avenue du Roi 202, B-1190 Brussels
Telephone: +32 2 538 43 08 • Fax: +32 2 538 08 41
Email: jean.de.lannoy@infoboard.be • Web site: http://www.jean-de-lannoy.be

CANADA
Bernan Associates, 4501 Forbes Blvd, Suite 200, Lanham, MD 20706-4346, USA
Telephone: 1-800-865-3457 • Fax: 1-800-865-3450
Email: customercare@bernan.com • Web site: http://www.bernan.com

Renouf Publishing Company Ltd., 1-5369 Canotek Rd., Ottawa, Ontario, K1J 9J3
Telephone: +613 745 2665 • Fax: +613 745 7660
Email: order.dept@renoufbooks.com • Web site: http://www.renoufbooks.com

CHINA
IAEA Publications in Chinese: China Nuclear Energy Industry Corporation, Translation Section, P.O. Box 2103, Beijing

CZECH REPUBLIC
Suweco CZ, S.R.O., Klecakova 347, 180 21 Praha 9
Telephone: +420 26603 5364 • Fax: +420 28482 1646
Email: nakup@suweco.cz • Web site: http://www.suweco.cz

FINLAND
Akateeminen Kirjakauppa, PO BOX 128 (Keskuskatu 1), FIN-00101 Helsinki
Telephone: +358 9 121 41 • Fax: +358 9 121 4450
Email: akatilaus@akateeminen.com • Web site: http://www.akateeminen.com

FRANCE
Form-Edit, 5, rue Janssen, P.O. Box 25, F-75921 Paris Cedex 19
Telephone: +33 1 42 01 49 49 • Fax: +33 1 42 01 90 90
Email: formedit@formedit.fr • Web site: http://www. formedit.fr

Lavoisier SAS, 145 rue de Provigny, 94236 Cachan Cedex
Telephone: + 33 1 47 40 67 02 • Fax +33 1 47 40 67 02
Email: romuald.verrier@lavoisier.fr • Web site: http://www.lavoisier.fr

GERMANY
UNO-Verlag, Vertriebs- und Verlags GmbH, Am Hofgarten 10, D-53113 Bonn
Telephone: + 49 228 94 90 20 • Fax: +49 228 94 90 20 or +49 228 94 90 222
Email: bestellung@uno-verlag.de • Web site: http://www.uno-verlag.de

HUNGARY
Librotrade Ltd., Book Import, P.O. Box 126, H-1656 Budapest
Telephone: +36 1 257 7777 • Fax: +36 1 257 7472 • Email: books@librotrade.hu

INDIA
Allied Publishers Group, 1st Floor, Dubash House, 15, J. N. Heredia Marg, Ballard Estate, Mumbai 400 001,
Telephone: +91 22 22617926/27 • Fax: +91 22 22617928
Email: alliedpl@vsnl.com • Web site: http://www.alliedpublishers.com

Bookwell, 2/72, Nirankari Colony, Delhi 110009
Telephone: +91 11 23268786, +91 11 23257264 • Fax: +91 11 23281315
Email: bookwell@vsnl.net

ITALY
Libreria Scientifica Dott. Lucio di Biasio “AEIOU”, Via Coronelli 6, I-20146 Milan
Telephone: +39 02 48 95 45 52 or 48 95 45 62 • Fax: +39 02 48 95 45 48
Email: info@libreriaaeiou.eu • Website: www.libreriaaeiou.eu

JAPAN
Maruzen Company Ltd, 1-9-18, Kaigan, Minato-ku, Tokyo, 105-0022
Telephone: +81 3 6367 6079 • Fax: +81 3 6367 6207
Email: journal@maruzen.co.jp • Web site: http://www.maruzen.co.jp

REPUBLIC OF KOREA
KINS Inc., Information Business Dept. Samho Bldg. 2nd Floor, 275-1 Yang Jae-dong SeoCho-G, Seoul 137-130
Telephone: +02 589 1740 • Fax: +02 589 1746 • Web site: http://www.kins.re.kr

NETHERLANDS
De Lindeboom Internationale Publicaties B.V., M.A. de Ruyterstraat 20A, NL-7482 BZ Haaksbergen
Telephone: +31 (0) 53 5740004 • Fax: +31 (0) 53 5729296
Email: books@delindeboom.com • Web site: http://www.delindeboom.com

Martinus Nijhoff International, Koraalrood 50, P.O. Box 1853, 2700 CZ Zoetermeer
Telephone: +31 793 684 400 • Fax: +31 793 615 698
Email: info@nijhoff.nl • Web site: http://www.nijhoff.nl

Swets and Zeitlinger b.v., P.O. Box 830, 2160 SZ Lisse
Telephone: +31 252 435 111 • Fax: +31 252 415 888
Email: infoho@swets.nl • Web site: http://www.swets.nl

NEW ZEALAND
DA Information Services, 648 Whitehorse Road, MITCHAM 3132, Australia
Telephone: +61 3 9210 7777 • Fax: +61 3 9210 7788
Email: service@dadirect.com.au • Web site: http://www.dadirect.com.au

SLOVENIA
Cankarjeva Zalozba d.d., Kopitarjeva 2, SI-1512 Ljubljana
Telephone: +386 1 432 31 44 • Fax: +386 1 230 14 35
Email: import.books@cankarjeva-z.si • Web site: http://www.cankarjeva-z.si/uvoz

SPAIN
Díaz de Santos, S.A., c/ Juan Bravo, 3A, E-28006 Madrid
Telephone: +34 91 781 94 80 • Fax: +34 91 575 55 63
Email: compras@diazdesantos.es, carmela@diazdesantos.es, barcelona@diazdesantos.es, julio@diazdesantos.es
Web site: http://www.diazdesantos.es

UNITED KINGDOM
The Stationery Office Ltd, International Sales Agency, PO Box 29, Norwich, NR3 1 GN
Telephone (orders): +44 870 600 5552 • (enquiries): +44 207 873 8372 • Fax: +44 207 873 8203
Email (orders): book.orders@tso.co.uk • (enquiries): book.enquiries@tso.co.uk • Web site: http://www.tso.co.uk

On-line orders
DELTA Int. Book Wholesalers Ltd., 39 Alexandra Road, Addlestone, Surrey, KT15 2PQ
Email: info@profbooks.com • Web site: http://www.profbooks.com

Books on the Environment
Earthprint Ltd., P.O. Box 119, Stevenage SG1 4TP
Telephone: +44 1438748111 • Fax: +44 1438748844
Email: orders@earthprint.com • Web site: http://www.earthprint.com

UNITED NATIONS
Dept. I004, Room DC2-0853, First Avenue at 46th Street, New York, N.Y. 10017, USA
(UN) Telephone: +800 253-9646 or +212 963-8302 • Fax: +212 963-3489
Email: publications@un.org • Web site: http://www.un.org

UNITED STATES OF AMERICA
Bernan Associates, 4501 Forbes Blvd., Suite 200, Lanham, MD 20706-4346
Telephone: 1-800-865-3457 • Fax: 1-800-865-3450
Email: customercare@bernan.com · Web site: http://www.bernan.com

Renouf Publishing Company Ltd., 812 Proctor Ave., Ogdensburg, NY, 13669
Telephone: +888 551 7470 (toll-free) • Fax: +888 568 8546 (toll-free)
Email: order.dept@renoufbooks.com • Web site: http://www.renoufbooks.com

Orders and requests for information may also be addressed directly to:

Marketing and Sales Unit, International Atomic Energy Agency
Vienna International Centre, PO Box 100, 1400 Vienna, Austria
Telephone: +43 1 2600 22529 (or 22530) • Fax: +43 1 2600 29302
Email: sales.publications@iaea.org • Web site: http://www.iaea.org/books

EPR–RANET

2013

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA