REGULATION ON DETERMINING NATIONAL ACCIDENT RESPONSE PLAN

"Official Gazette of RS", No. 30/2018

Article 1

This Regulation shall determine the National Accident Response Plan (hereinafter referred as: the Plan), which is attached to this Regulation and makes its constituent part.

Article 2

The Plan shall determine the intervention levels and derived intervention levels of ionizing radiation exposure, the protective measures for the public and the environment from the harmful effects of ionizing radiation, the manner of informing the public, as well as the operational programme for the implementation of the entire Plan or the parts thereof.

Article 3

This Regulation enters into force on the eighth day of its publication in the "Official Gazette of the Republic of Serbia".

ACCIDENT RESPONSE PLAN

I INTRODUCTION

The Plan serves to ensure the protection of people, health and the environment from the harmful effects of the ionizing radiation in case of an accident, and to prescribe the measures to prevent and remediate the harmful effects thereof, *i.e.*, to prevent deterministic effects and to mitigate the risk from stochastic radiation effects. The Government, at the proposal of Serbian Radiation Protection and Nuclear Safety Agency (hereinafter referred as: the Agency), shall declare an accident which poses a threat to the Republic of Serbia. Where there is a threat of a transboundary spread of contamination from the Republic of Serbia to the neighbouring countries, the Government shall inform the International Atomic Energy Agency (hereinafter referred as: the IAEA) and the competent authorities in the neighbouring countries thereof.

The activities taken with regard to the Plan are carried out in accordance with the Regulation on Ratification of the Convention on Early Notification of a Nuclear Accident ("Official Gazette of SFRY – International Agreements", No. 15/89 – hereinafter referred as: the Convention on Early Notification) and the Law on Ratification of the Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency ("Official Gazette of SFRY – International Agreements", No. 4/91 – hereinafter referred as: the Convention on Assistance), as well as the recommendations from the IAEA.

II INTERVENTION DOSE LEVELS IN CASE OF ACCIDENT

1. Intervention Levels for Prompt Protective Measures

The prompt protective measures shall be implemented in accordance with the IAEA recommendations, and based on the generic criteria and the operational intervention levels (hereinafter referred as: OILs) given under the Appendix, which is attached to this Plan and makes its constituent part (hereinafter referred as: the Appendix).

The decision on the implementation of the protective measures shall be brought by the competent Emergency Management Headquarters (hereinafter referred as: EMH). Where there is a suspicion of an accident and the possibility of contamination due to transboundary accident effects in nuclear reactors or facilities in a foreign country, an emergency radioactivity monitoring shall be carried out. This measure is in the purview of the Agency, and it is taken by the legal entities approved to carry out radiation protection duties. Depending on the results of the assessments carried out by the Republic Emergency Management Headquarters (hereinafter referred as: REMH), and with the consent from the Ministry responsible for defense, the material and human resources of Serbian Armed Forces can be engaged for the purpose of the emergency monitoring.

In order to take prompt protective measures, the operational criteria facilitating swift decisions and immediate implementation of certain protective measures, without additional analyses and interpretations, have been established. These are OILs which represent the values of dose rates or the activity concentrations of radionuclides in food and water samples, as well as any other samples taken from the environment, which can be measured directly in the field or determined in a laboratory.

The OILs are derived from the generic criteria established within the radiation effects assessment during emergencies in case of exposures to elevated radiation doses. The generic criteria serve to give recommendations on the implementation of the proper protective measures commensurate with the dose – projected dose, received dose, dose equivalent, effective dose, the values of which cannot be promptly or directly established.

The generic criteria for acute doses, assumed to require protective measures in any circumstances in order to avoid or minimize serious deterministic effects, are given under the Appendix (Table 1) hereof.

The generic criteria for the implementation of emergency protective measures serving to maintain the likelihood for stochastic effects or keep these as low as reasonably achievable are given under the Appendix (Table 2) hereof.

The OILs referring to the contamination of the environment expressed as the γ ray radiation dose rates in the air and specific counts of α and β emitters for surface contamination are given under the Appendix (Table 3) hereof.

The diagram of the use of OILs as criteria for taking protective measures in the contaminated areas is given under the Appendix (Figure 1) hereof.

The OIL5 values for foodstuffs, milk and drinking water samples expressed as total α, *i.e.*, β activity concentration, serving as the basis for bringing decision on the use of foodstuffs, are given under the Appendix (Table 4) hereof.

Radionuclide content limits (OIL6) in foodstuffs expressed as radionuclide activity concentrations (Bq/l, Bq/kg), above which these foodstuffs cannot be consumed, are given under the Appendix (Table 5) hereof.

2. Intervention Levels and Protection of Persons Engaged in Accident Response

Radiation exposure of persons engaged in the emergency response shall be limited to the annual dose limit for occupationally exposed persons of 50 mSv whenever applicable.

During the intervention, all measures ensuring that the effective dose for the members of the intervention unit does not exceed the double annual effective dose limit for the occupationally exposed persons, *i.e*., 100 mSv, shall be taken.

Any intervention during emergency events shall be justified. The type, scope and the length of the intervention shall be optimized so as to result in the maximum benefit of the intervention.

In special circumstances, the exposures above the prescribed limits are permissible during the intervention, which shall be approved by the competent EMH. The effective dose limits for the persons engaged in the response to an accident, as well as the circumstances in which the effective doses for the occupationally exposed persons can be exceeded are given under the Appendix (Table 6) hereof.

The persons engaged in the intervention shall be clearly and comprehensively informed beforehand on the health risks, adequately educated for such interventions, trained for the actions required, and consenting to such engagement.

Upon the completion of the intervention, the persons engaged in the response to an accident shall be referred to have a medical examination, informed on the committed exposure doses, and subjected to, if necessary, to a long-term medical surveillance.

The persons that are not employed or engaged by the licensee for a radiation practice or nuclear activity performance, but could be involved in the response to an accident, shall be adequately and regularly updated on the health protection measures that may be required during the intervention, and on the precaution measures to be taken in such a case. If any of the persons involved in the response to an accident is injured, contracts an illness or dies, the rights stemming from their health, pension and disability insurance shall be dealt with in accordance with the law.

III MEASURES TO PROTECT PUBLIC, DOMESTICATED ANIMALS AND ENVIRONMENT FROM HARMFUL EFFECTS OF IONIZING RADIATION

The protective measures for the public, domesticated animals and the environment from the harmful effects of ionizing radiation shall be implemented in order to prevent or reduce the exposure to the radiation sources. The prompt protective measures shall be taken forthwith, as soon as reasonably achievable after the accident occurrence, and shall include the following: evacuation, sheltering, human decontamination, respiratory organ protection and restrictions in the use of potentially contaminated foodstuffs, evacuation and decontamination of domesticated animals, slaughtering and by-product utilization of animals intended for human consumption.

Source Isolation and Prevention of Internal and External Contamination

In case of radiological emergencies involving dangerous radiation sources outside of control, the public and environmental protection from the harmful effects of ionizing radiation shall include a source isolation and contamination confinement, the aim of which is to reduce ionizing radiation exposure. In order to prevent internal contamination, hands and potentially contaminated objects must be kept away from the mouth. In case of a possible contamination through inhalation, respiratory protection equipment obtained by the Fire and Rescue Units (hereinafter referred as: FRU) must be used.

Skin contamination is not considered as a significant hazard and can be easily prevented, which pertains to the contaminant ingestion as well. The prevention of skin contamination is applied immediately in the form of measures which imply giving timely advice to the citizens.

For the purpose of public protection, it is advised to use personal protection means: protective masks, protective suit, protective shoe covers, gloves, adhere to recommendations on keeping distance and limit the occupancy of contaminated areas, rooms, etc.

Evacuation

A room, building or the entire area shall be evacuated based on the order from the competent EMH or the responsible person from the facility, *i.e*., the licensee. When bringing a decision on the evacuation, *i.e*., the decision on planning, preparing and coordinating the evacuation, and during the evacuation itself, there shall be a consideration of the evacuation route, access control, carrying out the procedures for the special population groups – the sick, the disabled, the elderly. The public evacuation is ordered by the EMH units in a local self-government that are responsible for planning, preparing, coordinating and conducting the evacuation, in accordance with the Law on Emergency Situations ("Official Gazette of RS", Nos. 111/09, 92/11 and 93/12). There shall also be a consideration of ensuring necessary means of survival, a consideration of domesticated animals, and the possibility to care for and protect wild animals and alike.

The evacuation routes and locations shall be determined in advance, by the local self-government units, based on the passed and adopted National Emergency Protection and Rescue Plans.

Sheltering

Sheltering shall be a short-term measure which is introduced together with the other protective measures and activities commensurate with the situation development. Proper and expeditious sheltering, accompanied by good hermitization of buildings and premises intended for shelters, and the use of protection means ensure protection from the exposure to radioactive contaminants during the early stages of an accident. The most efficient measure of sheltering is achieved in the underground, basement and other adapted parts of the building, in the mid-positioned rooms within a dwelling, with as few openings on the walls as possible, *i.e*., in dwellings with closed windows and other openings, the aim of which is hermitization of the room and protection from the penetration of radioactive particles. By implementing such a measure, the inhalation risk is reduced two to three times, and if implemented in the buildings of proper design and wall thickness even up to ten times.

Determination of sheltering locations shall be conducted in advance, by local self-government units, and based on the passed and adopted Emergency Protection and Rescue Plans.

Decontamination of People and Animals

In order to reduce the harmful effects from the exposure to ionizing radiation and to contain the spread of contamination, people, animals and equipment shall be examined for contamination, and the decontamination thereof performed.

Human decontamination is performed by removing and replacing clothes and shoes, washing and showering with proper agents, which considerably reduces the effect of contamination and the likelihood of its further spreading.

Animal decontamination is performed by their washing using proper agents, which considerably reduces the effect of contamination and the likelihood of its further spreading. After decontamination, the radiation level is measured and the procedure, if necessary, repeated.

Decontamination and contamination assessment are performed in the established field decontamination stations or in specialized buildings designated for such purpose.

Protective Measures in Agriculture, Restrictions on Contaminated Food and Water Consumption

The protective measures in agriculture and restriction of consumption of contaminated food and water are conducted in a period of time ranging from several days to several weeks for short-lived isotopes. However, in case of long-lived isotopes, this period can be considerably longer and the measures are implemented by the Ministry responsible for agriculture.

These measures shall include:

1) Ban on the use of contaminated foodstuffs and feeding stuff;
2) Ban on the use of drinking water and a ban or restriction on the use of certain foodstuffs, especially crops, fruit, vegetables, milk and dairy products;
3) Protection of animals and feeding stuff (keeping animals in closed space, ban on grazing and the use of fresh feeding stuff);
4) Restrictions on harvesting and the use of agricultural products, mushrooms, medicinal herbs and forest fruits;
5) Decontamination of domesticated animals;
6) If necessary and where evacuation and/or ensuring sufficient feeding stuff are not feasible, cattle by-product utilization through slaughtering and meat processing;
7) Restriction of or ban on the use of game meat;
8) Protection of sources of drinking water;
9) Provision of alternative sources of foodstuffs, water and feeding stuff;
10) Safe destruction of crops not fit for use;
11) Provision of additional control and production of safe foodstuffs and feeding stuff;
12) Addition of protective agents to feeding stuff;
13) Restriction of or temporary ban on game hunting in a certain area, and implementation of measures to protect, preserve and monitor the game population and habitat;
14) Restriction on fishing and recommendations for protection of fish in fishponds.

Stricter Border Control

Stricter border control is a measure which must be implemented in cases of a reasonable suspicion of a contamination of goods and foodstuffs from the countries exposed to radioactive fallout due to release of greater amounts of radioactive material during a nuclear accident in the country itself or its neighbouring countries. This is a temporary measure, but in certain areas it is implemented for a longer period of time or can result in a permanent ban on the import of foodstuffs from these areas. The decision on the measure implementation shall be brought by the Customs Administration in cooperation with the competent ministry, and based on the Agency's recommendation.

Establishment of Safety Areas

The measure of restricted access shall be implemented during radiological emergencies by banning physical access to the contaminated area or the area with the elevated radiation dose rates. The radii used for safety area establishment, *i.e*., the threshold values of ambient dose equivalent, surface contamination activity concentrations, and the distances between the safety areas for different emergencies are given under the Appendix (Table 7) hereof.

Providing Medical Care and Rehabilitating Non-Radiological Consequences

The paramedic units go to the area subject to accident impact and participate in caring for those exposed to danger. The Ministry responsible for health shall regularly take actions towards training the medical staff participating in providing care in case of a radiological accident so that they can recognize the symptoms resulting from external irradiation and take proper medical measures to care for those exposed to danger. The Ministry responsible for health shall set out the instructions and define the manner in which medical care is provided, coordinate handling and treatment of the irradiated and contaminated people.

The rehabilitation of non-radiological consequences involves providing psychological support, aid to socially vulnerable groups following a nuclear or radiological accident (destroyed crops, domesticated animals fund). These consequences are the most intense in cases when a wider area and a higher number of people are affected. In such cases, depending on the need, other institutions, such as the Red Cross of Serbia and other governmental and non-governmental support organization can be engaged. The competent EMH shall be responsible for the implementation of the measures serving to rehabilitate non-radiological consequences.

Measures to Mitigate and Eliminate Accident Consequences

In order to restore the circumstances prevailing prior to the accident, the prompt protective measures and the establishment of control over the situation, shall be followed by the implementation of long-term measures to protect the public and the environment.

Where there is radioactive contamination, the long-term measures to eliminate the consequences of the accident shall be implemented, *i.e.*, soil remediation measures, as well as natural resources (wild flora and fauna) remediation measures: designation of contaminated areas, additional radioactivity monitoring, dose assessment for vulnerable groups of the public, as well as determination of the acceptable contamination level below which decontamination is not conducted. The information on the on-site

accident circumstances, and on the possibility of restoring the pre-accident circumstances, shall be published after the field measurement and dose assessment for the public.

IV MANNER OF INFORMING PUBLIC

1. Informing, Activating and Seeking Assistance

In case of an accident, the Operational Center at the Sector for Emergency Management within the Ministry of the Interior (hereinafter referred as: the Operational Center of MoI SEM) shall be forthwith notified on the designated telephone number 1985, which is available 24 hours a day seven days a week.

The first responders are activated eighter directly or through the Operational Center of MoI SEM.

In case of a nuclear or radiological accident outside the territory of the Republic of Serbia, the Agency and the Operational Center of MoI SEM, based on the Convention on Early Notification of a Nuclear Accident, receive information from the IAEA. In accordance with the Convention on Early Notification the Agency is the National Competent Authority (NCA) with the IAEA, and the Operational Center of MoI SEM is the National Warning Point (NWP).

The data transfer and communication shall be conducted using telecommunication and information systems: radio operators, satellite system, mobile network operators, landline network operators, amateur radio operators, telefax and the internet.

The telephone numbers related to the Plan implementation by the institutions engaged in the response to an accident, used in communication, are given under the Appendix (Table 8) hereof.

The public is alerted on the radiological accident through the Operational Center of MoI SEM responsible for informing and alerting. The public is alerted by civil defense sirens and informed on the implementation of the protective measures through the central and local media, public address (PA) system or any other appropriate manner.

The Government seeks assistance from the other states based on the Convention on Assistance at the proposal of the REMH. The assistance is sought through the IAEA and the Agency as the National Competent Authority (NCA), or based on the bilateral agreements with other states.

2. Public Warnings and Instructions

The information on the accident shall be delivered to the public by a designated EMH public communication representative. The Agency shall prepare the public announcement on the protective measures containing all necessary information on the activities and the manner of their conduct. The content of the information that are imperatively delivered to the public even without a special request, which are of relevance in terms of conduct in case of an accident, are given under the Appendix (Table 9) hereof.

The information shall be updated and delivered to the at-risk public continuously and upon any change relevant for the implementation of the protective measures. In order to prevent the spread of panic, such

information must always be available to the public. The public affected by an accident is forthwith informed on the facts related to the accident, and, at the same time, instructed on the implementation of the health care measures.

The information and the instructions on the conduct and the protective measures for the public shall be delivered immediately after the reception of the information on the accident and include the appeal to the public to keep up to date with the announcements through the media, the guidelines and the recommendations on how to behave, including the guidelines for the institutions and recommendations to particularly vulnerable professions. The information for the public in the threatened areas must be in line with the nationwide public information. Informing on the radiological emergencies is conducted through the central and local media, and any other available and accessible manners.

V OPERATIONAL PROGRAMME FOR IMPLEMENTATION OF PLAN AS A WHOLE AND PARTS THEREOF

1. Institutions Engaged in Response

The scheme of the institutions engaged in the response to an accident is given in Figure 1, while the responsibilities – competencies of the institutions engaged in the response to an accident are given under the Appendix (Table 10) hereof.

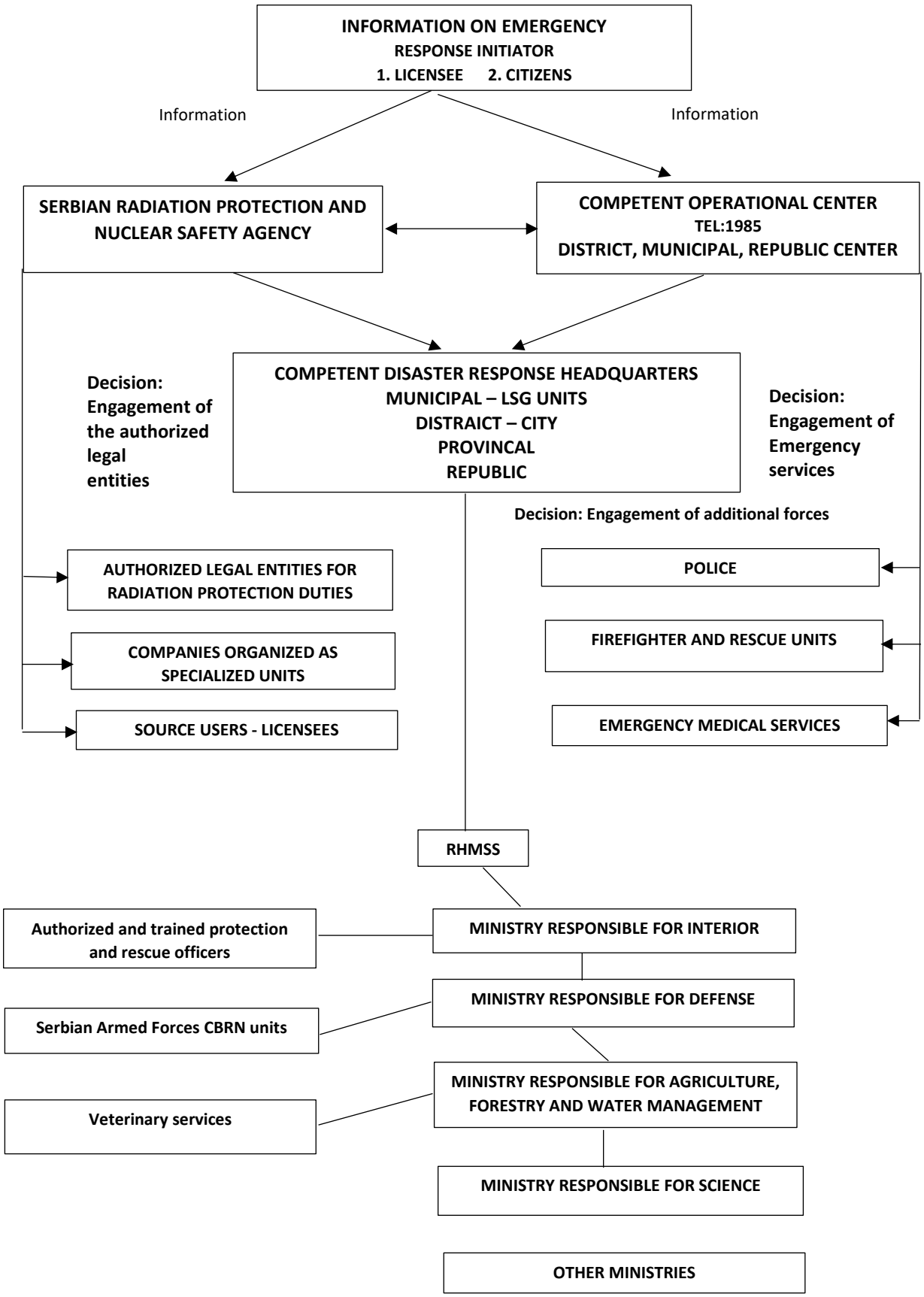

Figure 1: Scheme of the Institutions engaged in the emergency response

2. Initial Stage Assessment

The licensees for a radiation practice/nuclear activity performance are responsible for the assessment of the initial stage of an accident. An accident involving radiation sources in nuclear and radiation facilities which might give rise to on-site consequences, is not expected to result in a significant change in the assessment during the event development.

The level of hazard is announced concurrently with the accident, in accordance with the Classification of Emergency Hazards given in the Appendix (Table 11) hereof.

The criteria used to determine the level of hazard are established in advance in the following documents:

The Radiation Facility Plan – compiled for that facility, which is a part of the Design of Radiation Safety and Security Measures as the prerequisite document for a radiation practice performance, or

The Nuclear Facility Plan – compiled for that facility, which is a part of the Final Safety Analysis Report as the prerequisite document for a nuclear activity performance.

Radiological assessment of the circumstances on the site where the accident occurred during the later stages shall be performed by an expert team consisting of the licensee's responsible person and the representatives of the approved legal entities responsible for radiation protection duties. The radiological assessment is conducted by surveying the on-site circumstances, based on the measurements of the ambient dose equivalent, the level of radioactive contamination, the radiation exposure assessment as a measure of the committed effective dose and personal dose equivalent assessments.

The Agency shall be responsible for the emergency assessment in the initial stages when there is radioactive contamination resulting from a nuclear accident in another country which threatens the Republic of Serbia. When assessing an accident with transboundary spread of contamination, the data that are used are those retrieved from the Early Warning System, as well as those received from the neighbouring and other countries where the accident had occurred or where the irregular circumstances indicating an accident had been confirmed.

The system of continual monitoring of gamma ray dose rate in the Republic of Serbia consists of nine (9) networked stations with the detectors of the ambient dose equivalent for gamma ray radiation in the air which collect data every half an hour. The data on the gamma ray dose rate in the air in the Republic of Serbia are available on the Agency's internet web page (www.srbatom.gov.rs). The data on the gamma ray dose rate are sent to EUropean Radiological Data Exchange Platform EURDEP and, thus, are available on their official web page (http://eurdep.jrc.ec.europa.eu).

In case of an accident giving rise to radioactive contamination due to a nuclear accident in another country, the assessment of hazard can change during the event development. REMH and the Agency establish expert and operational team responsible for monitoring and assessing the situation. The expert and operational team consists of the experts from the professional and scientific institutions, as well as the managers and experts from the state administration bodies, provincial and local self-government units, special organizations, scientific institutions, companies and other legal entities whose remit covers the duties relevant for accident protection and rescue. The EMHs responsible for administrative districts also have their competent radiation protection experts or, otherwise, seek assistance from the REMH.

3. Response to Accident

3.1 Accidents Likely to Result in Spread of Radioactive Material Outside Nuclear Facility

The emergencies in the radioactive waste storages, hangar 1 (H1) and hangar 2 (H2), and RB research reactor can cause radioactive material to be released into the environment, and, thus expose to risk the people and the environment outside the facility site. The emergencies in the radioactive waste storage facilities can give rise to the increase in the public doses, which require prompt protective measures, but cannot give rise to severe deterministic effects. Therefore, the National Emergency Response Plans prepared by the licensee for the performance of the radiation practice – radioactive waste management, shall envisage the area surrounding the facility where prompt protective measures have to be implemented within a few hours of the accident occurrence, as well as proper communication with the local community.

Plan of Operations

The response to an accident commences and continues in accordance with the National Emergency Response Plan prepared by the Public Company Nuclear Facilities of Serbia (PC NFS). If this is not applicable, the responsible person from PC NFS shall announce the accident and mandatorily state the class of hazard commensurate with the previously established criteria in the Emergency Response Plan for the facility, and commensurate with the Classification of Emergency Hazards, under the Appendix (Table 11) hereof, and shall inform thereof the competent operational center, local community, the Agency and the competent inspection.

The overview of the institutions, activities and responsible persons for the management of accidents in the storage facilities H1 and H2, and RB research reactor are given in Table 1 hereof.

Table 1 *Overview of the institutions, activities and responsible persons for the management of accidents in the storage facilities H1 and H2, and RB research reactor*

Stage	Activity	Institutions included in response	Responsible for event management
Notification of accident	Notification of accident and class of hazard	Responsible person in the facility Competent operational center, Agency, Competent inspection	
Intervention	Rescue of the most vulnerable, Fire extinguishing Immediate medical care, Securing the event location	Fire and rescue units (FRU) Emergency medical services Police Licensee	Licensee's responsible person, in case of fire in the facility – Chief of FRU, EMH
Rehabilitation of consequences	Providing medical care for the injured, Referral of the gravely injured to medical centers, Dosimetry measurements, Contamination level measurement, Exposure assessment inside and outside the facility, Decontamination, Storage of contaminated material, Radiation and contamination level check, Informing the public	Emergency medical service, Competent institutions, Approved legal entities, Licensee	EMH
Finalization of operations, Reporting	Informing the public, Investigation and establishment of liability, Reporting on the event	Agency, Licensee, Police, Public prosecution office, Approved legal entities, Competent inspection	EMH

The competent service at the facility (where the accident occurred) assesses the spread of radioactive material and conducts contamination measurement in the area intended for the implementation of prompt protective measures.

The staff at the facility take the measures in order to prevent and reduce further spread of contamination.

The Agency orders the approved legal entities to conduct emergency monitoring measurements and radiological assessments.

The competent operational center and EMH provide for the emergency units. Based on the results of the measurements and radiological assessment, and based on the previously established criteria, EMH orders the implementation of the protective measures.

Within 24 hours, the EMH orders the establishment of triage-processing centre for the purpose of assessing public contamination, as well as the other facilities which have to be engaged in the response to an accident, as shown in Figure 4 and under the Appendix (Table 12) hereof. The licensee's responsible person manages the accident, an if there is a fire in the facility – the chief of fire and rescue units, and in the later stages, the competent EMH.

The emergency medical services care for and transport the irradiated and contaminated persons to the competent health institutions in accordance with the plan and the schedule of the Ministry responsible for health.

Public under threat follows the recommendations from the competent EMH.

The preparation, compilation and implementation of the plan of measures for mitigation and long-term remediation of the accident consequences shall be conducted based on the assessment.

The scheme of the information flow in case of an accident is shown in Figure 2.

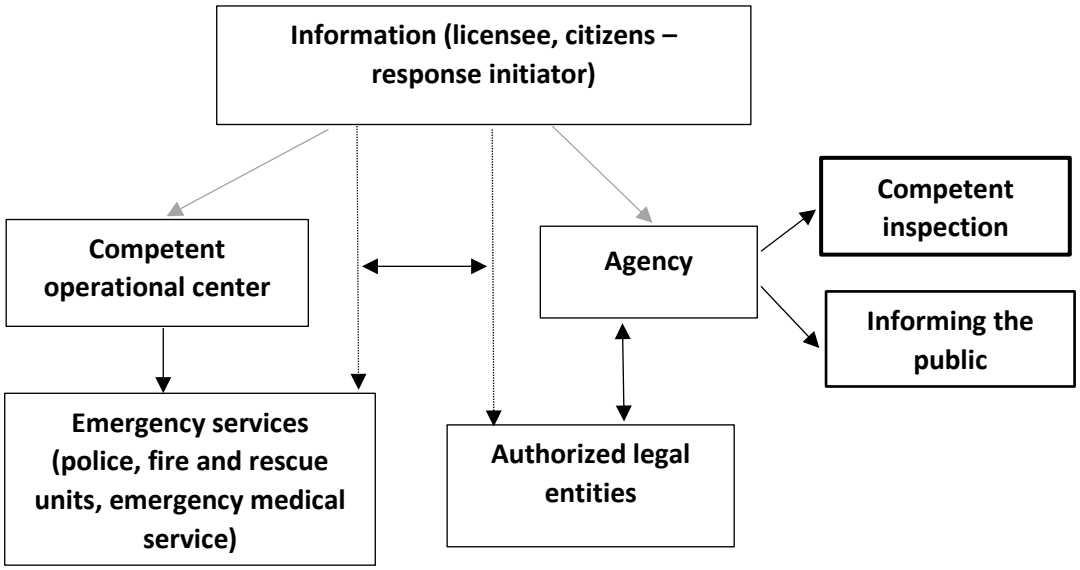

Figure 2: *The scheme of the information flow in case of an accident*

3.2 Emergencies with Consequences on Facility Site

An accident involving a radiation source not giving rise to consequences requiring prompt protective measures can cause distress or fear among the local public. There is also a risk that the contaminated persons could leave the facility, or that the parts of contaminated devices or other items could be taken out of the facility, which requires proper protective measures. Consequently, such emergencies can have a significant psychological and economic impact.

Where an accident results in a dose rate or contamination that can give rise to severe deterministic effects, the measures to mitigate the consequences are to be taken forthwith. In case of fire, there may be a need to evacuate the facility building. As a result, the facility staff must be properly educated and equipped.

The overview of the institutions, activities to be taken and the persons responsible for the management during a radiological accident is given in Table 2.

Table 2 *Overview of the institutions, activities implemented and responsible persons during a radiological accident*

Stage	Activity	Institutions included in response	Responsible for event management
Information	Notification of the event	The licensee's responsible person, Police, Competent operational center, Agency, Inspection	
Intervention	Rescue of the most vulnerable, Fire extinguishing Immediate medical care, Securing the event location	Licensee, Fire and rescue units (FRU) Medical emergency service, Police	The licensee's responsible person, in case of fire in the facility – Head of FRU, EMH
Rehabilitation	Providing medical care for the injured, Referral of the gravely injured to medical centers, Dosimetry measurements, Contamination level measurement, Exposure assessment,	Emergency medical service, Competent institutions, Approved legal entities, Agency	EMH

	Decontamination, Storage of the source and contaminated material, Radiation and contamination level check, Informing the public		
Finalization of operations, Reporting	Informing the public, Investigation and establishment of liability, Reporting on the event	Agency, User, Police, Public prosecution office, Approved legal entities, Competent inspection	EMH

Plan of Operations for Emergencies with Consequences on Facility Site

In case of a radiological accident in facilities or buildings where there is no threat to persons outside the facilities or buildings, the response to an accident commences with the notification on the non-compliances or an accident to the radiation protection officer.

If the consequences cannot be remediated through the measures envisaged by the Emergency Response Plan in the Design of Radiation Safety and Security Measures during a radiation practice performance, *i.e*., the Final Safety Analysis Report during a nuclear activity performance, which are approved by the Agency, the radiation protection officer assesses the situation and proposes to the responsible person at the facility to engage the emergency services. The responsible person at the facility announces the radiological hazard, as well as the class of hazard (accident in the building or alarm, which are given under the Appendix (Table 11) hereof), based on the pre-established criteria and procedures, and summons the fire and rescue units, police or an emergency medical service. The radiation protection officer at the facility, *i.e*., the head of the radiation protection service oversees whether the protective measures for the staff, persons at the facility, or persons engaged in implementing the measures and the activities related to providing assistance and remediating the consequences have been applied. Where there is a significant contamination or excessive irradiation, the emergency services shall organize the transport of persons to the competent health institution. During the initial stage, the user of the source, *i.e.*, the radiation protection officer, manages the response to an accident, in accordance with the Emergency Response Plan in the Design of Radiation Safety and Security Measures during a radiation practice performance, *i.e*., the Final Safety Analysis Report during a nuclear activity performance.

The licensee's responsible person shall notify the competent inspection and the Agency, which contacts the legal entity approved to perform radiological measurements and take care of the sources. Radioactivity monitoring and additional radioactivity measurements are conducted in the vicinity of the building where the accident occurred to determine whether the protective measures need to be

implemented outside the building. The licensee's responsible person shall notify the competent operational center and the competent EMH.

The command point – a room with the communication system – from which the event is managed and the information shared, shall be established. In the first stage, the event in the location where the accident occurred shall be managed by the command team (consisting of: the licensee's responsible person, the emergency service officers, the representatives of the legal entity for the radiation protection duties) and the commander – the licensee's responsible person, *i.e*., the head of the fire and rescue units if there is a fire in the facility. In the later stages, the response shall be managed by the competent EMH.

The decisions on the future actions and the implementation of protective measures are brought through the competent EMH. The protective measures, as well as the ban of access are implemented based on the threat assessment for the persons present on the spot, and based on the radiological measurements of the area surrounding the source.

Any instances of addressing the public shall be conducted in accordance with the previously established procedure, and exclusively by the appointed public relation officer.

Following the implementation of the prompt protective measures, the competent inspection establishes the facts on the implementation of the radiation protection measures commensurate with its competencies, and orders the implementation of the measures to remediate any non-compliances and fulfil the conditions for further work.

3.3. Emergencies Likely to Occur on Locations not Possible to Predict

The accidents involving ionizing radiation sources can occur on locations not always possible to predict, which means that a certain level of preparedness to respond on all levels must be consistently maintained. These can include the emergencies with radiation sources, the emergencies during the radiation source transport, the emergencies with severe excessive irradiation, a terrorist act.

The accidents involving radiation sources are: excessive irradiation; a lost or retrieved source; a dangerous portable radiation source; damage to a sealed radiation source that can give rise to radioactive material dispersal; exposure or contamination of the public; as well as decent – re-entry of nuclear-powered satellites.

The accidents with excessive irradiation or the accidents involving a radiation source retrieval are often determined only when an irradiated person visits a doctor due to symptoms of acute radiation syndrome, *i.e*., injuries caused by radiation – changes to the tissue, skin or other organs. In such situations, the doctors and the medical staff react promptly and provide care to the injured.

The accidents during the transport of radiation sources can give rise to release of radioactive material or impair the source shielding.

An accident involving severe excessive irradiation can be caused by radiotherapy equipment or other radiation sources under control, or a radiation source out of control. The cause of this can be a failure in the device, malfunctioning software or a human factor. Excessive irradiation requires prompt reaction and referral to specialized medical institutions. If the country does not have such hospitals, the assistance is

sought from the international institutions, through the IAEA or the World Health Organization (hereinafter referred as: the WHO).

An accident connected with a terrorist act involves a bomb or a sabotage threat, installation of a device incorporating a radioactive source with the intention to cause irradiation or dispersal of radioactive material. Possible consequences are contamination and/or irradiation of a greater number of people. Radiological hazard can exist as a possibility, in case of a threat, when the consequences are significant from a psychological or economic point of view. In such situations, it is important timely to inform the public, and that the police and public prosecution office timely conduct the investigation, as well as provide instructions on the conduct and gain the public trust.

Plan of Operations

In case of an accident involving radiation sources, which can occur on locations not likely to predict, it is important to recognize the radiological hazard, take the first response measures, as well as to use the possibility to seek assistance. The rehabilitation measures are implemented by a greater number of participants, from local to national level. Where the source is under the control of a user, the first measures are those from the Emergency Response Plan in the Design of Radiation Safety and Security Measures during a radiation practice performance, which is approved by the Agency. The licensee's responsible person informs the competent Operational Center of MoI SEM, the competent inspection and the Agency. The local self-government representatives, through their local EMHs, seek assistance from the higher instances – regional or republic EMHs, which provide them with the instructions.

The on-site management of the event is conducted by the radiation practice licensee's responsible person if the radiation source is within the regulatory control, who acts in accordance with the Emergency Response Plan in the Design of Radiation Safety and Security Measures during a radiation practice performance. In case of an accident involving a radiation source outside of regulatory control (retrieved source, explosive radiological dispersal device), the response shall be managed by the head of the emergency service which arrives at the accident site first – the police, *i.e*., the head of fire and rescue units in case of a fire.

The competent EMH brings the decisions on further conduct and the implementation of the protective measures. The protective measures are implemented based on the threat assessment for the persons and radiological measurements on the location.

Following the implementation of prompt protective measures, the competent inspection determines the facts relating to the implementation of the radiation protection measures commensurate with its competencies, and orders the measures to remove any non-compliances and to facilitate the fulfilment of the conditions for further work.

Emergencies Involving Radiation Sources

In case of an accident involving ionizing radiation sources giving rise to excessive irradiation of persons, or where there is suspicion of the symptoms of radiation injuries, the emergency services, after recognizing the symptoms in persons under threat, shall implement the necessary measures and bring decisions on their referral to the competent institutions. These services assist in saving lives and attend to the gravely injured even before receiving the information on the event circumstances and the results

of a radiological assessment, and they also isolate the event location. If this is the event involving the source with a known user, he or she acts in accordance with his or her own Emergency Response Plan in the Design of Radiation Safety and Security Measures during a radiation practice performance. The radiation protection officer conducts the measurements and takes the measures to protect the on-site individuals. The licensee's responsible person informs the competent inspection, the Agency and the competent Operational Center of MoI SEM, and seeks assistance from the competent authorities outside the event location. The Agency contacts the competent legal entity that will conduct the radioactivity monitoring, isolate or remove the source, conduct decontamination and radiological measurements after the rehabilitation stage.

The response actions in case of an accident involving a radiation source are managed by the licensee's responsible person in the initial stage, and, by the head of FRU in case of fire.

In case of a lost or stolen dangerous ionizing radiation source, the user of the source shall inform the Agency, the competent Operational Center and the competent inspection, and give information on the source and the related hazards. The police secure the location and conduct investigation. The source user participates in the search for the source, verifies the security of other sources and seeks assistance from the competent legal entities. Once the source has been found, it will be secured, the plan of source retrieval prepared, and the persons that might have been exposed to radiation while the source was out of regulatory control identified.

In case of a source of unknown user, based on its markings, colour, and identification of a device component or irradiation symptoms, the first information is directed at the police, the competent inspection and the Agency, which summons the competent legal entity. The measurements, assessments of the likelihood for human irradiation and protective measures are taken. The source is placed in a secure storage for radioactive sources or a radioactive waste storage. The Agency shall prepare and issue the information and the announcement for the public.

Such cases are likely to occur in metal scrap yards, which means that the activity operators bear the responsibility to conduct radiological control of the material being processed, and to prepare the response plan if a source is retrieved (The Rulebook on Conditions for Obtaining License to Perform Radiation Practices (*Official Gazette RS* Nos. 61/11, 101/16 and 50/18)).

In case of an accident involving a dangerous portable source under the user's control (radiography camera, measurement device incorporating a radioactive source), the device user shall conduct radiation oversight, demarcate the event location and seek assistance in accordance with the Emergency Response Plan in the Design of Radiation Safety and Security Measures during a radiation practice performance. The user of the device shall inform the competent Operational Center of MoI SEM, the competent inspection and the Agency which summons the competent radiation protection officer. The measurements and the situation assessment are conducted and the initial plan for establishing the control over the source is prepared. During the operations, the location is kept under continuous oversight and the exposure of the engaged persons is measured. The source is stored in the properly protected secure location.

In case of an accident in the facility giving rise to contamination due to a damaged stationary sealed source, the user of the source shall implement the measures in accordance with his or her own plan, primarily those measures aimed at saving lives and securing the event location. The radiation protection

officer organizes the measurements, examines the staff and the work premises for contamination, in order to assess the hazard in the location of the accident and the need to implement any additional measures. The licensee's responsible person seeks the assistance from the emergency services and informs the competent Operational Center of the MoI SEM, the competent inspection and the Agency, which summons the competent legal entity to conduct radiological measurements and care for the source. A contaminated or irradiated person is referred to the competent health care institution to receive medical care, with referral being conducted in the presence of the persons that can provide information or assistance related to the contamination check or the situation assessment. The access to a potentially contaminated area is restricted until a new decision based on the radiological evaluation has been announced.

If there is irradiation and /or radioactive contamination of the public during an accident, the relevant information is sent to the competent EMH, the Agency and the competent inspection through the Operational Centre of MoI SEM. The police isolate the event location and establish the command point in the vicinity of the accident location. The Agency summons the competent legal entities responsible for radiation protection so as to conduct the radiological measurements and determine the irradiation sources, identify the contaminants and the sources of contamination. The EMH representative appointed to conduct public communication informs on the event through the local media and provides the instructions for the line of conduct. The contaminated persons are referred to the competent medical institutions in the presence of staff performing additional radiological measurements that give the necessary information and advice on the conduct and fundamental protection. The public, based on the decision by the competent EMH, is evacuated from the contaminated areas. The centers for surveys, monitoring, triage of potentially contaminated persons and their referral to the relevant health care institutions, as well as other facilities that imperatively participate in the response to an accident, which are given under Figure 4, and under the Appendix (Table 12) hereof. Where necessary, the assistance from the international community is sought through the IAEA, based on the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. In the initial stage, the event is managed by the police. The control over the event location is established, access is forbidden, the areas with the restricted access are marked and the event location is secured. In the later stages, the event is managed by the competent EMH.

In case of contamination of goods and products during import, export and transit, the applicable regulation is the Rulebook on Radioactivity Control of Goods during Import, Export and Transit (*Official Gazette of RS*, No. 44/11). The event is analyzed and the circumstances leading to the occurrence of such products are established. The product containing excessive radionuclide content is returned to the country of origin, and the customs control of goods increased. If the product has reached the market, the competent inspection services shall ban the trade in the product and order its withdrawal from the market.

If contaminated goods and products appear on the market, the competent inspection services, the owner of the goods and products and the Agency are informed, and the Agency informs the competent Operational Center of MoI SEM and the police for the purpose of conducting the investigation of the circumstances leading to the presence of the contaminated products in the market. Based on the order of the market inspector, the goods are withdrawn from the market. The legal entities responsible for

radiation protection shall conduct sampling, measurement and the analysis of samples in order to detect and isolate the contamination sources.

In case of a response to a potential decent – re-entry of nuclear-powered satellites containing significant number of radionuclides, the state responsible for the satellite informs the IAEA on the time, location and likely risks related to the satellite descent. The IAEA informs those countries that . The Agency shall prepare the statement and inform the public on the potential risk, areas to be avoided, contaminated parts and debris resulting from the satellite descent and organize monitoring thereof.

Emergencies during Transport

In case of an accident during transport, the conveyor shall take the actions of saving lives and providing first aid. The source is to be isolated and the emergency services and the competent Operational Center of MoI SEM contacted. The emergency services shall act in accordance with the international markings on the shipment, secure the accident location and provide immediate medical assistance. The Agency shall be informed, which then contacts the approved legal entity to conduct radioactivity monitoring, assess the situation, care for the source and conduct decontamination. In case of an accident during transport, the initial stage of the response is managed by the conveyor, *i.e*., the head of fire and rescue units in case of fire, while in the later stage, it is managed by the competent EMH.

Emergencies Resulting in Severe Case of Excessive Irradiation

In case of an accident giving rise to a severe case of excessive irradiation with serious deterministic consequences and a threat to people lives, those with confirmed severe and excessive exposure to the ionizing radiation shall be cared for at the specialized institutions. The licensee's responsible person shall inform the Agency and the competent inspection, and seek medical assistance for the excessively irradiated. If the Ministry responsible for health determines insufficient resources to care for the persons excessively exposed to ionizing radiation, through the Agency, the request for the assistance is sent to the IAEA, or to the WHO. The licensee's radiation protection officer shall collect all necessary information on the event in order to have assessment of the received dose and the adequate treatment for an irradiated person. The circumstances leading to the excessive exposure shall be determined in order to prevent any further excessive irradiation. Where necessary, the approved legal entity shall be contacted to conduct radiological measurements and assess the circumstances. The licensee's responsible person shall prepare the information for the public.

Terrorist Threat

In case of a suspicion of a terrorist threat, the police and the competent Operational Center of MoI SEM shall be forthwith informed, which shall immediately inform the Security Intelligence Agency, REMH and the Agency. All immediate and necessary measures serving to mitigate the radiological, psychological and economic consequences shall be implemented. The activities are managed by the Republic EMH which consults the competent experts in the field of nuclear and radiation safety and security. In terms of

radiological segment of the response, the assistance is provided by the competent legal entities conducting the measurements and the situation assessment. The information shall be provided by the authorized representative of the Ministry of the Interior or the EMH.

3.4 Radioactive Contamination Resulting from Nuclear Accident in Other Country

These emergencies arise from nuclear accidents at nuclear power plants and reactors in the territories outside the Republic of Serbia, the consequences of which are manifested in the Republic of Serbia. In such cases, the populated areas and the areas under crop products and natural resources can be contaminated, which requires restrictions in the consumption of certain foodstuffs and the measures of safe use of food and water. Contaminated natural plant-based and animal-based resources are collected and stored. The state, where the accident with transboundary consequences occurred, notifies its neighbouring – potentially threatened states, and the IAEA, which then notifies potentially threatened states based on the Convention on Early Notification.

After receiving the information, the Agency shall instruct the approved legal entities responsible for radiation protection duties to conduct extraordinary radioactivity monitoring and implement the additional control over the transport means, passengers and goods at the border. At the Agency's proposal or based on the available information, REMH convenes and brings decisions on further response actions. The Agency and the expert operational team conduct threat assessment for the Republic of Serbia due to transboundary spread of radioactive material. The Republic Hydrometeorological Service of Serbia models and forecasts transboundary atmospheric movement of the radioactive material released during the accident.

Based on the received results and pre-determined intervention levels, the Ministry responsible for agriculture and the Ministry responsible for health bring the decisions on the protective measures for food, restrictions of trade and consumption of food and other products. The REMH, through the public relation officer, informs the public on the current circumstances, announces the instructions for the conduct in general or for travelling to certain countries.

The scheme of the flow of information in case of an accident resulting in radioactive contamination due to a nuclear accident in another country is given in Figure 3.

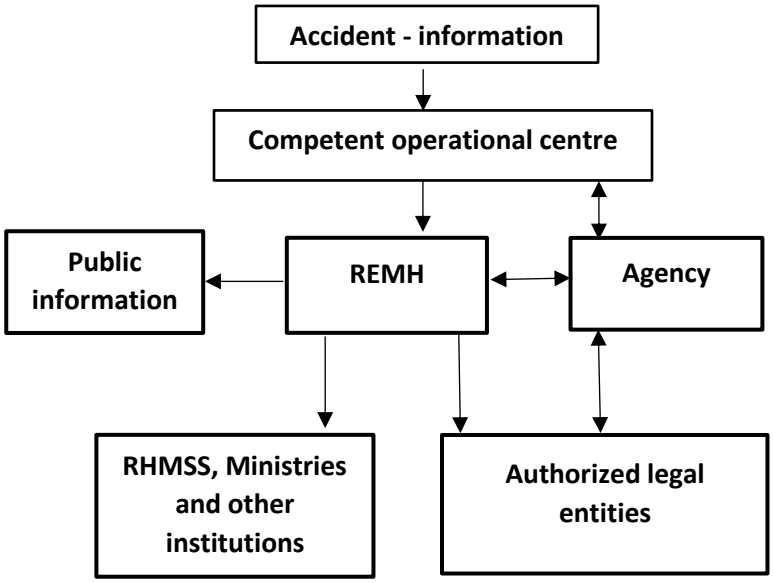

Figure 3. *The scheme of the flow of information in case of an accident resulting in radioactive contamination due to a nuclear accident in another country*

4. Termination of Emergency Situation

The termination of an emergency situation due to an accident means a complete resumption of regular circumstances as they were prior to the accident.

The Government, at the proposal of the Agency, decides on the termination of the emergency situation.

In case of mass contamination resulting from the transboundary spread of radioactive material or an accident connected with a terrorist threat (dispersal of radioactive material), the long-term measures serving to protect the public in the contaminated areas are implemented even after the implementation of prompt protective measures for the event rehabilitation. Where, based on the radioactivity measurements and the public dose assessment, it is deemed as acceptable that regular circumstances can be resumed, there shall be announced that the measures are no longer to be implemented.

5. Response Structures

Response structures are any structures and locations that are, if necessary, established in the field on the event site, outside the established safety areas, for the purpose of implementing the intended measures and actions during the response to an accident. The example of the organization of the structures and the establishment of the safe and secure areas is given in Figure 4 and in the Appendix (Table 12) hereof.

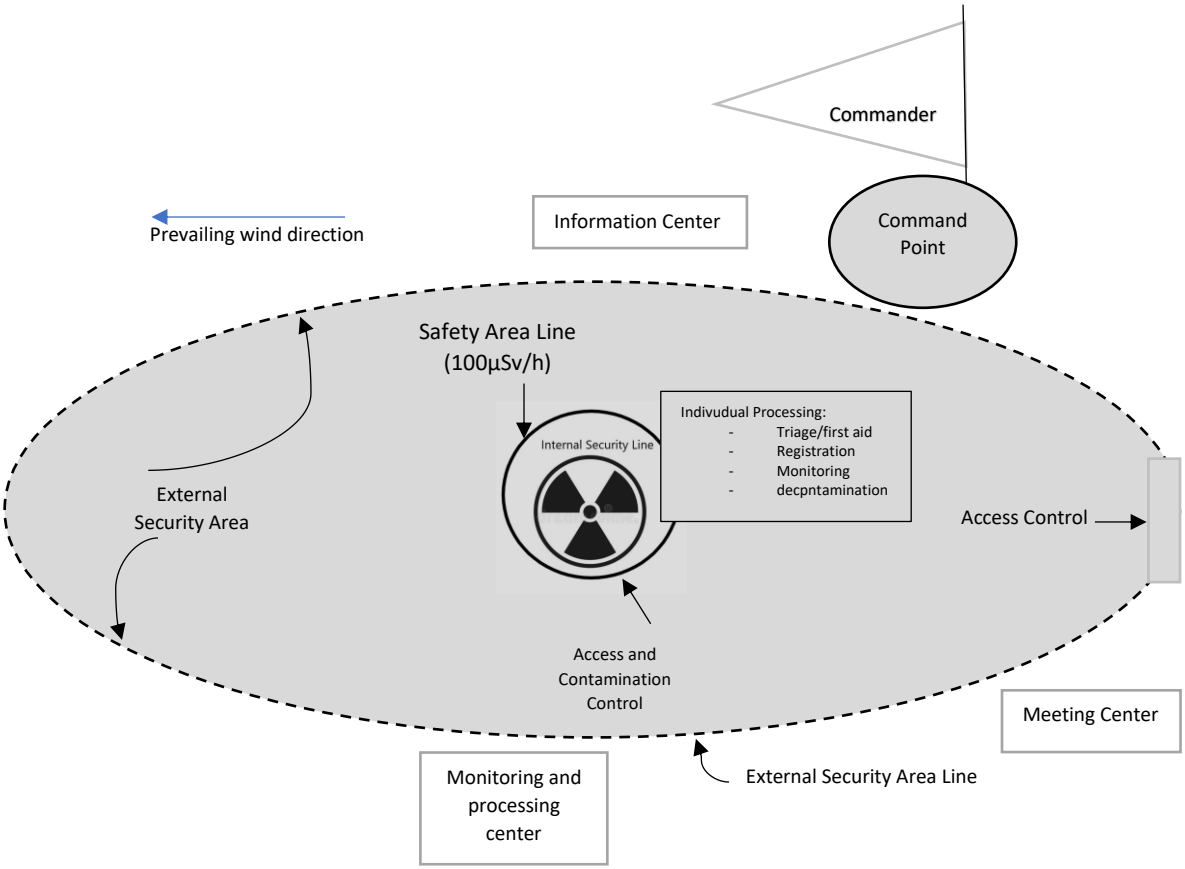

Figure 4. *Example of structure organization and safety and security area establishment*

6. Available Resources

The available resources are all the institutions that directly participate in the response to an accident and in the implementation of the Plan activities.

The overview of the contact details related to the Plan implementation, the available equipment and the institutional professional resources, as well as the approved legal entities responsible for radiation protection duties are given under the Appendix (Table 13) hereof.

7. Records and Data Management

All the institutions participating in the response to an accident shall maintain the records on the activities conducted during the accident and tasks conducted during the event rehabilitation. The records shall also be maintained on the accident preparedness activities– trainings, exercises, courses, maintenance and procurement of the equipment.

The Agency shall compile all relevant data into the accident report that incorporates referrals to all information and data sources.

The Agency shall announce the accident assessment commensurate with the criteria of the International Nuclear and Radiological Event Scale (INES).

8. Organization and Arrangements for Plan Implementation

All institutions involved in the response to an accident are acquainted with the Plan and being prepared and educated for the response in accordance with the Plan.

All institutions – participants in the response to an accident, as well as local self-government units that have under their jurisdiction a nuclear or radiation facility likely to give rise to an accident with the on-site consequences, shall prepare their own Emergency Response Plans commensurate with their competencies and this Plan.

The licensees for nuclear activities/radiation practices performance shall accord their Emergency Response Plans, which are a part of the Design of Radiation Safety and Security Measures during a radiation practice performance, *i.e.,* the Final Safety Assessment Report during a nuclear activity performance, with this Plan.

The timeframe for according and preparing the plans is six (6) months following the adoption of the Plan.

8.1. Training and Exercises

The training of persons participating in the response to an accident is mandatory and conducted in the organization of the institutions in the Republic of Serbia, as well as the international institutions (the IAEA).

For the purpose of testing the preparedness for the response to an accident, the exercises with the participating institutions under this Plan shall be periodically conducted. The exercises serve to examine certain response segments (information system, communication channels between the response participants, organization of certain response segments), the overall organization and the response to an accident.

The Agency, in cooperation with the MoI SEM, organizes exercises in accordance with the response system test scenario once every five years. The exercises are planned in advance and include all the participants envisaged by this Plan. The progress of the exercises is monitored and documented, which serves to take the measures to eliminate the perceived non-compliances.

8.2. Quality Assurance

Quality is assured through regular trainings and exercises, and participation in the international meetings, exchange of experience with other states, and by continuous monitoring and control of the segments of the Plan which are in the remit of the institutions and the authorities. This Plan shall be updated at least once every three years, based on the experiences and changes in the aforementioned period. The approved legal entities for radiation protection duties shall ensure proper maintenance, servicing and calibration of the equipment and protection means, and keep a proper record thereof.

The Emergency Response Plans prepared by the institutions licensed for nuclear activities/radiation practice performance shall also be subject to a periodic review and update.

APPENDIX

Table 1 *Generic criteria for acute doses perceived to require the implementation of protective measures in any circumstances serving to avoid and minimize severe deterministic effect*

Generic criteria		Protective measures
If the projected dose[1] due to acute external exposure (during the period < 10 hours) exceeds the given values – the protective measures have to be implemented		
$AD_{bone\ marrow}$[2]	1 Gy	- prompt protective measures (even in aggravating circumstances) to keep the doses below the generic criteria; - inform the public and issue the warnings; - prompt decontamination.
AD_{foetus}	0,1 Gy	
AD_{tissue}[3]	25 Gy at 0,5 cm	
AD_{skin}[4]	10 Gy at 100 cm^2	
If the received dose due to acute radionuclide intake (during the period Δ=30 days[5]), the protective measures have to be implemented		
$AD(\Delta)_{bone\ marrow}$	0,2 Gy for radionuclides Z ≥ 90 2 Gy for radionuclides Z ≤ 89	- Immediate medical examination, consultations and proper medical treatment; - Contamination examination - Conducting radionuclide decorporation[6] as soon as reasonably achievable; - Entry into records of persons under long-term health supervision; - Overall psychological counselling.
$AD(\Delta)_{thyroid\ gland}$	2 Gy	
$AD(\Delta)_{lungs}$	30 Gy	
$AD(\Delta)_{colon}$	20 Gy	
$AD(\Delta')_{foetus}$[7]	0,1 Gy	

[1] – projected dose means a dose received without the protective measures;
[2] - ADt -product of the absorbed radiation dose in a tissue or an organ and a relative biological effectiveness (RBE) for a given tissue or an organ (T);
[3] – dose received on the surface of 100 cm^2 and at the depth of 0,5 cm in the tissue in close contact with the source;
[4] – dose received on the surface of 100 cm2 (skin structure at the depth of 0,4 mm);
[5] - AD(Δ) represents the average AD dose rate value (footnote [2]) received during Δ time period, which will result in serious deterministic consequences in 5% of the exposed persons;
[6] – radionuclide decorporation – biological process aided by chemical or biological agents during which a radionuclide is eliminated from the body;
[7] - Δ' foetus development period.

Table 2 *Generic criteria for the implementation of protective measures in case of accident to keep the risk from stochastic effects as low as reasonably achievable*

Generic criteria		**Protective measures**
If the projected dose due to acute external exposure (during the period < 10 hours) exceeds the given values – the protective measures have to be implemented		
$H_{thyriod\ gland}$	50 mSv in the first seven days	Use of Potassium iodide (KI) tablets
E	100 mSv in the first seven days	Sheltering, evacuation, decontamination, intake limitation for food, milk and water intake limitation, contamination control, reassuring the public.
H_{foetus}	100 mSv in the first seven days	
If the projected dose exceeds the above values – the protective measures have to be implemented		
E	100 mSv a year	Temporary relocation, decontamination, replacement of food, milk and water, reassuring the public.
H_{foetus}	100 mSv for the entire *in utero* development	
If the received dose exceeds the above values – there have to be long-term activities serving to reveal and effectively treat the health impact due to radiation		
E	100 mSv for a month	Health screening based on the dose equivalent values for certain radiosensitive organs (basis for medical screening), counselling.
H_{foetus}	100 mSv for the entire *in utero* development	Counselling enabling informed decision for each case.

H_T – dose equivalent in a tissue or an organ T, E – effective dose

Table 3 *Operational intervention levels for the environmental contamination, as the gamma ray radiation dose rate values in the air and specific count of α and β emitters for surface contamination*

Environmental Contamination		
OIL	**OIL value**	**Actions taken if OIL is exceeded**
OIL1	Gama (γ) 1000 μSv/h at 1 m distance from the surface or the source	- conduct immediate evacuation or provide proper shelter[1]; - provide for decontamination of the exposed persons[2]; - reduce unwanted ingestion[3];
	2000 imp/s directly measured surface	

	contamination by beta (β) emiterima[5a]	- prevent intake of local products, rainfall and milk from the animals grazing in the affected area[4]; - register the evacuated persons in the need of medical care and provide medical care; - if a person has been in contact with a sealed source with the dose rate equal to or higher than 1000 μSv/h at 1 m distance from the surface[5], medical examination will be conducted without delay.
	50 imp/s directly measured surface contamination by alpha (α) emitters[6]	
OIL2	Gama (γ) 100 μSv/h at 1 m distance from the surface or the source	- prevent intake of local products[4], rainfall and milk from the animals grazing in the affected area until the measurements and the contamination levels assessments using OIL5 and OIL6 have been conducted; - relocate temporary the population from the affected area; - prior to relocation, advise people under threat not to consume food and water or keep their hands near mouth so as to keep the radionuclide content as low as reasonably achievable[3]; - assess the dose received by persons from the affected area in order to determine whether they need medical examination; - relocation from the area with the likelihood of the maximum exposure to be reached within a couple of days; - If a person has been in contact with a sealed source with a dose rate equal to or higher than 100 μSv/h at 1 m distance from the surface[5], they will be subject to medical examination, and if a pregnant woman has been in contact with such source, to provide medical examination and dose rate assessment without delay.
	200 imp/s directly measured surface contamination from beta (β) emitters[6]	
	10 imp/s directly measured surface contamination from alpha (α) emitters[6]	
OIL3	Gamma (γ) 1 μSv/h at 1 m distance from the surface	-prevent the intake of local products[4] (except basic foodstuffs), rainfall and the milk form animals[8] grazing in the affected area until the measurements and contamination level assessment based on OIL 5 and OIL6 have been conducted; - measurements of local products, rainfall and milk from the animals grazing in the affected area at the distance at least 10 times greater than the one where OIL3 has been exceeded and contamination level assessment based on OIL5 and OIL6; - consider the use of stabile iodine[10] in case of fissionable products emission and iodine contamination, if the replacement for basic
	20 imp/s directly measured surface contamination by beta (β) emitters[6,9]	
	2 imp/s directly measured surface contamination by alpha (α) emitters[6,9]	

		foodstuffs or milk produced in the affected area is not immediately available; - assess the dose received by people likely to have consumed the food, milk or rainfall in the areas subject to restrictions and decide whether these people require immediate medical examination.
Skin contamination		
OIL4	Gamma (γ) 1 μSv/h at 10 cm distance from the surface	Skin contamination - perform skin[2] decontamination and reduce inadvertent ingestion[3]; - conduct medical examination of contaminated people.
	1000 imp/s directly measured surface contamination by beta (β) emitters[6]	
	50 imp/s directly measured surface contamination by alpha (α) emitters[6]	

[1] within closed premises and brick and mortar facilities, away from the walls and windows;
[2] where prompt decontamination is not feasible, the evacuated to be counselled to have thorough washing and change of clothes;
[3] advice to the evacuated not to eat, drink or smoke and to wash their hands thoroughly;
[4] a local product is food produced in the open that can be directly contaminated and consumed within a couple of weeks (e.g., vegetables);
[5] this dose criterium is applied solely to dangerous sealed sources;
[5a] criteria for the measuring instruments to be used are to fulfil:
1. Instrument measuring range should meet the OIL values in Table 5 (imp/s, imp/min);
2. Instrument used for measuring of beta emitters needs to detect the emitters of both high and low energy (^{32}P, ^{14}C);
3. in order to measure the given values in imp/s, the instrument has to meet the following requirements: Instrument coefficient (calculated as the product of W and θ, where W is the detector window surface /cm^2/, θ energy dependency coefficient in 4π geometry / imp/s/Bq^{-1}/) which should be at least: for high- and middle-energy emitters (e.g., ^{36}Cl) – 0.1; for low-energy emitters (e.g., ^{14}C) -0.2; for alpha emitters – 0.5;
[6] measurement resulting from quality contamination monitoring established in practice;
[7] basic foodstuffs can be limited if there is a proper replacement;
[8] in case of the milk from small animals (goat), apply 10% of OIL3 value;
[9] deposition of short-lived natural radon progeny radionuclides can occur due to rainfall, resulting in the increase of the natural background radiation value several times. Following the rain, in a short period of time of several hours due to prompt radon progeny decay, the level of basic radiation returns to normal values;
[10] only for a couple of days, and if proper replacement is not available.

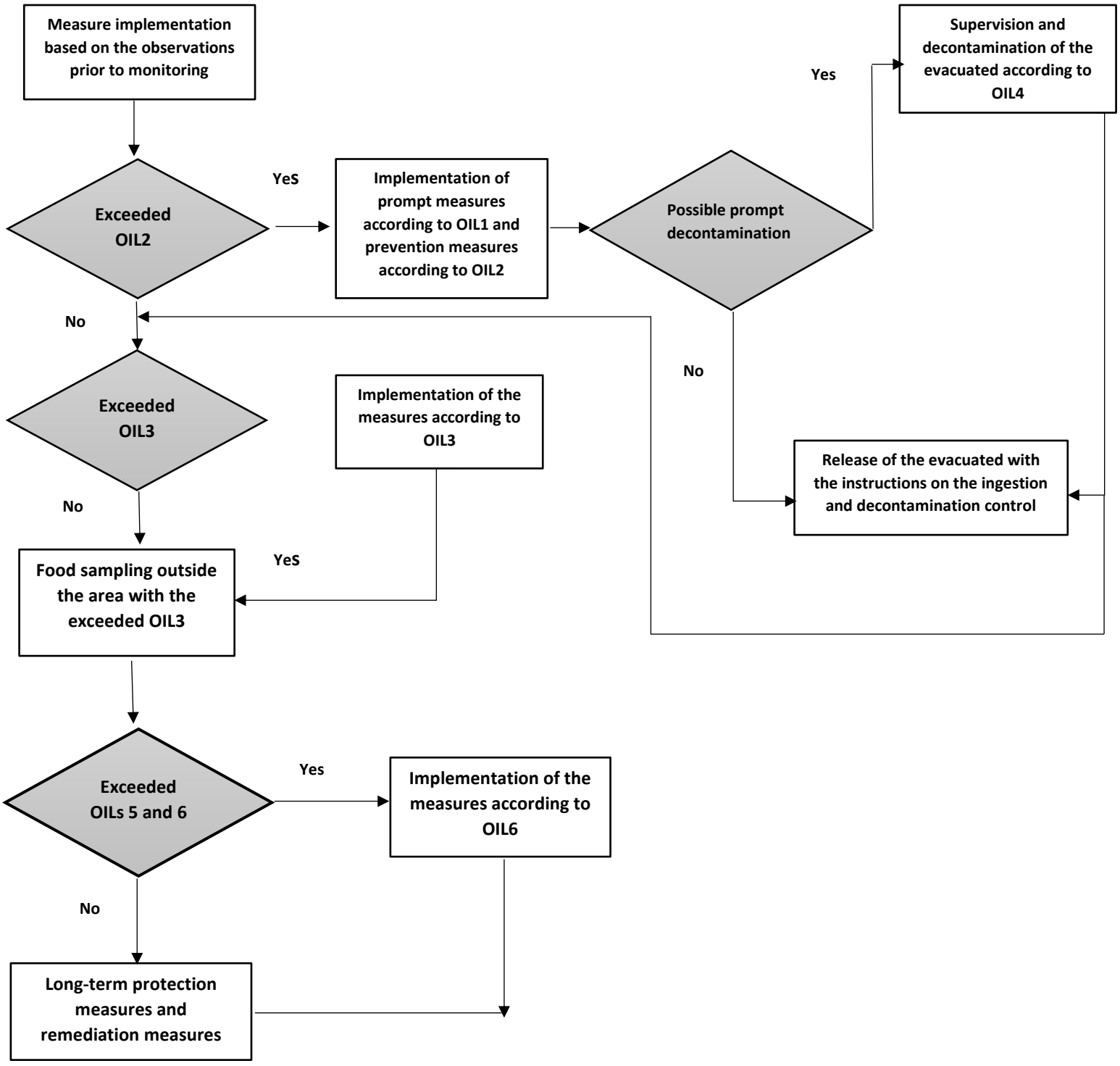

Figure 1 *Application of Operational Intervention Levels as criteria for the implementation of the protective measures in the contaminated areas*

Table 4 *OIL5 values for food, milk and water as total α i.e., β activity concentration values serving as a basis to bring decisions on the use of foodstuffs*

OIL	OIL value	Measures to be taken if measured values exceed OIL
OIL5	Gross beta activity (100 Bq/kg) Gross alpha activity (5 Bq/kg)	Below OIL5 – consumption during accident is allowed; Above OIL5: assessment based on the application of OIL6 limits in Table 6.

Table 5 *Radionuclide content limits (OIL6) in foodstuffs as radionuclide activity concentrations (Bq/l, Bq/kg), above which the foodstuffs are not consumed*

	Milk and dairy products	Other foodstuffs
Strontium isotopes, especially ^{90}Sr	125	750
Iodine isotopes, especially ^{131}I	500	2000
Alpha unstable plutonium isotopes, transplutonic elements, especially ^{239}Pl, ^{241}Am	20	80
Other nuclides with half-life longer than 10 days, especially ^{134}Cs, ^{137}Cs (including ^{14}C and ^{3}H)	1000	1250

Table 6 *Effective dose rate limits for persons engaged in the response to an accident*

Circumstances in which the doses can be reached	Dose rate values		
Actions of saving lives	H_p (10) [a]	E[b]	AD_T[v]
These values can be exceeded under the circumstances in which the gain exceeds the threat to the activity participants who are engaged on a voluntary basis by accepting the risk for their health	< 500mSv	< 500mSv	< 0,5 AD_T, tab.3[g]
Actions aiming at preventing severe deterministic effects of an action serving to deter disastrous turn of events likely to harm people's lives and the environment	< 500mSv	< 500mSv	< 0,5 AD_T, tab.3[g]
Actions serving to prevent large collective doses	< 100mSv	< 100mSv	< 0,1 AD_T, tab.3[g]

[a] Personal dose equivalent, Hp(d), where d=10mm;

[b] Effective dose E;

[v] ADT value – product of the absorbed radiation dose in a tissue or an organ and relative biological effectiveness (RBE) for the tissue or the organ;

[g] Appropriate ADT value in Table 2.

Table 7 *Radii used to establish safety areas* *

Circumstances in which an area is established	Safety area radius
Undamaged package bearing the markings I – white II – yellow III – yellow	Immediate surroundings of the package
Damaged package bearing the markings I – white II – yellow III – yellow, as well as any other unprotected or unknown source (damaged or undamaged)	30 m radius or: 100 µSv/h – ambient dose equivalent; 1000 Bq/cm^2 beta/gamma deposition; 100 Bq/cm^2 – alpha deposition.
Undamaged source of general use – as a smoke detector	Not enclosed
Liquid source – leaked	Area where the source leaked in a 30 m radius
Liquid source – significantly leaked	Area where the source leaked in a 300 m radius
Fire, radioactive material dispersal, explosion or evaporation, spent fuel, plutonium leakage	Radius area 300 m or more; or 100 µSv/h – ambient dose equivalent; 1000 Bq/cm^2 – beta/gamma deposition; 100 Bq/cm^2 – alpha deposition
Explosion/fire, including nuclear weapon	Radius area 1000 m; or or 100 µSv/h – ambient dose equivalent; 1000 Bq/cm^2 – beta/gamma deposition; 100 Bq/cm^2 – alpha deposition

*All persons and the members of the public not included in the response should be relocated from the safety area; if there is a suspicion of their contamination or irradiation, they are referred to have examination;

Persons engaged in the response are to use protection means and avoid any unnecessary contaminant ingestion;

The public in the area of a radius twice as large as the established safety area is advised to avoid the consumption of any food, drinks or tobacco, and the contamination thereof is to be checked.

Table 8 *Contact telephone numbers related to the implementation of the Plan of Institutions included in the response to an accident*

No.	Institution	Contact telephone number related to the Plan implementation
1.	Serbian Radiation Protection and Nuclear Safety Agency	063 617 408
2.	Ministry responsible for the internal affairs Sector for Emergency Management Competent Operational Center	1985
3.	Police	192
4.	Fire Department	193
5.	Emergency Medical Service	194
6.	Ministry responsible for finance Custom Administration	011 2 140 104 Fax 011 2699 722
7.	Ministry responsible for defense	011 3006 301,

	Defense system operational centre	011 2063 855 Fax 011 3006 338
8.	Ministry responsible for science	No information
9.	Ministry responsible for environmental protection Duty service of the sector for control and supervision Division for ionizing and non-ionizing radiation protection	011 311 7657 011 2287 691 062 88 66 088 011 2287 553, 062 8866 913 061 88 66 750
10.	Ministry responsible for health Sector for public health and programme health care	011 269 8 242
11.	Republic Hydrometeorological Service of Serbia (RHMSS) Center for hydrometeorological notification and warning system	011 3050 923 064 8385 001 011 3050 967 011 2542 184 064 8385 268

Table 9 *Information delivered to the public*

No.		
1.	Information delivered to the public in case of a possible accident threat	The following information are mandatorily delivered: - Basic facts on the radioactivity and its impact on people and the environment; - Types of emergencies and their impacts; - Measures intended to warn, protect and assist wider public in case of an accident; - Relevant information on the measures to be taken by the wider public in case of an accident.
2.	Information delivered to the public in the area threatened by an accident	The public under accident threat is delivered the following information: (a) information on the type of accident and its characteristics (e.g., its origin, scope and likely development); (b) advice on the protection that, depending on the type of accident can: - include a recommendation to remain in closed premises, to limit intake of certain foodstuffs that can be contaminated, simple rules on hygiene and decontamination, sharing and using protection substances, manner of and route for evacuation; - be followed up by special warnings for certain categories of the public; (v) announcements containing recommendations to abide by the instructions and requests from the competent institutions.

3.		Where there is pre-alarming stage recognized, the public receives the following recommendations and advice: - to follow the radio and TV news; - the above advice to the institutions with special collective responsibilities; - recommendations to occupationally engaged groups
4.		The information and advice are occasionally supplemented by the basic facts on the radioactivity and its impact on human health and the environment.

Table 10 *Responsibilities and competencies of the institutions included in the response to an accident*

Institution	Competencies
Serbian Radiation Protection and Nuclear Safety Agency	- prepares Draft National Emergency Response Plan; - ensures proper functioning of the network of detectors for continuous ambient dose equivalent measurements from the Early Notification System; - participates in the work of Republic Disaster Response Headquarters; - provides expert support, conducts the assessments during and after an accident; - requires extraordinary radioactivity monitoring; - engages approved legal entities; - monitors and coordinates the duties of the approved legal entities in terms of implementing the established protection measures and procedures; - in accordance with the situation assessment, proposes the additional protective measures serving to mitigate the accident consequences: - prepares and delivers the first official public announcement and participates in preparing further public announcements; - informs the IAEA and the neighbouring states on an accident in the Republic of Serbia; - receives the information from the IAEA and the neighbouring states in case of an accident outside the territory of the Republic of Serbia; - provides the information for the ministries on the accident and the event development; - prescribes and coordinates the extraordinary radioactive monitoring; - exchanges the information from the Early Warning System with the neighbouring states; - exchanges the radiological data via EURDEP.

Ministry responsible for the interior	- coordinates the work with all subjects in the protection and rescue system in terms of the organization, planning, preparation and the implementation of the measures and activities of risk prevention and mitigation, protection and rescue; - ensures the participation of police forces and other organizational units of the Ministry responsible for the interior in the implementation of the measures and performance of protection and rescue tasks; - prepares for and provides the security of the premises, infrastructure and the facilities relevant for the implementation of the measures and completion of the protection and rescue tasks; - sets up, organizes and equips the specialized units of civil protection in the Republic of Serbia and the administrative districts, organizes, supplies, services, maintains and stores the equipment used for protection and rescue needs; - maintains the records on human and material resources for the use of protection and rescue, and requires a partial mobilization of necessary human and material resources; - performs other duties in accordance with the law.
MoI SEM	- preserves the conditions necessary for normal life and makes preparations for overcoming the circumstances of fire, natural disasters, technical and technological hazards, the effect of hazardous material and other circumstances, a large-proportion hazards that can pose threat to people's health and lives and the environment or lead to a large-scale damage, and provides assistance in eliminating the consequences of the emergency situations; - implements preventive measures serving to prevent fire, mitigates the consequences of natural disasters, technical and technological hazards, etc.; - participates in organizing and coordinating protection and rescue activities in case of radiological and chemical hazards (hereinafter referred as: RHB) and accidents. In case of radiological emergencies, the specialized units for RHB protection are engaged for the purpose of RHB surveying, dosimetry control, laboratory analyses, human decontamination, decontamination of material and technical means, equipment, soil and facilities, participates in small fire extinguishing, pumping water from flooded facilities, provides drinking water to the public, makes for the disinfection, disinsectization, deratisation and sanitization, as well as any other tasks relating to RHB protection; - organizes telecommunication and information systems for the management and coordination of protection and rescue

	activities, and data and information transfer, and the protection thereof; - organizes the surveying, information, early warning and alerting systems in the Republic of Serbia; - if applicable, engages other specialized civil protection units in accordance with the threat assessment and the situation development.
Ministry responsible for finance Custom Administration	- gives proposals for the use of budget resources; - prepares the proposal of measures to ensure financial resources to eliminate accident consequences; - assesses the capabilities to issue additional budget resources; - maintains control serving to prevent illegal trade in radioactive and nuclear material; - in case of elevated radioactivity, informs the Agency and participates in conducting additional measures; - prevents, detects and investigates any attempts of sending unauthorized shipments of radioactive and nuclear material; - performs any other duties within its remit.
Ministry responsible for foreign affairs	- investigates the possibilities of and requirements to ensure foreign assistance in eliminating the accident consequences; - informs foreign diplomatic and consular missions in the republic of Serbia on the accident consequences and the circumstances affecting the foreign citizens living in the Republic of Serbia; - provides information to the IAEA and other relevant international organizations and agencies headquartered in Vienna and participates in seeking the international assistance; - in case of an accident abroad, establishes contacts with the government of the state where the accident occurred and obtains information on the citizens of the Republic of Serbia living in that country.
Ministry responsible for defense	- performs radiological, dosimetry and meteorological surveys and investigations in the areas under threat together with the other protection and rescue forces; - performs radiological decontamination of people, material assets and soil, together with the other protection and rescue forces; - performs sampling and conducts radiological sample analysis; - assists in the implementation of fundamental protective measures against radioactive contamination; - assists in the evacuation of civilian population; - assists in providing the accommodation and care for the public under threat in case of evacuation; - ensures the engagement of the organizational segments of the Ministry responsible for defense, commands, units and

	institutions of Serbian Armed Forces for providing assistance in protection and rescue in accordance with the law.
Ministry responsible for transportation	- performs the duties related to the transportation organization and safety; - performs the inspection oversight duties; - performs any other duties in accordance with the law.
Ministry responsible for agriculture, forestry and water management	- monitors the circumstances and implements the measures to protect the soil and plants in the areas under threat; - monitors the circumstances and implements the measures to protect the forests, forest soil and the game in the areas under threat; - directs the production, processing and trade, and gives instructions on the safe use of agricultural products, foodstuffs and feeding stuff; - gives recommendations on the processing of primary animal-related products; - limits harvesting and the use of agricultural products, mushrooms, herbs and woodland fruits; - conducts safe destruction of crops not fit for use, takes care of the status of the farms in the area under threat; - prohibits the use of contaminated food and feeding stuff, limits grazing; - proposes alternative sources of safe food, water and feeding stuff; - ensures control and safe production of foodstuffs and feeding stuff based on the data on the accident; - proposes alternative sources of safe foodstuffs, water and feeding stuff; - ensures the control and safe production of foodstuffs and feeding stuff base on the date on the accident; - plans the measures serving to protect the animals (hermetization of establishments for animal keeping, removal of animals from the open space), and animal food and water; - proposes adding protective agents into feeding stuff; - if applicable, proposes animal decontamination with proper storage of contaminated waste; - limits or temporarily prohibits game hunting in certain area and proposes protective measures, measures to preserve and monitor game population and game habitat; - makes recommendations on limiting fishing of certain fish and makes recommendations for the protection of fish in fish ponds; - proposes the measures to restrict (forbid) the trade in the products originating from the contaminated areas; - performs extraordinary and stricter control over transboundary trade.

Ministry responsible for environmental protection	- performs state administration duties relating to the environmental protection; - performs state administration duties relating to radiation protection; - performs inspection oversight in the field of radiation protection; - participates in investigative actions and prescribes rehabilitation measures.
Ministry responsible for science	- performs state administration duties relating to the research in the field of nuclear energy, safety of nuclear facilities, production and temporary storage of radioactive materials except in nuclear energy facilities; - performs inspection oversight over nuclear safety and radioactive waste management measures;
Ministry responsible for health	- gives instructions and defines the conduct of medical teams and manner of providing medical care on all levels in case of radiological accident, and conducts proper training; - ensures sustainable and efficient functioning of emergency medical assistance and hospital care for the injured; - participates in the initial emergency response; - determines which medical institutions can care for the excessively irradiated and contaminated persons; - commensurate with its competencies, provides support, and, if necessary, coordinates the work of health-care institutions in the areas under threat; - monitors the situation and proposes treatment for the irradiated persons abroad; - informs and seeks help from the WHO; - provides for a long-term health surveillance of the persons under threat; - prescribes and implements the measures of additional control of food (within its remit) and drinking water; - if necessary, participates in the identification of persons; - coordinates the activities of planning, preparing for and conducting the evacuation of the patients from hospitals in the areas under threat; - conducts any other duties within its remit.
Local self-government units	- bring decisions on the organization and functioning of civil protection under the jurisdiction of a local self-government unit; - pass the plan and the programme of the protection and rescue system development under the jurisdcition of a local self-government unit; - establish EMH; - determine properly educated legal entities of relevance for the protection and rescue;

	- prepare and pass the Threat Assessment and the Emergency Protection and Rescue Plan; - those local self-government units with nuclear or radiation facilities that can result in an on-site Response Plans in case of a radiological accident.
Republic Hydrometeorological Service of Serbia (RHMSS)	- provides meteorological data; - provides meteorological forecasts; - analyses and processes the data on the transboundary atmospheric radionuclide movement and deposition, and ensures the delivery thereof to the Agency
PC Nuclear Facilities of Serbia (PC NFS)	- provides for the storage and the transport of radioactive material; - analyses and processes the data on the atmospheric radionuclide transport and deposition from the Vinca site and ensures the delivery thereof to the Agency; - conducts decontamination of the working environment and the environment.
Legal entities responsible for radiation protection duties	- conduct the measurements within their competences; - conduct additional radioactivity monitoring; - perform decontamination of the working environment and the environment; - perform human decontamination; - conduct dose assessments; - participate in the assessment and analysis of the radiation circumstances.
Users of sources - licensees	- in case of an accident, the legal entities performing nuclear activities and the legal entities performing radiation practices are responsible for: - implementing prompt and immediate measures serving to mitigate the accident consequences; - assessing the situation and implementing the Emergency Response Plan; - establishing the command point, room, premises from which the event is managed and the information exchanged; - the protection of people in the vicinity of the accident location, outside the internal cordon areas; - informing the local self-government units; - giving recommendations for protective measures and providing technical assistance in the vicinity of the accident location; - the environmental radioactivity monitoring.

Table 11 *Classification of accident risk levels – classes of hazards*

Class of hazard	Accident characteristics
General hazard	General hazard implies a significant risk from the release of the radioactive substances into the environment or the risk from radiation exposure, which requires prompt off-site protective measures.
On-site accident	On-site accident implies a significant decline in the level of the protection of the people on the site and in the vicinity of the facility, which requires prompt protective measures so as to mitigate the consequences, to protect the people on the site, and to implement off-site protective measures.
Accident within facility	Accident which implies a significant decline in the level of protection of the people in the facility but not posing a threat to the people outside the facility site.
Alert	Alert is released in case of decline in safety or a significant decline in the level of the protection of the public or people on the site. Prompt assessment and mitigation measures are implemented, and on-site and off-site accident response participants are placed on standby.
Other emergencies	The emergencies which involve incidents with sources out of regulatory control – loss, theft of a dangerous source or loss of control over a dangerous source, re-entry of a nuclear-powered satellite incorporating a dangerous source.

Table 12 *Overview of the buildings/rooms that have to be included in the Accident Response Plan*

Building/Room	Use	During accident
Operational center (Alert center)	Exchange of information on the accident in order to alarm and activate the authorities and institutions, 24 hours seven days a week	Operational Centre of MoI SEM
Meeting center	Location designated to serve as a gathering place for the persons to be moved from the event location or to be protected through evacuation or sheltering	Room in the facility or adapted premises in the vicinity of the accident location
Help center	A place where the public can seek help – financial, communication-wise, etc.	Adapted place in the vicinity of the accident location accessible to the public
Information center	Providing relevant accident-related information to the public and the media	Specially-designated room in the facility; Room designated by the competent EMH; Improvised and adapted area in the field outside the area where

		prompt protective measures are implemented
Command point	Decisions on future actions and activities, as well as activation of the appropriate response forces	A room within the facility designated in advance with capacities to maintain communication; A room designated by the competent EMH; In the field – a place in the vicinity of the accident location, outside the established areas
Monitoring and assessment center	Coordination of radiological monitoring, sampling and assessment	A location established depending on the accident and the circumstances in the field
Public processing center	Location where radiological and medical triage of the threatened, monitoring and human decontamination are performed, immediate medical care is provided, and referral to the competent medical centers is arranged	Area established in the vicinity of the accident location with a proper access point for medical transport
Health institution admitting the irradiated/contaminated	Health institutions with capacities to treat irradiated and/or contaminated persons	Determined by the Ministry responsible for health

Table 13 *Overview of contact data related to the implementation of the Plan, available equipment and professional resources of the institutions and approved legal entities for radiation protection duties*

Institution	**Institution address/tel.**	**Contact telephone related to Plan implementation**	**No. of experts**	**Equipment/pieces**
1.Institute for Occupational Health, Nis, Diagnostic Laboratory Service, Radiation Protection Ward	18000 Nis Vojislava Ilića b.b. 018 232801 018224878 Management/Director	018 4576 148 066 8604 307	6/2	HP Ge/one Alpha beta counter /one Dosimetry for ambient dose rate equivalent measurement /five
2.KVARK d.o.o.	34000, Kragujevac, Karađorđeva 33	034 333 229 034 352 702	1/3	Spectrometer AT6101/one Personal dosimeter DMC 2000 X/one Ionizing chamber

				451p-RYR/one Contamination meter MOKO 100/one Radiation monitor TBM 15C/one Radiation monitor TBM 15D/one
3.Vinca Institute of Nuclear Sciences Department of Nuclear and Plasma Physics	Beograd 11351 Vinca, Mike Alasa 12-14 3408-314	011 3408 148 011 6308 866	8	HPGe/two NaI(Tl)/one Alpha spectrometer/one
4. Institute for the Application of Nuclear Energy INEP, University of Belgrade	Beograd, 11080 Zemun, Banatska 31b	011 2199 242 011 2618 666/112 011 2617 252 011 2619 252	5	HPGe/one
5. Faculty of Sciences, University of Novi Sad Department of Physics, Chair of Nuclear Physics, Laboratory for radioactivity testing in samples and ionizing and non-ionizing radiation dose testing	21000 Novi Sad, Trg Dositeja Obradovića 3	021 459 368 021 4852 823	10	HPGe detectors/four Liquid scintillation detector Quantulus 1220/one Well type NaI detector (NaI "9 x9") /one Portable dosimeter/twelve Portable radon detector RAD7/two Portable neutron dosimeter/one
6. SP Laboratory a.d. Becej	21220 Becej, Industrijska 3 021/6811-603	021 6811 603	2/2	Ionizing radiation measuring device Quantulus, 1220-003, Perkin Elmer/one
7. Serbian Institute of Occupational Health	Deligradska 29, 11000 Belgrade, 011/3400958; 011/ 3400929 Fax: 011/ 2643-675	011 3400 958 011 3400 994	6/6	HPGe detector/one Alpha beta counter/one portable γ and neutron radiation meter /one

8. Scientific Veterinary Institute of Serbia	Vojvode Toze 14 11000 Belgrade	011 6673 759	3	HPGe/one
9. PC Nuclear Facilities of Serbia (PC NFS)	Mihajla Petrovića Alasa 12-14, Vinca, Belgrade, office@nuklearniobjekti.rs Tel.: 011 3408 642 Fax: 011 644 74 57	062 8869 104 062 8869 101 062 8869 004 062 8869 107	21	Department for Development and Application of Nuclear technologies (SRPNT): HPGe (XtRa, Coaxial in Pb shield) γ-spectrometer/one HPGe (Coaxial in Pb shield) γ - spectrometer with Pb/Fe collimators /one Si (PIPS) β - spectrometer/one Si (CAM) α - spectrometer/one α/β stationary proportional counter with gas protocol/one Portable HPGe (Coaxial in Pb shield) γ-spectrometer with Pb/Fe collimators/one Portable CdZnTe γ - spectrometer with W collimators/two Portable NaI γ - spectrometer with Pb/Fe collimators/five Portable β/γ surface activity counters /eight Portable α/β surface activity counters /four Portable monitor for α and β aerosol and radon

				activity measurement in the air /three Portable monitor for radioactive gases activity measurement in the air za (tritium, 85Kr, xenon etc.)/one Portable mini – dosimetry system for γ - radiation/three Portable dosimeter of γ - radiation/six Portable dosimeter of β - radiation/four Portable dosimeter of neutron radiation /two For all γ and β radiation detectors, SRPNT, in addition to experimental calibration (using standard sources), provided numeric calibration (using Monto Carlo programme MCNP5) Department for radiation safety (SRS): HPGe detector/one Proportional alpha and beta counter /one Liquid scintillation spectrometer/one Portable gamma spectrometer/two Portable dose rate

				monitor - identifier/four Ionizing chamber/five Dose rate monitor including three teletectors /20 Neutron radiation monitors/two Contamination monitors/five WBC measuring chain/one TL, OSL; EL dosimeters Stationary GM probe incorporated in the local early warning system of an accident /six Department for radioactive waste management (SURAO): Portable γ radiation detector/four Portable NaI temperature stable γ spectrometer/one
10. Vinca Institute of Nuclear Sciences, Department of Radiation and Environmental Protection	Mihaila Petrovića Alasa 12-14, Belgrade, 11351 Vinca	011 2453 867 011 3408 484 011 3408 461	10	HPGe/three Portable HPGe/one Portable NaI/one Alpha beta counter/one Dosimeter for dose rate measurement /eight Portable neutron dosimeter/two Portable scintillation detector/two

				Ionizing chambers/two
11. Faculty of Veterinary Medicine, University of Belgrade, Department for radiology and radiation hygiene	Bulevar oslobođenja 18, 11000 Belgrade	011 2685 291	2	HPGe/two
12. Vinca Institute of Nuclear Sciences, Department of Chemical Dynamics and Permanent Education	Mihaila Petrovića Alasa 12-14, Belgrade, 11351 Vinca	011 6455 654 064 8505 010	4/1	HPGe/three Ambient dose rate equivalent meter Atomteex AT6130/one